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

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State of Biodiversity for Food and Agriculture in Bangladesh

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LIST OF ABBREVIATIONS

ADB	Asian Development Bank
AFACI	Asian Food & Agriculture Cooperation Initiative
BAPA	Bangladesh Paribesh Andolon
BARC	Bangladesh Agricultural Research Council
BARI	Bangladesh Agricultural Research Institute
BAU	Bangladesh Agricultural University
BCCRF	Bangladesh Climate Change Resiliance Fund
BCCSAP	Bangladesh Climate Change Strategy and Action Plan
BDKN	Bangladesh Disaster Knowledge Network
BECA	Bangladesh Environment Conservation Act
BELA	Bangladesh Environment Lawyers Association
BFRI	Bangladesh Forest Research Institute
BINA	Bangladesh Institute of Nuclear Agriculture
BJRI	Bangladesh Jute Research Institute
BLRI	Bangladesh Livestock Research Institute
BMO	Biodiversity Management Organization
BNH	Bangladesh National Herbarium
BRAC	Bangladesh Rural Advancement Committee
BRRI	Bangladesh Rice Research Institute
BSMRAU	Bangabandhu Sheikh Mujibur Rahman Agricultural University
BSRI	Bangladesh Sugarcrop Research Institute
BTRI	Bangladesh Tea Research Institute
BYEI	Bangladesh Youth Environmental Initiative
CBA	Community Based Association
CBD	Convention on Biological Diversity
CBOs	Community Based Organizations
CCA	Climate Change Adaption
CCGT	Combined Cycle Gas Turbine
CDB	Cotton Development Board
CIGs	Common Interest Groups
CREL	Climate-Resilient Ecosystems and Livelihoods
CWBM	Coastal & Wetland Biodiversity Management
CZP	Coastal Zone Policy
DAE	Department of Agricultural Extension
DLS	Department of Live Stock
DoE	Department of Environment
DoF	Department of Fisheries
DoL	Department of Livestock
ECA	Ecologically Critical Area
ECOFISH	Enhanced Costal Fisheries Project
ECR	Environment Conservation Rules
EWS	East West Seed (Bd.) Ltd. (Now Lal Teer Seed Limited)
FAnGR	Farm Animal Genetic Resources

FAO	Food and Agriculture Organization
FD	Forest Department
FFSs	Farmers Field Schools
GCC	Global Climate Change
GDP	Gross Domestic Product
GIZ	Gesellschaft fur Internationale Zusammenarbeit
GPA	Global Plan of Action
GOB	Government of Bangladesh
HRC	Horticulture Research Centre
ICM	Integrated Crop Management
ICZM	Integrated Coastal Zone Management
ILCCP	Integrated Livestock and Crop Conservation Project
ILRI	International Livestock Research Institute
INSARAG	International Search and Rescue Advisory Group
IPM	Integrated Pest Management
ITPGRFA	International Treaty on Plant Genetic Resources for Food and Agriculture
IUCN	International Union for Conservation of Nature
MACH	Management of Aquatic Ecosystem through Community Husbandry
MDGs	Millennium Development Goals
MoA	Ministry of Agriculture
MoEF	Ministry of Environment and Forest
MPA	Marine Protected Area
NAEP	New Agricultural Extension Policy
NAPA	National Adaptation Programme of Action
NARS	National Agricultural Research System
NATP	National Agricultural Technology Project
NBSAP	National Biodiversity Strategy and Action Plan
NCS	National Conservation Strategy
NEMAP	National Environment Management Action Plan
NGOs	Non-Government Organizations
NISM-GPA	National Information Sharing Mechanism- Global Plan of Action
NRM	Natural Resource Management
NSB	National Seed Board
NSP	National Seed Policy
NWMP	National Water Management Plan
OP	Open Pollinated
ORC	Oilseed Research Centre
PGR	Plant Genetic Resources
PGRFA	Plant Genetic Resources for Food and Agriculture
PIC	Prior Informed Consent
PKSF	Palli Karma Shahayak Foundation
PRS	Poverty Reduction Strategy
PRSP	Poverty Reduction Strategy Paper
RARS	Regional Agricultural Research Stations
SAARC	South Asian Association for Regional Cooperation
SCDP	Second Crop Diversification Project

SDMC	SAARC Disaster Management Centre
SFG	Small Farmers Group
SIS	Small Indigenous Species
SNC	Second National Communication
RCC	Red Chittagong Cattle
RIMES	Regional Integrated Multi Hazard Early Warning System
SEMP	Sustainable Environment Management Plan
SRTI	Sugarcane Research and Training Institute
TRIPS	Trade Related Aspects of Intellectual Property Rights
UBINIG	Policy Research for Development Alternative
UNDP	United Nations Development Program
UNEP	United Nations Environmental Programme
UNFCCC	United Nations Framework Convention of Climate Change
USDA	United States Department of Agriculture
VCG	Village Conservation Groups

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EXECUTIVE SUMMARY

Bangladesh is situated between $20^0$34' and $26^0$38' in the North latitude and between $88^0$01' and $92^0$41' East longitudes. The total area of Bangladesh is 147,570 sq. km of which 89.76% is land and 10.24% comprised of water. Bangladesh agriculture contributes of the GDP. It is a sub-tropical country having all types of sub-tropical production systems. Bangladesh is rich in biodiversity of crops, fishes, farm animals and forest frees used for food and agriculture. Bangladesh is blessed with immense biodiversity of rice, jute, legumes, pulses, oil seeds, taro, sweet potato, litchi, melon, citrus, mango, jackfruit, jamun, guava, plantain, areca nut, coconut and jujube species. It also possesses rich diversity of vegetables, leafy vegetables and spices crops. Out of 8000 rice land races of Bangladesh, BRRI has conserved 5132 local rice germplasm accessions. BARI has a reasonable collection of oilseeds, pulses, cereals other than rice, vegetables, spices, fruits and other crops. The PGRC of BARI is maintaining 9490 accessions of 129 different agrihorticultural crops.

Bangladesh is rich in farm animal diversity. The total livestock population is composed of 23.20 million cattle, 25.11 million goats, 1.44 million buffalo, 3.08 million sheep, 242.8 million chicken and 45.7 million ducks. Most of the species are indigenous type. Exotic and commercial types are about 20% cattle and 25% chicken. A 50 cow Nucleus herd formation has been done for RCC which has been transferred to a rural community for maintenance and increase. Conservation programs through 40 cow herd of Pabna cattle, a Black Bengal goat selection, Stock of indigenous non-discript, necked neck and hilly chicken conservation is in execution on station at the BLRI.

Bangladesh is very rich in indigenous fishes. Its water bodies known to be the habitat of 267 species of fresh water fishes, 475 marine fishes, 24 exotic fishes and a number of other vertebrates and invert-brates. Among the documented aquatic fauna, finfish tops the list, followed by the crustaceans and molluscs. Production of inland capture fisheries declined from 90% in 1960s to 42% in 2010-11 while the aquaculture contributed about 48%.

The total forest of the country is 2.52 million ha out of which 83% are natural forests while 17% is plantation forests. Evergreen and semi evergreen forest cover 43% of the total forest land while natural mangrove forest covers 40%. Natural forests are decreasing while the planted forests are increasing.

Overall biodiversity of Bangladesh used for food and agriculture has been decreasing. In crop sector, the expansion of a few successful HYVs because of the demand of higher production, has replaced many land races. Many of the varieties, although conserved in gene banks, are not available in the field. The introduction of good hybrid varieties of vegetables is replacing the local varieties in the field. The similar trend is observed for other crops. Importation of livestock genetic material with indiscriminate cross breeding and a clear neglect of indigenous breeds pushed a number of native breeds of livestock under threat of extinction. In recent years the production of inland open water bodies is decreasing alarmingly. As per IUCN 2000 Red list, 54 indigenous riverine fishes are threatened. A study of 2014 reported 100 riverine fishes under threat and a number of species are already lost. Huge amount of Bangladesh forest have been lost due to encroachment for aquaculture and agriculture during the last two decades.

The major drivers causing the decrease of the biodiversity for food and agriculture are common for all the sectors. Rapid growth of population, expansion of human settlement and agriculture, shifting cultivation, habitat degradation and destruction are the major threats to biodiversity in Bangladesh. Change in land use pattern and hydrological regime have had detrimental effect on biodiversity.

Terrestrial and aquatic ecosystems are polluted by discharges of untreated industrial elements, domestic organic and inorganic wastes and agro-chemicals. Over exploitation of biodiversity components is also a threat to biodiversity. Some invasive alien species of fishes and plants have had detrimental effect on biodiversity and ecosystems. Expansion of monoculture, use of a pesticides, loss of agricultural land and introduction of high yielding of varieties/breeds crops, fishes, livestock and forest trees, are also playing negative impact on biodiversity. No systematic research has been carried out on associated biodiversity and no specific data could be provided on the decrease of various biodiversities present in and around various production systems of the country. The associated agriculture biodiversity has also been decreasing because of the above reasons. No good policies are in place giving due importance to associated biodiversity in Bangladesh.

A number of policies have been adopted giving more emphasis on increasing productivity where the importance of the issues of maintenance and conservation of biodiversity for food and agriculture has given low priority. The knowledge gap and the ignorance of the role of biodiversity for food and metritional security of the policy markers were responsible for these. A number of strategies programmes and projects are undertaken in all sectors of agriculture which directly or indirectly playing role in the maintenance of biodiversity and in the restoration of the ecosystems, particularly the inland water and forest ecosystems. Under the Development and Management Schemes and projects by DoF, 500 fish sanctuaries were established by 2012 which have become important and efficient tool for management in protection and conservation of fishes and other aquatic organisms. Conservation of aquatic and terrestrial animals and plants by creating safe habitat is enhanced through the establishment of wetland sanctuaries. The initiatives taken by DoF for the management of Ecologically Critical Areas, establishment of National parks, IBAs, Ecoparks and Safari parks, MPA, VCF and declaration of Ramsar site, East Asian Australian Flywary site, World Heritage site have had positive effect in the maintenance and conservation of biodiversity. In crop sector, DAE has been implementing projects on IPM approaches and organic agriculture to enhance safe crop production along with restoration of environment. In livestock sectors, initiatives have been taken where only a few local breeds of cattle and a goat breed conservation and improvement programe is in execution. However, the efforts taken are not enough to maintain and conserve the ecosystems and the biodiversity unless they are continued and strengthened further.

Biodiversity conservation in crop sector has had strong footings in Bangladesh as collection and conservation activities started in 1980s which are still continuing in BRRI, BARI, BJRI, BSRI, BINA and private sectors and agricultural universities. However, the lack of fund and skilled man power and lack of proper co-ordination because of lack of national PGR authority, the PGR activities are very traditionally carried out. Due to lack of policy and programmes the wild crops and wild relatives of crops and the soil biodiversity and the pollinators and predators are quite ignored. The government of Bangladesh and a number of NGOs have taken a number of regulatory and development interventions for sustainable management of the natural fisheries. Several acts, plans and programmes are in place to reverse/slow down the trend in fisheries. However, some of the project based initiatives become inoperative if the practices are not monitored and programmes are not continued. Programs towards improving livelihood of rural poor through conservation of indigenous FAnGRs of Bangladesh is minimum. Programs based on rigorous screening of genetically superior animals/birds from wider local populations are yet to be piloted. Potential indigenous populations of the country are under threat where well-designed and systematic programme based on genetic screening and open nucleus breeding is yet to be attempted. The Government of Bangladesh have enacted acts policies and legislations, and also have established some community institutions for co-management of forests and wetlands. Co-management practices have been implemented in forest and wetland ecosystems that

have been accessible to local communities as common pool natural resources for their livelihoods. The future success of landscape co-management would depend largely on successful implementation of such lessons in establishing gainful partnerships with key stoke holders.

Although Bangladesh has prepared NBSAP in 2006, the initiatives were not taken as per NBSAP as the biodiversity issues were not mainstreamed into sectoral and cross-sectoral policies. As no national body for the maintenance and conservation of biodiversity is in place having representation from different sectors of agriculture, the linkage among the different sectors are very weak. There is lack of co-ordination, collaboration and co-operation with relevant government and non government sectors, universities and institutes. The policy planners are yet to be fully convinced about the contribution of ecosystem goods and services to the gross national economy and sustainability of the overall development of the country. The revised NBSAP and the enactment of Bangladesh biodiversity Act would be instrumental in taking right policies, framing rules and regulations that might enhance conservation and utilization of biodiversity for food and agriculture.

CHAPTER 1
INTRODUCTION TO THE COUNTRY AND TO THE ROLE OF BIODIVERSITY FOR FOOD AND AGRICULTURE

1.1. General overview of the country

2. In a few paragraphs, provide a synthetic overview of your country, including the size, location, and main physiographic and climatic features. Include a section on human population, providing disaggregated data on women and men's contribution and involvement in agriculture. Briefly discuss as well the overall nature and characteristics of the economy, including the contribution of the different sectors. You may wish to draw upon the country overviews provided in the first chapters of previous and ongoing Country Reports on Forest, Aquatic, Animal or Plant Genetic Resources.

Bangladesh is a South Asian Country, situated between $20^0$34' and $26^0$38' in the North latitude and between $88^0$01' and $92^0$41' East longitudes. The country is surrounded by Indian territories in the west, the north and the east, except a small strip in the southeast by Myanmar. The Bay of Bengal lies in the south. The total area of Bangladesh is 147, 570 sq. km, of which around 89.76% is land and 10.24% comprised of water. In Bangladesh the total area of agricultural land makes up 65% of the geographic surface, forest land accounts for almost 17.5% (FD 2004), while urban areas cover 8% of the land. Water and other land uses account for the remaining 10%. About 8.50 million hectares cutivable land is used for crop agriculture. Inland open waters and closed waters cover 6.96 million hectares and the forest of different types covers almost 2.53 million hectares.

The climate is sub-tropical monsoon, marked by sweltering temperature in summer months. Six seasons are generally recognized of which four are very conspicuous: winter (December-February), summer (March-May), monsoon (June-August) and autumn (September-November). Temperature ranges from 5^0C to 28^0C in winter and 22^0C to 40^0C in summer months. Humidity ranges from 60 to 70 percent in winter and 80 to 98 percent during the wet summer months. Rainfall varies 1429 mm in the north and North West parts to 4338 mm in the east and southeast parts. About 60 percent of the total rainfall is concentrated in the monsoon season, with occassional shower in summer, and hardly any rainfall in the autumn and winter.

The population of the country is estimated as 157.9 million in 2014-15. The rate of population increase as per census held in 2012 is 1.39. The population is expecting to be 190 million in 2030. Gross birth rate in 2012 was 18.9 per 1000 person while the gross death rate was 5.3 in the same year. About 45 percent population is involved in agriculture and the rest in non-agricultural activities (BER, 2015) The Bangladesh agriculture and forest sector contribute 16.50 percent to GDP. Of these the contribution of crop agriculture is 9.28 percent.

In 2013-14 financial years, the contribution of fisheries sector was 3.69 percent in GDP. However, this sector contributes almost 23 percent of total Agricultural income of the country (BER, 2015). The total production of fisheries was 35.48 lakh ton in 2013-14. The contribution of livestock sector was 1.78 percent in 2013-14 considering 2005-06 financial year as base year. The forest sector however, contributes about 1.43 percent in GDP (BBS, 2014).

Bangladesh has been divided into 30 agro-ecological zones and 88 subzones on the basis of physiographiy, soil properties, soil salinity, depth and duration of flooding which are relevant for land

use and for the assessment of agricultural potential. The general agro-ecological variations of Bangladesh range from below sea-level basins to small hills. Physiographically, Bangladesh has three categories of lands: flood plain (80%), terraces (8%) and hills (12%) (Jahangir, 2015).

1.2. Role of biodiversity for food and agriculture

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.

Bangladesh has diverse crop biodiversity. It is blessed with immense biodiversity of rice, jute, millets, legumes, pulses, oilseeds, taro, yam, sweet potato, litchi, melon, citrus, mango, jackfruit, jamun, guava, banana, plantain, areca nut, coconut, and jujube spp. It also possesses rich diversity of vegetables (e.g., brinjal, okra, cucurbits etc.), leafy vegetable and spices crop.

Food grain production in Bangladesh has been reached to 35088000 M Tons with the production of 33833000 M Tons of rice and 1255 Million Tons of wheat in 2012-13. Bangladesh has almost achieved self sufficiency in food grain production. She is more than sufficient in potato production. The production of pulses, oil seeds, vegetables, fruits is 2110000 M Tons, 804000 M tons, 2931 M Tons, 4360 M Tons respectively. Rice is cultivated 76.11% cultivable land where wheat, oil seeds and pulses cover only 2.78%, 2.71% and 1.89% respectively. However, Bangladesh has to import wheat, oil seeds and pulse to meet the demand of the people.

As regards to crop biodiversity, there were over 8000 rice land races in Bangladesh (Haque and Mia, 1989) which has now been reduced to around 50 land races because of the cultivation of few high yielding varieties. Most of the land races are in cultivation where HYVs cannot be cultivated. However, BRRI gene bank has 5132 local rice germplasm accessions conserved for short, medium and long term periods. The gene bank of BARI has a reasonable collection of the diversity that exists within the country for crops like oilseeds, pulses, millets, yam, egg plant, okra and other vegetables. The PGRC of BARI is maintaining 9490 accessions of 129 different agri-horticultural crops in the gene bank and at the field gene bank. Mostly the land races are collected from different regions of Bangladesh. Among them 1661 accessions are creals other than rice, 3408 pulses, 427 oilseed, 3582 vegetables, 165 spices, 91 fruits, 120 vegetative plants and 36 other crops (Al Amin *et al.,* 2012). BSRI has conserved 1132 sugarcane of which 321, 177 and 591 are exotic, indigenous and Institute bred accessions. The institute has 43 wild *Saccharum spontenum* accessions. BJRI has conserved 52 species of jute, kenaf, mesta and allied genera having total accession number of 6012.

Bangladesh is rich in farm animal biodiversity. The species of interest are cattle, buffalo, goat, sheep, horse pig, rabbit, chicken, duck, geese and pigeon. Most of the species are indigenous type having breeds/types with enormous diversity. Exotic and commercial types cover about 20% cattle and 25% chicken (Bhuiyan, 2014). The total livestock population of Bangladesh is composed of 23.20 million cattle, 25.11 million goats, 1.44 million buffalo, 3.08 million sheep, 242.8 million chicken and 45.7 million ducks (DLS, 2012). Bangladesh can meet up the requirement of milk, meat and egg by 20.41%, 35.96% and 47.45% respectively which indicates the huge shortage of livestock products in

Bangladesh.

Importation of inappropriate genetic material with indiscriminate cross breeding and a clear neglect of indigenous breeds have created a situation, where a number of native breeds of livestock are under threat of extinction (MOFL, 2007). A 50 cow Nucleus Herd formation has been done in BAU which was transformed into a rural community for RCC conservation. Conservation programs through 40-cow herd of Pabna Cattle, a Black Bengal goat selection, flocks of indigenous Non-descript, Nacked Neck and Hilly Chicken conservation is in execution on-station at the BLRI.

Fish has been an integral part of the people of Bangladesh. The sector plays a vital role in the country's economy, employment generation, animal protein supply and foreign currency earning and poverty alleviation. The people of Bangladesh largely depend on fish to meet their protein needs in both rural and urban areas. Bangladesh's water bodies are known to be the habitat of 267 freshwater fishes, 475 marine fishes, 24 exotic fishes and a number of other vertebrates and invertebrates. During 1960s, the inland capture fisheries contributed about 90% of the country's total fish production. Production from inland capture fishers has declined significantly over the years and in 2010-11 it accounted only about 42%. Due to the rapid increase of aquaculture production and sharp decrease of capture fishery production in 2010-11, the aquaculture contributed (about 48%) more than inland capture fisheries in total fish production of the country (DoF 2012). Among the documented aquatic fauna, fin fish tops the list, followed by the crustaceans and molluscs.

In recent years the production of Inland open water bodies is decreasing alarmingly. Many fishes are either endangered or critically endangered. Many have already become extinct from the water of Bangladesh. According to the Red list, 54 indigenous riverine fishes are threatened (IUCN-Bangladesh 2000). As per recent study by the BAU (2009-10), more than 100 riverine fishes are presently under threat and a number of species are already lost (Hossain, 2014). The government policy has enhanced CBFM, establishment of fish sanctuaries, fish stock enhancement, fish habitat improvement for the protection, conservation and management of fisheries resource of the country.

Forests have a widely realized contribution to Bangladesh. Besides providing timber and other NTFPs for human consumption, forests also provide cultural values. Forests in Bangladesh are rich in plant and animal genetic resources. The total forest includes classified and unclassified state lands, homestead forest and tea and rubber garden. Of the 2.13 million ha of forest land, the Forest Department manages 1.53 million ha including hill, sal and sundarban forests (FAO, 2006). By 2012, the forest of different types covers 2.67 million ha which are 17.72% of the total area of the country (Hassan, 2012).

The forest has got flora and fauna of immense importance for food and nutrition. The Encyclopedia of Flora and Fauna of Bangladesh (2007-09) recorded 3611 taxa of angiosperms from the Bangladesh territory By 2013, eight new species has been recorded (Irfanullah, 2013) and very recently BNH recorded 40 more new species, However, the total of angiosperms recorded upto 2015 is 2723 (Ara and whan, 2015). Huge amount of Bangladesh forest have been lost due to encroachment for aquaculture and agriculture during the last two decades.

Bangladesh has certain obligations as a signatory of a number of international movements, however, the issues of conservation and protection of forest biodiversity had low priority here. The forest resources are conserved both in situ and *ex situ* conditions. *In situ* conservation covers nature reserve, reforestation, development of seed orchard, seed stands etc. Bangladesh has B4 protected areas

including 17 national parks and 17 wild life sanctuaries upto 05-03-2012. Bangladesh has set up 2 Safari parks, 1 Marine protected areas, 2 Vulture Save Zone, 7 ecoparks as well.

As regards food security and nutrition, diets have improved considerably since 1990-92 in both quantity and quality. Per capita availability of dietary energy increased from 2155 kcal/person/day in 1990-92 to 2413 in 2010-12, while the availability of protein increased from 46 gm/person/days to 56 gm/person/day and the availability of fat increased from 20 to 28 gm/person/day. Diet, however, is not balanced as cereals, particularly rice and wheat account for over 70% of the total intake of dietary energy per person per day.

1.3. Production systems in the country

4. Indicate, for each of the production systems listed in Table 1 below, whether it is found in your country or not (Y: yes, N: no), regardless of its importance.

Table 1. Production systems present in the country.

Sector	Code	Production system names	Present (Y/N)
Livestock	L1	Livestock grassland-based systems: Tropics[6]	N
	L2	Livestock grassland-based systems: Subtropics[7]	Y
	L3	Livestock grassland-based systems: Temperate[8]	N
	L4	Livestock grassland-based systems: Boreal and /or highlands[9]	N
	L5	Livestock landless systems: Tropics	N
	L6	Livestock landless systems: Subtropics	Y
	L7	Livestock landless systems: Temperate	N
	L8	Livestock landless systems: Boreal and /or highlands	N
Forests	F1	Naturally regenerated forests: Tropics	N
	F2	Naturally regenerated forests: Subtropics	Y
	F3	Naturally regenerated forests: Temperate	N
	F4	Naturally regenerated forests: Boreal and /or highlands	N
	F5	Planted forests: Tropics	Y
	F6	Planted forests: Subtropics	N
	F7	Planted forests: Temperate	N
	F8	Planted forests: Boreal and /or highlands	N
Aquaculture and Fisheries	A1	Self-recruiting capture fisheries: Tropics	N
	A2	Self-recruiting capture fisheries: Subtropics	Y
	A3	Self-recruiting capture fisheries: Temperate	N
	A4	Self-recruiting capture fisheries: Boreal and /or highlands	N
	A5	Culture-based fisheries: Tropics	N
	A6	Culture-based fisheries: Subtropics	Y
	A7	Culture-based fisheries: Temperate	N
	A8	Culture-based fisheries: Boreal and /or highlands	N
	A9	Fed aquaculture: Tropics	N
	A10	Fed aquaculture: Subtropics	Y

	A11	Fed aquaculture: Temperate	N
	A12	Fed aquaculture: Boreal and /or highlands	N
	A13	Non-fed aquaculture: Tropics	N
	A14	Non-fed aquaculture: Subtropics	Y
	A15	Non-fed aquaculture: Temperate	N
	A16	Non-fed aquaculture: Boreal and /or highlands	N
Crops	C1	Irrigated crops (rice) : Tropics	N
	C2	Irrigated crops (rice) : Subtropics	Y
	C3	Irrigated crops (rice) : Temperate	N
	C4	Irrigated crops (rice) : Boreal and /or highlands	N
	C5	Irrigated crops (other) : Tropics	N
	C6	Irrigated crops (other) : Subtropics	Y
	C7	Irrigated crops (other) : Temperate	N
	C8	Irrigated crops (other) : Boreal and /or highlands	N
	C9	Rainfed crops : Tropics	N
	C10	Rainfed crops : Subtropics	Y
	C11	Rainfed crops : Temperate	N
	C12	Rainfed crops : Boreal and /or highlands	N
Mixed[10]	M1	Mixed systems (livestock, crop, forest and /or aquatic and fisheries): Tropics	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	N
	M4	Mixed systems (livestock, crop, forest and /or aquatic and fisheries): Boreal and /or highlands	N
Others	01	Vegetables in floating beds	Y

5. List in Table 2 the production systems that have been identified as occurring in your country in Table 1, indicating the codes and/or the names of the production systems as provided.

Table 2. Production systems present in the country.

Code of production system	Name of production system	Description
L2	**Livestock grass land based systems : sub-tropics**	Most of the farm animals are raised by small farmers who own 1-2 heads of cattle, 2-3 heads of goat, 1 sheep and a few poultry birds. Management system is a combination of both fethering and scavenging with or little inputs for breeding, feeding and healthcare. This type of subsistance farming system covers nearly 80% of the livestock farming environment while the rest being of commercial production system. In some cases, livestock keepers with their herds move in char and fallow land for feed of their animals.
L6	**Livestock landless system: sub-tropical**	Poultry industry started with the introduction of laying hens and chickens from different countries. Poultry is reared in landless system both for egg and broiler production. A number of breeds are imported and raised for egg production. With the introduction of hybrid chickens an intigrated and more specialized poultry industry developed in a relatively short period of time in some locations of the country. Specilied hybrid stocks are being imported from a relatively small number of international breeding companies. The number of poultry farm in the country is 148933. There are some duck farms as well, the number in 2009-10 approches to 62604 (Akbar and Hossain,

		2015). Cattle farming in landless system are growing slowly. The farming has mostly started by the exotic and crossbred animals. The farms are established mostly for dairy purposes. The number of dairy farm in Bangladesh was 79847 in 2009-10 periods. Our goat farming is mostly based on our own goat breed 'Black Bengel'
F2	Naturally regenerated forest: Subtropics	Forest is the sum total of the various plants and animal in a place. Total forest of the country is 2.52 million ha which is about 17.49% of the land area of the country. In Bangladesh 83% natural forests and 17% is plantation forests (NFA 2007). Reserved Forest (RF): 12,581, 37.411 ha, (sec20), 55446.526ha (see 4&6), Protected Forest (PF): 3.6996.72 ha, Acquired Forest (AF):11575.44 ha, Vested Forest (VF): 3139.862 ha, Water development board (Embankment): 7,120.00 km. But it is only10% according to UNESCO. According to FAO it is about 9%. Forests of Bangladesh are grouped into three broad categories depending on their location, nature and management type. These are: Mangrove forest, Evergreen and semi evergreen forest, and Moist deciduous forests. Besides these, village is also considered as Village forest. **1. Natural Mangrove Forests:** The largest single tract of natural mangrove forest is the Sundarban. It consists of a total of 6,01,700 hectare which is 4.07% of total landmass of the country and 40% of total forestland. 1,39,700 hectare forest land of Sundarban is declared as World Heritage Site where three wildlife sanctuaries viz.Sundarban East, Sundarban West and Sundarban South wildlife sanctuaries are located. Sundarban harbours 334 species of trees, shrubs and epiphytes and 269 species of wild animals. World-renowned Royal Bengal Tiger is the magnificent animal of the Sundarban. The forest inventory of 1998 exhibits that there are 12.26 million cubic meter timber is available from the species of Sundri (Heritiera fomes), Gewa (*Excoecaria agallocha*), Keora (*Sonneratia apetala*), Baen (*Avecennia officinalis*), Dhundul (*Xylocarpus granatum*), Passur (*Xylocarpus mekongensis*) etc with 15cm and above diameter. Sundri is the most important tree species in the Sundarban which is distributed over 73% of the reserve. Extent of Sundri is followed by Gewa (Excoecaria agallocha), Baen (*Avecinnia offcecinalis*), Passur (*Xylocarpur mekongensis*), Keora (*Sonneratia apetala*) etc. There are some other non-wood forest products like Golpata (*Nypa fruticans*), honey, wax, fish, crab etc which are also of high value. Sundarban is a unique habitat for a number of wildlife. ***2. Evergreen and semi evergreen forest***: Tropical evergreen and semi evergreen forests are extended over Chittagong, Cox's Bazar, Chittagong Hill Tracts and Sylhet. The total area is 6,70,000 hectare which is 4.54% of total landmass of the country and 44% of national forest land. Depending on topography, soil and climate these areas are categorized as i) Tropical wet evergreen forests and ii) Tropical semi-evergreen forests. The hill forests are abundant with numerous plant as well as animal species. Some important flora are Garjan (*Dipterocarpus* spp.), Chapalish (*Artocarpus chaplasha*), Telsur (*Hopea odorata*), Tali (*Palaquium polyanthum*), Kamdeb (*Callophyllum polyanthum*), Uriam (*Mangifera sylvatica*), Jarul (*Legarstromia speciosa*), Civit (*Swintonia floribunda*), Toon (*Cedrela toona*), Bandorhola (*Duabanga grandiflora*) etc. These forests are brought under plantation programme since 1871 with teak in Kaptai. At present, plantation activities are being conducted under development projects. Some valuable plantation species are Teak (*Tectona grandis*), Gamar (*Gmelina arborea*), Mehogani (*Swietenia* spp), Chapalish (*Artocarpus chaplasha*), Jarul (*Legarstromia speciosa*), Koroi (*Albizzia* spp), Chikrassi (*Chikrassia tabularis*), Pynkado (*Xylia dolabriformis*), Kadam (*Anthocephalus cadamba*), Telsur (*Hopea odorata*) etc. There are canes, climbers and ferns etc. in these forests. **3. Moist deciduous Forests:** The Central and Northern districts covering an area of 1,20,000 ha about 0.81% of total land mass of the country and 7.8% of the country's forest land are bestowed with Tropical Moist Deciduous Forests. The important areas are Barind region, Madhupur and Bhawalgore etc.This forest is intermingled with the neighboring settlements and fragmented into smaller patches. Sal (*Shorea robusta*) is the main species there with other associates like Koroi (*Albizzia*

		procera), Azuli (*Dillenia pentagyna*), Sonalu (*Cassia fistula*), Bohera (*Terminalia belerica*), Haritaki (*Terminalia chebula*), Kanchan (*Bauhinia acuminata*), Jarul (*Lagerstroemia speciosa*), Jam (*Syzygium* spp) etc. A recent forest inventory encountered that 3.75 million cubic meter wood available in the sal forests. Presently participatory forestry programme are being implemented here under the social forestry initiatives.
F6	Planted Forest	Bangladesh is a densely populated country in the world and land is very scarce resource in the country. Here per capita forest is about 0.02 ha which is the lowest in the world. The forests of Bangladesh are situated mainly in the south-west (mangroves), south-east and north-east (hill forests) and central-northern (sal forests) parts of the country. There were no national forests in the 28 districts of the country. But now due to social forestry in almost all districts and localities there exists forests. Total forest of the country is 2.52 million ha which is about 17.49% of the land area of the country. In Bangladesh 83% natural forests and 17% is plantation forests (NFA 2007). The community forestry activities introduced by the Forest Department have enhanced the rural forests by raising plantations along the roads and railroads. Between 1991 and 1998, the Forest Department established forest plantations on about 149 000 ha. Another 23 800 km of strip plantations have been raised along the roads and railways. Mangrove afforestation along the entire southern coastal frontier is an innovation of foresters. During 1960-61, Government undertook afforestation programme along the shore land of coastal districts. This initiative got momentum from 1980-81 with the aid of development partners and afforestation programs are extended over foreshore islands, embankments and along the open coasts. Since 1960-61 upto 1999-2000, 142,835 hectare of mangrove plantations have been raised under a number of coastal afforestation projects. The present net area of mangrove plantation is 132,000 hectare after losing some area due to natural calamities. Tree coverage in the village forest are 270000 hectare which acts as the source of a remarkable portion of the national demand of forest produces.
A2	Self-recruiting capture fisheries (SIS): Subtropics	The majority of fish eaten by the rural poor people is the small indigenous fish species (SIS), which have been defined as species which grow to a maximum length of about 25 cm. There are many small fishes in Bangladesh viz. punti (*Puntius* sp.), chapila (*Gudusia* chapra), mola (*Amblypharyngodon* mola), chanda (*Chanda* sp.), bata (*Labeo bata*), pabda (*Ompok* sp.), dhela (*Osteobramcotio cotio*), colisa (*Colisa fasciata)*, kachi (*Corica soborna)*, darkina (*Esomus danricus), bata (Cihinus reba,) magur (Clarias batrachus), shing (Heteropneustes fossilis)* etc., which are potential for freshwater aquaculture. These small fishes used to play a vital role in the inland capture fisheries. These were abundantly available in rivers, streams, ponds, beels, ditches and floodplains in the past. Now a days, these species have gradually been disappearing from the natural systems, which in turn severely affecting the bio-diversity.
A6	Culture-based fisheries: Subtropics	Culture based fisheries i.e. Carp polyculture in Bangladesh is a traditional and popular practice, where optimum utilization of aquatic space, manure and feed take place, as different fish species have different feeding habits and living habitats. In polyculture management, the growth and development of fish and consequently the production is affected by species, stocking density, feed, and fertilization and also by ecological conditions. Farmers in this country usually stock their ponds in the months of June to August with newly nursed fry/fingerlings at a comparatively higher stocking densities (6,000-10,000/ha) and obtain fish production of about 3 to 4 tonnes/ha/year.
A10	Fed aquaculture: Subtropics	Commercially 7 to 10 species are being cultured in Bangladesh with applying feed. The culture fish species includes Pangus, Tilapia, Carps, Koi, Shing, Magur, Pabda and Gulsha
A14	Non-fed aquaculture: Subtropics	Only for domestic consumption, most of the farmers in rural areas are growing carps and tilapia. Without applying supplementary feed, carps and tilapia did not grow satisfactorily.
C2	Irrigated crops(Rice): subtropics	Irrigated rice has become the main rain crop of Bangladesh. It has become prominant rice crop because of the use of modern rice varieties and modern agricultural inputs like irrigation, fertilizers and pesticides. The area covered under irrigated rice was 4.78 million hactare and the production was 18.76 million ton. The per hactare yield for irrigated rice was higher (3.945 ton).

C6	Irrigated crops (others)	Irrigated crops are grown in winter which is called rabi season. Crops during rabi season are much more diverse and comprise pulses, oil seeds, spices, potatoes, vegetables and others. Boro rice has become mejor rice crop under irrigated condition. The area under boro rice was 4705200 ha and production was 18778000 tons during 2012-13. Wheat was grown in 0.417 million ha and the production has increased to 1.255 million tons. Oil seed crops cover 0.755 million hectare and the production during the same period was 804000 tons. Pulses area covers 0.707 million ha with a production of 265000 tons. Area for spices and condiments was 0.04 million ha and he total production was 1822000 tons. Wheat in Bangladesh is mainly grown in irrigated, hot and humid environment (Mega environment-5) after harvesting monsoon paddy (T. aman rice). About 85% wheat in Bangladesh is grown after harvesting paddy mainly under double or triple cropping system (Wheat-Jute/Mungbean/Aus-T. aman cropping pattern).
C10	Rain-fed crops: Subtopics	The rainfed rice crop consists of aus, broadcast aman, and local transplant aman, sesame, cowpea, sorghum, and some millets like cheena (panicum miliaceum), kaon (*Setaria italia*), bajra (*Pennisetum* spp.) etc. are grown in the Kharif season while wheat, maize, oil and pulse crops in the Rabi season. The rainfed area in 2007-08 was 8.05 million ha which was about 58.65% of the total cropped area of 13.73 million ha. Only 4.47% of the boro rice crop is rainfed which mostly covers local boro variety grown in very low lying area. The rainfed area of pulse and oilseed is about 98.74% and 9073% of the total area, respectively. Major pulses grown in Bangladesh are grass pea (Lathyrus sativus), lentil (Lens culinaris), chickpea (*Cicer arietinum*), black gram (*Vigna phaseolus*) and mung (*Vigna radiata*). These cover about 90% of the total pulse crop area. The total pulse production in 2014-15 was 0.89 million metric tonnes. About 90% of the edible oil producing crops are grown under residual soil moisture. Mustard and groundnut respectively cover 72 and 7 percent of the total area under edible oil seeds (BBS, 2013). Jute covers about 100% rainfed area and total jute production in Bangladesh was about 7.5 million bales in the year 2012-13 (BBS, 2013). About 86.63 % of the sugarcane is grown under rainfed condition with 4469 thousand metric tonnes production in the year 2012-13 (BBS, 2013).
M2	Mixed systems (livestock, crop, forest and /or aquatic and fisheries): Subtropics	Recent trend in aquaculture development is toward intensification of culture, with its emphasis on a more complex and advanced technology and high input of resource and energy. Such development has led to the separation and specialization in food production, which is often justified as a more productive and efficient approach, but is extremely inefficient in resource use. There is also constraint against the adaptation of high-yielding technology by the resource poor rural farmers due to lack of advanced technical know-how and involvement of high input cost. Perhaps the integrated approach to fish-livestock-crops production may be a solution to this regard. The possibilities for integration of fish farming with livestock and crop farming have special significance for subsidiary occupation for millions of small farmers. If such activities are undertaken properly it would result in diversification of farm produce, increased cash income improved quantity and quality of food production for home consumption and exploitation of unutilized resources available to small farmers.

O1	Vegetables in Floating beds	Cultivation on floating beds, called soil-less agriculture or hydroponics, is an indigenous practice in the south-western part of Bangladesh. People living within the wetland ecosystem utilize locally avaiable paddy straw, water hyacinths and various aquatic plants for making floating islands of organic material on which crops, seedlings and vegetables are grown. This practice is now receiving renewed interest as a potential solution for farmers whose lands have been waterlogged, and also for landless people. The basic construction of the floating bed requires bamboo poles, a boat and a simple tool to cut the weeds. The bed floating is built up of layers of aquatic weeds, mainly water hyacinths (*Eichhornia crassipes*) but also other kinds of water weeds like water lettuce (Pistia stratiotes), duckweed (*Najas graminea*), *Salvinia spp*. and *Potamogeton alpinus* are also used. Organic materials like paddy stubs, straw and coconut husk are also added. Construction of loating starts at the beginning of the monsoon (June-July) with the collection of water hyacinths and other aquatic weeds and it continues up to late autumn. To start the sconstruction, farmers put a long bamboo pole (as long as they want the final bed to be), on a collected mas of fullly matured water hyacinths. The first layer of water hyacinths acts as the base of the floating bed and maintains he stability, buoyancy and thickness of the bed. A single man then stands on the bamboo pole lying over the mass of water hyacinths and starts to pull the water hyacinths together from both sides of the bamboo. In this process, he proceeds towards the end of the bamboo and compacts the accumulated hyacinths under his feet. This process is continued until the desired height and length of the bed is obtained. When the construction of the bed is complete, the bamboo is removed. After 7-10 days a second round of water hyacinths are dumped on the bed and then the bed is left to decompose before being planted. The top of the floating bed needs 15-20 days to decompose before sowing seed or planting seedlings. Sometimes farmers use semi-decomposed aquatic plants such as water lettuce, duckweed and immature water hyacinths on the top of the bed to speed up the decomposition, thereby making nutrients available for seedlings and reducing evaporation from the bed. To improve conditions for the young seedlings further, the seeds are sometimes placed inside a ball made of compost, manure and aquatic creepers (locally called tema), before being planted on the floating bed. In this way, a smooth germination and sufficient nutrients are ensured for the initial establishment. However, the newly constructed floating bed can also be cultivated from the first day - if compost is available and is spread thickly on the bed before planting. There are no fixed rules about the size and shape of the floating beds, but generally the villagers construct beds that are 15-50 metres in length, 1.5-2.5 metres in width and about one metre in height above the water level. Vegetables are the main crops of this farming system. The villagers have grown 23 different types of vegetables and 5 types of spices on floating beds. Vegetables and seedlings raised on floating beds during the monsoon season include ladies finger (okra), cucumber, ridged gourd, bitter gourd, snake gourd, amaranth, red amaranth, egg plant (brinjal), pumpkin, Indian spinach, taro, wax gourd, and turmeric. During the winter season spinach, bottle gourd, yard long bean, bean, tomato, potato, cauliflower, cabbage, kohlrabi, turnip, radish, carrot, ginger, onion, chilli, and garlic are grown. Some vegetables are grown on the bed all the year round in rotation. In seasonally flooded areas, the beds are spread over the soil as the water withdraws. Winter crops can then be grown on this soil without further tillage or fertilizer.

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

A map covering all the production system existing in Bangladesh is not available. However, agricultural regions are mostly outlined in Questions 2.

7. For each production system found in your country (refer to Table 1), indicate in Table 3 the area under production (km^2, hectares, acres, other). If not applicable, indicate the estimated

production quantity (major products aggregated) using the appropriate unit or measure (tonne, head, inventory, cubic metre, etc.) for the production system. If available, indicate the contribution of the production system to the agricultural sector economy in the country (%). Please use the most recent data available and indicate the year of reference for the data or estimates. Specify NK if not known or NA if not applicable.

Table 3. Area under production, production quantity and contribution to the agricultural sector economy for production systems in the country.

Code of production system	Name of production system	Area (indicate unite)	Production- quality (indicate unit)	Contribution to the agricultural sector economy (%)	Reference year
L2	Livestock grass land based systems : Sub-tropics	NK	(Million) Cattle- 23.44 Buffalo- 1.45 Goat- 25.61 Sheep- 3.15 Chicken- 259.42 Duck- 48.05	10.85	BER, 2014
L6	Livestock landless system: Sub-tropical	NK			
F2	Naturally regenerated forest: Subtropics	(million) 1.52 ha	NK	10.55	
F6	Planted Forest: Sub-tropics	(million) 1.00 ha	NK		
A2	Self-recruiting capture fisheries : Subtropics	(thousand) Closed water- 1578.642 ha Open water- 7820.106 ha Marine water- 119.523 sq.km	1591190 metric ton	22.36	Agriculture Dairy, 2016
A6	Culture-based fisheries: Subtropics		2952730 metric ton		
A10	Fed aquaculture: Subtropics		NK		
A14	Non-fed aquaculture: Subtropics		NK		
C2	Irrigated rice: Sub-tropics	(million ha) Boro Rice-4.846	(million ton) 19.343	56.24	Agriculture Dairy, 2016
C6	Irrigated crops (others) : Sub-tropics	(million) Wheat- 0.437 ha Maize- 0.355 ha Potato- 0.471 ha Oil crops- 0.834 ha Pulses- 0.785 ha Vegetable- 0.798 ha	(million ton) 1.348 2.361 9.254 1.042 0.892 14.237		Agriculture Dairy, 2016
C 10	Rainfed Rice: Sub-tropics	(million) Aman rice- 5.530 ha Aus rice- 1.045 ha Jute- 0.673	(million ton) 13.190 2.328 14.237 (bale)		Agriculture Dairy, 2016
M2	Mixed systems (livestock, crop, forest and /or aquatic and fisheries): Subtropics	NK	NK	NK	
01	Vegetables in floating beds	NK	NK	NK	

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.

To fulfill the food grain demand of the country we have to use few successful HYVs for cultivation purpose that prohibits farmers in growing landraces. Thus the biodiversity of cereal crops are reducing every day. The situation is more or less similar with other groups of crops as well. Heavy demand for some of the landraces, on the other hand, has encouraged the farmers to grow them every year in higher amount. Some local aromatic rice seeds and many local vegetables and fruits have high demand in foreign countries where Bangladeshi people are living. These demands are pushing farmers to grow some of the local diversified crops.

The high demand of meat and milk is not meet by the local breeds of cows. Thus the introduced breeds are gaining popularity at the cost of local breeds or types thus narrowing down the genetic resources of animal. The demand for eggs is met by farming the introduced chicken breeds thus reducing the extant of bio-diversity.

Local inland natural fresh water fishes have high demand in the country and in abroad where Bangladeshi people are living. The demand for hilsa in both home and abroad has initiated the government to save the catching of laying hilsa for a certain period by obstructing fishermen to catch hilsa. This program has increased the hilsa population significantly. The govt. has also declared quite a good number of riverine areas as fish sanctuary to protect the breeding of local fishes and involved the community people in the management process. This initiative has resulted the higher population of high demanding local fishes. The program has helped the increase of biodiversity of some endangered fish species.

CHAPTER 2
DRIVERS OF CHANGE

2.1. Effects of drivers of change on associated biodiversity

9. What have been the most important driver 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.

- Exotic fish species have been recognized as an agent of the loss of indigenous aquatic biodiversity. Alteration of species and ecosystem caused by exotic invasive animals influence the functioning and overall health of the affected ecosystems (Ameen 1999). Several introduced species viz. African magur, Thai pangas, Sucker mouth, Cat fish, Red piranha etc. are highly carnivorous and predatory and eat almost everything including the small indigenous species of fish.
- Pollution and external inputs have detrimental effect on soil biodiversity and on aquatic associated biodiversity. Fishes and other aquatic animals that are very supportive to the aquatic ecosystem have been diministing. Loss of many types of local small fishes viz..... in the open water disturbs food chain hampering the growth and development of other fishes and aquatic associated organisms. Aquatic associated animals viz. aquatic snakes, aquatic toads and frogs are playing important role in nutrient cycle in aquatic ecosystems, controls aquatic weeds and grass by feeding them, dead animal feeding habit helps aquatic habitats clean, controls insect pests etc. The declining trends of aquatic associated animals have had detrimental effect on aquatic ecosystems. Use of pesticides have had detrimental effect on natural pollinators and preditors.
- Cyclone Sidr struck the south-west coast of Bangladesh with winds upto 240 km per hour or on 15 November 2007. The category 4 storm was accompanied by tidal waves upto 5 meters high and surges upto 6 meters in some areas, breaching coastal and river embankment, flooding low-lying areas. Cyclone Aila hit 14 districts on the south-west coast of Bangladesh on the 25th May 2009. It was the second major blow for the region in less than two years. The cyclones washed away or destroyed livestock, shrimp ponds and crop land. Both aquatic and terrestrial bio-diversity of plants and animals have been severely affected by the natural disasters.
- Faulty water use and water management has had detrimental effect on aquatic ecosystem and on aquatic fish and associated biodiversity.
- Capture fisheries in inland water production system which are based on natural productivity generally have reached the level of overexploitation. The inland open water fisheries have now been under serious threat of resource depletion due to various man-made causes. Some rivers and flood plains have been modified to such a level that they are only recognized as narrow ditches and paddy fields. Ecosystem integrity has often been destabilized and aquatic system now fails to support aquatic life.
- Climate change has already started playing a negative role on all sorts of bio-diversity including associated bio-diversity. Sea level rise has been causing salinity intrusion into the non-saline aquatic and terrestrial areas through the canals and rivers. Salinity intrusion has negative impact on the non-saline fish and aquatic organisms. Moreover, the terrestrial plants

suffer mostly during dry season as the salinity reaches to its peak adversely affecting the flora of different species.

- As a side-effect of the application of pesticides, beneficial soil organisms are killed breaking the complex interacting system between pests and active soil organisms and causing deterioration of soil fertility (Anonymous, 2015).

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.

Bangladesh is at most risk from climate change. The low deltaic coastal regions being prone to floods and cyclones are among the factors that make Bangladesh the number one exposed country to climate change. Drought and siltation together are reducing over-wintering habitats for the fish and other aquatic species resulting in less recruitment into the grazing field to grow open water inland fisheries. Due to decrease in ground water and surface water, tremendous pressure has been exerted on our lands converting them to agricultural land, resulting in a serious decline in the number of not only fish species but aquatic associated biodiversity as a whole. The flood plains of the country are now among the fastest disappearing of all ecological systems affecting badly all sorts of biodiversity.

2.2. 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	Divers[14]	Effect of drivers on sector biodiversity for food and agriculture (2, 1, 0, -1, -2, NK, NA)			
L2 Livestock grassland-based systems: Subtropics		PGR	FGR	AnGR	AqGR
	Changes in land and water use and management	NK	NK	-2	NK
	Pollution and external inputs	NK	NK	-1	NK
	Over-exploitation and overharvesting	NK	NK	0	NK
	Climate change	NK	NK	-1	NK
	Natural disasters	NK	NK	-1	NK
	Pests, diseases, alien invasive species	NK	NK	-1	NK
	Markets, trade and the private sector	NK	NK	-1	NK
	Policies	NK	NK	0	NK
	Population growth and urbanization	NK	NK	-2	NK
	Changing economic, socio-political, and	NK	NK	1	NK

	cultural factors				
	Advancements and innovations in science and technology	NK	NK	1	NK
	Other [please specify]	NK	NK	NK	NK

Production	Divers[14]	Effect of drivers on sector biodiversity for food and agriculture (2, 1, 0, -1, -2, NK, NA)			
L6 Livestock landless systems: Subtropics		PGR	FGR	AnGR	AqGR
	Changes in land and water use and management	NK	NK	-2	NK
	Pollution and external inputs	NK	NK	-1	NK
	Over-exploitation and overharvesting	NK	NK	0	NK
	Climate change	NK	NK	-1	NK
	Natural disasters	NK	NK	-1	NK
	Pests, diseases, alien invasive species	NK	NK	-1	NK
	Markets, trade and the private sector	NK	NK	-1	NK
	Policies	NK	NK	0	NK
	Population growth and urbanization	NK	NK	-2	NK
	Changing economic, socio-political, and cultural factors	NK	NK	1	NK
	Advancements and innovations in science and technology	NK	NK	1	NK
	Other [please specify]	NK	NK	NK	NK

Production	Divers[14]	Effect of drivers on sector biodiversity for food and agriculture (2, 1, 0, -1, -2, NK, NA)			
F2 Naturally regenerated forests: Subtropics		PGR	FGR	AnGR	AqGR
	Changes in land and water use and management	NK	-1	NK	NK
	Pollution and external inputs	NK	-1	NK	NK
	Over-exploitation and overharvesting	NK	-2	NK	NK
	Climate change	NK	-1	NK	NK
	Natural disasters	NK	-1	NK	NK
	Pests, diseases, alien invasive species	NK	-1	NK	NK
	Markets, trade and the private sector	NK	-1	NK	NK
	Policies	NK	1	NK	NK
	Population growth and urbanization	NK	-1	NK	NK
	Changing economic, socio-political, and cultural factors	NK	1	NK	NK
	Advancements and innovations in science and technology	NK	1	NK	NK
	Other [please specify]	NK	NK	NK	NK

Production	Divers[14]	Effect of drivers on sector biodiversity for food and agriculture (2, 1, 0, -1, -2, NK, NA)			
F6 Planted forests: Subtropics		PGR	FGR	AnGR	AqGR
	Changes in land and water use and management	NK	1	NK	NK
	Pollution and external inputs	NK	-1	NK	NK
	Over-exploitation and overharvesting	NK	-1	NK	NK
	Climate change	NK	-1	NK	NK
	Natural disasters	NK	-1	NK	NK
	Pests, diseases, alien invasive species	NK	-1	NK	NK
	Markets, trade and the private sector	NK	1	NK	NK
	Policies	NK	1	NK	NK
	Population growth and urbanization	NK	-1	NK	NK
	Changing economic, socio-political, and cultural factors	NK	1	NK	NK

	Advancements and innovations in science and technology	NK	1	NK	NK
	Other [please specify]	NK	NK	NK	NK

Production	Divers[14]	Effect of drivers on sector biodiversity for food and agriculture (2, 1, 0, -1, -2, NK, NA)			
A2 Self-recruiting capture fisheries: Subtropics		PGR	FGR	AnGR	AqGR
	Changes in land and water use and management	NK	NK	NK	-2
	Pollution and external inputs	NK	NK	NK	-1
	Over-exploitation and overharvesting	NK	NK	NK	-1
	Climate change	NK	NK	NK	-1
	Natural disasters	NK	NK	NK	-1
	Pests, diseases, alien invasive species	NK	NK	NK	1
	Markets, trade and the private sector	NK	NK	NK	-1
	Policies	NK	NK	NK	-1
	Population growth and urbanization	NK	NK	NK	-1
	Changing economic, socio-political, and cultural factors	NK	NK	NK	1
	Advancements and innovations in science and technology	NK	NK	NK	-1
	Other [please specify]	NK	NK	NK	NK

Production	Divers[14]	Effect of drivers on sector biodiversity for food and agriculture (2, 1, 0, -1, -2, NK, NA)			
A6 Culture-based fisheries: Subtropics		PGR	FGR	AnGR	AqGR
	Changes in land and water use and management	NK	NK	NK	1
	Pollution and external inputs	NK	NK	NK	0
	Over-exploitation and overharvesting	NK	NK	NK	NA
	Climate change	NK	NK	NK	-1
	Natural disasters	NK	NK	NK	-1
	Pests, diseases, alien invasive species	NK	NK	NK	-1
	Markets, trade and the private sector	NK	NK	NK	-1
	Policies	NK	NK	NK	1
	Population growth and urbanization	NK	NK	NK	0
	Changing economic, socio-political, and cultural factors	NK	NK	NK	NA
	Advancements and innovations in science and technology	NK	NK	NK	2
	Other [please specify]	NK	NK	NK	NK

Production	Divers[14]	Effect of drivers on sector biodiversity for food and agriculture (2, 1, 0, -1, -2, NK, NA)			
A10 Fed aquaculture: Subtropics		PGR	FGR	AnGR	AqGR
	Changes in land and water use and management	NK	NK	NK	-1
	Pollution and external inputs	NK	NK	NK	-1
	Over-exploitation and overharvesting	NK	NK	NK	0
	Climate change	NK	NK	NK	-1
	Natural disasters	NK	NK	NK	-1

	Pests, diseases, alien invasive species	NK	NK	NK	NK
	Markets, trade and the private sector	NK	NK	NK	-1
	Policies	NK	NK	NK	0
	Population growth and urbanization	NK	NK	NK	NA
	Changing economic, socio-political, and cultural factors	NK	NK	NK	1
	Advancements and innovations in science and technology	NK	NK	NK	2
	Other [please specify]	NK	NK	NK	-1

Production	Divers[14]	Effect of drivers on sector biodiversity for food and agriculture (2, 1, 0, -1, -2, NK, NA)			
A14 Non-fed aquaculture: Subtropics		PGR	FGR	AnGR	AqGR
	Changes in land and water use and management	NK	NK	NK	NA
	Pollution and external inputs	NK	NK	NK	NK
	Over-exploitation and overharvesting	NK	NK	NK	NK
	Climate change	NK	NK	NK	NK
	Natural disasters	NK	NK	NK	NK
	Pests, diseases, alien invasive species	NK	NK	NK	-1
	Markets, trade and the private sector	NK	NK	NK	NA
	Policies	NK	NK	NK	NK
	Population growth and urbanization	NK	NK	NK	-1
	Changing economic, socio-political, and cultural factors	NK	NK	NK	0
	Advancements and innovations in science and technology	NK	NK	NK	1
	Other [please specify]	NK	NK	NK	-

Production	Divers[14]	Effect of drivers on sector biodiversity for food and agriculture (2, 1, 0, -1, -2, NK, NA)			
C2 Irrigated crops (rice) : Subtropics		PGR	FGR	AnGR	AqGR
	Changes in land and water use and management	-2	NK	NK	NK
	Pollution and external inputs	-1	NK	NK	NK
	Over-exploitation and overharvesting	0	NK	NK	NK
	Climate change	-1	NK	NK	NK
	Natural disasters	-1	NK	NK	NK
	Pests, diseases, alien invasive species	-1	NK	NK	NK
	Markets, trade and the private sector	-1	NK	NK	NK
	Policies	1	NK	NK	NK
	Population growth and urbanization	-2	NK	NK	NK
	Changing economic, socio-political, and cultural factors	-1	NK	NK	NK
	Advancements and innovations in science and technology	-2	NK	NK	NK
	Other [please specify]	NK	NK	NK	NK

Production	Divers[14]	Effect of drivers on sector biodiversity for food and agriculture (2, 1, 0, -1, -2, NK, NA)			
C6 Irrigated crops (other) : Subtropics		PGR	FGR	AnGR	AqGR
	Changes in land and water use and management	-2	NK	NK	NK

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

Production	Divers[14]	Effect of drivers on sector biodiversity for food and agriculture (2, 1, 0, -1, -2, NK, NA)			
C10 Rainfed crops : Subtropics		PGR	FGR	AnGR	AqGR
	Changes in land and water use and management	-1	NK	NK	NK
	Pollution and external inputs	-1	NK	NK	NK
	Over-exploitation and overharvesting	-1	NK	NK	NK
	Climate change	-1	NK	NK	NK
	Natural disasters	-1	NK	NK	NK
	Pests, diseases, alien invasive species	-1	NK	NK	NK
	Markets, trade and the private sector	-1	NK	NK	NK
	Policies	0	NK	NK	NK
	Population growth and urbanization	-2	NK	NK	NK
	Changing economic, socio-political, and cultural factors	-1	NK	NK	NK
	Advancements and innovations in science and technology	-1	NK	NK	NK
	Other [please specify]	NK	NK	NK	NK

Production	Divers[14]	Effect of drivers on sector biodiversity for food and agriculture (2, 1, 0, -1, -2, NK, NA)			
M2 Mixed systems (livestock, crop, forest and /or aquatic and fisheries): Subtropics		PGR	FGR	AnGR	AqGR
	Changes in land and water use and management	-1	NK	-2	NK
	Pollution and external inputs	-1	NK	-1	NK
	Over-exploitation and overharvesting	-1	NK	0	NK
	Climate change	-1	NK	-1	NK
	Natural disasters	-1	NK	-1	NK
	Pests, diseases, alien invasive species	-1	NK	-1	NK
	Markets, trade and the private sector	0	NK	-2	NK
	Policies	-1	NK	-1	NK
	Population growth and urbanization	-2	NK	-2	NK
	Changing economic, socio-political, and cultural factors	-1	NK	1	NK
	Advancements and innovations in science and technology	-1	NK	1	NK
	Other [please specify]	NK	NK	NK	NK

Production 01 Vegetables in floating bfds	Divers[14]	Effect of drivers on sector biodiversity for food and agriculture (2, 1, 0, -1, -2, NK, NA)			
		PGR	FGR	AnGR	AqGR
	Changes in land and water use and management	NK	NK	NK	NK
	Pollution and external inputs	NK	NK	NK	NK
	Over-exploitation and overharvesting	NK	NK	NK	NK
	Climate change	NK	NK	NK	NK
	Natural disasters	NK	NK	NK	NK
	Pests, diseases, alien invasive species	NK	NK	NK	NK
	Markets, trade and the private sector	NK	NK	NK	NK
	Policies	NK	NK	NK	NK
	Population growth and urbanization	NK	NK	NK	NK
	Changing economic, socio-political, and cultural factors	NK	NK	NK	NK
	Advancements and innovations in science and technology	NK	NK	NK	NK
	Other [please specify]	NK	NK	NK	NK

2.3. Effects of drivers of change on ecosystem services

12. What have been the main drivers (descriptions in Annex 3) affecting regulating and supporting ecosystem services (descriptions in Annex 4) in the country during the last 10 years? Describe, for each production system identified in Table 1, the major driver(s) affecting ecosystem services and indicate the effect on ecosystem services as being strongly positive (2), positive (1), negative (-), strongly negative (-2), no effect (0), not known (NK), or not applicable (NA) in Table 5 (repeat table for each production system).

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

Production system	Drivers[15]	Effect of drivers on ecosystem services[16] (2, 1, 0, -1, -2, NK, NA)								
L2 Livestock grassland-based systems: Subtropics7		Pollination	Pest and disease regulation	Water purification and waste treatment	Natural hazard regulation	Nutrient cycling	Soil formation and production	Water cycling	Habitat provisioning	Production of oxygen/Gas regulation
	Changes in land and water use and management	NA	-1	1	0	1	1	NK	0	NK
	Pollution and external inputs	NA	0	-1	-1	-1	NK	-1	NK	NK
	Over-exploitation and overharvesting	NA	0	0	-1	-1	NK	NK	NK	NK
	Climate change	NA	-1	-1	-1	-1	NK	NK	NK	NK
	Natural disasters	NA	-1	-1	-1	-2	NK	NK	NK	NK
	Pests, diseases, alien invasive species	NA	-1	-2	-1	-1	NK	NK	NK	NK
	Markets, trade and the private sector	NA	-1	1	0	1	NK	NK	NK	NK

	Policies	NA	0	0	0	1	NK	NK	NK	NK
	Population growth and urbanization	NA	-1	-2	1	1	NK	2	NK	NK
	Changing economic, socio-political, and cultural factors	NA	1	2	1	1	NK	NK	NK	NK
	Advancements and innovations in science and technology	NA	1	1	1	1	NK	2	NK	NK
	Other [please *specify]*	NA	NK	NK	NK	NK	NK	NK	NK	NK

Production system	Drivers[15]	Effect of drivers on ecosystem services[16] (2, 1, 0, -1, -2, NK, NA)								
L6 Livestock landless systems: Subtropics		Pollination	Pest and disease regulation	Water purification and waste treatment	Natural hazard regulation	Nutrient cycling	Soil formation and production	Water cycling	Habitat provisioning	Production of oxygen/Gas regulation
	Changes in land and water use and management	NA	-1	0	0	0	1	0	0	NK
	Pollution and external inputs	NA	-1	0	0	0	0	0	0	NK
	Over-exploitation and overharvesting	NA	0	0	-1	-1	NK	-1	NK	NK
	Climate change	NA	-1	-1	-1	NK	NK	NK	NK	NK
	Natural disasters	NA	0	-1	-1	NK	NK	NK	NK	NK
	Pests, diseases, alien invasive species	NA	-1	-1	-1	-1	NK	NK	NK	NK
	Markets, trade and the private sector	NA	0	1	0	1	NK	NK	NK	NK
	Policies	NA	0	0	0	0	0	0	0	0
	Population growth and urbanization	NA	-1	-2	1	1	NK	2	NK	NK
	Changing economic, socio-political, and cultural factors	NA	1	2	1	1	NK	NK	NK	NK
	Advancements and innovations in science and technology	NA	1	1	1	1	NK	1	NK	NK
	Other [please *specify]*	NA	NK	NK	NK	NK	NK	NK	NK	NK

Production system	Drivers[15]	Effect of drivers on ecosystem services[16] (2, 1, 0, -1, -2, NK, NA)								
F2 Naturally regenerated forests: Subtropics		Pollination	Pest and disease regulation	Water purification and waste treatment	Natural hazard regulation	Nutrient cycling	Soil formation and production	Water cycling	Habitat provisioning	Production of oxygen/Gas regulation
	Changes in land and water use and management	-1	-1	-1	NK	-1	-1	-1	-1	1
	Pollution and external inputs	-1	-1	NK	NK	NK	NK	NK	NK	NK
	Over-exploitation and overharvesting	-1	-1	-1	-1	-1	-1	-1	-1	-1
	Climate change	-1	NK	NK	NK	NK	NK	NK	NK	-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	-1
	Markets, trade and the private sector	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Policies	NK	1	1	1	NK	1	NK	1	1
	Population growth and urbanization	-1	-1	-1	-1	NK	-1	-1	-1	-1
	Changing economic, socio-political, and cultural factors	NK	1	1	1	NK	NK	NK	1	1
	Advancements and innovations in science and technology	NK	1	NK	NK	NK	NK	NK	1	1
	Other [please *specify]*	NK	NK	NK	NK	NK	NK	NK	NK	NK

Production system	Drivers[15]	Effect of drivers on ecosystem services[16] (2, 1, 0, -1, -2, NK, NA)								
F6 Planted forests: Subtropics		Pollination	Pest and disease regulation	Water purification and waste treatment	Natural hazard regulation	Nutrient cycling	Soil formation and production	Water cycling	Habitat provisioning	Production of oxygen/Gas regulation
	Changes in land and water use and management	-1	-1	NK	-1	NK	NK	NK	1	NK
	Pollution and external inputs	-1	-1	-1	-1	-1	-1	NK	-1	-2
	Over-exploitation and overharvesting	-1	NK	-1	-1	NK	-1	-1	-1	-1
	Climate change	-1	-1	-1	-1	-1	-1	-1	-1	-2
	Natural disasters	-1	-1	-1	NK	-1	-1	-1	-1	-1
	Pests, diseases, alien invasive species	-1	NK	-1	NK	-1	-1	-1	-1	-1
	Markets, trade and the private sector	NK	NK	NK	NK	NK	NK	NK	NK	NK
	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	NK	1	NK	NK	NK	1	NK	-1	NK
	Advancements and innovations in science and technology	1	1	1	1	1	1	1	1	1
	Other [please *specify]*	NK	NK	NK	NK	NK	NK	NK	NK	NK

Production system	Drivers[15]	Effect of drivers on ecosystem services[16] (2, 1, 0, -1, -2, NK, NA)								
A2 Self-recruiting capture fisheries: Subtropics		Pollination	Pest and disease regulation	Water purification and waste treatment	Natural hazard regulation	Nutrient cycling	Soil formation and production	Water cycling	Habitat provisioning	Production of oxygen/Gas regulation
	Changes in land and water use and management	-1	NA	NA	-1	NA	-1	-1	-1	NA
	Pollution and external inputs	-2	-1	-1	NA	-1	-1	NA	-1	-2
	Over-exploitation and overharvesting	NA	NA	NA	NA	NA	NA	NA	-1	NA
	Climate change	NA	NK	NK	-1	NK	NK	NK	-1	NA
	Natural disasters	-1	-1	-1	-1	NK	NK	NK	1	NK
	Pests, diseases, alien invasive species	NA	-1	NA	NA	NA	NK	NA	NA	-1
	Markets, trade and the private sector	-1	NA	NA	NA	NA	NA	NA	NA	NA
	Policies	1	NK	1	1	NA	NA	NA	1	NA
	Population growth and urbanization	-1	NK	NK	NK	NK	NK	NK	-1	NA
	Changing economic, socio-political, and cultural factors	NA	NA	NA	NA	NA	NA	NA	-1	NA
	Advancements and innovations in science and technology	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Policy implementation	-1	-1	-1	-1	NA	NA	NA	-1	NA

Production system	Drivers[15]	Effect of drivers on ecosystem services[16] (2, 1, 0, -1, -2, NK, NA)

A6 Culture-based fisheries: Subtropics		Pollination	Pest and disease regulation	Water purification and waste treatment	Natural hazard regulation	Nutrient cycling	Soil formation and production	Water cycling	Habitat provisioning	Production of oxygen/Gas regulation
	Changes in land and water use and management	-1	-1	-1	NA	-1	-1	-1	-1	NK
	Pollution and external inputs	-1	-1	-1	NA	-1	-1	-1	-1	-1
	Over-exploitation and overharvesting	NA	NA	NA	NA	NA	NA	NA	-1	NA
	Climate change	-1	-1	-1	-1	NK	NK	NK	-1	NA
	Natural disasters	-1	-1	-1	-1	-1	NK	-1	-1	NK
	Pests, diseases, alien invasive species	-1	-1	-1	-1	NK	NK	NA	NA	NA
	Markets, trade and the private sector	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Policies	NA	NA	NA	NA	NA	NA	NA	1	NA
	Population growth and urbanization	-1	-1	-1	NK	NK	NK	NK	-1	NA
	Changing economic, socio-political, and cultural factors	NA	NA	NA	NA	NA	NA	NA	-1	NA
	Advancements and innovations in science and technology	NK	NK	NK	NK	NK	NK	NK	1	NA
	Other [please *specify]*	NK	NK	NK	NK	NK	NK	NK	NK	NK

Production system	Drivers[15]	Effect of drivers on ecosystem services[16] (2, 1, 0, -1, -2, NK, NA)								
A10 Fed aquaculture: Subtropics		Pollination	Pest and disease regulation	Water purification and waste treatment	Natural hazard regulation	Nutrient cycling	Soil formation and production	Water cycling	Habitat provisioning	Production of oxygen/Gas regulation
	Changes in land and water use and management	-1	-1	-1	-1	-1	NK	NK	NK	-1
	Pollution and external inputs	-1	-1	NK	NK	NA	NK	NK	-1	-1
	Over-exploitation and overharvesting	-1	NK	1	-1	1	-1	NK	NA	-1
	Climate change	-1	-1	-1	-1	-1	-1	NK	NA	-1
	Natural disasters	-1	-1	0	NK	NA	NK	NA	NA	NA
	Pests, diseases, alien invasive species	0	-1	-1	NK	NA	NA	NK	NA	NK
	Markets, trade and the private sector	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Policies	1	1	1	1	1	1	1	1	1
	Population growth and urbanization	-1	-1	-1	-1	0	1	NK	-1	-1
	Changing economic, socio-political, and cultural factors	0	0	NK	NA	NA	NA	NA	NA	NA
	Advancements and innovations in science and technology	1	0	1	1	1	NA	NA	1	NK
	Other [please *specify]*	NK	NK	NK	NK	NK	NK	NK	NK	NK

Production system	Drivers[15]	Effect of drivers on ecosystem services[16] (2, 1, 0, -1, -2, NK, NA)								
A14 Non-fed aquaculture: Subtropics		Pollination	Pest and disease regulation	Water purification and waste treatment	Natural hazard regulation	Nutrient cycling	Soil formation and production	Water cycling	Habitat provisioning	Production of oxygen/Gas regulation

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

Production system	Drivers[15]	Effect of drivers on ecosystem services[16] (2, 1, 0, -1, -2, NK, NA)								
C2 Irrigated crops (rice) : Subtropics		Pollination	Pest and disease regulation	Water purification and waste treatment	Natural hazard regulation	Nutrient cycling	Soil formation and production	Water cycling	Habitat provisioning	Production of oxygen/Gas regulation
	Changes in land and water use and management	0	1	NK	-1	-1	-1	-2	-2	1
	Pollution and external inputs	-1	-1	-1	-1	-1	-1	-2	-1	-1
	Over-exploitation and overharvesting	0	NA	1	-1	-1	NA	NA	NA	NA
	Climate change	-1	1	-1	-1	-1	-1	-1	-1	-1
	Natural disasters	-1	-1	-1	-1	-1	-1	-1	-1	-1
	Pests, diseases, alien invasive species	NA	1	-1	-1	0	NA	-1	-1	-1
	Markets, trade and the private sector	NA	0	0	0	0	NA	NA	NK	NA
	Policies	NA	1	+1	+1	1	1	1	+1	1
	Population growth and urbanization	NA	NK	-1	1	-1	-1	-1	-2	-2
	Changing economic, socio-political, and cultural factors	NA	NK	1	NK	0	NK	1	-1	NK
	Advancements and innovations in science and technology	NA	+1	+1	+1	+1	1	1	1	NK
	Other [please *specify]*	NK	NK	NK	NK	NK	NK	NK	NK	NK

Production system	Drivers[15]	Effect of drivers on ecosystem services[16] (2, 1, 0, -1, -2, NK, NA)								
C6 Irrigated crops (other) : Subtropics		Pollination	Pest and disease regulation	Water purification and waste treatment	Natural hazard regulation	Nutrient cycling	Soil formation and production	Water cycling	Habitat provisioning	Production of oxygen/Gas regulation
	Changes in land and water use and management	-1	1	NK	-1	-1	-1	-1	-1	-1
	Pollution and external inputs	-1	1	-1	-1	-1	-1	-1	-1	-1
	Over-exploitation and overharvesting	NA	NA	0	NA	-1	NA	NA	NA	NA
	Climate change	-1	-1	-1	-1	-1	-1	-1	-1	-1
	Natural disasters	-1	-1	-1	-1	-1	-1	-1	-1	-1
	Pests, diseases, alien invasive species	NA	1	-1	-1	0	NA	NA	-1	-1
	Markets, trade and the private sector	NA	0	0	0	0	NA	NA	NK	NA
	Policies	NA	1	1	1	1	1	1	1	1
	Population growth and urbanization	NK	NK	-1	1	-1	-1	-1	-2	-1

	Changing economic, socio-political, and cultural factors	0	NK	1	1	0	NK	1	-1	NK
	Advancements and innovations in science and technology	1	1	1	1	1	1	1	1	NK
	Other [please *specify]*	NK	NK	NK	NK	NK	NK	NK	NK	NK

Production system	Drivers[15]	Effect of drivers on ecosystem services[16] (2, 1, 0, -1, -2, NK, NA)								
C10 Rainfed crops : Subtropics		Pollination	Pest and disease regulation	Water purification and waste treatment	Natural hazard regulation	Nutrient cycling	Soil formation and production	Water cycling	Habitat provisioning	Production of oxygen/Gas regulation
	Changes in land and water use and management	0	1	NK	1	1	-1	-1	-1	1
	Pollution and external inputs	-1	-1	-1	-1	-1	-1	-1	-1	-1
	Over-exploitation and overharvesting	0	NA	NA	1	NA	NA	NA	NA	NA
	Climate change	-1	-1	-1	-1	-1	-1	-1	-1	NK
	Natural disasters	-1	-1	-2	-1	-1	-1	-1	-1	-1
	Pests, diseases, alien invasive species	NK	1	-1	-1	0	NA	NA	0	-1
	Markets, trade and the private sector	NA	0	0	0	0	NA	NA	NA	NA
	Policies	1	1	1	1	1	1	1	1	1
	Population growth and urbanization	-1	NK	-1	1	-1	-1	-1	-1	-1
	Changing economic, socio-political, and cultural factors	0	NK	1	NK	0	NK	NK	-1	NK
	Advancements and innovations in science and technology	1	1	1	1	1	1	1	1	1
	Other [please *specify]*	NK	NK	NK	NK	NK	NK	NK	NK	NK

Production system	Drivers[15]	Effect of drivers on ecosystem services[16] (2, 1, 0, -1, -2, NK, NA)								
M2 Mixed systems (livestock, crop, forest and /or aquatic and fisheries): Subtropics		Pollination	Pest and disease regulation	Water purification and waste treatment	Natural hazard regulation	Nutrient cycling	Soil formation and production	Water cycling	Habitat provisioning	Production of oxygen/Gas regulation
	Changes in land and water use and management	NK	NK	NK	-1	-1	-1	-1	-1	1
	Pollution and external inputs	-1	-1	-1	-1	-1	-1	-1	-1	-1
	Over-exploitation and overharvesting	NA	NK	-1	1	-1	-1	-1	-2	-1
	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	NK	1	-1	-1	NK	NK	NA	-1	NK
	Markets, trade and the private sector	NA	0	NA	0	0	NA	NA	0	NA
	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	0	NK	1	NK	-1	0	NK	-1	NK
	Advancements and innovations in science and technology	1	1	1	1	1	1	1	1	1
	Other [please *specify]*	NK	NK	NK	NK	NK	NK	NK	NK	NK

Production system	Drivers[15]	Effect of drivers on ecosystem services[16] (2, 1, 0, -1, -2, NK, NA)

01 Vegetables in floating beds		Pollination	Pest and disease regulation	Water purification and waste treatment	Natural hazard regulation	Nutrient cycling	Soil formation and production	Water cycling	Habitat provisioning	Production of oxygen/Gas regulation
	Changes in land and water use and management	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Pollution and external inputs	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Over-exploitation and overharvesting	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Climate change	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Natural disasters	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Pests, diseases, alien invasive species	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Markets, trade and the private sector	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Policies	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Population growth and urbanization	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Changing economic, socio-political, and cultural factors	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Advancements and innovations in science and technology	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Other [please *specify]*	NK	NK	NK	NK	NK	NK	NK	NK	NK

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.

- Rice in irrigated conditions is mostly high input based where irrigation, fertilizers, pesticides and herbicides are used intensively which have some negative impact on ecosystem services. Similar conditions are observed for other irrigated crops as well.
- Pollution and external inputs in irrigated crops are very common phenomena affecting the soil biodiversity.
- Natural disasters like floods, cyclones, drought, salinity and high temperature cause negative impact on all ecosystem services prevailing in crop, fish and forest based production system.
- Population growth and urbanization has negative impact on ecosystem service as over-exploitation and over-harvesting has become a common phenomenon. Moreover, atleast 0.5 percent cultivated land has converted to non-agricultural land each year.
- Climate change has negative impact as well, through salinity intrusion that has been changing the ecosystem permanently.
- Pests, diseases and alien invasive species all have negative impact in the most production systems because of their mode of behaviour on ecosystems.
- Use of pesticides in crop fields have had negative impact on honey bees, bumble bees and other beneficial insects like predators.

- Some of the alien invasive fish species have negative impact on aquatic associated biodiversity. Thai pangas eats finfish, crustacean and insects, periphyton and benthos. Red piranha feeds on insects, worms and small and large fishes. Pirapatinga's natural diet is terrestrial plants, fruits, insects and crustaceans (Hossain, 2014).
- Use of pesticides and insecticides in the crop fields is one of the major causes of disappearance of not only fishes but also the aquatic associated organisms (Mazid, 2002; Parveen and Faisal, 2002 ; Anonymous, 2016)
- Unscrupulous forest clearance and over exploitation of forest and wild species have led to the loss of many forest species, wild food crops and wild relatives of crops (Razzaque, 2007).
- Due to intensive agriculture with modern varieties, the diversity of minor crops and under utilized species is decreasing fast (Razzaque, 2007).

2.4. 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[17]	Effect of drivers (2, 1, 0, -1, -2, NK, NA)		
	Availability of wild foods	Knowledge of wild foods	Diversity of wild food
Changes in land and water use and management	-2	0	-1
Pollution and external inputs	-2	NA	-2
Over-exploitation and overharvesting	-2	NK	-1
Climate change	-2	0	-2
Natural disasters	-1	0	-1
Pests, diseases, alien invasive species	-1	NK	-1
Changing markets	NA	1	1
Policies	1	1	1
Population growth and urbanization	-2	NK	-2
Changing economic, socio-political, and cultural factors	-1	1	-1
Advancements and innovations in science and technology	-1	2	-2
Other [please *specify]*	NK	NK	NK

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.

Wild foods are used by the rural community for long. Still no organized program/project activity to raise public awareness of the value of the crop wild relatives and wild food plants in food security and plant breeding has been undertaken. This is inspite of the fact that rural people often use many wild plants as food, not necessarily in times of food crisis or failure, but also in their everyday life. However, with time, such sources of food are disappearing fast because niches of wild plants have been converted to either agricultural land or used for infrastructure of one kind or the other. Over exploitation of the marine wild food viz. crabs, molluscl (oyster), whale etc. has become responsible for the loss of these wild food (Hossain, 2001; Islam, 2003; Ahmed *et al*, 2012). Many of the Goyal (*Bos frontalis*), wild fig (*Sus scrofa scrofa*), Red Jungle fowl (*Gallus domesticus murgi*, wild quail

(*Cotamix coromandelica*) available in the hilly areas are also consumed for meat by the hill people (FAnGRBD, BLRI, 2015). A number of wild animals viz. swamp dear (*Cervus duvauali*) one harned rhinoceros (*Rhinoceros unicornis*) and wild water buffalo (*Bubalus arnee)* were once abundant in Sundarban and used as food have already become extinct (IUCN, 2000).

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

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?

- Economic development of the rural people has had negative effect on indigenous poultry rearing in the household by the women that was one of the most important way of maintaining poultry biodiversity in the rural areas of Bangladesh. Expansion of selected fruit orchards in the hilly areas has negative effect on the hill biodiversity that was mostly utilized by the tribal women in daily diet. Hill women usually use leaves, flowers, fruits and other parts of various plants as foods. Clearing of hilly areas for mango, banana, litchi, papaya and other fruits orchards has been reducing the hill forest thus making many useable plants biodiversity unavailable to them.

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

Changes in land use, over-exploitation and over harvesting are the drivers which have the most significant effect on the maintenance and use of traditional knowledge. Changes in land use by the dissemination and introduction of a few successful new good crop varieties have led to the loss of many local varieties. Unscrupulous forest clearance and over exploitation of forest and aquatic species have enhanced loss of forest as well as aquatic associated flora and fauna. The traditional knowledge was mostly associated with the local flora and fauna used for food and agriculture. The loss of local biodiversity and the use of introduced and new genetic resources requires no use of traditional knowledge and as such has had negative impact on the 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?

Drivers that have had the most significant effect on the role of biodiversity for food and agriculture in improving food security and sustainability are-

- Markets and trade - Market demand of the some of the rice, brinjal and mango local cultivars has been acting as major driver for the maintenance and cultivation of those cultivars. Same is the case for some the open water natural fishes, particularly of small indigenous fishes. Demand of these fishes in the local market and in the Bangladeshi people working abroad has been supportive to give more attention in maintenance and utilization of these fish biodiversity.
- The involvement of private sector in seed sectors - Private sector seed companies are allowed to introduce hybrid and open pollinated varieties of different crops in Bangladesh. These initiatives have given the opportunity of introducing huge number of genetic materials some of which are used as released varieties and others are being used as parental materials for further breeding programmes. Private sector breeders are now able to produce hybrid seeds of vegetables and rice in Bangladesh which are playing role in providing diversity in food consumed.

- Changing economic, sociopolitical and cultural factors- The overall economic conditions of Bangladeshi people have been improving that are creating demand of having diversified food in their daily diet. Moreover, some of the agro friendly policies of the Govt. and our multi- cultural heritage have always been supportive to diversified food that ultimately depend on maintenance of our biodiversity.

- Advancements and innovations in science and technology- Advances in science if used properly have had positive effect on biodiversity as they are providing more scope to utilize valuable genetic resources for the development of new crop and fish varieties. The use of local rice varieties as sources of Zn has made it possible to release Zn rich rice varieties in Bangladesh through cross-breeding programmes. GM technologies are being used to transfer genes form other organisms into crops to develop stress tolerant crops. Bangladesh has already released 5 Bt brinjal varieties resistant to Brinjal shoot and fruit borer.

2.6. 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.

- Community based coastal and wetland biodiversity management and community based adaptation strategies in the Ecologically Critical Areas and some agri-environment schemes reduce adverse consequences of drivers on both associated biodiversity and ecosystem services (Mostafa *et al.,* 2014).
- Projects are undertaken to increase fish production and to restore wetland habitats and functions of the flood plain ecosystem through increased aquatic biodiversity, productivity of the resources of the resources through involvement of the people in the integrated natural resource management of the ecosystem (Aziz *et al*., 2014).
- Community based forest management and the declaration of wild life sanctuaries and other areas as protected areas have brought positive effect on the biodiversity and habitat environment.
- Declaration of fish sanctuaries that prohibited unauthorized fish and other aquatic biodiversity.
- IPM and ICM approaches and organic practices in crop production have had positive effect on crop ecosystem and associated biodiversity.

CHAPTER 3
THE STATE AND TRENDS OF BIODIVERSITY FOR FOOD AND AGRICULTURE

3.1. Overall synthesized assessment of forest, aquatic, animal or plant genetic resources

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.

Aquatic genetic resources

- Water resources of Bangladesh hoar bour and support populations of a large variety of fishes, vertebrate and invertebrate aquatic living organisms. The country is rich in fish and aquatic resources and other biodiversity.
- Bangladesh's water bodies are known to be the habitat of 267 fresh water fishes, 457 marine fishes, 24 exotic fishes. The number of fresh water prawn species in 20 where as number of shrimp species is 41.
- Fresh water and marine mollusca species are 26 and 338 respectively. Fresh water crab and marine crab species are 4 and 11 respectively.
- The number of species of lobster, frog, crocodiles, sualles, olters, dolphin, whale and turtle and tortoise are 6, 10, 3, 24, 3, 9, 3 and 31 respectively. There are series concern about the slow decline in the condition of open water fish stocks due to a serious of natural and anthropogenic induced changes. The biodiversity of riverine fishes is presently in great danger. According to the IUCN- Bangladesh Red list, 54 indigenous riverine fishes of Bangladesh are threatened (IUCN- Bangladesh 2000). A survey carried out by researches of BAU during 2009-10 showed that more than 100 riverine fishes are presently under threat and a number of species are already lost.

Plant genetic resources

- National Agricultural Research Institutes are involved in conserving and evaluating Plant Genetic Resources. BARI gene bank has a total of 9646 accessions of germplasm which include 3523 pulses, 3947 vegetables, 1607 cereals other than rice, 1297 major and minor fruits, 795 potato, 630 oilseeds, 1261 vegetables of 27 species, 467 aroids covering all species, 359 flowers of 18 species and 86 others accessions. BRRI has 6745 accessions including 121 wild accessions, breeding lines, indigenous indica rice land races. BSRI has 1362 accessions of sugar crops in gene bank. BTRI has 475 accessions of tea germplasm including cultivated and wild genetic resources.
- BJRI gene bank is the international depository of jute genetic resources. This gene bank conserves 4111 accessions of *Corchorus capsularis,* C. *olitorius* and wild genetic resources. For *Hibiscus* species, the BJRI gene bank has 1520 accessions. It has 347 allied genera and inter species hybrids. Cotton seeds of 490 accession of CDB are conserved also in BJRI gene bank.
- Public Agricultural Universities are also conserving PGR especially of horticultural crops. BAU has field gene bank of fruit species. EWS (Bd) Ltd. has 6443 accession of vegetable crops. BRAC has 336 accessions of 17 species of flowers and other crops (Chowdhury, 2012).

Animal genetic resources

- The contribution of livestock sub-sector to GDP at constant prices was 2.58 percent in FY 2010-11. The estimated contribution to GDP during FY 2011-12 from this sub-sector was 2.50 percent. Though the share of the livestock sub-sector in GDP is small, it has immense contribution towards meeting the daily protein (animal origin) requirements and plays a vital role in national economy, employment and livelihood. The total livestock population of Bangladesh is composed of 23.20 million cattle, 25.11 million goats, 1.44 million buffalo, 3.08 million sheep, 245.8 million chicken and 45.7 million ducks. The total production of milk, meat and egg in 2011-12 was 3.46 million ton, 2.33 million ton and 7304 million pieces, respectively (DLS, 2012). However, the same figure for horse, pig, geese and pigeon are not available neither in FAO Yearbook nor in government statistics.

3.2. State and trends of associated biodiversity and ecosystem services

21. Have any changes been detected in your country for the different production systems over the last 10 years in components of associated biodiversity? If so, indicate if trends are strongly increasing (2), increasing (1), stable (0), decreasing (-1) or strongly decreasing (-2) in Table 7. If no information is available, indicate not known (NK). If not applicable, (NA).

Table 7. Trends in the state of components of associated biodiversity within production systems.

Production system	**Trends in last 10 years (2,1,0,-1,-2, NK, NA)**			
Code or name	Micro-organisms	Invertebrates	Vertebrates	Plants
L2	NK	NK	0	NK
L6	NK	NK	1	NK
F2	1	NK	NK	1
F6	-2	NK	NK	-2
A2	NK	NK	NK	NK
A6	NK	NK	NK	NK
A10	NK	NK	NK	NK
A14	NK	NK	NK	NK
C2	NK	NK	NK	1
C6	NK	NK	NK	1
C10	1	1	NK	-1
M2	NK	NK	1	1
01	NK	NK	1	NK

22. Briefly describe the changes or trends in diversity recorded in Table 7. Where possible provide information on: baseline levels (last 10 years, indicate if otherwise), measurements and indicators used, the extent of change, and the likely cause(s). Include references to the sources of information.

- There is a lack of good understanding and knowledge of associated biodiversity in Bangladesh. Due to budgetary constraints little attention is provided on associated biodiversity. As no survey has yet been carried out throughout the country, no baseline data are available for the different production systems to provide accurate information.
- The indigenous bee species *Apis dorsata* is in decline because of habitat destruction and unscientific collection of honey. Introduced honey bee, *Apis mellifera* population however, is increasing in Bangladesh because of its high nectar production capability in artificial bee cases.

This managed pollinator is found effective in pollination of twenty three species of plants (Sakhawat, 2013).

- The wild food plants are in sharp decline because of unscrupulous clearing of the many natural forests. Almost no collection and conservation strategies are in operation for these wild plants. The expansion of orchard in the hilly areas is also causing the reduction of the wild hilly fruit plants.
- Natural aquatic biota is seriously hampered because of the expansion of rice farming in the rivers, canals, beels, haors etc. The use of chemical fertilizers and pesticides in the crop field has direct negative impact not only on native fishes but also on the other associated flora and fauna in these water bodies. Over fishing and exhaustive fishing are also responsible for the sharp reduction of associated biodiversity of aquatic habitat (Mostafa, 2014).
- Insect predators and spiders, valuable suppressor of insect pests in the crop field, are diminishing because of the increasing trend of use of pesticides in the field. The training of spray of insecticides and the correct doses are not maintained by the untrained spray men.

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 system		Trends in last 10 years (2,1,0,-1,-2, NK, NA)								
Code or name	Pollination	Pest and disease regulation	Water purification and waste treatment	Natural hazard regulation	Nutrient cycling	Soil formation and production	Water cycling	Habitat provisioning	Production of oxygen/Gas regulation	Others: [please specify]
L2	NA	NK	NK	NK	NK	NK	NK	NK	NK	NK
L6	NA	NK	NK	NK	NK	NK	NK	NK	NK	NK
F2	NK	1	1	1	1	1	NK	1	1	NK
F6	NK	-1	NK	NK	-1	-1	-1	-1	1	NK
A2	NA	NK	NK	NK	NK	NK	NK	NK	NK	NK
A6	NA	NK	NK	NK	NK	NK	NK	NK	NK	NK
A10	NA	NK	NK	NK	NK	NK	NK	NK	NK	NK
A14	NA	NK	NK	NK	NK	NK	NK	NK	NK	NK
C2	NK	1	0	NK	NK	-1	NK	-2	0	NK
C6	NK	NK	NK	NK	NK	NK	NK	NK	NK	NK
C10	NK	NK	NK	NK	NK	NK	NK	NK	NK	NK
M2	NK	NK	NK	NK	NK	NK	NK	NK	NK	NK
01	NK	NK	NK	NK	NK	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.

- Pollination is hampered due to the reducing trend of pollinators because of indiscriminate use of pesticides, use of band pesticides and disturbances caused by the honey collectors *.

- Pest and disease attack is increasing because of use of fake pesticide selection pressure leading to resistance of pest and diseases against pesticides.
- Soil formation and protection is being hampered in many areas where soil micro organism diversity is affected by the use of pesticides, fertilizers etc. (Alam, 2014).

25. Is there evidence that changes in biodiversity for food and agriculture have impacted ecosystem services in your country? Indicate if strongly increasing (2), increasing (1), stable (0), decreasing (-1) or strongly decreasing (-2) in Table 9 and provide a description of specific situations and documentation where available (repeat table for each production system).

Table 9. Impact of changes in biodiversity for food and agriculture on ecosystem services.

Production system	Changes	**Impact of changes in biodiversity for food and agriculture on ecosystem services** (2, 1, 0,-1, -2, NK, NA)								
L2 Livestock grassland-based systems: Subtropics		Pollination	Pest and disease regulation	Water purification and waste treatment	Natural hazard regulation	Nutrient cycling	Soil formation and production	Water cycling	Habitat provisioning	Production of oxygen/Gas regulation
	Changes in animal genetic resources	NA	-1	0	0	1	0	0	0	0
	Changes in crop genetic resources	NA	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in forest genetic resources	NA	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in aquatic genetic resources	NA	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in micro-organism genetic resources (associated biodiversity)	NA	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in invertebrates genetic resources (associated biodiversity)	NA	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in vertebrates genetic resources (associated biodiversity)	NA	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in plants genetic resources (associated biodiversity)	NA	NK	NK	NK	NK	NK	NK	NK	NK

Production system	Changes	**Impact of changes in biodiversity for food and agriculture on ecosystem services** (2, 1, 0,-1, -2, NK, NA)								
L6 Livestock landless systems: Subtropics		Pollination	Pest and disease regulation	Water purification and waste treatment	Natural hazard regulation	Nutrient cycling	Soil formation and production	Water cycling	Habitat provisioning	Production of oxygen/Gas regulation
	Changes in animal genetic resources	NA	-1	0	0	0	0	0	0	0
	Changes in crop genetic resources	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in forest genetic resources	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in aquatic genetic resources	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in micro-organism genetic resources (associated biodiversity)	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in invertebrates genetic resources (associated biodiversity)	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in vertebrates genetic resources (associated biodiversity)	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in plants genetic resources (associated biodiversity)	NK	NK	NK	NK	NK	NK	NK	NK	NK

Production system	Changes	**Impact of changes in biodiversity for food and agriculture on ecosystem services** (2, 1, 0,-1, -2, NK, NA)								
F2 Naturally regenerated forests: Subtropics		Pollination	Pest and disease regulation	Water purification and waste treatment	Natural hazard regulation	Nutrient cycling	Soil formation and production	Water cycling	Habitat provisioning	Production of oxygen/Gas regulation
	Changes in animal genetic resources	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in crop genetic resources	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in forest genetic resources	NK	1	NK	1	1	1	1	1	1
	Changes in aquatic genetic resources	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in micro-organism genetic resources (associated biodiversity)	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in invertebrates genetic resources (associated biodiversity)	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in vertebrates genetic resources (associated biodiversity)	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in plants genetic resources (associated biodiversity)	1	1	NK	1	1	1	1	1	2

Production system	Changes	**Impact of changes in biodiversity for food and agriculture on ecosystem services** (2, 1, 0,-1, -2, NK, NA)								
F6 Planted forests: Subtropics		Pollination	Pest and disease regulation	Water purification and waste treatment	Natural hazard regulation	Nutrient cycling	Soil formation and production	Water cycling	Habitat provisioning	Production of oxygen/Gas regulation
	Changes in animal genetic resources	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in crop genetic resources	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in forest genetic resources	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in aquatic genetic resources	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in micro-organism genetic resources (associated biodiversity)	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in invertebrates genetic resources (associated biodiversity)	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in vertebrates genetic resources (associated biodiversity)	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in plants genetic resources (associated biodiversity)	-2	1	NK	-2	-1	-1	-1	-1	1

Production system	Changes	**Impact of changes in biodiversity for food and agriculture on ecosystem services** (2, 1, 0,-1, -2, NK, NA)								
A2 Self-recruiting capture fisheries: Subtropics		Pollination	Pest and disease regulation	Water purification and waste treatment	Natural hazard regulation	Nutrient cycling	Soil formation and production	Water cycling	Habitat provisioning	Production of oxygen/Gas regulation
	Changes in animal genetic resources	NA	NK	NK	NK	NK	NK	NK	NK	NK

	Changes in crop genetic resources	NA	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in forest genetic resources	NA	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in aquatic genetic resources	NA	NA	NA	NA	NA	NA	NA	NK	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)	NA	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in vertebrates genetic resources (associated biodiversity)	NA	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in plants genetic resources (associated biodiversity)	NA	NK	NK	NK	NK	NK	NK	NK	NK

Production system	Changes	**Impact of changes in biodiversity for food and agriculture on ecosystem services** (2, 1, 0,-1, -2, NK, NA)								
A6 Culture-based fisheries: Subtropics		Pollination	Pest and disease regulation	Water purification and waste treatment	Natural hazard regulation	Nutrient cycling	Soil formation and production	Water cycling	Habitat provisioning	Production of oxygen/Gas regulation
	Changes in animal genetic resources	NA	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in crop genetic resources	NA	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in forest genetic resources	NA	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in aquatic genetic resources	NA	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in micro-organism genetic resources (associated biodiversity)	NA	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in invertebrates genetic resources (associated biodiversity)	NA	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in vertebrates genetic resources (associated biodiversity)	NA	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in plants genetic resources (associated biodiversity)	NA	NK	NK	NK	NK	NK	NK	NK	NK

Production system	Changes	**Impact of changes in biodiversity for food and agriculture on ecosystem services** (2, 1, 0,-1, -2, NK, NA)								
A10 Fed aquaculture: Subtropics		Pollination	Pest and disease regulation	Water purification and waste treatment	Natural hazard regulation	Nutrient cycling	Soil formation and production	Water cycling	Habitat provisioning	Production of oxygen/Gas regulation
	Changes in animal genetic resources	NA	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in crop genetic resources	NA	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in forest genetic resources	NA	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in aquatic genetic resources	NA	NK	NK	-1	NK	NK	NK	-1	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)	NA	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in vertebrates genetic resources (associated biodiversity)	NA	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in plants genetic resources (associated biodiversity)	NA	NK	NK	NK	NK	NK	NK	NK	NK

Production system	Changes	**Impact of changes in biodiversity for food and agriculture on ecosystem services** (2, 1, 0,-1, -2, NK, NA)								
A14 Non-fed aquaculture: Subtropics		Pollination	Pest and disease regulation	Water purification and waste treatment	Natural hazard regulation	Nutrient cycling	Soil formation and production	Water cycling	Habitat provisioning	Production of oxygen/Gas regulation
	Changes in animal genetic resources	NA	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in crop genetic resources	NA	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in forest genetic resources	NA	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in aquatic genetic resources	NA	NK	NK	-1	NK	NK	NK	-1	NK
	Changes in micro-organism genetic resources (associated biodiversity)	NA	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in invertebrates genetic resources (associated biodiversity)	NA	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in vertebrates genetic resources (associated biodiversity)	NA	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in plants genetic resources (associated biodiversity)	NA	NK	NK	NK	NK	NK	NK	NK	NK

Production system	Changes	**Impact of changes in biodiversity for food and agriculture on ecosystem services** (2, 1, 0,-1, -2, NK, NA)								
C2 Irrigated crops (rice) : Subtropics		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
	Changes in animal genetic resources									
	Changes in crop genetic resources	NA	-1	-1	-1	-1	0	-1	-2	NK
	Changes in forest genetic resources	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in aquatic genetic resources	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in micro-organism genetic resources (associated biodiversity)	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in invertebrates genetic resources (associated biodiversity)	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in vertebrates genetic resources (associated biodiversity)	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in plants genetic resources (associated biodiversity)	NK	1	NK	NK	1	1	0	NK	NK

Production system	Changes	**Impact of changes in biodiversity for food and agriculture on ecosystem services** (2, 1, 0,-1, -2, NK, NA)								
C6 Irrigated crops (other) : Subtropics		Pollination	Pest and disease regulation	Water purification and waste treatment	Natural hazard regulation	Nutrient cycling	Soil formation and production	Water cycling	Habitat provisioning	Production of oxygen/Gas regulation
	Changes in animal genetic resources	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Changes in crop genetic resources	-1	-1	0	-1	-1	0	-1	-1	NK
	Changes in forest genetic resources	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in aquatic genetic resources	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in micro-organism genetic resources (associated biodiversity)	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in invertebrates genetic resources (associated biodiversity)	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in vertebrates genetic resources (associated biodiversity)	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in plants genetic resources (associated biodiversity)	NK	NK	NK	NK	NK	NK	NK	NK	NK

Production system	Changes	**Impact of changes in biodiversity for food and agriculture on ecosystem services** (2, 1, 0,-1, -2, NK, NA)								
C10 Rainfed crops : Subtropics		Pollination	Pest and disease regulation	Water purification and waste treatment	Natural hazard regulation	Nutrient cycling	Soil formation and production	Water cycling	Habitat provisioning	Production of oxygen/Gas regulation
	Changes in animal genetic resources	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Changes in crop genetic resources	0	-1	NA	-1	-1	0	-1	-1	NK
	Changes in forest genetic resources	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in aquatic genetic resources	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in micro-organism genetic resources (associated biodiversity)	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in invertebrates genetic resources (associated biodiversity)	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in vertebrates genetic resources (associated biodiversity)	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in plants genetic resources (associated biodiversity)	NK	NK	NK	NK	NK	NK	NK	NK	NK

Production system	Changes	**Impact of changes in biodiversity for food and agriculture on ecosystem services** (2, 1, 0,-1, -2, NK, NA)								
M2 Mixed systems (livestock, crop, forest and /or aquatic and fisheries): Subtropics		Pollination	Pest and disease regulation	Water purification and waste treatment	Natural hazard regulation	Nutrient cycling	Soil formation and production	Water cycling	Habitat provisioning	Production of oxygen/Gas regulation
	Changes in animal genetic resources	NK	NK	NK	NK	NK	NK	NK	NK	NK

	Changes in crop genetic resources	0	-1	NA	-1	-1	0	-1	-1	NK
	Changes in forest genetic resources	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in aquatic genetic resources	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in micro-organism genetic resources (associated biodiversity)	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in invertebrates genetic resources (associated biodiversity)	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in vertebrates genetic resources (associated biodiversity)	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in plants genetic resources (associated biodiversity)	NK	NK	NK	NK	NK	NK	NK	NK	NK
Production system	Changes	**Impact of changes in biodiversity for food and agriculture on ecosystem services** (2, 1, 0,-1, -2, NK, NA)								
01 Vegetables in floating beds		Pollination	Pest and disease regulation	Water purification and waste treatment	Natural hazard regulation	Nutrient cycling	Soil formation and production	Water cycling	Habitat provisioning	Production of oxygen/Gas regulation
	Changes in animal genetic resources	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in crop genetic resources	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in forest genetic resources	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in aquatic genetic resources	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in micro-organism genetic resources (associated biodiversity)	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in invertebrates genetic resources (associated biodiversity)	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in vertebrates genetic resources (associated biodiversity)	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in plants genetic resources (associated biodiversity)	NK	NK	NK	NK	NK	NK	NK	NK	NK

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.

Impact of changes in biodiversity for food and agriculture on ecosystem services are not clearly known in most of the cases as data are not available. Change in animal genetic resources has some effect on pest and disease regulation. The introduction of forign breeds of cattle and chickens has brought some diseases as well that has created problems in disease management in Bangladesh, Changes in plant genetic resources have some negative effect on pollination and natural hazard vegetation but positive on pest and disease regulation. Pollination in trees are caused mainly by birds which are reluctant to visit many introduced tree plants in our country as they are not accustomed to the new species. Bangladesh is a disaster prone country as cyclone, floods, storms often visit. Introduced species in many cases do not provide natural hazard vegetation. However, some introduced vegetable hybrids are showing resistance against pest and diseases. Similarly, change in genetic resources of crops has negative effect on most of the ecosystem services. The use of HYVs require higher amount of inputs including chemical fertilizers and pesticides have had negetive impacts on 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	Actively managed species (name) and sub-species (where available)	Production systems (code or name)	Availability of diversity information (Y/N)	Source of information
Pollination	*Apis mellifera*	C6, C10	N	Shakhawat, 2013
Pest and disease regulation	*Coccinella septempunctata*	C6, C10	Y	Entomology Division, BARI
	Trichoderma harzianum	C2, C10	Y	Raju and Hossain, 2015; Hossain *et al*., 2009; Sultana *et al.,* 2009
	Salmonella pullorum *Salmonella gallinarum*	L2	Y	Haider *et al*.,2012 Haider *et al*.,2012
	Mycoplasma gallisepticumin		Y	Arefin *et al.,* 2012
	Rani Khet vaccine (RDV) Baby Chick Rani Khet dissease vaccine Fowl pox vaccine Pigeon pox vacine Foot & mouth disease vaccine Rabies vaccine Goat pox vaccine Paste des Petes Ruminants vaccine virus (PPRV) Gum-boro vaccine Marek's disease vaccine Anthrax vaccince HS (Haemorregic septecemia) raceme BQ (Back Quarter) vaccine FC (Fowl cholera) vaccine Duck plaque vaccine Newcastle Disease Virus Avian Influenza virus (AIV)	L2	Y	DLS and BLRI Chowdhury *et al*., 2014 Islam *et al.,* 2012 Nooruzzaman *et al*., 2015
Water purification and waste treatment	NK	NK	NK	NK
Natural hazard regulation	*Avecinia alba, Baringtonia acutangularis, Casuarina equisitifolia, Cocos nucifera, Nypa fruiticens, Pongamiea pinnata, Sonneretia apatala*	F2, F6	Y	BFD
Nutrient cycling	NK	NK	NK	NK
Soil formation and protection	*Sesbania sp.* *Mycorrhiza sp.*	C6, C10	Y	NK
	Rhizobium legumisorum *Rhizobium sp.* *Bradyrhizobium sp.* *Bradyrhizobium japonicum*	C10	NK	Bangladesh Gazette, 10 May,2001, No. 19
Water cycling	NK	NK	NK	NK
Habitat provisioning	*Artocarpus chaplasha, Ceriops roxburghii, Elaeocarpus floribundus, Ficus spp., Syzygium spp. Mangifera sylvetica, Phyllanthus emlica, Sonneretia apetala, Terminalia ballerica*	F2, F6	Y	BFD
Production of oxygen/ Gas regulation	NK	NK	NK	NK

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.

- Research activities on associated bio-diversity are very meager. As the most of the research activities are project based, little or no fund is available for even base line survey on different components of associated biodiversity active in different production systems. As no mainstreaming has been carried out for the associated biodiversity, research on these issues is not progressing and there is no systematic monitoring activities prevailing for associated biodiversity.

3.3. Species of associated biodiversity at risk of loss

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[18]. 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
Abelmoschus hostilis (Wall.) Khan and Sakhawat	VU	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Acanthephippium sylhetense Lindl.	EN	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Acanthus leucostachyus Wall.	EN	Deforestation/ Habitat loss	RDB - Ara et al. (2013)
Achyrospermum wallichianum Benth.	EN	Deforestation/ Habitat loss	RDB - Ara et al. (2013)
Actinosmemma tenerum Griff.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Aeschynanthus hookeri C. B. Clarke	EN	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Aganosma marginata (Roxb.) G. Don	Cd	Deforestation/ Habitat loss	RDB - Rahman (2013)
Aglaonema hookerianum Schott	VU	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Agrostophyllum khasiyanum Griff.	VU	Deforestation/ Habitat loss	RDB - Ara et al. (2013)
Aidia micrantha (K. Schum.) F. White	VU	Deforestation/ Habitat loss	RDB - Rahman (2013)
Aldrovanda vesiculosa Linn.	CR	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Alphonsea lutea (Roxb.) Hook.f.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Alphonsea ventricosa (Roxb.) Hook.f. & Thom.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Alphonsea ventricosa Hook. f. & Thom.	EN	Deforestation	RDB - Ara et al. (2013)
Alstonia nerifolia D. Don	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Amblyanthopsis membranacea Mez.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Amomum aromaticum Roxb.	VU	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Amomum costatum (Roxb.) Benth.	EN	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Amorphophallus excentricus Hett.	CR	Habitat destruction	RDB - Ara et al. (2013)
Ampelopsis glandulosa (Wall.) Momiy.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Anamirta cocculus (L.) Wight & Arn.	CR	Deforestation/ Habitat loss	RDB - Rahman (2013)
Ancistrocladus wallichii Planch.	CR	Deforestation	RDB - Ara et al. (2013)
Andrographis paniculata (Burm.f.) Wall. *ex* Nees	CD	Deforestation/ Habitat loss	BNH
Angiopteris sylhetensis de Vriese	CR	Deforestation/	RDB - Ara et al. (2013)

		Habitat loss	
Anisoptera scapula (Roxb.) Pierre	EN	Deforestation	BNH
Antidesma khasianum Hook. f.	VU	Deforestation/ over exploitation	RDB - Ara et al. (2013)
Antidesma montanum Blume var. salicinum Hoffm.	VU	Deforestation, over exploitation	RDB - Ara et al. (2013)
Aquilaria agallocha Roxb.	CD	Deforestation/ Over exploitation	RDB - Khan et al.(2001)
Ardisia khasiana var. *thomsoni* C.B. Clarke	VU	Deforestation/ Habitat loss	RDB - Rahman (2013)
Ardisia colorata Roxb.	VU	Deforestation/ Habitat loss	RDB - Rahman (2013)
Ardisia elliptica Thunb.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Argostemma sarmentosum Wall.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Ariopsis peltata Nimmo	CR	Deforestation/ Habitat loss	RDB - Ara et al. (2013)
Aspidopterys oxyphylla Juss	EN	Deforestation	RDB - Ara et al. (2013)
Aspidopterys rotundifolia A. Juss.	EN	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Asplenium phyllitidis D. Don	CR	Deforestation	RDB - Ara et al. (2013)
Atalantia monophylla A. DC.	EN	Deforestation	RDB - Ara et al. (2013)
Balsamodendron roxburghii Am.	EN	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Begonia alaecida C.B. Clarke	CR	Habitat destruction	RDB - Ara et al. (2013)
Begonia alaecida C.B. Clarke	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Begonia barabata Wall. *ex.* A. DC.	nt	Deforestation/ Habitat loss	RDB - Rahman (2013)
Begonia silhetensis (A.DC.) C.B. Clarke	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Beilschmiedia roxburghiana Ness	EN	Deforestation/ Habitat loss	RDB - Ara et al. (2013)
Beumontia grandiflora Wall.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Bhesa robusta Ding Hou	VU	Deforestation/ Over exploitation	RDB - Ara et al. (2013)
Boesenbergia islamii Yusuf & Rahman	EN	Deforestation/ Habitat loss	RDB - Ara et al. (2013)
Bombax insigne Wall. *ex* Hook. f.	VU	Deforestation	RDB - Khan et al.(2001)
Bouea oppositifolia (Roxb.) Meissner	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Brownlowia elata Roxb.	VU	Deforestation/ Over exploitation	RDB - Ara et al. (2013)
Buchanania lancifolia Roxb.	VU	Deforestation	RDB - Khan et al.(2001)
Buchania lanzan Spreng.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Bulbophyllum protractum Hook.	EN	Deforestation/ Habitat loss	RDB - Ara et al. (2013)
Bulbophyllum roxburghii (Lindl.) Reichb. f.	EN	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Butea listeri (Prain) Blatter	VU	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Calamus erectus Roxb.	VU	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Calamus guruba Buch. -Ham. *ex* Mart.	VU	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Calamus latifolius Roxb.	VU	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Calamus longisetus Griff.	VU	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Calliandra umbrosa (Wall.) Benth.	VU	Deforestation	RDB - Khan et al.(2001)
Calotropis acia F. Ham.	VU	Deforestation/ Habitat loss	RDB - Rahman (2013)

Canarium bengalense Roxb.	VU	Deforestation	RDB - Khan et al.(2001)
Canarium resiniferum Brace	EN	Deforestation/ Over exploitation	RDB - Khan et al.(2001)
Canscora andrographioides Griff.	EN	Restricted distribution	RDB - Ara et al. (2013)
Carex caespitita Nees	CR	Alteration of habitat	RDB - Ara et al. (2013)
Careya herbacea Roxb.	VU	Deforestation/ Over exploitation	RDB - Ara et al. (2013)
Careya sphaerica Roxb.	CR	Deforestation/ Over exploitation	RDB - Ara et al. (2013)
Casearia kurzii Clarke	EN	Deforestation/ Over exploitation	RDB - Ara et al. (2013)
Castanopsis castanicarpa Spach.	VU	Deforestation/ Over exploitation	RDB - Ara et al. (2013)
Caulokaemferia secunda (Wall. *ex* Roxb.) Larsen	VU	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Caulokaempferia linearis K. Larsen	EN	Habitat destruction	RDB - Ara et al. (2013)
Cayratia pedata (Lam.) Juss. *ex* Gagnep.	nt	Deforestation/ Habitat loss	RDB - Rahman (2013)
Cayratia tenuifolia (Wight & Arn.) Gagnep.	nt	Deforestation/ Habitat loss	RDB - Rahman (2013)
Cephalanthus occidentalis L.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Cephalanthus tetrandra (Roxb.) Ridsdale *et* Bakh.f.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Ceriscoides turgida (Roxb.) Tirveng.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Ceropegia longifolia Wall. subsp. longifolia	VU	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Chisocheton dysoxylifolius Kurz	VU	Deforestation/ Over exploitation	RDB - Ara et al. (2013)
Chonemorpha assamensis Furtado	EN	Habitat destruction	RDB - Ara et al. (2013)
Chonemorpha assamensis Furtado	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Chonemorpha griffithii Hook.f.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Cissus pentagona Roxb.	nt	Deforestation/ Habitat loss	RDB - Rahman (2013)
Citruullus colocynthis (L.) Schard.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Cleisostoma appendiculatum Benth. & Hook.f.	EN	Restricted habitat	RDB - Ara et al. (2013)
Colocasia manii Hook. f.	EN	Deforestation/ Habitat loss	RDB - Ara et al. (2013)
Colocasia virosa Kunth	CR	Deforestation/ Habitat loss	RDB - Ara et al. (2013)
Corypha taliera Roxb.	CR	Failure of natural regeneration	RDB - Khan et al.(2001)
Cosmostigma racemosa (Roxb.) Wight & Arn.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Crepidium biauritum Szlach.	EN	Deforestation/ Habitat loss	RDB - Ara et al. (2013)
Cryptocarya andamanica Hook.f.	EN	Deforestation/ Over exploitation	RDB - Ara et al. (2013)
Cryptocarya andamanica Hook.f.	CR	Deforestation	RDB - Ara et al. (2013)
Cryptolepis buchananii Roem. & Schult.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Cryptolepis sinensis (Lour.) Merr.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Cucumis callosus (Rottl.) Cogn	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Cucumis hystrix Chakrav.	R/EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Cucumis hystrix Chakravarty	EN	Habitat loss/ Over exploitation	RDB - Ara et al. (2013)
Curcuma amada Roxb.	EN	Deforestation/	RDB - Ara et al. (2013)

		Habitat loss	
Curcuma ferruginea Roxb.	EN	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Curcuma latifolia Rosc.	EN	Destruction of habitat	RDB - Ara et al. (2013)
Curcuma rubescens Roxb.	VU	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Cyathea gigantea (Wall. *ex* Hook.) Holtt.	VU	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Cycas pectinata Griff.	VU	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Cyclea barbata Miers	VU	Deforestation/ Habitat loss	RDB - Rahman (2013)
Cyclobalanopsis oxydon Oerst.	EN	Deforestation/ Over exploitation	RDB - Ara et al. (2013)
Cymbidium aloifolium (Linn.) Sw.	VU	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Cymbopogon osmastonii R.N.Parker	VU	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Cynanchum callialata F. Ham. *ex* Wight	lc	Deforestation/ Habitat loss	RDB - Rahman (2013)
Cynanchum corymbosum Wight	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Cynanchum wallichii Wight	VU	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Cynoglossum lanceolatum Forssk.	cd	Deforestation/ Habitat loss	RDB - Rahman (2013)
Cyperus thomsonii Boeck	VU	Deforestation/ Habitat loss	RDB - Ara et al. (2013)
Dalhousiea bracteata (Roxb.) Grah.	EN	Deforestation	RDB - Ara et al. (2013)
Dehaasia kurzii King	VU	Deforestation/ Over exploitation	RDB - Ara et al. (2013)
Dendrobium longicornu Wall. *ex* Lindl.	CR	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Dendrobium ruckeri Lindl.	CR	Deforestation/ Over exploitation	RDB - Ara et al. (2013)
Desmos dumosus (Roxb.) Saff.	Cd	Deforestation/ Habitat loss	RDB - Rahman (2013)
Desmos dunalii (Hook.f. & Thom.) Saff.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Desmos longiflorus (Roxb.) Safford	VU	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Dioscorea prazeri Prain & Burkill	VU	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Diospyros benghalensis Bakh.f.	VU	Deforestation/ Over exploitation	RDB - Ara et al. (2013)
Diospyros ramiflora Roxb.	EN	Deforestation/ Over exploitation	RDB - Ara et al. (2013)
Diploclisia glaucescens (Blume) Diels	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Diplocyclos palmatus (L.) Juffery	R/EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Dischidia bengalensis Colebr.	VU	Deforestation/ Habitat loss	RDB - Rahman (2013)
Dischidia major (Vahl) Merr.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Dischidia numularia R. Br.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Dolichandron spathacea K. Schum	EN	Deforestation	RDB - Ara et al. (2013)
Drimycarpus racemosus Hook.f.	VU	Deforestation/ Habitat loss	RDB - Rahman (2013)
Drypetes assamica Pax & Hoffm.	EN	Deforestation	RDB - Ara et al. (2013)
Dysoxylum binectariferum Hook.f. *ex* Bedd.	VU	Deforestation	RDB - Khan et al.(2001)
Elaeocarpus acuminatus Wall. *ex* Mast.	VU	Deforestation	RDB - Khan et al.(2001)
Elaeocarpus petiolatus Wallich	EN	Deforestation	RDB - Ara et al. (2013)
Elaeocarpus prunifolius Masters	EN	Deforestation/	RDB - Ara et al. (2013)

		Habitat loss	
Elaeocarpus rugosus Roxb.	VU	Deforestation	RDB - Ara et al. (2013)
Embelia nutans Wall.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Embelia robusta Roxb.	VU	Deforestation/ Habitat loss	RDB - Rahman (2013)
Erythroxylum kunthianum Wall.	CR	Deforestation	RDB - Ara et al. (2013)
Eulophia mackinnonii Duthie	VU	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Euonymus attenuatus Wall. *ex* Law.	VU	Deforestation/ Habitat loss	RDB - Ara et al. (2013)
Fagerlindia fasciculata (Roxb.) Tirveng.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Finlaysonia obovata Wall.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Fissistigma bicolor (Hook.f. & Thom.) Merr.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Fissistigma polyanthum (Hook.f. & Thom.) Merr.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Fissistigma polyanthum Merr.	VU	Deforestation/ Habitat loss	RDB - Ara et al. (2013)
Fissistigma rubiginosum (A. DC.) Merr.	Cd	Deforestation/ Habitat loss	RDB - Rahman (2013)
Fissistigma rufinerve (Hook.f. & Thom.) Merr.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Fissistigma wallichii (Hook.f. & Thom.) Merr.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Friesodielsia fornicata (Roxb.) Das (1963)	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Garcinia anomala Planch. & Triana	EN	Deforestation	RDB - Ara et al. (2013)
Garcinia lanceaefolia Roxb.	VU	Deforestation	RDB - Ara et al. (2013)
Gardenia latifolia Aiton	VU	Deforestation/ Habitat loss	RDB - Rahman (2013)
Gardenia resinifera Roth.	CR	Deforestation	RDB - Ara et al. (2013)
Gastrodia zeylanica Schlechter	VU	Deforestation/ Habitat loss	BNH
Genianthes laurifolius (Roxb.) Hook.f.	VU	Deforestation/ Habitat loss	RDB - Rahman (2013)
Globba multiflora Wall. *ex* Baker	VU	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Glochidion heyneanum Wight	EN	Deforestation	RDB - Ara et al. (2013)
Glochidion hirsutum Voigt	EN	Deforestation/ Habitat loss	RDB - Ara et al. (2013)
Glochidion sphaerogynum Kurz	VU	Deforestation	RDB - Ara et al. (2013)
Gluta elegans (Wall.) Hook.f.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Gnetum latifolium BI. var. funiculare (Bl.) Mgf.	VU	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Gnetum montanum Mgf.	VU	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Gnetum oblongum Mgf.	VU	Deforestation	RDB - Khan et al.(2001)
Gomphostemma mastersii Benth.	EN	Habitat loss	RDB - Ara et al. (2013)
Gomphostemma melissifolium Wall.	EN	Deforestation/ Habitat loss	RDB - Ara et al. (2013)
Gomphostemma salarkhaniana Khanam and Hassan	CR	Deforestation	RDB - Ara et al. (2013)
Gomphostemma velutinum Benth.	EN	Habitat loss	RDB - Ara et al. (2013)
Gongronema nepalense (Wall.) Decne	VU	Deforestation/ Habitat loss	RDB - Rahman (2013)
Goniothalamus sesquipedales (Wall.) Hook.f. & Thom.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Guettarda speciosa L.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Gymnema latifolium Wall. *ex* Wight	VU	Deforestation/ Habitat loss	RDB - Rahman (2013)

Gymnema molle Wall. *ex* Wight	VU	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Gymnostachyum listeri Prain	VU	Deforestation	RDB - Khan et al.(2001)
Haematocarpus validus (Miers) Bakh.f. *ex* Forman	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Hedychium aureum Clarke & Mann *ex* Baker	VU	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Hedychium coccineum Buch. -Ham.	VU	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Hedychium glaucum Rose.	VU	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Hedychium gracile Roxb.	VU	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Hedychium griffithianum Wall.	VU	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Hedychium speciosum Wall. *ex* Roxb.	EN	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Hedychium stenopetalum Lodd.	VU	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Hedychium thyrsiforme Buch.-Ham. *ex* Smith	VU	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Hedyotis ovatifolia Cav.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Hedyotis thomsoni Hook.f.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Hedyotis trinervia (Retz.) Roem. et Schult.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Hemidesmus indicus (L.) R. Br.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Heritiera papilio Bedd.	CR	Deforestation	RDB - Ara et al. (2013)
Hibiscus scandens Roxb.	VU	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Himalrandia tetrasperma (Wall. *ex* Roxb.) Yamazaki	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Hitchenia careyana Benth.	VU	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Hodgsonia macrocarpa Cogn.	VU	Deforestation	RDB - Ara et al. (2013)
Holigarna longifolia Roxb.	VU	Deforestation	RDB - Khan et al.(2001)
Holostemma ada-kodien Schultes	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Homalium nepalense Benth.	CR	Deforestation	RDB - Ara et al. (2013)
Homalium schlichii Kurz	EN	Deforestation	BNH
Horsefieldia amygdalina Warb.	VU	Deforestation	RDB - Ara et al. (2013)
Horsfieldia kingii Warb.	VU	Deforestation	RDB - Ara et al. (2013)
Hoya acuminata (Wight) Benth. *ex.* Hook. f.	VU	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Hoya alexicana (Jacq.) Moon	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Hoya arnottiana Wight	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Hoya fusca Wall.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Hoya globulosa Hook. f.	VU	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Hoya lanceolata Wall. *ex* Don	VU	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Hydnocarpus kurzii (King) Warb.	VU	Deforestation	RDB - Khan et al.(2001)
Hypserpa nitida Miers	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Ilex embelioides Hook. f.	CR	Deforestation	RDB - Ara et al. (2013)
Ilex odorata Buch.-Ham. *ex* D. Don	EN	Deforestation/ Over exploitation	RDB - Ara et al. (2013)
Ixora tigriomustax Bremek.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)

Justicia oreophila C.B. Clarke	VU	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Kedrostis foetidissma (Jacq.) Cogn.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Knema bengalensis de Wilde	VU	Deforestation	RDB - Khan et al. (2001)
Knema clarkeana Warb.	VU	Deforestation/ Over exploitation	RDB - Ara et al. (2013)
Lagenandra gomezii Bogner and Jacob.	VU	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Lasianthus attenuatus Jack	CR/EX	Deforestation/ Habitat loss	RDB - Rahman (2013)
Lasianthus verticillatus (Lour.) Merr.	CR	Deforestation/ Habitat loss	RDB - Rahman (2013)
Leea alata Edgew.	VU	Deforestation	RDB - Khan et al.(2001)
Lepisanthes tetraphylla Radlk.	VU	Restricted habitat/ Deforestation	RDB - Ara et al. (2013)
Leptochilus decurrens Blume	EN	Restricted habitat	RDB - Ara et al. (2013)
Licuala peltata Roxb.	VU	Deforestation	RDB - Khan et al.(2001)
Limnophila cana Griff.	VU	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Lithocarpus acuminata (Roxb.) Rehder	VU	Deforestation	RDB - Khan et al.(2001)
Lithocarpus thomsonii Rehder.	VU	Deforestation/ Over exploitation	RDB - Ara et al. (2013)
Litsea clarkei Prain	VU	Deforestation	RDB - Khan et al.(2001)
Litsea thomsonii Meiss.	VU	Deforestation/ Habitat loss	RDB - Ara et al. (2013)
Lodes hookeriana Baill.	CR	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Luffa echinata Roxb.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Luffa graveolens Roxb.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Machilus fruticosa Kurz.	EN	Deforestation	RDB - Ara et al. (2013)
Maesa bengalensis Mez.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Maesa chisia F. Ham. *ex* D. Don	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Maesa paniculata A. DC.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Magnolia griffithii Hook.f. & Thom.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Magnolia hodgsonii (Hook.f. & Thom.) King	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Magnolia pterocarpa Roxb.	VU	Deforestation	BNH
Mangifera longipes Griff.	VU	Deforestation/ Habitat loss	RDB - Rahman (2013)
Mangifera sylvatica Roxb.	VU	Deforestation	RDB - Khan et al.(2001)
Mantisia radicalis (Roxb.) D.P. Dam & N.Dam	VU	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Mantisia spathulata (Roxb.) Schult.	VU	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Marsdenia eriocarpa Hook. f.	VU	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Marsdenia tenacissima (Roxb.) Moon	VU	Deforestation/ Habitat loss	RDB - Rahman (2013)
Marsdenia thyrsiflora Hook.f.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Marsdenia tinctoria R. Br.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Mastixia macrophylla Kosterm.	CR	Deforestation/ Habitat loss	RDB - Ara et al. (2013)
Melodinus Khasianus Hook.f.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Melodinus monogynus Roxb.	EN	Deforestation	RDB - Ara et al. (2013)
Melodinus monogynus Roxb.	EN	Deforestation/	RDB - Rahman (2013)

		Habitat loss	
Mesua floribunda (Wall.) Kosterm.	CR	Deforestation/ Habitat loss	RDB - Ara et al. (2013)
Michelia panduana Hook. f. & Thom.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Michelia mannii King	CR	Deforestation/ Over exploitation	RDB - Ara et al. (2013)
Michelia montana Blume	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Michelia panduana Hook.	CR	Deforestation/ Over exploitation	RDB - Ara et al. (2013)
Microtoena griffithii Prain	CR	Deforestation/ Habitat loss	RDB - Ara et al. (2013)
Miliusa globosa (DC.) Panigr. & Mishra	Cd	Deforestation/ Habitat loss	RDB - Rahman (2013)
Miliusa longiflora (Hook.f. & Thom.) Finet & Gagnep.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Miliusa tomentosa (Roxb.) J. Sinclair	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Mitrephora maingayi Hook. f. & Thom.	EN	Deforestation	RDB - Ara et al. (2013)
Mitrephora mangayi Hook.f. & Thom.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Mitrephora tomentosa Hook.f. & Thom.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Munronia pinnata Theobald	EN	Deforestation/ Habitat loss	RDB - Ara et al. (2013)
Mycetia listeri Deb	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Mycetia mukerjiana Deb *et* Dutta	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Myrioneuron clarkei Hook. f.	VU	Deforestation	RDB - Khan et al.(2001)
Myrioneuron nutans Wall. *ex* Kurz	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Myriopteron extensum (Wight) K. Schum.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Nepenthes khasiana Hook. f.	CR	Deforestation/ Habitat loss	RDB - Ara et al. (2013)
Nostolachma khasiana (Korth.) Deb *et* Lahiri	CR	Deforestation/ Habitat loss	RDB - Rahman (2013)
Nothopegia acuminata J. Sinclair	CR	Deforestation	RDB - Khan et al.(2001)
Nyssa javanica Wagner	CR	Deforestation	RDB - Ara et al. (2013)
Oberonia mannii Hook. f.	EN	Deforestation/ Habitat loss	RDB - Ara et al. (2013)
Oberonia wallichii Hook. f.	VU	Deforestation/ Habitat loss	RDB - Ara et al. (2013)
Ochna wallichii Planch	CR	Deforestation/ Habitat loss	RDB - Ara et al. (2013)
Olax nana Wallich	CR	Deforestation/ Habitat loss	RDB - Ara et al. (2013)
Ophiorrhiza fasciculata D. Don	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Ophiorrhiza tingens C.B. Clarke *ex* Fischer	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Ophiorrhiza villosa Roxb.	VU	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Osbeckia capitata Benth. *ex* Naud.	VU	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Paphiopedilum insigne (Wall. *ex* Lindl.) Pfitz.	VU	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Paphiopedilum venustum (Wall. *ex* Sims.) Pfitz	VU	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Parthenocissus semicordata (Wall. ex Roxb.) Planch.	nt	Deforestation/ Habitat loss	RDB - Rahman (2013)
Parthenocissus semicordata Planch.	VU	Deforestation/ Habitat loss	RDB - Ara et al. (2013)

Pavetta breviflora DC.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Pavetta subcapitata Wall. *ex* Hook.f.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Pentabothra nana (F. Ham. *ex* Wight) Hook.f.	VU	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Pentasacme wallichii Wight	CR	Restricted distribution	RDB - Ara et al. (2013)
Pentatropis capensis (L.f.) Bullock	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Periploca acuminate Rahman & Wilcock	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Persicaria eciliata Hassan	EN	Deforestation/ Habitat loss	RDB - Ara et al. (2013)
Phoenix acaulis Buch.-Ham.	EN	Habitat loss	RDB - Ara et al. (2013)
Phrynium imbricatum Roxb.	VU	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Phyllanthus roxburghii Muell.-Arg.	EN	Habitat loss	RDB - Ara et al. (2013)
Picrasma javanica Blume	VU	Deforestation	RDB - Ara et al. (2013)
Pinanga gracilis Bl.	VU	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Polyalthia simiarum (Buch-Ham. *ex* Hook.f.) Hook.f. & Thom.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Polyalthia simiarum Benth. & Hook.f.	VU	Deforestation/ Over exploitation	RDB - Ara et al. (2013)
Psilotum nudum (L.) P. Beauv.	VU	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Psychotria helferiana Kurz	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Psychotria montana Blume.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Psychotria silhetensis Hook.f.	VU	Deforestation/ Habitat loss	RDB - Rahman (2013)
Psychotria stipulacea Wall.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Psychotria symplocifolia Kurz	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Psydrax umbellata (Wight) Bridson	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Pterospermum semisagittatum Buch.-Ham. *ex* Roxb.	VU	Deforestation	RDB - Khan et al.(2001)
Pycnarrhena pleniflora Hook. f. & Thoms.	VU	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Rauvolfia serpentina Benth. *ex* Kurz	VU	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Rhaphidophora schottii Hook.f.	EN	Deforestation	RDB - Ara et al. (2013)
Rhus succedanea L.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Rotala simpliciuscula (S. Kurz) Koehne	VU	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Sageraea listeri King var. listeri	CR	Deforestation	RDB - Khan et al.(2001)
Scaphium scaphigerum Guib. & Plan.	VU	Deforestation	RDB - Ara et al. (2013)
Semecarpus acuminata Thw.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Semecarpus albescence Kurz	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Semecarpus heterophylla Blume	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Semecarpus nigroviridis Thw.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Semecarpus subpanduriformis Wall. *ex* Hook.f.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Siphonodon celastrineus Griff.	EN	Deforestation	RDB - Ara et al. (2013)
Smilax roxburghiana Wallich	EN	Deforestation/ Habitat loss	RDB - Ara et al. (2013)
Sonerila maculata Roxb.	CR	Restricted habitat	RDB - Ara et al. (2013)

Spermacoce pusilla Wall.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Spiradiclis cylindrica Wall. *ex* Hook.f.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Staurogyne thyrsoidea O. Kuntze	VU	Habitat loss	RDB - Ara et al. (2013)
Stephania glabra (Roxb.) Miers	VU	Deforestation/ Habitat loss	RDB - Rahman (2013)
Sterculia versicolor Wall.	EN	Deforestation	RDB - Ara et al. (2013)
Steudnera colocasifolia Koch	EN	Deforestation	RDB - Ara et al. (2013)
Steudnera colocasioides Hook. f.	VU	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Steudnera gagei Krause	EN	Deforestation	RDB - Ara et al. (2013)
*Stichoneuron membrana*ceum Hook. f.	CR	Restricted habitat	RDB - Ara et al. (2013)
Streptocaulon sylvestre Wight	EN/EX	Deforestation/ Habitat loss	RDB - Rahman (2013)
Swintonia floribunda Griff.	VU	Deforestation	RDB - Khan et al.(2001)
Symplocos macrophylla Wall.	VU	Deforestation	RDB - Ara et al. (2013)
Syzygium reticulatum Walp.	EN	Deforestation/ Over exploitation	RDB - Ara et al. (2013)
Tarenna disperma (Hook.f.) Pitard	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Tarenna helferi (Hook.f.) N. P. Balakr.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Tarenna odorata (Roxb.) Rabinson	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Tarenna scandens	EN	Deforestation/ Habitat loss	RDB - Ara et al. (2013)
Tarenna scandens (Roxb.) Good	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Taxillus thelocarpa (Hook. f.) Alam	VU	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Tectaria chattagramica (Clarke) Ching	VU	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Tectaria simonsii (Baker) Ching	CR	Deforestation/ Habitat loss	RDB - Ara et al. (2013)
Telosma cordata (Burm. f.) Merr.	VU	Deforestation/ Habitat loss	RDB - Rahman (2013)
Terminalia citrina (Gaertn.) Roxb. *ex* Fleming	VU	Deforestation	RDB - Khan et al.(2001)
Tetradium glabrifolium Hartley	EN	Deforestation	RDB - Ara et al. (2013)
Tetraphyllum bengalense Clarke	CR	Restricted habitat	RDB - Ara et al. (2013)
Tetrastigma dubium (Laws.) Planch.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Tetrastigma dubium Planch.	EN	Deforestation	RDB - Ara et al. (2013)
Tetrastigma serrulatum (Roxb.) Planch.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Thelypteris loyalii Fraser.-Jenk.	CR	Deforestation/ Habitat loss	RDB - Ara et al. (2013)
Thottea tomentosa (Bl.) Ding Hou	CR	Restricted habitat	RDB - Ara et al. (2013)
Tinospora crispa (L.) Hook.f.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Tinospora sinensis (Lour.) Merr.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Tournefortia roxburghii C. B. Clarke	VU	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Tournefortia viridiflora C. B. Clarke	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Toxocarpus acuminatus (Wight) Benth. *ex* Hook.f.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Toxocarpus himalensis Falc. *ex* Hook.f.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Toxocarpus kleinii Wight & Arn.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Triandenum breviflorum (Wall. *ex* Dyer) Kimura	VU	Deforestation/ Habitat loss	RDB - Khan et al.(2001)

Trichosanthes cucumerina L.	cd	Deforestation/ Habitat loss	RDB - Rahman (2013)
Trichosanthes listeri Chakravarty	R/EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Trichosanthes nervifolia L.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Trichosanthes tricuspidata Lour.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Trichosanthes wallichiana (Seringe) Wight	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Trichosanthis ovigera Blume	R/EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Trivalvaria argentea (Hook.f. & Thom.) J. Sinclair	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Trivalvaria dubia (Kurz) J. Sinclair	VU	Deforestation/ Habitat loss	RDB - Ara et al. (2013)
Trivalvaria dubia (Kurz) J. Sinclair	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Turpinia cochinchinensis Merr.	VU	Deforestation	RDB - Ara et al. (2013)
Tylophora hirsute (Wall) Wight	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Typhonium gracile Schott.	VU	Deforestation/ Habitat loss	RDB - Ara et al. (2013)
Typhonium listeri Prain	VU	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Uncaria macrophylla Wall.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Uvaria cordata (Dunal) Alston	VU	Deforestation/ Habitat loss	RDB - Rahman (2013)
Uvaria ferruginea Buch.-Ham. *ex* Hook.f. & Thom.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Uvaria hirsuta Jack (1820)	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Uvaria lurida Hook.f. & Thoms. var. lurida	VU	Deforestation	RDB - Khan et al.(2001)
Vallaris solanacea (Roth.) O. Kuntze	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Vandopsis gigantea (Lindl.) Pfitz.	CD	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Vanilla parishii Reichb. f.	CD	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Vernonia thomsoni Hook. f.	VU	Deforestation/ Habitat loss	RDB - Khan et al.(2001)
Vitis heyneana Roem. & Schult.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Wendlandia heynei (Roem. *et* Schult.) Santap. *et* Marchant	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Wendlandia paniculata (Roxb.) DC.	CR/EX	Deforestation/ Habitat loss	RDB - Rahman (2013)
Wendlandia scabra Kurz (1872)	CR/EX	Deforestation/ Habitat loss	RDB - Rahman (2013)
Wendlandia tinctoria (Roxb.) DC.	VU	Deforestation/ Habitat loss	RDB - Rahman (2013)
Wendlandia tinctoria DC. ssp. *orientalis* Cowan	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Willoughbeia edulis Roxb.	VU	Deforestation/ Habitat loss	RDB - Rahman (2013)
Wrightia arborea (Dennst.) Mabb.	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Wrightia coccinea (Roxb.) Sims	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)
Zehneria japonica (Thunb.) H.Y.Liu	EN	Deforestation/ Habitat loss	RDB - Rahman (2013)

3.4. Conservation of associated biodiversity

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	NK	NK	NK	NK	NK
Invertebrates	*Eisenia fetida* and *Lumbricus rubellus*	Not known	*Ex situ conservation*	for the production of vermicompost	Not done
	Apis millifera	Not known	Maitained at aftificial Bee hive	For pollination and honey collection	Charactrization partially done
	Bracon hebetor	Not known	Maintained by BARI and Ispahani Agrolimited	Used as larval paratisoid of insects	Charactrization Partially done
	Tricogramma chilonsis	Not known	Maintained by BARI and Ispahani Agrolimited	Used as larval paratisoid of insects	Charactrization Partially done
	Chrysoperla carnea	Not known	Maintained by Ispahani Agrolimited	Insect predator	Charactrization Partially done
	Coccinella septempunctata	Not known	Maintained by Ispahani Agrolimited	Insect predator	Charactrization partially done
	Mud crab *(Scylla serrata)*	Not known	Pond	Fattering for internal consumption and export	Partially done
Vertebrates	Jungle Fowl	50	Ex situ Conservation at BLRI	Conservation and improvement	Charactrization Partially done
	Deer	12	Ex situ Conservation at BLRI	Conservation and improvement	Note done
	Hilly goat	200	Ex situ Conservation at BLRI	Conservation and improvement	Partially done
	Hilly chicken	250	Ex situ Conservation at BLRI	Conservation and improvement	Done
	Goyal	10	Ex situ Conservation at BLRI	Conservation and improvement	Partially done

Plants	*Erianthis Spp*	24 accession	Maintaining at field gene bank	To conserve as active and base collection	Evaluation under way
	Saccharum spontaneum	43 accession	Field gene bank	Conservation purpose	Evaluation under way
	Wild *Corchorus*	Species No. 13	282 accessions conserved	Conservation for future use	Not done
	Wild *Hibiscus*	20 accession conserved	*Ex situ* conserved at BJRI	Conservation for future use	Not done
	Jute Allied genus	Species No. 15	*Ex situ* conserved at BJRI	Conservation for future use	Not done
	Wild rice species	54 accessions	*Ex situ* conservation at BRRI	Conservation for future use	Not done
	Mangrove forest species	32 preservation plots	*Ex situ* conservation under BFRI	Conservation for study, research for future use	Not done
	7 trees species	4 ha in 2 clonal banks	*Ex situ* conservation under BFRI	Conservation for study, research for future use	Not done
	27 species of bamboo and 6 exotic species	1.5 ha bambusetum	*Ex situ* conservation under BFRI	Conservation for study and research for future use	Not done
	7 species of cane	0.5 ha arboretum	*Ex situ* conservation under BFRI	Conservation for study and research for future use	Not done
	Camellia assamica, Camellia lasiocalyx	NK	To conserve in active and base collection	For study and Future Research	Evaluation under way

31. Does your country currently have any *in situ* conservation and management activities or programmes in your country that support the maintenance of associated biodiversity? If so provide any available information on organisms and species managed or conserved, site name and location, production system(s) involved, conservation objective and specific actions that secure associated biodiversity or ecosystem services (if any).

Table 13. *In situ* conservation or management activities or programmes for associated biodiversity for food and agriculture.

Components of associated biodiversity	**Organisms, species and sub-species (where available) conserved**	**Site name and location**	**Production system(s) involved (code or name)**	**Conservation objective(s)**	**Specific actions that secure associated biodiversity or ecosystem services**
Micro-organisms	NK	NK	NK	NK	NK
Invertebrates	Fish and other aquatic species found in Island, Haor, Lake, Beach etc.	Cox's Bazar-Teknaf Sea Beach, St Martin's Island, Sonadia Island, Hakaluki Haor, Tanguar Haor, Marjat Baor, Gulshan Lake,	A2	Natural aquatic biodiversity conservation	Decleration of Ecologically Critical Areas

		Strip of 10 km outside the Sundarbans Reserved Forest			
Vertebrates	Goyal *(Bos frontalis)*	In the protected forest of Bandarban district	F2	Conservation of wild relatives of FAnGR	Protected area
	Wild quale (*Cotumix crocomendelica)*	In the south east and north east forest	F2	Conservation of wild relatives of FAnGR	Protected area
	Wild pig *(Sus scrofa scrofa)*	In the south east and north east forest	F2	Conservation of wild relatives of FAnGR	Protected area
	Red jungle fowl (*Gallus domesticus)*	In the south east and north east forest and Sundarban	F2	Conservation of wild relatives of FAnGR	Protected area
Plants	Sal forest species	Mudhupur NP Tangail, Bhawal Np Gazipur, Ramsagar NP Dinajpur	F2	Wild life is protected for Education and Research	Not allowed to disturb the eco system
	Hill forest species	Himchari NP Cox's Bazar, Lawachara Np Moulovibazar, Kaptai NP Rangamati, Medha Kachapia NP Cox's Bazar, Satchari NP Hobigang, Khadmnagar NP Sylhet, Pablakhali WS Rangamati, Chunati WS Chittagong, Teknuf GR Cox's Bazar, Rema Kalenga WS Hobiganj	F2	Wild life is protected for Education and Research	Not allowed to disturb the eco system
	Coastal Mangrove Species	Nijhum Dweep NP Noakhali, Char Kukri Mukri WS Bhola,	F2	Wild life is protected for Education and Research	Not allowed to disturb the eco system
	Natural Mangrove species	Sundarban (East) WS Bagerhat,	F2	Wild life is protected for Education and	Not allowed to disturb the eco system

		Sundarban (South) WS Khulna, Sundarban (west) WS Bagerhat,		Research	

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.

- Importance on traditional knowledge has so far been given on medicinal plants. No plan of action is really formulated to give special attention on associated biodiversity prevailing in any sector of Agriculture.
- Traditional knowledge related to biodiversity has been documented on Aurvedic Practices.
- A book entitled "Traditional use of ethno medicinal plants the Chittagong Hill Tracts" has been published by the Government of Bangladesh.
- Hill communities, traditional medicinal knowledge and practices have been documented in many research papers and books.
- Use of indigenous technological knowledge (ITK) of the ethnic people of Northern region of Bangladesh culture Cuchia (*Monopterus Cuchia*) has become the basis of increaseing their production to met the demand of ethnic people of the country and to export them abroad for earning foreign currency.

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.

Rural and hilly women are more in touch with the wild food plants. They do care more about wild plants. They usually collect fruits from them.

3.5. 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
Fish					
Along	*Bengala elanga*	Natural waterbodies	-2	N	
Angrot	*Labeo angra*	Natural waterbodies	-2	N	
Ayre	*Mystus aor*	Natural waterbodies	-1	N	Hossain, 2001
Bacha	*Eutropiichthys vacha*		-1	N	Hossain, 2001
Bairagi Icha	Macrobachium styliferus		-1	N	Hossain, 2001
Bamosh	*Anguilla bengalensis*	Natural waterbodies	-2	N	
Baro Biam	*Macrognahus aculeatus*	Natural waterbodies	-1	N	Hossain, 2001
Bata	*Labeo bata*		-1	N	Hossain, 2001
Bechi	*Oryzias dancena*	Natural waterbodies	-2	N	
Bhagna	*Cirrhinus reba*	Natural waterbodies	-2	N	
Bilturi	*Acanthocobitis botia*	Natural waterbodies	-2	N	
Boal	*Wallago attu*	Natural waterbodies	-1	N	Hossain, 2001
Boali pabda	*Ompok bimaculatus*	Natural waterbodies	-2	N	
Catla	*Calta calta*	Natural waterbodies	-1	N	Hossain, 2001
Chapila	*Gudusia chapra*	Natural waterbodies	-1	N	Hossain, 2001
Chatka Chingri	*Macrobachium* sp.	Natural waterbodies	-1	N	Hossain, 2001
Cheka	*Chaca chaca*	Natural waterbodies	-2	N	
Chep Chela	*Chela cachius*	Natural waterbodies	-2	N	
Darkina	*Rasbora daniconius*	Natural waterbodies	-2	N	
Fulchela	*Salmostoma phulo*	Natural waterbodies	-2	N	
Ghagla	*Hemibagrus*	Natural	-2	N	

	menoda	waterbodies			
Gharua	*Clupisoma garua*	Natural waterbodies	-2	N	
Gilipunti	*Puntius gelius*	Natural waterbodies	-2	N	
Guchi Baim	*Macrobachium rosenbergi*	Natural waterbodies	-1	N	Hossain, 2001
Guizza Air	*Sperata seenghala*	Natural waterbodies	-2	N	
Gulsha	*Mystus bleekery*	Natural waterbodies	-1	N	Hossain, 2001
Gulsha	*Mystus bleekery*	Natural	-1	N	Hossain, 2001
Ilish	*Hilsa ilisha*	Natural waterbodies	-1	N	Hossain, 2001
Jaya	*Aspidoparia jaya*	Natural waterbodies	-2	N	
Kajuli	*coric sabora*	Natural waterbodies	-1	N	Hossain, 2001
Kalabata/ Tatkini	*Crossocheilus latius*	Natural waterbodies	-2	N	
Kalbaus	*Labeo gonius*	Natural waterbodies	-1	N	Hossain, 2001
Katla	*Gibelion catla*	Natural waterbodies	-2	N	
Kchaia	*Monopterus cuchia*		-1	N	Hossain, 2001
Koi	*Anabus testudineus*	Natural waterbodies	-1	N	Hossain, 2001
Laubuca	*Chela laubuca*	Natural waterbodies	-2	N	
Luchi Baim	*Macrognahus. pancalus*	Natural	-1	N	Hossain, 2001
Magur	*Clarius batrachus*	Natural waterbodies	-1	N	Hossain, 2001
Mohashol	*Tor tor*	Natural waterbodies	-2	N	
Mola	*Amblypharyngodon mola*	Natural waterbodies	-1	N	Hossain, 2001
Morari	*Aspidoparia morar*	Natural waterbodies	-2	N	
Mrigal	*Cirrhinas mrigla*	Natural waterbodies	-1	N	Hossain, 2001
Muri bacha	*Eutropiichthys murius*	Natural waterbodies	-2	N	
Pabda	*Ompok pabda*	Natural waterbodies	-1	N	Hossain, 2001
Pangas	*Pangasius pangasius*	Natural waterbodies	-2	N	

Pholi, Chitol	*Notopretus* spp.	Natural waterbodies	-1	N	Hossain, 2001
Phutki buguri	*Rama chandramara*	Natural waterbodies	-2	N	
Poa	*Otolithes masculatus*	Natural waterbodies	-1	N	Hossain, 2001
Puiya	*Lepidocephalus annandalei*	Natural waterbodies	-2	N	
Punti	*Puntis* spp.	Natural waterbodies	-1	N	Hossain, 2001
Putul	*Botia lohachata*	Natural waterbodies	-2	N	
Rui	*Labeo ruhita*	Natural waterbodies	-1	N	Hossain, 2001
Rui	*Macrobachium. barmanicus*	Natural waterbodies	-1	N	Hossain, 2001
Sarputi	*Puntis sarana*	Natural waterbodies	-1	N	Hossain, 2001
Shillong	*Silonia silondia*	Natural waterbodies	-2	N	
Shilong	*Siloni silondica*	Natural waterbodies	-1	N	Hossain, 2001
Shing	*Heteropneuestes fossilis*	Natural waterbodies	-1	N	Hossain, 2001
Taki, Sol, etc.	*Channa sp.*	waterbodies	-1	N	Hossain, 2001
Tara Baim	*Mastacembelus sp.*	Natural	-1	N	Hossain, 2001
Tatkini	*Cirrhinus reba*	waterbodies	-1	N	Hossain, 2001
Tengra	*Mystus* spp.		-1	N	Hossain, 2001
Plant					
Alianga-lata	Cissus adnata Roxb.	F2	1	Y	Khatun *et al*. 2013
Amloki	*Phyllanthus emblica* L.	F2 & F6	-1	Y	Ahmed et al.2008
Amrul	*Oxalis corniculata* L.	F2	-1	Y	Ahmed et al. 2009
Ankura	*Alangium salvifolium*	F2	-2	Y	Das 1987
Ashphal	*Dimocarpus longan* Lour.	F2	-1	Y	Ahmed et al. 2009b
Bahera	*Terminalia bellirica*	F2	-1	Y	Ahmed *et al*.2008
Bakful, Agusti	*Sesbania grandiflora* Poir.	C10	0	Y	Ahmed et al. 2008b
Bamboo shoot	*Meloccana baccifera* and *Phyllostachys edulis*	C10	-1	Y	Ahmed et al. 2008a
Bansh bamboshoot)	*Bambusa nutans*	F2 & F6	1	Y	Ahmed et al. 2008a
Bansh (bamboshoot)	*Bambusa burmanica*	F2 & F6	1	Y	Ahmed et al. 2008a

Bansh bamboshoot)	*Bambusa tulda*	F2 & F6	1	Y	Ahmed et al. 2008a
Banshial Buka	*Antidesma bunius* Spreng.	F2	-1	Y	Ahmed et al. 2008a
Baola	*Samecarpus anacardium* L.f.	F2	-1	Y	Ahmed *et al*. 2008
Baoli-lata	*Sarcolobus globosas*	F2	-1	Y	Ahmed et al. 2008
Baraharina	*Lepisanthes rubiginosa* Leenh.	F2	-1	Y	Ahmed et al. 2009b
Bara-Harina	*Lepisanthes rubiginosum* (Roxb.) Leenh.	F2	-1	Y	Ahmed *et al*. 2009
Barta	*Artocarpus lakoocha*	F2	-1	Y	Das 1987
Barun, Bannya	*Crateva magna* DC.	F2	1	Y	Ahmed et al. 2008a
Batua Shak	*Chenopodium album* L.	F2	1	Y	Ahmed et al. 2008a
Betphal (cane fruit)	*Calamus spp.*	F2	-1	Y	Ahmed et al. 2008a
Beuchi	*Flacourtia indica* Merr.	F2	-1	Y	Ahmed et al. 2009
Bohal	*Cordia dichotoma* Forst.f.	F2	-1	Y	Ahmed *et al*. 2008
Boinchi	*Flacourtia indica*	F2	-1	Y	Ahmed et al. 2009
Bokphul	*Sesbania grandiflora* (L.) Poir.	F2	1	Y	Ahmed *et al*.2009
Bon bhendi	*Abelmoschus moscatus* L.	F2	-1	Y	Ahmed et al. 2009
Bon kachu	*Colocasia esculanta*	F2	1	Y	Ahmed et al. 2007
Bon Palong	*Rumex maritimus* L.	C10	1	Y	Khatun *et al*. 2013
Bon-Boroi	*Ziziphus rugosa*	F2	-1	Y	Ahmed *et al*.2009
Bonjamir	*Paramigyna scandens* (Griff.) Craib	F2	1	Y	Ahmed et al. 2009
Bonlichu	*Xerospermum laevigatum* Radlk.	F2	-2	Y	Ahmed et al. 2009b
Boti-Jam	*Cleistocalyx nervosum* DC. Kosterm. var. paniala (Roxb.) J. Parn. & P. Chantara	F2	-1	Y	Ahmed *et al.* 2009
Brammi Shak	*Bacopa monnieri* (L.) Pennell	C10	-1	Y	Khatun *et al*. 2013
Chalita-jam	*Syzygium macrocarpa*	F2	1	Y	Ahmed et al.2009
Chanchi	*Alteranthera sessilis* L.	F2	-1	Y	Ahmed et al. 2008

Chapalish	*Artocarpus chaplasha* Roxb.	F2	-1	Y	Ahmed *et al.* 2009
Chatla	*Dillenia indica*	F2	-1	Y	Ahmed et al. 2008
Chikon Shak	*Homalomena aromatica* Schott	F2	1	Y	Khatun *et al*. 2013
Dephal	*Garcinia xanthochymus*	F2	-1	Y	Ahmed et al.2008
Deshi gab	*Diospyros malbarica* (Desr.) Kostel.	F2	-1	Y	Ahmed et al. 2008
Deshi-amra	*Spondias pinnata* Kurz	F2	-1	Y	Ahmed et al. 2008
Dheki Shak	*Blechnum orientale* L.	F2	1	Y	Khatun *et al*. 2013
Dheki Shak	*Diplazium esculentum* Sw.	F2	1	Y	Khatun *et al*. 2013
Dumur	*Ficus hispida*	F2	1	Y	Ahmed et al. 2009a
Elena	*Antidesma ghesaembilla*	F2	-1	Y	Das 1987
Gandha Bhaduli	*Paederia foetida* L.	F2	1	Y	Ahmed et al. 2009b
Gemashak	*Glinus oppositifolius* A. DC.	F2	1	Y	Ahmed et al. 2008b
Ghagra, Hagra	*Xanthium indicum* Koen.	C10	1	Y	Ahmed et al. 2008
Ghetkachu	*Typhonium trilobatum* Schott	C10	1	Y	Khatun *et al*. 2013
Golpata	*Nypa fruticans* Wurmb.	F2	1	Y	Ahmed *et al*. 2007
Gotaharina	*Lepisanthes senegalensis* Leenh.	F2	0	Y	Ahmed et al. 2009b
Hargaza	*Dillenia pentagyna*	F2	-1	Y	Ahmed et al. 2008
Haritaki	*Terminalia chebula*	F2	-1	Y	Ahmed *et al*.2008
Harphata	*Baccaurea ramiflora*	F2	-1	Y	Das 1987
Helencha	*Enhydra fluctuans* Lour.	A2	-1	Y	Ahmed et al. 2008
Highcha	*Alternanthera sessilis* R. Br.	C10	1	Y	Ahmed et al. 2008
Hintal	*Phoenix paludosa* Roxb.	F2	-1	Y	Ahmed *et al.* 2007
Jalpai	*Elaeocarpus floribundus*	F2	-1	Y	Ahmed et al. 2008
Jogdumur	*Ficus racemosa* L.	F2	-1	Y	Ahmed et al. 2009a -
Kadam-bet	*Calamus erectus*	F2	-2	Y	Ahmed et al. 2008a
Kalmi	*Ipomea aquatic* Forsk.	F2	1	Y	Ahmed et al. 2008

Kanta Kachu	*Lasia spinosa* (L.) Thwait.	F2	1	Y	Khatun *et al*. 2013
Kanta shasha	*Cucumic hystrix* Chakravarty	F2	-2	Y	Ahmed et al. 2008a
Kao	*Garcinia cowa*	F2	-1	Y	Ahmed et al. 2008
Katanotey (Spiny amaranth)	*Amaranthus spinosus* ***L.***	F2	1	Y	Ahmed et al. 2008
Kath badam	*Terminalia catappa*	F2	-1	Y	Ahmed *et al*. 2008
Keora	*Sonneratia apetala* Buch.-Ham.	F2	1	Y	Ahmed et al. 2009
Khirni	*Manilkara hexandra*	C10	-1	Y	Ahmed et al. 2009
Khudijam	*Antidesma ghaesembilla* Gaertn.	F2	-1	Y	Ahmed *et al*. 2008a
Kusum	*Schleichera oleosa* (Lour.) Oken.	F2	1	Y	Ahmed *et al*. 2009
Lal cowgola	*Garcinia speciosa* Wall.	F2	-1	Y	Ahmed et al, 2008a
Lalong	*Premna esculenta* Roxb.	F2	1	Y	Ahmed et al. 2009b
Lata Am	*Willoughbeia edulis* Roxb.	F2	-1	Y	Ahmed et al. 2008
Lata Dheki Shak	*Stenochlaena palustris* Bedd.	F2	-1	Y	Khatun *et al*. 2013
Lata-Kanchan	*Bauhinia vahlii* Wight & Arn.	F2	-1	Y	Ahmed *et al*. 2008
Lataphutki	*Cardiospermum halicacabum* L.	F2	1	Y	Khatun *et al*. 2013
Luchi Pata	*Peperomia pellucida* H.B.K.	C10	1	Y	Khatun *et al*. 2013
Lunia Shak	*Portulaca oleracea* L.	C10	1	Y	Ahmed et al. 2009a
Madhumalati	*Stixis suaveolens* Pierre	F2	-1	Y	Ahmed et al. 2008a
Mailam, Bhallam	*Bouea oppositifolia* Meissner	F2	-1	Y	Ahmed *et al*. 2008
Makhna	*Euryale ferox*	F2	-2	Y	Ahmed et al. 2009b
Malancha	*Alternanthera philoxeroides* Griseb.	M2	1	Y	Ahmed et al. 2008
Mohicharan Shak	*Ampelygonum chinense* Lindley	F2	1	Y	Khatun *et al*. 2013
Mohua	*Madhuca longifolia* (Koenig) Mac. Bride	F2	-1	Y	Ahmed *et al*. 2009
Nali jam	*Syzygium claviflorum*	F2	1	Y	Ahmed et al.2009
Not available	*Begonia roxburghii* DC.	F2	-1	Y	Ahmed et al. 2008a
Nunia	*Portulaca oleracea* L.	F2	1	Y	Ahmed *et al*.2009
Orcha, Shoila	*Sonneratia caseolaris*(L.)	F2	1	Y	Ahmed et al. 2009

	Engl.				
Padma (lotus)	*Nelumbo nucifera*	F2	-1	Y	Ahmed et al. 2009
Pahari Kola (wild banana)	*Mus acuminate Colla.*	F2	1	Y	Ahmed et al. 2007a
Pani Dhekia	*Ceratopteris thalictroides* Brong.	F2	1	Y	Khatun *et al*. 2013
Paniala, Lukluki	*Flacourtia jangomas* Raeusch.	F2	-1	Y	Ahmed et al. 2008b
Paniphal	*Trapa bispinosa* Roxb.	F2	-2	Y	Ahmed et al. 2009b
Panyamala	*Flacourtia jangomas*	F2	-1	Y	Ahmed et al. 2009
Pata sheeola.	*Vallisneria spiralis* L.	F2	-1	Y	Ahmed et al. 2007a
Pesta-alo (Yams)	*Dioscorea bulbifera* L.	F2	-1	Y	Ahmed et al. 2008
Pial, Piyal	*Buchanania lanzan* Spreng.	F2	-1	Y	Ahmed et al. 2008
Puti-jam	*Syzygium fruticosum*	F2	1	Y	Ahmed *et al*.2009
Ram Kola (wild banana)	*Musa ornate* Roxb.	F2	1	Y	Ahmed et al. 2007a
Roskao	*Carallia brachiata*	F2	-2	Y	Ahmed et al. 2009
Sadusi, Sadimadi	*Ficus semicordata* Buch.-Ham.	F2	1	Y	Ahmed et al. 2009a
Sanchi-bet	*Calamus rotung*	F2	-1	Y	Ahmed et al. 2008a
Shaknotey (wild amaranth)	*Amaranthus viridis* L.	F2	1	Y	Ahmed *et al*. 2008
Shaluk	*Nymphaea pubescens*	F2	-1	Y	Ahmed et al.2009
Shushni shak	*Marsilea quadrifolia* L.	F2	1	Y	Khatun *et al*. 2013
Shyamkola	*Ottelia alismoides* (L.) Pers.	F2	-1	Y	Ahmed *et al*. 2007
Sia-kul	*Ziziphus oenoplia*	F2	-1	Y	Ahmed *et al*.2009
Sword bean	*Canavalia gladiata*	F2	-1	Y	Ahmed et al. 2009
Tahnkuni	*Centella asiatica* L.	F2	-1	Y	Ahmed *et al*. 2009
Takpalang (Sorrel)	*Rumex vasicarious*	F2	-1	Y	Ahmed *et al*.2009
Tamal, Jharamb	*Garcinia xanthochymus* Hook. f.	F2	-1	Y	Ahmed et al. 2008a
Telakucha	*Coccinia grandis* Voigt	F2	1	Y	Khatun *et al*. 2013
Tentul	*Tamarindus indica* L.	F2	1	Y	Ahmed *et al*.2008
Tokpata	*Begonia barbata* Wall.	F2	-1	Y	Ahmed et al. 2008a
Tripatri leaves	*Desmodium trifolium*	F2	1	Y	Ahmed et al. 2009

Tutphal (Mulberry)	*Morus alba*	C10	0	Y	Ahmed et al. 2009
Uri Aam	*Mangifera sylvatica* Roxb.	F2	-1	Y	Ahmed et al. 2008
Velvet apple	*Diospyros discolor*	F2	-1	Y	Ahmed et al. 2008
Water lily	*Nymphaea stellata*	F2	-1	Y	Ahmed et al.2009
Yams	*Dioscorea spp.*	F2	-1	Y	Ahmed et al. 2008
Zhora dhan	*Oryza rufipogon* Griff.	C2, C10	-2	Y	Ahmed et al. 2008a

3.6. Wild food resources at risk

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[19]. Include a description of the threat and list references or sources of information if available.

Table 15. Main threats to wild food species identified as at risk.

Wild food species (scientific name)	Degree of threat	Main threat (indicate)	References or sources of information if available
Plants			
Zanthoxylum rhetsa	Threatened	Habitat destruction	-
Calamus spp.	Threatened	Habitat destruction	-
Sesbania grandiflora	Threatened	Lack of awareness	-
Artocarpus chaplasha	Threatened	Habitat destruction	-
Diospyros peregrina	Threatened	Lack of awareness	-
Artocarpus lakoocha	Threatened	Lack of awareness	-
Spondias pinnata	Threatened	Habitat destruction	-
Nelumbo nucifera	Threatened	Habitat destruction	-
Trapa bispinosa	Threatened	Habitat destruction	-
Ottelia alismoides	Threatened	Habitat destruction	-
Canavalia gladiata	Threatened	Habitat destruction	-
Cucumic hystrix Chakravarty	EN	Destruction of habitat and over exploitation	Ara *et al*., 2013
Mangifera sylvatica Roxb.	VU	Deforestation	BNH
Xerospermum laevigatum Radlk.	VU	Deforestation	Ara *et al*., 2013
Fish			
Labeo nandina *Punties ticto* *Chana barca* *Ctenops nobilis* *Rasbora elonga* *Nandus nandus* *Ailia coila* *Badis badis*	Threatened and/or endangered	1. Most of the areas have now been brought under rice cultivation 2. Over exploitation of fisheries resources.	Hossain (2001)

Barilius bendelisis			
Barilius bola			
Begarius begarius			
Cirrhinus reva			
Clupisoma naziri			
Eutropiichthya vacha			
Labeo calbasu			
Pseudeutropius atherinoides			
Rita rita	Threatened and/or endangered	Over exploitation of fisheries resources.	-
Tor putitora	Threatened and/or endangered	Over exploitation of fisheries resources.	-
Forest Trees			
Alangium salvifolium	-1 and -2 for most of the species growing in the natural forests of Bangladesh. These species are becoming extinct day by day. There is information as per IUCN criteria.	Degradation of natural forest and change of land use.	Long time field observation, discussion with taxonomists, and forest scientists.
Antidesma ghesaembilla			
Baccaurea ramiflora			
Buchauania lanzan			
Carallia brachiata			
Cordia dichotoma			
Ehretia acuminate			
Ficus racemosa			
Flacourtia indica			
Garcinia cowa			
Garcinia xanthochymus			
Madhuca indica			
Paramigyna citrifolia			
Parkia roxburghii			
Schleichera oleosa			
Samecarpus anacardium			
Willughbea edulis			
Acacia concinna			
A. pinata			
Auricularia auricular			
Homalomena aromatica			
Amorpholhallus bulbifer			
Begonia roxburghii			
Eryngium foetidum			
Etlingera linguiformis			
Cissus repens			
Citrullus colocyanthis			
Celosia argentea			
Chenopodium album			
Crotalaria tetragona			

Clitoria ternatea			
Coix lachryma-Jobi			
Desmodium triflorum			
Dioscorea alata			
Flascopa scandens			
Wild Animals			
Jungle fowl	Threatend	Habitat destruction, lack of awareness	FAO Country Reports on FAnGR
Goyal	Threatend	Habitat destruction, lack of awareness	FAO Country Reports on FAnGR
Hilly chicken	Threatend	Habitat destruction, lack of awareness	FAO Country Reports on FAnGR

3.7. 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
Plant				
Baccaura ramiflora	NK	Medium and long term storage	To protect the vulnerable plant foods	NK
Garcina cowa	NK	Medium and long term storage	To protect from extinction	NK
Dioscorea sp.	NK	Medium and long term storage	To protect from extinction	NK
Ficus sp.	NK	Medium and long term storage	Sacred tree and food	NK
Hibiscus spp.	NK	Medium and long term storage	Food	NK
Arum	NK	Medium and long term storage	Food	NK
Cassava	NK	Medium and long term storage	Food	NK
Saccharum spontenium	19	Medium and long term storage	To protect from extinction	NK
Erianthis spp.	24	Medium and long term storage	To protect from extinction	NK
H. sabdariffa var. sabdariffa	16	Medium and long term storage	-do-	Done
Protium serrutum	NK	Field Gene bank	For Future use	Done
Haematocarpus validus	NK	Field Gene bank	For Future use	Done
Animal				
Jungle Fowl	50	Ex situ Conservation at BLRI	Conservation and improvement	Partially done
Deer	12	Ex situ Conservation at BLRI	Conservation and improvement	Note done
Hilly goat	200	Ex situ Conservation	Conservation and	Partially done

		at BLRI	improvement	
Hilly chicken	250	Ex situ Conservation at BLRI	Conservation and improvement	Done
Goyal	10	Ex situ Conservation at BLRI	Conservation and improvement	Partially done

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
Many wild food species viz. *Podocarpus nuriifolius, Artocarpus lakoocha, Sterculia foetida, Randia uliginosa, Phoenix paludosa, Autidesma ghesaembilla* etc. grown in forest	In natural forest, Protected forest, Reserve forest and Village Common Forest	KN	Biodiversity conservation, traditional food supply	Declaration of protected areas like wild life sanctuaries
*Caulerpa racemosa(*Green sea weed*), Hypnea musciformis(*Red sea weed)	Saint Martin Island and Inani Beach, Cox's Bazar	Size Not known, The environment is marine water environment	Maintenance of sea weed for their commercial multiplication	Collection, conservation and cultivation
Smal Indigenous fishes viz. *Pantis spp, Mystus vittatus, Channa sp., Chela cachius, Labeo bata* etc.	In natural water body	KN	Biodiversity Conservation	Declaration of protected areas like fish sanctuaries

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?

No planned activity has been carried out regarding maintaing traditional knowledge of wild food species as priority has not been set in any plan to maintain them.

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.

Traditionally women are more involved in the maintenance of and knowledge about wild foods. As no formal research or activity has been carried under any Departments it cannot be mentioned clearly.

3.8. 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)
Natural disasters			
Aila	C2, L6, M2	-2	**-2**
Sidr	C2, L6, M2	-2	**-2**
Tsunami	C2	-2	**-2**
Flood in main land	C6, C10	-1	**-1**
Flood	F2, A2	-1	-1
Land slide	F2	-1	-1

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.

- Bangladesh experiences different types of Natural Disasters almost every year because of the Global Warming as well as Climate Change impacts, these are:
  Floods/Flash Floods- Almost 80% of the total area of the country is prone to flooding.
  Cyclones and Storm Surges- South and South-eastern parts of the country were hit by Tropical Cyclones during the last few years.
  Salinity Intrusion- Almost the whole Coastal Belt along the Bay of Bengal is experiencing Salinity problem.
  Extreme Temperature and Drought- North and North-western regions of the country are suffering because of the Extreme Temperature problem.
- **Cyclone Sidr**
  Cyclone Sidr (JTWC designation: **06B**, also known as **Extremely Severe Cyclonic Strom Sidr**) was a tropical cyclone that resulted in one of the worst natural disasters in Bangladesh. The fourth named storm of the 2007 North Indian Ocean cyclone season, Sidr formed in the central Bay of Bengal, and quickly strengthened to reach peak 1-minute sustained winds of 260 km/h (160 m/ph), making it a Category-5 equivalent tropical cyclone on the Saffir-Simpson Scale. The storm eventually made landfall in Bangladesh on November 15, 2007, causing large-scale evacuations, 3,447 deaths were blamed on the storm. Save the Children estimated the number of

deaths associates with the cyclone to be between 5,000 and 10,000, while the Red Crescent Society reported on November 18 that the number of deaths could be up to 10,000. Over 3,000 fishermen were reported missing on over 500 fishing boats. International groups pledged US$95 million to repair the damage, which was estimated at $1.7 billion.

Coastal districts of Bangladesh faced heavy rainfall as an early impact of the cyclone. The damage in Bangladesh was extensive, including tin shacks flattened, houses and schools blown away and enormous tree damage. The entire cities of Patuakhali, Barguna and Jhalokati District were hit hard by the storm surge of over 5 meters 16 ft). About a quarter of the world heritage site Sunderbans were damaged. Researchers said mangrove forest Sunderban would take at least 40 years to recover itself from this catastrophe. The local agricultural industry was also devastated. Huge number of livestock, crops and fish hatcheries and vegetation were severely damaged along with biodiversity of all categories.

- **Cyclone Aila**

  Severe Cyclonic Storm Aila was the worst natural disaster to affect Bangladesh Since Cyclone Sidr in November 2007. The second tropical cyclone of the 2009 North Indian Ocean cyclone season, Aila formed over the Bay of Bengal on May 23. A relatively strong tropical cyclone, it caused extensive damage in Bangladesh.

  The storm was responsible for at least 339 deaths across Bangladesh and India; more than 1 million people were left homeless. Health officials in Bangladesh confirmed a deadly outbreak of diarrohea on 29 May, with more than 7,000 people being infected and four dying. In Bangladesh, an estimated 20 million people were at risk of post-disaster diseases due to Aila.

  Torrential rains from Aila resulted in 190 fatalities and at least 7,000 injuries across the Khulna and Satkhira Districts. Across 11 of the nation's 64 districts, approximately 600,000 thatched homes, 8,800 km of roads, 1,000 km of embankments, and 123,000 hectares of land were damaged or destroyed. Approximately 9.3 million people were affected by the cyclone, of which 1 million were rendered homeless. One year after the storm, 200,000 people remained homeless. Total damage amounted to 18.85 billion taka (US$269.28 million). Huge loss of agrobiodiversity occurred.

- **Drought**

  Drought has been considered as the main cause hampering the agricultural production in Bangladesh over the last few decades. Every five years, Bangladesh is experiencing the major countrywide droughts. North western regions of Bangladesh are particularly exposed to droughts. During the kharif season, it causes significant destruction of the transplant aman crop in approximately 2.32 million ha every year (IOP, 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.

- Floods of 2014, 2009 and 2007 in the south-western part of Bangladesh inundated 50%, 30% and 60% of the land area of Khulna and Satkhira districts. At least 15 million people were affected during 2004 flood while more or less 10 million people were affected during 2009 in that 2 regions. Floods caused by Aila (2009) reduced the income (about 44%) in the affected households. Most of the income dropped due to destruction of crops and livestock (Roy and Sultana, 2010).
- During the last 50 years, Bangladesh suffered from about 20 drought conditions. It is claimed that as high as 47% area of the country is drought vulnerable where 53% of current population live. In 1995 drought occured during the late kharif period and caused a net reduction of 377000 tons of Aman rice production (Roy and Sultana, 2010).

43. Provide any available evidence that the enhanced use of biodiversity for food and agriculture has contributed to improving livelihoods, food security and nutrition in the context of natural or human-made disasters. Describe and provide source of information.

- After the damage of crops and livestocks caused by the natural disasters like aila and sidr cyclones, the soil of the affected areas has become more saline. Then researchers have started screening for saline tolerant rice and other crops. The tolerant types were multiplied and the seeds were supplied to the farmers for those affected areas.
- In some areas, after natural calamity arum, water lilies, padma (*Nymphaea nouchali*), paniphal (*Trapa maximowiczii*), ghechu (*Aponogeton echinatus*), jungle fowl, goyal, hilly goat, wild pig etc. natural wild foods are used as food due to lack of food supply.
- In case of some made disasters, attempts are taken in some cases to reverse the natural process to increase the production of the affected biodiversities. In case of our national fish hilsa, a ban on catching mother hilsa fish for egg laying period has caused tremendous increase of hilsa fishes in several natural selected water bodies.

3.9. 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)
Plants			
Acacia auriculiformis	F2, F6	NK	**-2**
Acacia farnesiana	F2	0	0
Acanthospernum hispidum (katahara)	C2	-1	-2
Acanthus ilicifolius	F2	2	1
Achyranthes aspera	F2	1	0
Actinoscirpus grossus	C2	1	0
Ageratum conyzoides	F2, F6	NK	-2
Alternanthera flocoidea	F2, F6	NK	-2
Alternanthera paronychioides	C10	1	0
Alternanthera philoxeroides	C10	1	0
Amaranthus spinosus	C10	1	0
Argemone mexicana	C10	1	0
Argyreia capitiformis	F2	1	0
Arundo donax	M2	2	1
Asclepias curassavica	F2	0	0
Atylosia scarabaeoides	C2	-1	-2
Blumea lacera	F2	1	1
Calotropis gigantea	F2	0	0
Calycopteris floribunda	F2	1	1
Cassia alata	F2	0	0
Cassia hirsuta	F2	0	0

Cassia occidentalis	F2	1	0
Cassia orientalis	F2, F6	NK	-1
Cassia tora	F2	1	0
Celosia argentea	C10	0	0
Centrum diurnum	F2, F6	NK	-1
Chamaesyce hirta	C10	1	0
Chloris barbata	C10	1	0
Chromolaena odorata	F2	2	2
Chrozophora rottleri	F2	1	0
Cleome gynandra	C10	1	0
Cleome rutidosperma	C10	1	0
Cleome viscosa	C10	1	0
Colocasia esculenta	C10	1	0
Combretum decandrum	F2	1	1
Commelina oblique	F2, F6	NK	-2
Convolvulus arvensis	C2	-1	-2
Corchorus aestuans	F2	1	1
Crassocephalum crepidioides	F2	1	0
Crotalaria pallida	F2	1	0
Crotalaria retusa	F2	1	0
Croton bonplandianum	C10	1	1
Cuscuta reflexa	F2	1	1
Cyperus difformis	C2	1	0
Cyperus distans	C2	1	0
Cyperus exaltatus	C2	1	0
Cyperus iria	C2	1	0
Cyperus javanicus	C2	1	0
Cyperus malaccensis	C2	1	1
Cyperus pilosus	C2	1	0
Cyperus rotundus	C2	1	0
Derris trifolia	F2	2	2
Desmodium triflorum	F2	1	0
Echinochloa colona	C2	1	0
Echinochloa crusgalli	C2	1	0
Eichhornia crassipes	A2	2	2
Eichhornia crussipes	F2, F6	NK	-2
Emilia sonchifolia	C10	1	0
Entada rheedii	F2	2	2
Eucalyptus canadulensis	F2, F6	NK	-2
Eupatorium odoratum	F2, F6	NK	-2
Evolvulua nummularis	F2, F6	NK	-1
Fuirena ciliaris	C2	1	0
Grangea maderaspatana	C10	1	0
Heliotropium indicum	C10	1	0
Hibiscus tiliaceus	F2	1	1
Hydrilla verticillata	A2	2	1
Hygrophila polysperma	C10	1	0
Hyptis suaveolens	F2, F6	NK	-2
Imperata cylindrica	F2	2	1
Ipomea carnea	F2, F6	NK	-2
Ipomoea fistulosa	M2	1	0
Ipomoea hederifolia	F2	1	0
Ipomoea pes-tigridis	F2	1	0
Ipomoea quamoclit	F2	1	0
Lantana camara	F2, F6	NK	-2
Leucanna leucocephala	F2, F6	NK	-2
Lippia alba	F2	1	1
Ludwigia adscendens	F2, F6	NK	-2
Ludwigia octovalvis	C10	1	0

Ludwigia perennis	C10	1	0
Malachra capitata	F2	1	0
Mecardonia procumbens	C10	1	0
Melochia corchorifolia	C10	1	0
Merremia umbellata	F2	1	0
Mikania cordata (Assam lota)	C2	-1	-2
Mikania micrantha	F2	2	2
Mimosa pudica	F2, F6	NK	-2
Monochoria vaginalis	A2	1	0
Mucuna gigantea	F2	1	1
Mucuna monosperma	F2	1	1
Mucuna pruriens	F2	1	1
Nicotiana plumbaginifolia	C10	1	0
Ocimum americanum	C10	1	0
Oxalis corniculata	C10	1	0
Paederia foetida	F2	1	0
Parthenium hysterophorus	C10	2	2
Passiflora foetida	F2	1	0
Pennisetum purpureum	M2	1	0
Peperomia pellucida	C10	0	0
Persicaria glaber	M2	1	0
Persicaria hydropiper	M2	1	1
Persicaria orientalis	M2	1	1
Phyla nodiflora	C10	1	0
Pilea microphylla	C10	0	0
Pistia stratiotes	A2	1	1
Portulaca oleracea	C10	1	0
Ruellia tuberosa	M2	0	0
Rumex maritima	C10	1	1
Saccharum spontaneum	F2	2	1
Sagittaria sagittifolia	M2	1	0
Salvinia molesta	A2	2	1
Scoparia dulcis	C10	1	0
Sida acuta	C10	1	0
Solanum americanum	C10	1	0
Solanum torvum	F2	1	0
Spermacoce hispida	C10	1	0
Spermococce latifolia	F2	1	1
Spilanthes acmella	C10	1	0
Synedrella nodiflora	C10	1	0
Thunbergia grandiflora	F2	1	1
Torenia fournieri	F2	1	0
Tridax procumbens	C10	0	0
Triumfetta rhomboidea	F2	1	0
Turnera ulmifolia	M2	0	0
Typha elephantica	M2	1	1
Urena lobata	F2	1	0
Vitis trifolia	F2	1	1
Xanthium indicum	C10	1	1
Youngia japonica	C10	0	0
Livestock			
Bos taurus (Holstein Friesian, Jersey and Sahiwal)	L6, M2 and 01	-1,-2 and -2 corresponding to column 2	-1,-1- and -1 corresponding to
Goat (Boer, Sirohi, Jamunapari)	L6, M2 and 01	-1,-2 and -2 corresponding to column 2	-1,-1- and -1 corresponding to
Chicken (RIR, White Leghorn, Fayoumi and Sonali)	L6, M2 and 01	-1,-2 and -2 corresponding to column 2	-1,-1- and -2 corresponding to

Duck (Jhending, Indian Runner, hybrids)	L6, M2 and 01	-1,-2 and -2 corresponding to column 2	-1,-1- and -2 corresponding to
Horse (Indian breeds)	L6, M2 and 01	-1,-2 and -2 corresponding to column 2	-1,-1- and -1 corresponding to
Buffalo (Murrah, Nili Ravi)	L6, M2 and 01	-1,-2 and -2 corresponding to column 2	-1,-1- and -1 corresponding to
Insects			
Giant mealy bug	C2, C10	NK	NK
Cut worm-*Spodoptera litura*	C10	-1	-1
Kenaf beetle-*Nisotra orbiculata*	C10	0	-1
Fishes			
Tilapis (*Oreochromis mossambicus*)	A2, A10	-1	-1
Common carp (*Cyprinus carpio*)	A2, A10	-1	-1
Grass carp (*Ctenopharyngodon idella*)	A2, A10	-1	-1
Silver carp (*Hypophthalmichthys molitrix*)	A2, A10	-1	-1
Thai sarpunti (*Barbonymus gonionotus*)	A2, A10	-1	-1
African magur (*Clarias gariepinus*)	A2, A10	-1	-1
Thai pangas (*Pangasius hypophthalmus*)	A2, A10	-1	-1
Mosquito fish (*Gambusia affinis*)	A2, A10	-1	-1
Sucker mouth catfish (*Hypostomus plecosomus*)	A2, A10	-1	-1
Red piranha (*Pygocentrus nattereri*)	A2, A10	-1	-1
Pirapatinga (*Piaractus brachypomus*)	A2, A10	-1	-1

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.

- **Introduction of Invasive Alien fish species**
  Over the last three decades, 24 fishes have been introduced into the country which spread over the wetlands as biological explosives during the rainy seasons. This posed one of the major threats to the biodiversity of many indigenous fishes in the country. Several introduced species are highly carnivorous and predatory and eat other species including the small indigenous fishes. African magur, Thai pangas, Sucker mouth cat fish, Red piranha predate almost all small and medium fishes. They feed on small crustaceans as well. Piranha feeds on insects, worms and small and large fishes. The spread of these invasive fish species has caused the reduction of fish species and other aquatic biodiversity significantly.

- **Invasive Plant Species of Sundarban Mangrove Ecosystem**
  Altogether 24 plant species of two broad types viz. aquatic weed and climbers were identified as invasive. Of these, 19 are native or naturalized to Sundarbans Mangrove. Abundance of invasive species, diversity and rate of invasion were highest at the riverbanks and gradually decreased with increase proximity to the forests.

- The Hill forests of Bangladesh consists of valuable tropical species of *Dipterocarpus turbinatus, D. alatus, D. costatus, Swintonia floribunda, Aphanamaxis polystachya, Artocarpus chaplasha, Tetrameles nudiflora, Daubanga grandifolia and Pterygota alata*. The species were adapted to the hill ecosystems after a long succession process, but the invasive plants are becoming a major threat to natural ecosystems and their species. The deliberate preferences of economically important species (*Tectona grandis, Xylia kerrii* and *Swietenia macrophylla*) through clear-felling followed by artificial regeneration eroded some of the native species and the genetic resources abruptly. Some of the invasive plants are so well established that they have become noxious weeds of forests and wastelands (*Chromolaena odoratum, Mikania cordata, Lantana camara* etc.). Some are considered as noxious weeds of cultivated fields also (*Alternanthera, Scoparia* and *Heliotropium* spp.). Some troublesome weeds are also invading the wetland ecosystems. e.g. *Eichhornia crassipes*, *Pistia stratiotes*.

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.

No such example is yet available in Bangladesh

3.10. 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.

No such assessment yet carried out in these issues

3.11. 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?
The appropriate data regarding associated biodiversity is very limited. Although WARS has been carried out research on corps, fishers, livestock and forestry since long to develop good varieties and/or breeds and to better manage them for high productivity, very little research is being carried out on associated biodiversity and even on ecosystem service. Research related to associate biodiversity within each production system is not carried out giving proper priorities. However, some sporadic research done by the faculties of Universities, Scientists of NARS are not compiled properly.

b) What are the main capacity or resources limitations?

- Lack of funding for research on associated biodiversity
- Lack of trained researchers for doing research on associated biodiversity.

c) What are the main policy and institutional constraints?

The earlier agricultural development policies did not always support the conservation of associated biodiversity as more thrusts were given on increasing the productivity. The scenario has been changing slowly with the changes of policies in all sectors of agriculture towards sustainable agriculture through following environment friendly techniques. Institutionally no focused research programs are in place to study the state, trends and conservation of associated biodiversity.

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

More attention should be given on the associated biodiversity for each production system. Programs should be developed keeping the importance of associated biodiversity in mind. The projects should be not only on increasing productivity but also the habitat and ecosystems as a whole.

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?

The state of the wild resources for food is not well recorded. The data on their present state is not quite available. The decreasing land of wild resources for food is recognized.

b) What are the main capacity or resources limitations?

Technological and financial limitations to study on the wild resources.

c) What are the main policy and institutional constraints?

The conservation of wild genetic resources has not been given priority in our policies.

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

Due importance to wild resources should be emphasized in new plans and/or strategies. Inventory should be done on wild genetic resources. Need man power development programmes to better equip the researchers.

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?

The impact of natural and human made disasters on biodiversity is acknowledged although appropriate data are not always available on the effect of disasters on agri-biodiversity.

b) What are the main capacity or resources limitations?

- Lack of funding
- No appropriate national body or agency to given attention on biodiversity.

c) What are the main policy and institutional constraints?

- Some policies need to be updated
- Institutional capacity need to be strengthened.

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

- The impacts of the disasters should be assessed correctly to address the effect of disaster effectively

- Development and/or selection of appropriate adaptation and mitigation measures to combat and protect natural and human made disasters.

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?

There is good understanding now as to how invasive alien species impact overall biodiversity.

b) What are the main capacity or resources limitations?

Lack of long term funding.

c) What are the main policy and institutional constraints?

The lack of parity in the activities and national coordination.

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

- Need long term funding
- Need national coordination in species management activities.

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

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

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

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

L2 Livestock grassland-based systems: Subtropics7			
Management practices[21]	**Percent of production area or quantity under the practice (%)**	**Change in production area or quantity under the practice (2,1,0,-1,-2, NK, NA)**	**Effect on biodiversity for food and agriculture (2,1,0,-1,-2, NK, NA)**
Integrated Plant Nutrient Management (IPNM)	NK	NK	NK
Integrated Pest Management (IPM)	NK	NK	NK
Pollination management	NK	NK	NK
Landscape management	NK	NK	NK
Sustainable soil management practices	NK	NK	NK
Conservation agriculture	NK	NK	NK
Water management practices, water harvesting	NK	NK	NK
Agroforestry Organic agriculture	NK	NK	NK
Low external input agriculture	NK	NK	NK
Home gardens	NK	NK	NK
Areas designated by virtue of production features and approaches	NK	NK	NK
Ecosystem approach to capture fisheries	NK	NK	NK
Conservation hatcheries	NK	NK	NK
Reduced-impact logging	NK	NK	NK
Others (describe)	NK	NK	NK

L6 Livestock landless systems: Subtropics			
Management practices[21]	**Percent of production area or quantity under the practice (%)**	**Change in production area or quantity under the practice (2,1,0,-1,-2, NK, NA)**	**Effect on biodiversity for food and agriculture (2,1,0,-1,-2, NK, NA)**
Integrated Plant Nutrient Management (IPNM)	NK	NK	NK
Integrated Pest Management (IPM)	NK	NK	NK

Pollination management	NK	NK	NK
Landscape management	NK	NK	NK
Sustainable soil management practices	NK	NK	NK
Conservation agriculture	NK	NK	NK
Water management practices, water harvesting	NK	NK	NK
Agroforestry Organic agriculture	NK	NK	NK
Low external input agriculture	NK	NK	NK
Home gardens	NK	NK	NK
Areas designated by virtue of production features and approaches	NK	NK	NK
Ecosystem approach to capture fisheries	NK	NK	NK
Conservation hatcheries	NK	NK	NK
Reduced-impact logging	NK	NK	NK
Others (describe)	NK	NK	NK

F2 Naturally regenerated forests: Subtropics			
Management practices[21]	**Percent of production area or quantity under the practice (%)**	**Change in production area or quantity under the practice (2,1,0,-1,-2, NK, NA)**	**Effect on biodiversity for food and agriculture (2,1,0,-1,-2, NK, NA)**
Integrated Plant Nutrient Management (IPNM)	NK	1	1
Integrated Pest Management (IPM)	NK	1	1
Pollination management	NK	1	1
Landscape management	NK	1	1
Sustainable soil management practices	NK	1	1
Conservation agriculture	NK	1	1
Water management practices, water harvesting	NK	**1**	**1**
Agroforestry Organic agriculture	NK	**1**	**1**
Low external input agriculture	NK	NK	NK
Home gardens	NK	1	1
Areas designated by virtue of production features and approaches	NK	NK	NK
Ecosystem approach to capture fisheries	NK	0	1
Conservation hatcheries	NK	NK	NK
Reduced-impact logging	NK	1	2
Others (describe)	NK	NK	NK

F6 Planted forests: Subtropics			
Management practices[21]	**Percent of production area or quantity under the practice (%)**	**Change in production area or quantity under the practice (2,1,0,-1,-2, NK, NA)**	**Effect on biodiversity for food and agriculture (2,1,0,-1,-2, NK, NA)**
Integrated Plant Nutrient Management (IPNM)	NK	1	1
Integrated Pest Management (IPM)	NK	1	1
Pollination management	NK	1	1
Landscape management	NK	1	1
Sustainable soil management practices	NK	1	1
Conservation agriculture	NK	1	1
Water management practices, water harvesting	NK	1	1
Agroforestry Organic agriculture	NK	1	1
Low external input agriculture	NK	NK	NK
Home gardens	NK	1	1
Areas designated by virtue of production features and approaches	NK	1	1
Ecosystem approach to capture fisheries	NK	1	1
Conservation hatcheries	NK	NK	NK
Reduced-impact logging	NK	1	1
Others (describe)	NK	NK	NK

A2 Self-recruiting capture fisheries: Subtropics			
Management practices[21]	**Percent of production area or quantity under the practice (%)**	**Change in production area or quantity under the practice (2,1,0,-1,-2, NK, NA)**	**Effect on biodiversity for food and agriculture (2,1,0,-1,-2, NK, NA)**
Integrated Plant Nutrient Management (IPNM)	NK	NK	NK
Integrated Pest Management (IPM)	NK	NK	NK
Pollination management	NK	NK	NK
Landscape management	NK	NK	NK
Sustainable soil management practices	NK	NK	NK
Conservation agriculture	NK	NK	NK
Water management practices, water harvesting	NK	NK	NK
Agroforestry 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	80%	1	2
Conservation hatcheries	NK	NK	NK

Reduced-impact logging	NK	NK	NK
Others (describe)	NK	NK	NK

A6 Culture-based fisheries: Subtropics			
Management practices[21]	**Percent of production area or quantity under the practice (%)**	**Change in production area or quantity under the practice (2,1,0,-1,-2, NK, NA)**	**Effect on biodiversity for food and agriculture (2,1,0,-1,-2, NK, NA)**
Integrated Plant Nutrient Management (IPNM)	NK	NK	NK
Integrated Pest Management (IPM)	NK	NK	NK
Pollination management	NK	NK	NK
Landscape management	NK	NK	NK
Sustainable soil management practices	NK	NK	NK
Conservation agriculture	NK	NK	NK
Water management practices, water harvesting	NK	NK	NK
Agroforestry 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 cultur fisheries	20%	1	NK
Conservation hatcheries	NK	NK	NK
Reduced-impact logging	NK	NK	NK
Others (describe)	NK	NK	NK

A10 Fed aquaculture: Subtropics			
Management practices[21]	**Percent of production area or quantity under the practice (%)**	**Change in production area or quantity under the practice (2,1,0,-1,-2, NK, NA)**	**Effect on biodiversity for food and agriculture (2,1,0,-1,-2, NK, NA)**
Integrated Plant Nutrient Management (IPNM)	NK	NK	NK
Integrated Pest Management (IPM)	NK	NK	NK
Pollination management	NK	NK	NK
Landscape management	NK	NK	NK
Sustainable soil management practices	NK	NK	NK
Conservation agriculture	NK	NK	NK
Water management practices, water harvesting	NK	NK	NK
Agroforestry 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 culture fisheries	90% of culture production areas	1	0
Conservation hatcheries	NK	NK	NK
Reduced-impact logging	NK	NK	NK
Others (describe)	NK	NK	NK

A14 Non-fed aquaculture: Subtropics			
Management practices[21]	**Percent of production area or quantity under the practice (%)**	**Change in production area or quantity under the practice (2,1,0,-1,-2, NK, NA)**	**Effect on biodiversity for food and agriculture (2,1,0,-1,-2, NK, NA)**
Integrated Plant Nutrient Management (IPNM)	NK	NK	NK
Integrated Pest Management (IPM)	NK	NK	NK
Pollination management	NK	NK	NK
Landscape management	NK	NK	NK
Sustainable soil management practices	NK	NK	NK
Conservation agriculture	NK	NK	NK
Water management practices, water harvesting	NK	NK	NK
Agroforestry 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 culture fisheries	10% of culture production area	-1	0
Conservation hatcheries	NK	NK	NK
Reduced-impact logging	NK	NK	NK
Others (describe)	NK	NK	NK

C2 Irrigated crops (rice) : Subtropics			
Management practices[21]	**Percent of production area or quantity under the practice (%)**	**Change in production area or quantity under the practice (2,1,0,-1,-2, NK, NA)**	**Effect on biodiversity for food and agriculture (2,1,0,-1,-2, NK, NA)**
Integrated Plant Nutrient Management (IPNM)	20	1	1
Integrated Pest Management (IPM)	10	1	1
Pollination management	Negligible	NK	NK

Landscape management	NK	0	NK
Sustainable soil management practices	20	1	1
Conservation agriculture	1	1	0
Water management practices, water harvesting	50	1	1
Agroforestry Organic agriculture	1	1	1
Low external input agriculture	2	1	1
Home gardens	5	1	1
Areas designated by virtue of production features and approaches	10	-1	-1
Ecosystem approach to capture fisheries	5	1	1
Conservation hatcheries	1	1	1
Reduced-impact logging	NK	NK	NK
Others (describe)			

C6 Irrigated crops (other) : Subtropics			
Management practices[21]	**Percent of production area or quantity under the practice (%)**	**Change in production area or quantity under the practice (2,1,0,-1,-2, NK, NA)**	**Effect on biodiversity for food and agriculture (2,1,0,-1,-2, NK, NA)**
Integrated Plant Nutrient Management (IPNM)	25	1	0
Integrated Pest Management (IPM)	40	1	0
Pollination management	NK	NK	0
Landscape management	10	-1	-1
Sustainable soil management practices	25	1	0
Conservation agriculture	20	1	1
Water management practices, water harvesting	25	1	0
Agroforestry Organic agriculture	10	-1	-1
Low external input agriculture	15	0	0
Home gardens	5	0	0
Areas designated by virtue of production features and approaches	NK	NK	NK
Ecosystem approach to capture fisheries	25	1	-1
Conservation hatcheries	20	1	-1
Reduced-impact logging	NK	NK	NK
Others (describe)	-	-	-

C10 Rainfed crops : Subtropics			
Management practices[21]	**Percent of production area or quantity under the practice (%)**	**Change in production area or quantity under the practice (2,1,0,-1,-2, NK, NA)**	**Effect on biodiversity for food and agriculture (2,1,0,-1,-2, NK, NA)**
Integrated Plant Nutrient Management (IPNM)	05	1	1
Integrated Pest Management (IPM)	02	0	1
Pollination management	0	0	NK
Landscape management	70	1	1
Sustainable soil management practices	70	1	1
Conservation agriculture	60	1	1

Water management practices, water harvesting	90	NK	1
Agroforestry Organic agriculture	NK	NK	NK
Low external input agriculture	50	0	NK
Home gardens	80	0	NK
Areas designated by virtue of production features and approaches	01	0	NK
Ecosystem approach to capture fisheries	5	1	1
Conservation hatcheries	1	1	1
Reduced-impact logging	NK	NK	NK
Others (describe)	NK	NK	NK

M2 Mixed systems (livestock, crop, forest and /or aquatic and fisheries): Subtropics			
Management practices[21]	**Percent of production area or quantity under the practice (%)**	**Change in production area or quantity under the practice (2,1,0,-1,-2, NK, NA)**	**Effect on biodiversity for food and agriculture (2,1,0,-1,-2, NK, NA)**
Integrated Plant Nutrient Management (IPNM)	NK	NK	NK
Integrated Pest Management (IPM)	NK	NK	NK
Pollination management	NK	NK	NK
Landscape management	NK	NK	NK
Sustainable soil management practices	NK	NK	NK
Conservation agriculture	NK	NK	NK
Water management practices, water harvesting	NK	NK	NK
Agroforestry Organic agriculture	NK	NK	NK
Low external input agriculture	NK	NK	NK
Home gardens	NK	NK	NK
Areas designated by virtue of production features and approaches	NK	NK	NK
Ecosystem approach to capture fisheries	NK	NK	NK
Conservation hatcheries	NK	NK	NK
Reduced-impact logging	NK	NK	NK
Others (describe)	NK	NK	NK

01 Vegetables in floating beds			
Management practices[21]	**Percent of production area or quantity under the practice (%)**	**Change in production area or quantity under the practice (2,1,0,-1,-2, NK, NA)**	**Effect on biodiversity for food and agriculture (2,1,0,-1,-2, NK, NA)**
Integrated Plant Nutrient Management (IPNM)	NK	NK	NK
Integrated Pest Management (IPM)	NK	NK	NK
Pollination management	NK	NK	NK

Landscape management	NK	NK	NK
Sustainable soil management practices	NK	NK	NK
Conservation agriculture	NK	NK	NK
Water management practices, water harvesting	NK	NK	NK
Agroforestry Organic agriculture	NK	NK	NK
Low external input agriculture	NK	NK	NK
Home gardens	NK	NK	NK
Areas designated by virtue of production features and approaches	NK	NK	NK
Ecosystem approach to capture fisheries	NK	NK	NK
Conservation hatcheries	NK	NK	NK
Reduced-impact logging	NK	NK	NK
Others (describe)	NK	NK	NK

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

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

L2 Livestock grassland-based systems: Subtropics[7]			
Management practices[22]	**Percent of production area or quantity under the practice (%)**	**Change in production area or quantity under the practice (2,1,0,-1,-2, NK, NA)**	**Effect on biodiversity for food and agriculture (2,1,0,-1,-2, NK, NA)**
Diversification	NK	NK	NK
Base broadening	NK	NK	NK
Domestication	NK	NK	NK
Maintenance or conservation of landscape complexity	NA	NA	NA
Restoration practices	NK	NK	NK
Management of micro-organisms	NK	NK	NK
Polyculture/Aquaponics	NK	NK	NK
Swidden and shifting cultivation agriculture	NA	NA	NA
Enriched forests	NA	NA	NA
Others [*please specify*]	NA	NA	NA

L6 Livestock landless systems: Subtropics			
Management practices[22]	**Percent of production area or quantity under the practice (%)**	**Change in production area or quantity under the practice (2,1,0,-1,-2, NK, NA)**	**Effect on biodiversity for food and agriculture (2,1,0,-1,-2, NK, NA)**

Diversification	NK	NK	NK
Base broadening	NK	NK	NK
Domestication	NK	NK	NK
Maintenance or conservation of landscape complexity	NA	NA	NA
Restoration practices	NK	NK	NK
Management of micro-organisms	NK	NK	NK
Polyculture/Aquaponics	NA	NA	NA
Swidden and shifting cultivation agriculture	NA	NA	NA
Enriched forests	NA	NA	NA
Others [*please specify*]	-	-	-

F2 Naturally regenerated forests: Subtropics			
Management practices[22]	**Percent of production area or quantity under the practice (%)**	**Change in production area or quantity under the practice (2,1,0,-1,-2, NK, NA)**	**Effect on biodiversity for food and agriculture (2,1,0,-1,-2, NK, NA)**
Diversification	NK	0	1
Base broadening	NK	0	1
Domestication	NK	0	-1
Maintenance or conservation of landscape complexity	NK	1	1
Restoration practices	NK	1	1
Management of micro-organisms	NK	1	1
Polyculture/Aquaponics	NK	0	1
Swidden and shifting cultivation agriculture	NK	-1	-1
Enriched forests	NK	1	1
Others [*please specify*]	NK	NK	NK

F6 Planted forests: Subtropics			
Management practices[22]	**Percent of production area or quantity under the practice (%)**	**Change in production area or quantity under the practice (2,1,0,-1,-2, NK, NA)**	**Effect on biodiversity for food and agriculture (2,1,0,-1,-2, NK, NA)**
Diversification	NK	1	1
Base broadening	NK	1	1
Domestication	NK	1	1
Maintenance or conservation of landscape complexity	NK	1	1
Restoration practices	NK	1	1
Management of micro-organisms	NK	1	1

Polyculture/Aquaponics	NK	NK	NK
Swidden and shifting cultivation agriculture	NK	NK	NK
Enriched forests	NK	1	1
Others [*please specify*]	NK	NK	NK

A2 Self-recruiting capture fisheries: Subtropics			
Management practices[22]	**Percent of production area or quantity under the practice (%)**	**Change in production area or quantity under the practice (2,1,0,-1,-2, NK, NA)**	**Effect on biodiversity for food and agriculture (2,1,0,-1,-2, NK, NA)**
Diversification	NK	-2	-2
Base broadening	NK	NK	NK
Domestication	NK	1	1
Maintenance or conservation of landscape complexity	NK	-1	-1
Restoration practices	NK	1	1
Management of micro-organisms	NK	NK	NK
Polyculture/Aquaponics	NA	NA	NA
Swidden and shifting cultivation agriculture	NK	NK	NK
Enriched forests	NK	NK	NK
Others [*please specify*]	NK	NK	NK

A6 Culture-based fisheries: Subtropics			
Management practices[22]	**Percent of production area or quantity under the practice (%)**	**Change in production area or quantity under the practice (2,1,0,-1,-2, NK, NA)**	**Effect on biodiversity for food and agriculture (2,1,0,-1,-2, NK, NA)**
Diversification	NK	2	2
Base broadening	NK	NK	NK
Domestication	NK	1	1
Maintenance or conservation of landscape complexity	NK	NK	NK
Restoration practices	NK	NK	NK
Management of micro-organisms	NK	NK	NK
Polyculture/Aquaponics	NK	1	1
Swidden and shifting cultivation agriculture	NK	NK	NK
Enriched forests	NK	NK	NK
Others [*please specify*]	NK	NK	NK

A10 Fed aquaculture: Subtropics			
Management practices[22]	**Percent of production**	**Change in production**	**Effect on biodiversity**

	area or quantity under the practice (%)	area or quantity under the practice (2,1,0,-1,-2, NK, NA)	for food and agriculture (2,1,0,-1,-2, NK, NA)
Diversification	NK	2	2
Base broadening	NK	NK	NK
Domestication	NK	1	1
Maintenance or conservation of landscape complexity	NK	NK	NK
Restoration practices	NK	NK	NK
Management of micro-organisms	NK	NK	NK
Polyculture/Aquaponics	NK	NK	NK
Swidden and shifting cultivation agriculture	NK	NK	NK
Enriched forests	NK	NK	NK
Others [*please specify*]	NK	NK	NK

A14 Non-fed aquaculture: Subtropics			
Management practices[22]	**Percent of production area or quantity under the practice (%)**	**Change in production area or quantity under the practice (2,1,0,-1,-2, NK, NA)**	**Effect on biodiversity for food and agriculture (2,1,0,-1,-2, NK, NA)**
Diversification	NK	NK	NK
Base broadening	NK	NK	NK
Domestication	NK	NK	NK
Maintenance or conservation of landscape complexity	NK	NK	NK
Restoration practices	NK	NK	NK
Management of micro-organisms	NK	NK	NK
Polyculture/Aquaponics	NK	NK	NK
Swidden and shifting cultivation agriculture	NK	NK	NK
Enriched forests	NK	NK	NK
Others [*please specify*]	NK	NK	NK

C2 Irrigated crops (rice) : Subtropics			
Management practices[22]	**Percent of production area or quantity under the practice (%)**	**Change in production area or quantity under the practice (2,1,0,-1,-2, NK, NA)**	**Effect on biodiversity for food and agriculture (2,1,0,-1,-2, NK, NA)**
Diversification	30	1	1
Base broadening	30	1	1
Domestication	30	1	1
Maintenance or conservation of landscape complexity	NK	NK	NK
Restoration practices	10	1	1
Management of micro-organisms	20	NK	NK
Polyculture/Aquaponics	NK	NK	NK

Swidden and shifting cultivation agriculture	2	1	1
Enriched forests	NK	NK	NK
Others [*please specify*]	NK	NK	NK

C6 Irrigated crops (other) : Subtropics			
Management practices[22]	**Percent of production area or quantity under the practice (%)**	**Change in production area or quantity under the practice (2,1,0,-1,-2, NK, NA)**	**Effect on biodiversity for food and agriculture (2,1,0,-1,-2, NK, NA)**
Diversification	25	1	1
Base broadening	40	1	1
Domestication	NK	NK	0
Maintenance or conservation of landscape complexity	NK	NK	NK
Restoration practices	8	1	1
Management of micro-organisms	20	1	1
Polyculture/Aquaponics	25	1	0
Swidden and shifting cultivation agriculture	2	1	1
Enriched forests	15	0	0
Others [*please specify*]	NK	NK	0

C10 Rainfed crops : Subtropics			
Management practices[22]	**Percent of production area or quantity under the practice (%)**	**Change in production area or quantity under the practice (2,1,0,-1,-2, NK, NA)**	**Effect on biodiversity for food and agriculture (2,1,0,-1,-2, NK, NA)**
Diversification	55	1	1
Base broadening	40	1	2
Domestication	25	1	1
Maintenance or conservation of landscape complexity	NK	NK	NK
Restoration practices	NK	NK	NK
Management of micro-organisms	15	NK	NK
Polyculture/Aquaponics	NA	NA	NA
Swidden and shifting cultivation agriculture	2	1	1
Enriched forests	NK	NK	NK
Others [*please specify*]	8.5	1	1

M2 Mixed systems (livestock, crop, forest and /or aquatic and fisheries): Subtropics			
Management practices[22]	**Percent of production area or quantity under the practice (%)**	**Change in production area or quantity under the practice (2,1,0,-1,-2, NK, NA)**	**Effect on biodiversity for food and agriculture (2,1,0,-1,-2, NK, NA)**
Diversification	55	1	1
Base broadening	40	1	2
Domestication	25	1	1
Maintenance or conservation of landscape complexity	NK	NK	NK

Restoration practices	NK	NK	NK
Management of micro-organisms	15	NK	NK
Polyculture/Aquaponics	NA	NA	NA
Swidden and shifting cultivation agriculture	2	1	1
Enriched forests	NK	NK	NK
Others [*please specify*]	8.5	1	1

01 Vegetables in floating beds			
Management practices[22]	**Percent of production area or quantity under the practice (%)**	**Change in production area or quantity under the practice (2,1,0,-1,-2, NK, NA)**	**Effect on biodiversity for food and agriculture (2,1,0,-1,-2, NK, NA)**
Diversification	NK	NK	NK
Base broadening	NK	NK	NK
Domestication	NK	NK	NK
Maintenance or conservation of landscape complexity	NK	NK	NK
Restoration practices	NK	NK	NK
Management of micro-organisms	NK	NK	NK
Polyculture/Aquaponics	NK	NK	NK
Swidden and shifting cultivation agriculture	NK	NK	NK
Enriched forests	NK	NK	NK
Others [*please specify*]	NK	NK	NK

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

A. Projects for Diversification

i. Second Crop Diversification Project (SCDP)

The SCDP is a follow on project of the North West Crop Diversification project funded by GoB and ADB. The Duration of the project is 01 Jul 2010 to 30 June 2016. The main objective of the project is to reduce poverty by improving farmers income in 52 upazilas under 27 districts in the SouthWest and North West of Bangladesh through expanding high value crops production, reducing post harvest losses and strengthening market access. The SCDP identified 33 different crops suitable for commercialization due to their popularity in terms of area coverage and marketability. The crops include 6 vegetables, 6 spices, 10 fruits, 6 medicinal and 5 other crops. The promotional activities of these crops are done through training, formation of Small Farmers Groups (SFGs) demonstration, field day, motivational tour, workshop, agricultural fair etc.

B. Project for Base Broadening

i. UNEP-GEF-ILRI FAnGR Asia Project

This as a CGAIR supported GEF funded project which has been continuing with the partnership of ILRI and implemented by BAU since 2004 where research on *in-situ* indigenous chicken and goat conservation and improvement with a view to development and application of decision support tools to conserve and sustainable use of genetic diversity in indigenous livestock is being pursed.

ii. Collection, Characterization and promotion of rice, chili, cucumber and melon in Bangladesh

This is a co-ordinated project being implemented through BARC, BARI and BRRI funded by AFACI. The objective is collect germplasms of rice, chilli, cucumber and melon to secure sustainable use, regeneration and conservation and to select superior germplasm for distribution to breeders for exploitations in crop improvement programe. BRRI has already collected 96 rice germplasm from 8 districts of Bangladesh and conserved in short term storage for characterization and distribution to breeders. Scientists of PGRC, BARI explored 49 upazilas of 21 districts in northern, southern and central regions of the country and have collected a total of 270 chilli, 67 cucumber and 197 melon. Characterization would be carried out for utilizing them in the breeding program.

iii. Collection, characterization and utilization of rice, minor cereals and chilli in Bangladesh

This was a co-ordinated project implemented through BARC, BARI and BRRI funded by AFACI. The project duration was from 2012 – 2014. The genetic resources of rice, chilli and minor cereals are carried out in stress-prone less accessible areas like hills, coastal regions, swamp areas and char land. A total of 389 germplasm of seven crops viz. rice, chilli, foxtail millet, barley, finger millet, barnyard millet and pronomillet have been collected from 59 upazilas of 22 districts. The collected germplasm are being conserved in BRRI and BARI genebanks. Some of them have been regenerated and characterized at their morphological level.

iv. Conservation through Utilization of Red Chittagong Cattle programme

The conservation programme of RCC was initiated by BAU in 2014 through USDA on funding where on-station 50 cow Nucleus herd formation, and phenotypic studies were done on genetic characterization, performance evaluation and feeding system development and after five years of work the nuclers herd was transferred into a rural community driven farmer participatory system in 2009. RCC conservation and pure breeding programme is still active and being replicated in more communities. The DLS and BRAC are continually screening pure RCC bulls and their semen being used in the national hards of RCC to enhance conservation through utilization of this valuable cattle genetic resource.

C. Project for Restoration Practices

i. The Enhanced Costal Fisheries in Bnagladesh (SCOFISHBD) Project –

The project is implementing by Govt. organization – DoF and Internal Organization – World Fish with 8 sub-partners. The project duration is from January, 2014 to June 2019. The project area covers coastal areas of 9 coastal districts viz. Barisal, Barguna, Bhola, Patuakhali, Pirojpur, Jhalakhati, Chandpur, Lasksmipur, and Sariatpur. The project is using collaborative mode of implementation to support the fisheries management, help build the capacity of fisher community to strengthen enforcement in fish sanctuaries, establish fisheries, co-management. The project is also designed to enhance the biodiversity of aquatic animals and hilsa fishery in Bangladesh.

ii. Climate Resilient Ecosystems and livelihood (CREL) Project:

The project area covers 3 regions of Bangladesh, viz. North –Eastern (Moulovi Bazar and Sylhet), South-Eastern (Chittagong and Cox's Bazar) and South-Western (Sundarban) part. The objective of the project is to adapt and expand successful co-management model to conserve wel-lands, ECAs, improve governmence of natural resources and biodiversity and increase resiliance to climate change through improved planning and livelihood diversification. The project duration is .....

iii. Wetland Biodiversity Rehabilitation Project (WBRP)

The WBRP has been implemented by DoF, Bangladesh jointly with GIZI. German Development Co-operation in Bangladesh with funding assistance from the German Federal Ministry for Economic Cooperation and Development (BMZ). The project duration was from 2009-2015. The project work has been completed in the open flood plain wetland ecosystem of Padma-Jamuna delta region, comprising nine upazillas in three north western districts of Bangladesh. The project helped to increase fish production along with restoration of wetland habitats and functions of the floodplain ecosystem thereby contributing to increased biodiversity, productivity of the resources, operating the sluicegates in agro-fish friendly and improve livelihoods of the poor wetland people.

Management of Microorganisms

i . Safe Crop Production Through Integrated Pest Management (IPM) Approach

The project is implementing by DAE of MoA. The duration of the project is from July 2013 to June 2018. This is a DAE-DANIDA-IFMC Project which is covering IPM approach of 275 upazilas of 64 districts of the country. The key objectives of the project are to produce safe and more crops in a sustainable manner concurrently improving environment and human health through IPM practices. The project work has been progressing through the formation of Farmers Field School, providing training to trainers and then farmers, IPM workshop, IPM club and demonstration of organic agriculture and biological pest management.

4.2. Sustainable use of biodiversity for food and agriculture

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

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

Types of practices	Major practice (Y/N)	Description	Reference
Over-use of artificial fertilizers or external inputs	Y	Over use of urea in the crop field	
Over-use of chemical control mechanisms (e.g. disease control agents, pesticides, herbicides, veterinary drugs, etc.)	Y	Fungicide, Insecticides, Herbicides/Weedicides use in intensive crop farming	Kashem, 2015
Inappropriate water management	Y	Wastage of water during crop cultivation and unplanned drainage system	
Practices leading to soil and water degradation	Y	Excessive soil nutrient mining without replenishing, Hill slope cultivation, Not following the site capability index (SCI)	Jahiruddin, 2015
Over-grazing	Y	Domestic and wild animals in natural regeneration process are hampered	
Uncontrolled forest clearing	Y	Clear felling of forest land for shifting cultivation, root crop cultivation and production of horticulture crops in the natural forests, urbanization, conversion of forest for agriculture etc.	
Fishing in protected areas	**Y**	There are various type of water bodies found in this country such as pond, canal, beel, haor etc. During dry season, fishes are harvested by using	Hossain, 2014

		different type of fishing gear. All sorts of fish either small or big are captured and some assicated biodiversity damaged	
Overharvesting	**Y**	Various types of water bodies are found in this country such as pond, canal, beel, haor etc. During dry season, fish have been harvested by different type of fishing gear. All sorts of fish either small or big are being harvested and same associated biodiversity destroyed.	
Others	Y	Unplanned crossbreeding practices in Animal Genetic Resources	Bhuiyan, 2014

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

- The Government of Bangladesh is encouraging Integrated Pest Management techniques in crop production to minimize excess use of fertilizer, pesticides and insecticides that might reduce detrimental effect on soil biodiversity.
- Reduced subsidy in chemical fertilizer is in place. Initiatives have been taken to conserve biodiversity as a whole by introducing financial systems, for example- micro-capital-grant, endowment fund and alternative incomes generation activities.
- Projected areas, Ecologically Critical Areas, fish and wild life sanctuaries have been established is many areas to protect all sorts of biodiversity.
- DoF has introduced fishing areas restriction, seasonal fishing ban and banned bottom frawling to facilitate biodiversity in the wetland.
- Sustainable management of aquatic resources has been practiced, although in limited scale, to protect fish and aquatic animals.
- A large area of open water fisheries has been brought under sanctuary management by the involvement of the local fisher communities.
- Some protected areas and wetland have been managed pertaining to biodiversity conservation through co-management of forest and wetland resources.
- Some initiatives have been taken to reduce anthropogenic pressures on mangrove ecosystem and inland wetlands to improve the livelihoods of local communities dependent on vulherable and critical ecosystems.
- DoF has declared a marine reserve in 2000 which covers an area of 69800 ha.
- Substantial portion of plain and forest ecosystems have already been restored through implementing social forestry system with the involvement of women and vulnerable people of local communities as beneficiaries.
- Sundarban is declared as the world heritage site by United Nations and it works as a reserve forest. Biodiversity is maintained accordingly.
- A number of haors in the greater Sylhet/Kishoreganj region are restricted to harvest fish and act as a natural breeding site.

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

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

Production system	Biodiversity component for which diversity is lacking[23]	Extent of problem (2,1)	Effect on food security and nutrition	Effect on livelihood	Reference
F2	Wild food	1	Lack of food and nutrition during calamity	Cannot be used during natural calamity as usually done	
F6	Wild food	1	Lack of food and nutrition during calamity	Cannot be used during natural calamity as usually done	
A2	Indigenous small fishes & aquatic flora and fauna	2	Reduced supply of small bony fishes which hampers food security and nutrition	Local fishers are depried of catching fishes	
A6	Normally, targeted fish species is growing in this system to get more production	1	Through growing maximum production, food security as well as nutrition may ensure	Through fish culture, livelihood is ensure for fisherman	
C2 and C10	Rice diversity	1	Most of cultivated rice is modern variety, narrow genetic base, vulnerable to pest/disease outbreak, a threat to food security and nutrition.	Lesser nutrition indicating negative impact on rural livelihood.	
C6	Narrow genetic base of wheat	1	Stress tolerant variety cannot developed that is hampering wheat production	Need to import wheat spending hard currency	
C6 and C10	sugarcane diversity	1	Most of the cultivated sugarcane is modern variety, narrow genetic base, vulnerable to pest/disease outbreak, a threat to food security and nutrition.	Lesser nutrition indicating negative impact on rural livelihood.	
C10	Pulses genetic resources	2	Low production of pulse hampers nutritional security	Lesser nutrition indicating negative impact on rural livelihood.	

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

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.

- Genetic resources of wheat provided by the CYMMIT every year to the Wheat Research Centre of BARI have become the main basic materials for developing wheat variety of the country. The selection of HYVs and heat tolerant varieties has made the increase of wheat production of the country.
- Genetic materials of vegetables introduced in the country as open pollinated and hybrid varieties have resulted the increase of vegetable production of the country. The production of vegetables in Bangladesh was 7373000 M tons in 2008-09 which increased to 10999000 M tons in 2012-13 (BBS, 2013).
- Introduced cotton genetic resources are the only basic materials of the country for the release of cotton varieties of the country.
- Introduced poultry genetic resources have increased the production of both meat and egg in Bangladesh. The meat production has increased from 1.08 million tons to 2008-09 to 5.007 million tons during 2012-13. During the same period the production of egg has increased from 4692 million to 7617.78 million tons (BBS, 2013).
- Some of the introduced fish species have made our culture based fisheries contribution significant in the country. The production of fishes of cultured fisheries has shown spectacular increase from 1351979 M ton (2009-10) to 1956825 M ton during 2013-14 (DoF, 2015).
- Introduced fruit genetic resources have made it possible to select and release of varieties of strawberry, dragon fruit etc.
- Introduced maize lines from CYMMIT have become the main genetic resources for the development of maize hybrid varieties of the BARI scientists. Moreover, huge hybrid seeds have been imported from the seed companies abroad which increased our maize production from 8.99 thousand M tons to 15.52 thousand M tons (BBS, 2013).
- Introduced pulses genetic resources have been used vigorously in our breeding programs in the country as the genetic base of pulses of our country is very narrow. These breeding activities have led to the development of comparatively good varieties which have resulted increase of pulse production from 196 thousand M tons (2008-09) to 266 thousand M tons during 2012-13 (BBS, 2013).
- Introduced spices genetic resources have made it possible to develop some good varieties of species that has resulted the increase of spices production in the country from 1104 thousand M tons (2008-09) to 1822 thousand M tons during 2012-13 (BBS, 2013).
- Use of bee hives in the mustard, rape seed, til etc. crop field have increased the pollination of these crops and as a result yield has been increased substantially of these crops.

- Community based fish management in the open water fisheries has increased the natural fish production substantially.
- Declaration of fish sanctuaries of some water bodies and eco-friendly co-management approaches increased the open water fishes.
- Restriction of capturing hilsa fish during egg laying season has increased its production significantly.

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).

There is no clear cut information on the population that uses wild food and nutrition. The tribal people living in the 3 hilly districts of Bangladesh do use wild food more often than the plain main land people as the wild food plants are very much around the hilly people and they are accustomed to use various types of wild food for their daily diet and nutrition. Although data are not available, hilly people use the wild food frequently during the lean period when there is scarcity of jhum product prevails before starting the harvesting of jhum crop.

4.4. The adoption of ecosystem approaches

60. Describe in Table 24 the extent to which you consider that ecosystem approaches24 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 approaches25 that have been adopted in your country.

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

Production systems	Ecosys tem approach adopted (name)	Extent of adoption (2,1,0,NA)	Importance assigned to the ecosystem approach (2,1,0,NA)
F2	• Community based social forest management	1	2
	• By the declaration and management of the wild life sanctuaries	2	2
	• Maintaining Ecologically Critical Areas	2	2
A2	• Establishment of protected areas/sanctuaries for natural breeding	2	2
	• Plantation of swamp plants for enhancing wetland flora and biodiversity	1	1
	• Eco-friendly sluice gate management	2	2
C2, C6, C10	• Use of IPM technology to conserve the soil and other biodiversity	1	1
	• Use of ICM approaches to maintain the crop ecosystem	1	1

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.

- *In situ* conservation of Mangrove and fresh water wetland and forests have been done through declaration and management of protected areas. DoF has declared 37 such protected areas to conserve fish species and ecosystem diversity.
- Substantial portion of plain land forest ecosystem has already been restored through implementing social forestry system.
- Declaration of fish sanctuaries in different flood plains prohibits catching fishes in certain period of time has created very good result. Fish sanctuary in Bangladesh has been proved to be an important and efficient tool for management in protection and conservation of fishes and other aquatic organisms (Ali *et.al.* 2009). Having very good result up to 2007, 463 sanctuaries were established covering 98,405 ha water body.
- In community based wetland management stackholders are being involved in the management of wetland that has enhanced substantially the aquatic biodiversity along with fishes.
- Use of IPM and ICM approaches in crop production systems has shown positive effect on the restoration of the ecosystem.

4.5. 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?
There is very limited knowledge of the management practices which favour the maintenance and use of biodiversity for food and agriculture.
b) What are the main capacity or resources limitations?

- lack of funding for the continuation of biodiversity friendly management practices
- lack of funding for research on management practices.

c) What are the main policy and institutional constraints?
Existing policy is not against biodiversity friendly management practices. However, lack of trained and skill personals to help farmers is the main bottleneck.

d) What actions are required and what would be the priorities?
Priority should be given on biodiversity based management practices. More research should be carried out in this area. Farmers should be informed of the benefit of these practices.

63. With respect to the sustainable use of biodiversity for food and agriculture:
a) What are the major gaps in information and knowledge?

- The value of biodiversity is not known to the most of the people.
- Some management practices have negative impact on sustainable use of biodiversity.

b) What are the main capacity or resources limitations?

- The pressure on land for cultivation of high yielding varieties is so intense that it is not possible to maintain many types of biodiversity for sustainable use.
- To implement environment friendly ecosystem approaches in all production systems prevailing in the country is a big problem.

c) What are the main policy and institutional constraints?

- Policy does not work to maintain biodiversity properly because of the high demand for high amount of food in a very limited amount of land per capita.
- Policies are not always adopted.

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

- Need to people make aware of the importance of biodiversity.
- Need more action based program.
- Need continuous support from the government.
- Need to conserve the habitat to support the various components of biodiversity.

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?

Although, utilization of biodiversity is contributing in improving productivity, food security and nutrition, many of the people have little or no information and knowledge regarding the value of biodiversity.

b) What are the main capacity or resources limitations?

Researchers are not quite capable of utilizing many valuable biodiversity in their crop improvement program. Weak horticultural crop research program and less priority of breeding in the public institutions are major constraints.

c) What are the main policy and institutional constraints?

Policy is not providing thrust on developing our breeding program on horticultural crops which are providing good amount of food and nutrition in our diet.

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

- Valuable genetic resources should be utilized in the breeding program
- Research capability should be strengthened to carry out biodiversity maintenance activities.
- Need to continue the community based approaches through constant monitoring.

65. With respect to the adoption of ecosystem approaches:

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

- Lack of enough base line information.
- Ecosystem approaches are not known to the most of the farmers.

b) What are the main capacity or resources limitations?

Lack of financial capacity and financial support are the two main resources limitations to ecosystem approaches.

c) What are the main policy and institutional constraints?

Policy is not quite favourable to ecosystem approaches. Lack of skilled manpower in the public institutions to disseminate the ecosystem approaches to the land uses.

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

More research should be carried out to find out suitable ecosystem approaches for various sectoral biodiversity conservation and use.

CHAPTER 5

THE STATE OF INTERVENTIONS ON CONSERVATION AND USE OF BIODIVERSITY FOR FOOD AND AGRICULTURE

5.1. 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.

International Conventions

Bangladesh is a signatory to some international conventions (Islam 1996), which have bearing on protected areas. These conventions are:

1. Convention on international Trade in Endangered Species of Wild Fauna and Flora (CITES). The purpose of CITES is to protect certain endangered species from over-exploitation by means of a system of import and export control
2. Convention Concerning the Protection of the World Cultural and Natural Heritage. The purpose is to establish an effective system of collective protection of the cultural and natural heritage of outstanding universe value, organized on a permanent basis and in accordance with modern scientific methods.
3. International Plant Protection Conservation. The objectives is to maintain and increase international cooperation in controlling pests and disease of plants and plant products, and in preventing their introduction and spread across national boundaries.
4. Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention) to stem the progressive encroachment on and loss of wetlands now and in the future, recognizing the fundamental ecological functions of wetlands and their economic, cultural, scientific and recreational value.
5. Convention on Biological Diversity (CBD) to conserve biological diversity, promote the sustainable use of its components, and encourage equitable sharing of the benefits arising out of the utilization of genetic resources.

National Levels:

National Agricultural Policy

The policy was approved in 1999 which has been updated recently and is now ready for approval. The major thrust is on reorganizing and developing the agricultural production system into a more dynamic and commercially profitable sector by modernizing and diversifying the crop sector. The objectives of the policy is to ensure a profitable and sustainable production system, preserving and developing land productivity reducing excessive dependence on any single crop to minimize the risk. The policy gives emphasis on preserving existing bio-diversity of different crops and taking necessary steps to ensure environmental protection as well as environment-friendly sustainable technologies.

National Integrated Pest Management Policy 2002

The policy took into consideration the indiscriminate and excessive use of pesticides and that such reliance on chemicals would lead to serious environmental and human health problems, pest resurgence, new pest problems and development of resistance. In the policy, IPM has been given topmost priority in order to safe guard corps from pests and combat environmental degradation due to pesticide uses. The policy emphasizes.

National FAnGR Breeding Policy (MoFL, 2007)

The policy supported the conservation and utilization of valuable Red Chittagong Cattle (RCC). Later RCC conservation and development has further strength themed by BLRI, DLS, BRAC and world vision Bangladesh. The DLS and BRAC are continuously screening pure RCC bulls and their semen being used in the national herds of RCC to enhance conservation through utilization of this valuable cattle genetic resources.

New Agricultural Extension Policy

The MoA prepare the new agricultural extension policy (NAEP) in 1996 accordance with the agricultural policies and priorities set out in the fifteen-year perspective plan, 1995-2010. These policies and priorities include (i) attainment of self-sufficiency in food grain and increase production of other nutritional crops, (ii) ensuing sustainable agricultural growth through more efficient and balanced uses of land, water and other resources, (iii) increasing foreign exchange earnings through agricultural exports, (iv) 12 introducing high value cash crops, (v) improving the quality and availability of seeds, (vi) reducing environmental degradation, (vii) increasing fish, livestock and forestry production and (viii) conserving and developing forest resources. The main goal of NAEP is to encourage the various partners and agencies within the national agricultural extension system to provide efficient and effective services which complement and reinforce each other in an effort to increase the efficiency and productivity of agriculture in Bangladesh. The NAEP lists 11 policy measures, called components. These components include extension support to all categories of farmers, efficient extension services, decentralization, demand-led extension, working with groups of all kinds, strengthened extension-research linkage, training of extension personnel, appropriate extension methodology, integrated extension activities, coordinated extension activities, and integrated environmental support.

Pest Management Policy

Integrated Pest Management (IPM) will be the main policy for controlling pests and disease. More importance will be given to the following activities for pest control under the Agriculture Policy:

- Farmers will be motivated to use more pest resistant varieties of crops. Modern cultivation practices will be followed so that the incidence of pest infestation is reduced.

- Use of mechanical control measures such as light trap, hand net, etc. will be increased and popularized. Biological control measures will be used to destroy harmful insects and preserve the useful ones.
- Regular training and discussion programs on IPM will be conducted among the farmers under the supervision of Union Agricultural Development Committee with a view to successful introduction and popularization of the method at the farmers' level.
- Pest surveillance and monitoring system will be strengthened.

Chemical pesticides will only be used in cases where IPM fails to control the pests. The following measures will be taken in respect of distribution and use of chemical pesticides in the light of existing rules and regulations:

- Production, import, distribution or use of any chemical pesticide will be banned which is directly or indirectly harmful for human, animal and aquatic health.
- Use of any chemical pesticide harmful for natural environment will be discouraged and eventually banned.
- The system of approval of pesticides at the national level will be continued and its monitoring along with the testing of effectiveness of approved pesticides will be strengthened.

National Environment Management Action Plan (NEMAP)

The national Environmental Management Action Plan (NEMAP) is a wide ranging and multifaceted plan, which builds on and extends the statements set out in the National Environmental Policy, NEMAP was development to address issues and management requirements for a period between 1995 to 2005 and set out the framework within which the recommendations of the National Conservation Strategy are to be implemented.

- Identification of key environmental issues affecting Bangladesh.
- Identification of actions necessary to halt or reduce the rate of environmental degradation.
- Improvement of the natural and built environment.
- Conservation of habitats and bio-diversity.
- Promotion of sustainable development, and
- Improvement in the quality of life of the people.

National Biodiversity Strategy and Action Plan for Bangladesh (NBSAP)

The NBSAP provides a framework for conservation, sustainable use and sharing the benefits of biodiversity of country. A major focus of the plan is to ensure cross-sectoral linkages, reflecting the fact that in Bangladesh, more so than most other countries, biodiversity conservation is closely inter-woven with social and economic development. Thus, the NBSAP also provides a framework for securing the necessary environmental settings to reduce poverty, ensure sustainable development and implementation of Poverty Reduction Strategy Paper (PRSP). Sixteen strategies have been developed to shape and direct the actions towards achieving the goals and objectives of the NBSAP.

The Ministry of Environment and Forests is to coordinate the implementation of the NBSAP. All relevant Ministries/Divisions, government agencies, institutions, academic institutions, non-governmental organizations and communities would be responsible for activities that fall within their mandate. An 'Apex Body' was proposed to coordinate the implementation of the NBSAP. A financing strategy was proposed for re-sourcing the implementation of the NBSAP. This focused on increasing of public budget allocations, use of domestic instruments like taxes on water, timber, levies from road, rail and air passenger tariffs, debt swap trust funds and development partners' contribution.

A communication strategy was also incorporated in the plan for effective awareness raising and information dissemination.

National Forest Policy (1994)

The Forest Policy 1994 recognizes the importance biodiversity for environmental sustenance. The aim 3 and 8 of the policy explicitly mentioned that habitats for the wildlife and vegetation will be conserved through afforestation and by bringing forest lands under ProtectedAreas. It is imperative to mention here that the current Forest Policy 1994 targets to bring 20% of the total land area of the country under forest cover, and at least 10% of which under Protected Areas by 2015. It also declared that measures will be taken to improve the degraded forests so that richness of the biodiversity could be maintained. The Policy insists on harvesting and using forest products without disturbing the state of biodiversity. The Policy, at the same time, advocated for social forestry, which includes agroforestry, woodlot plantation, strip plantation in vacant public and private lands of the country.

The social forestry approach is, in many ways, contradictory to biodiversity conservation; the policy, in this regard, did not clarify how to attain mutual interests (i.e. promoting social forestry and at the same time biodiversity conservation) simultaneously.

Wetland Policy 1998

The Policy is relevant to the Project because it seeks to conserve wetlands to sustain their ecological and socio-economic functions and further sustainable development; establish key principles for wetland sustainability and unsustainable practices; maintain existing levels of biodiversity; maintain wetland functions and values; and actively promote integration of wetland functions in resources management and economic development decision taking.

National Fisheries Policy 1998

Although fisheries policy of the country aims at enhancing production of fish resources from inland and marine sources and to increase the export oriented foreign currency earning, it at the same time focus on environmental balance and biodiversity conservation (mentioned in objective 5 of the policy). The policy identified different threats to fisheries resources, such as population pressure, (ii) construction of infrastructure in the floodplains, (iii) pollution by chemical fertilizers, insecticides and pesticides; and urged for reducing these threats as to improve the situation.

Bangladesh Wildlife (Preservation) (Amendment) Act, 1974

The Bangladesh Wildlife (Preservation) Order, 1973 was promulgated under Presidential Order No. 23 in 1973 and was subsequently enacted and amended as the Bangladesh Wildlife (Preservation) (Amendment) Act, 1974. The law provides for the preservation, conservation and management of wildlife in Bangladesh. According to the Act the term wildlife or 'wild animals' means 'any vertebrate creature, other than humans beings and animals of usually domesticated species or fish, and include the eggs of birds and reptiles' only. The law itself if not sufficient to provide legal protections to the significant aquatic biodiversity component of the ecosystem. For example, by this definition, the important components of the coral species in the St. Martin's Island, and also fishes and mollusks, remain outside the legal protection of this Act.

Livestock Development Policy 1992

Livestock development policy of Bangladesh puts major emphasis to enhance livestock and poultry (meat and egg) production in order to ensure a sustained supply of animal protein for the people of the country. However, some of the objectives have relevance to biodiversity conservation. For instance,

Its target to produce biogas production may contribute in reducing pressure (e.g. fuel wood collection by the rural community) on forest resources.

National Seed Policies

National Seed Policy 1993, The Seeds (Amendment) Act 1997, The Seed Rules 1998 are mainly aiming at achieving self sufficiency in food production. Thus the instruments got provisions for liberalizing of import of seed and seed processing machineries, strengthening of quality control and research system and maintaining a seed security arrangement. These instruments have little attention on conservation of indigenous or local crop diversity and to protect local ecosystems and habitats from invasion of IAS.

Land Use Policy 2001

Land utilization policy have little direct focus on biodiversity conservation, but have components like reduce illegal landuse conversion, ensure facilities so that landuse activities is attuned with environmental conservation; these holds indirect linkage to biodiversity conservation. The policy advocated tree plantation in the riverine and coastal islands to increase forest cover in the country.

National Water Policy (2012)

National water policy mentions that this policy is a bold step for governance in the water sector. It explicitly mentions that it will play an important role in biodiversity conservation and ensuring a sound environment in the country. Sections 4.9, 4.12 and 4.13 clearly focus on importance of water on fisheries and wildlife, water for the environment and preservation of wetlands respectively.

Coastal Zone Policy 2005

The coastal zone policy recognizes the importance of ecosystems and biodiversity conservation needs as it mentioned, "The coast contains several ecosystems that have important conservation values. Part of the Sundarbans, the world's largest stretch of mangrove ecosystem, has been declared a World Heritage Site, whereas coral ecosystems are found around St Martin's Island. The coastal zone has not only biodiversity hot spots, but also provides the ecological foundation for an important common property resource; Alarge portion of these resources are various types of fisheries resources available in the Bay of Bengal".

Bangladesh Environment Conservation Act (BECA) is set of laws enacted by the government of Bangladesh in 1995

The Act gives operational definitions of terms that historically did not exist, including *ecosystem, pollution, waste* and *hazarodus substance*. Seven areas in Bangladesh are defined as Ecologically Critical Areas under this law beyond the scope of the Forest Act of 1927 enacted by the British Raj.

National Conservation Strategy (NCS)

The need for a National Conservation Strategy was first emerged in September 1986. Its primary goal was to provide a national strategy for conservation of all concerned sectors. It provides specific strategies for sustainable use of natural resources as well as sustainable development in 18 different sectors. The National Conservation Strategy Implementation Project I (1994-1999) was a five-year project implemented by the Ministry of Environment and Forest (MoEF), with financial and technical support from NORAD and IUCN. Through this NCS Phase 1, one major programme was implemented in four distinct ecosystems–tropical and mangrove forest areas, *St. Martin's Islan, Tanguar Haor and Barind Tract*. The main objective of all these activities is conservation of biodiversity.

Bangladesh Forest Act, 1978 and Subsequent Amendments

The law provides protection and development of forests. The government may assign a reserved forest to any forestland or wasteland, or any land suitable for aforestation, which is the property of the government, over which the government is entitles. Subsequently, the Forest Law has been amended and updated foe a number of times in response to changing needs. The Forest Act, 1972, the Forest (Amendment) Act 1990 and the amendment in 2000 may be mentioned in this regard. These are contributing quite a lot to the conservation of biodiversity, although not enough, and much more remains to be done.

Forest Policy and Forestry Sector Master Plan

The GOB first formulated the National Forest Policy in 1979. But as the situation began to change with demand for forestry products and consequent depletion of forest resources and degradation of the overall environment, the Government had to update it and formulate a revised policy which is known as the Forest Policy 1994.

The biodiversity issue has been given increased importance in the latest policy. The policy stated that attempts will be made to bring about 20% of the country's land under the afforestaiton programmes of the government and the private sector by 2015. In order to achieve self-reliance in forest products and maintenance of ecological balance, the government will work hand in hand with the NGO's and people's participation will be encouraged.

The policy further stated that the priority protection areas are the habitats that encompass representative samples of flora and fauna in the core areas of National Parks, Wildlife Sanctuaries and Game Reserves. Attempts will also be made to increase the extent of these protected areas by 10% of the reserved forest area by 2015.

Integrated Coastal Zone Management (ICZM)

In December 2000 the Minister of Water Resources announced the Government's intention to develop an ICZM policy. Among other objectives, the ICZM policy will attempt to rationalize and coordinate more effectively a number of environment and development initiatives taking place in the coastal zone. A number of donors, including the World Bank and the Netherlands Government, will be supporting the development of the policy over the coming years.

Management of Aquatic Ecosystem through Community Husbandry (MACH)

The natural resources in the floodplains and wetlands throughout Bangladesh are in decline. Thus, to conserve these resources the Government of Bangladesh and the United States of America have jointly developed a programme called MACH. An agreement to implement this programme was signed in May 1998. Its goal is to ensure the sustainable productivity of all wetland resources such as water, fish, plant and wildlife over an entire wetland ecosystem.

Sundarbans Biodiversity Conservation Programme

The Asian Development Bank funded the project "Biodiversity Conservation in the Sundarbans Reserved Forest." The objective of the project was to establish a effective system for the participatory and sustainable management of the ecosystem of the Sundarbans Reserved Forest. The scope of the project included biodiversity conservation, sustainable resource management, community development, participatory resources management programme, development of ecotourism infrastructure, and establishing a new multi-sectorla management agency that will work for an integrated conservation and development approach.

67. List up to 10 major policies, programmes and enabling frameworks in your country that enhance the application of an ecosystem approach29 or a landscape approach30 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.

ECOFISHBD Project is a five-year, USAID-funded initiative designed to improve the resilience and governance of the Padma-Meghna river-estuarine ecosystem and livelihood of communities rellant on Hilsa fisheries, implemented jointly by World Fish and Department of Fisheries (DoF) started on June 01, 2014. The project is using a collaborative mode of implementation to support the use of science based decisions in fisheries management; help build the capacity of relevant government and non-governmental partners, as well as the fisher communities to strengthen enforcement in fish sanctuaries; establish fisheries co-management; and support the socio-ecological resilience of fisher's livelihoods, specially women. The project is also designed to enhance the biodiversity of aquatic animals and Hilsa fishery in Bangladesh by reducing overexploitation and threats to the habitat which will provide multiple benefits, including: (1) a sustainable supply of fish that is high-quality protein affordable to the poor; (2) nutrition and income benefits that improve the quality of life of all members of small-scale fishing communities; and (3) healthy marine and coastal ecosystems that can cope with climate change and provide essential ecosystem goods and services to underpin both livelihoods and a resilient Hilsa fishery.

Climate-Resilient Ecosystems and Livelihoods

CREL Project are to adapt and expand successful co-management models to conserve wetlands, Ecological Critical Areas (ECAs), improve governance of natural resources and biodiversity, and increase resilience to climate change through improved planning and livelihoods diversification to help Bangladesh to become a knowledge-based, healthy, food-secure, and climate-resilient middle income democracy." The CREL project will assist Bangladesh to reduce its vulnerability to climate change impacts, decrease the environmental, economic, and social consequences of climate change, and improve the effectiveness and sustainability of Bangladesh's general development goals. Major performance targets within the context of framework of USAID's broader Global Climate Change (GCC) initiative include: 80,000 stakeholder with increased capacity to adapt to impact of climate variability and change; 500,000 people with increased climate change resilient economic benefits; 300,000 tones CO^2 reduced emission; 80 institutions to build climate change adaption (CCA) capacity; 740,000 ha under improved natural resource management (NRM); 14 policy targets to stabilize co-management of NRM and $20 million leveraged from public and private sources to support CREL goals and improve responsiveness to climate change.

The Wetland Biodiversity Rehabilitation Project

WBRP of the Department of Fisheries, Bangladesh has been in implementation since 2009 and will continue up to 2015, jointly with the Deutsche Gesellschaft fur Internationale Zusammenarbeit (GIZ) GmbH/German Development Cooperation in Bangladesh with funding assistance from the German Federal Ministry for Economic Cooperation and Development (BMZ). The project is working in the open flood plain wetland ecosystem of Padma-Jamuna delta region, comprising nine potential upazilas in three north-western districts of Bangladesh.

Management of Aquatic Ecosystems through Community Husbandry (MACH)
The project is funded by USAID, PAC, BCAS and Caritas for the period of 2008-2010 and the location was at aquatic area of Sherpur, Gazipur and Moulovibazar. The objective of the project was to support CBOs and networks and build linkages to service providers initially created under the MACH project. The MACH project aimed to promote environmentally sound management of wetland resources (fish, aquatic vegetation, other wetland products and water) for the sustainable supply of food to the poor people of Bangladesh. This is a follow-up project to monitor the interventions and processes set by the MACH project and to provide support to the community bodies set-up as part of the project.

Coastal & Wetland Biodiversity Management (CWBMP)
The project location was at Hakaluki haor, one of the largest and most important freshwater of the country. It was funded by the GEF-UNDP for the period of April 2005-March 2006. The objectives of the project was to establish and demonstrate an innovative system for management of Ecologically Critical Areas (ECAs) in Bangladesh. The project is being implemented by the Department of Environment (DoE), Ministry of Environment & Forest in cooperation with five NGOs. The project supports DoE's efforts to operationalize the ECA concept at two main sites: Cox's Bazaar (which includes three ECAs) within the biodiversity-rich coastal zone and Hakaluki haor at one of the largest inland freshwater wetlands.
The outputs of the project are-

- Mobilization of communities towards ECA management
- Community-led Participatory Action Plan Development (PAPD), for formation of Village Conservation Groups (VCGs)
- Capacity building for the local institutions
- Development of community led urgent conservation measures through consolation process

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

- National Disaster Management Plan (2010-2015) has been approved as the part of commitment expressed in "The Hugo Framework for Acton (HFA)" adopted in the world conference for disaster reduction held in Kobe, Japan in 2005.
- Ministry of Relief and Disaster and Management is preparing SAARC Plan of Action for Disaster Management through integration of disaster Management Plan and Policies.
- Disaster Management Act has been effective for Disaster Management in the country. Draft of National Disaster Management Policy is going to be finalized. Formulation of rules under the Disaster management Act is under active consideration.
- A treaty has been signed between SAARC Disaster Management Centre (SDMC) and Bangladesh to established Bangladesh Disaster Knowledge Network (BDKN) for mutual exchange of Disaster information on disaster risk reduction, mitigation, response/preparedness and recovery.
- Bangladesh has become the member of Asian Disaster Management Centre (ADMC), Regional Integrated Multi Hazard Early Warning System (RIMES), Asian Ministerial Conference on DR (AMCDR) and International Search and Rescue Advisory Group (INSARAG).
- The inundation maps/risk maps for flood (for flood prone areas) and storm surge (coastal area) have been developed (up to upazila level) and uploaded in the DMIC website

(www.dmic.org.bd/inmap). The map could be used to determine the safe plinth level for construction of houses, shelter, killa, road, embankment and any other infrastructure.

- Climate proofing guideline for fisheries and livestock sector and training manual on 'Coastal Zone Vulnerability to Climate Change Adaptation' have been prepared with the assistance of Department of Environment.
- For dissemination of information relating to Disaster Management information to the upazilla level network have been extended to 75 more upazilla in addition to 410 disaster information centre.

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.31).

- One of the most significant impacts of climate change is the rise of sea-level. The sea-level has risen by 17 to 21 centimeters over the past century. Bangladesh is precariously exposed to the adverse impacts of climate change for being located on the sea-shore. A recent survey and evaluation suggest that impact of climate change have reduced Bangladesh to one of the most vulnerable and risk-prone countries in world. Poverty and excessive reliance on the natural resources has intensified this vulnerability. Floods, drought, cyclone, salinity and the rise of sea level are impeding economic growth.
  Recently, the following changes have occurred in Bangladesh due to climate change:
  - Saline water from the Bay of Bengal is reported to have penetrated an area of 100 km or more along tributary channels during the dry season;
  - Annual mean rainfall shows increasing trends. High rainfall causes water logging, especially in cities;
  - Serious floods occurred place in 2002, 2003 and 2004;
  - Serious damages occurred by SIDR in 2007 and AILA in 2009 in the coastal areas;
  - Frequency and intensity of cyclones origination from the Bay of Bengal have increased. Unpredictable and rough sea adversely affects the livelihood of fishermen.
- The government has established the Climate Change Trust Fund with an allocation of Tk. 700 crore from domestic sources in FY 2009-10 to combat the risks of climate change and accelerate adaptation activities. Over the last three consecutive fiscal years, the Government allocated a total of Tk. 2,700 crore for this fund. The main objective of this fund is to implement the Bangladesh Climate Change Strategy and Action Plan (BCCSAP)l. In compliance of the law, Tk. 1,155,00 crore is fixed deposited as FDR in different banks. A total of 270 projects (207 projects by government agency and 63 projects by NGOs) are now being implemented (up to June 2014) using the resources from this fund.
- The Department of Environment has taken up the following projects for implementation under the Trust Fund:
  - Waste Reduce, Reuse and Recycle (3R) Initiative in Gulshan, Baridhara and Dhanmondi areas of Dhaka and Nasirabad and Khulshi areas of Chittagong cities;
  - Programmatic CDM through utilization of waste in all towns (Municipalities) of Bangladesh;
  - Community Based Adaptation in the Ecologically Critical Areas through Biodiversity Conservation and Social Protection;

- Modernization and Extension of Chittagong Divisional Laboratory of Department of Environment to strengthen the monitoring and assessment system due to the adverse impact of climate change;
- Environment Friendly Management of Poly-Packaging Waste to reduce water logging and adverse impact of Climate Change.

- A multi-donor trust fund called 'Bangladesh Climate Change Resilience Fund (BCCRF)' has been established in 2011 in order to facilitate projects taken for adaptation. As of June 2014, an amount of US$ 190 million has been deposited for this fund from international development partners. Under the BCCRF, six projects undertaken by different ministry/division/directorate are as follows:
  - Establishment of Multipurpose Cyclone Shelter in the coastal area which is governed by the Ministry of Local Government, Rural Development and Co-operatives;
  - Agricultural Adaptation in Climate Risk Prone (drought, flood and saline prone areas) Areas of Bangladesh (under preparation) project which is governed by the Department of Agriculture Extension (DAE), Food and Agriculture Organization (FAO) of the United Nations;
  - Community Climate Change project which is governed by Palli Karma Shahayak Foundation (PKSF);
  - Climate Resilient Participatory Afforestation and Reforestation project which is governed by the Bangladesh Forest Department.
- The Ministry of Environment and Forest has signed Bilateral Offset Credit Mechanism (BOCM) contract with the Government of Japan. It is expected that Japan will finance in 'Power Generation with energy efficient Combined Cycle Gas Turbine (CCGT)' of Bangladesh so that The emission of carbon dioxide is reduced to half. The Directorate of Environment has prepared Second National Communication (SNC) and submitted it to UNFCCC secretariat. Under the SNC, besides other activities, future action plans for adaptation and mitigation are adopted.
- The Department of Forest has taken a number of initiatives to tackle/address global warming due to climate change. As part of these initiatives, 8 projects are undertaken under Climate Change Trust Fund. The target of these projects is to make block garden in 2,538.33 hectares, strip garden in 54 kilometers and production of 130.00 lakh plants. Besides these, in FY 2012-13, 1,371 hectares block garden and 539 km. strip garden plantation is targeted under the Climate Resilient Participatory Afforestation and Reforestation project being implemented under Bangladesh Climate Change Resilient Fund.

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)?

The Water Act 2013

The act is designed for integrated development, management, extraction, distribution, usage, protection and conservation of water resources of Bangladesh. The act covers surface water, ground water, sea water, rain water and atmospheric water within the territory of the country. In view of water resources protection and conservation, the Act has permitted the executive committee to issue a protection order to the owner or appropriate authority for conservation of such water source, as a source of potable water. The Act Provides Provisions for punishment and financial penalty for non-compliance.

National River Protection Commission Act 2013

The parliament approved this Act on 14 July 2013 to establish a commission to protect rivers and water bodies from illegal encroachment, pollution and unscrupulous exploitation. The commission will coordinate the activities of different ministries involved in the management of water and rivers and provide advice to the Government on measures to be adopted.

Sustainable Environment Management Plan (SEMP)

A segment of NEMAP, centered on green initiatives, was launched in 1998 by MoEF through the implementation of a US $ 26 million 'umbrella' programme called the "Sustainable Environment Management Programme (SEMP)" which lasted until 2006. The SEMP was unique in the sense that it was the largest single initiative under the environment sector, the first initiative launched under it was the largest single initiative under the environment sector, the first initiative lunched under "programme approach", aimed at a larger national objective in the area of environment with the participation of a host of government departments, agencies and ministries, NGOs, CSOs and international bodies like IUCN. They implemented 26 individual projects addressing various aspects of NEMAP under 5 thematic areas as follow:

- Environmental Policy & Legislation
- Participatory Eco-system Management
- Community Based Environmental Sanitation
- Advocacy & Awareness Campaigns
- Training & Education

Perspective Plan 2010-2021

The Perspective Plan of Bangladesh 2010-2021 has provided the road map of materialization of the national goals enshrined in The Vision 2021. The goal of the perspective plan is to implement strategies to protect environment from further degradation and protect the country from unpleasant effects of climate change and global warming. The plan targets to take all necessary actions to protect the vulnerable people from natural calamities, to take actions for the prevention of industry and transport related air pollution and to ensure disposal of waste in a scientific manner. Required steps will also be taken to make Bangladesh an ecologically attractive place and to promote environment-friendly tourism.

Industrial Policy (2010)

The Industrial Policy, 2010 presents an integrated strategy for achieving high economic growth in the country through rapid industrialization. It has been prepared taking into consideration the government's determination to achieve the Millennium Development Goals (MDGs) by 2015, and halve the number of the unemployed and hunger and poverty-stricken people by 2017.

The Industrial Policy, 2010 aims to ensure a high rate of investment by the public and private sectors, a strong productive sector, direct foreign investment, development of labour intensive industries, introduction of new appropriate technology, women's participation, development of small and cottage industries, entrepreneurship development, high growth of export, infrastructure development, and environmentally sound industrial development.

National Energy Policy 1995

One of the seven 'objectives' (section 1.2) addresses the environment and says "to ensure environmentally sound sustainable energy development programs causing minimum damage to environment". Policy issue (section 7.1) includes both 'energy conservation' and 'environmental

consideration issues'. Section 7.18 'energy conservation' requires "an end-use based energy planning process method to be undertaken to incorporate energy conservation measures in energy planning process". Section 7.19 (environmental consideration) says that "Environmental issues will be conserved for all type of fuels and in each and every step of fuel cycle; namely, exploration, appraisal, extraction, conversion, transportation and consumption. It may be reiterated that at present per capita emission of carbon dioxide is very low. It is envisaged that in foreseeable future, emission of carbon dioxide gas would not exceed that existing average emission of low income developing countries". While considering the legal issues, the energy policy recommends (section 7.1.19 legal Issues) "Environmental issues to be considered under National Energy Policy are to be mandated under National Environment Policy and Environment Act".

- As specific policy recommendation under chapter 1.9, 'Environment Policy,' the Energy Policy has seven recommendations. Four of these are relevant here:
- Environmental impact assessment should be made mandatory and should constitute an integral part of any new energy development project.
- Use of economically viable environment friendly technology is to be promoted.
- Use of fuel wood is to be discouraged and replacement fuels are to be made available at an affordable price.
- Popular awareness to be promoted regarding environmental conservation.

The Bangladesh Environment Conservation Act, 1995 and Environment Conservation Rules 1997

The Bangladesh Environment Conservation Act of 1995 was enacted for environmental conservation, environmental standard development and environmental pollution control and mitigation. ECA 1995 is currently the main legislative framework relating to environmental protection in Bangladesh. The Environment Conservation Rules, 1997 (ECR 1997), are the first set of rules which have been promulgated under the ECA 1995. The major aspects covered by ECR 1997 are the National Environmental Quality Standard; requirements and procedures to get environmental clearance; requirement of Initial Environmental Examination and Environmental Impact Assessment for any project. However, the major application of ECA 1995 was to declaration of Ecologically Critical Areas (ECA).

Environment Policy 1992

The Environment Policy 1992 built upon the spirit of Rio Conference and acknowledged that sustained development of the country is based on the well-being of the environment and ecosystems since it provides the services necessary for ensuring progress. Section 3 of the Policy focused on the biodiversity conservation. It envisioned biodiversity protection through achieving the following targets.

Forest conservation, extension and further development was recommend for maintaining environmental balance and to fulfill the socio-economic need of the community.

-Inclusion of tree plantation in all development activities.

-Reduction of erosion in forestlands and forest resources.

-Innovation of alternative materials to wood so that pressure on wood resources is reduced.

-Wildlife and biodiversity conservation and support research activities in related fields.

-Wetland conservation and development and protection of the habitat for migratory birds.

National Land Use Policy 2001

Land utilization policy have little direct focus on biodiversity conservation, but have components like reduce illegal landuse conversion, ensure facilities so that landuse activities is attuned with environmental conservation; these holds indirect linkage to biodiversity conservation. The policy advocated tree plantation in the riverine and coastal islands to increase forest cover in the country.

National Water Policy 1999

National water policy mentions that this policy is a bold step for governance in the water sector. It explicitly mentions that it will play an important role in biodiversity conservation and ensuring a sound environment in the country. Sections 4.9, 4.12 and 4.13 clearly focus on importance of water on fisheries and wildlife, water for the environment and preservation of wetlands respectively.

National Adaptation Programme of Action (NAPA) 2005

The Government of the People's Republic of Bangladesh is a signatory to the United Nations Framework Convention of Climate Change (UNFCCC) and Kyoto Protocol (KP). As a response to the UNFCCC, Ministry of Environment and Forests, Government of Bangladesh has prepared the National Adaptation Programme of Action (NAPA) in 2005 to address immediate and urgent adaptation needs. This has been well received by the international community. Subsequently, in 2008 Ministry of Environment and Forests has formulated the Bangladesh Climate Change Strategy and Action Plan (BCCSAP) which has been updated and endorsed by present government in 2009.

This updated National Adaptation Programme of Action has identified 38 adaptation measures of which 16 have been further developed for implementation by different ministries and departments. The northworthy national level adaptation strategies, programmes and plans include National Adaptation Programme of Action (NAPA) – 2005, and Bangladesh Climate Change Strategy and Action Plan (BCCSAP) – 2009, General objectives of these national documents are to incorporate potential adaptation measures into overall development planning processes, make development resilient to climate change, and promote susta he NAPA was the beginning of a long journey to address adverse impacts of climate stimuli including variability and extreme events keeping urgent and immediate needs.

The updated NAPA has moved from the immediate and urgent needs to wider adaptation requirement to address medium and long-term climate issue. It gave emphasis on four basic national security issues of Bangladesh i.e. a) food security, b) energy security, c) water security, and d) livelihood security (including right to health) and respect for local community on resource management and extraction. Bangladesh government has already integrated climate change into several sectoral policies and plans. Climate changes have been incorporated into the Coastal Zone Policy in 2005. Bangladesh National Water Management Plan (NWMP) 2001 has recognized climate change and knowledge gap need to be addressed. Climate change has also been adopted in the preparation of disaster preparedness plans by Ministry of food and Disaster Management. Recently, the Government has prepared the Poverty Reduction Strategy (PRS) where issue of climate change has been incorporated.

Bangladesh Climate Change Strategy and Action Plan (BCCSAP) 2008

In the aftermath of the COP13 at Bali, Indonesia, the Government of Bangladesh increasingly felt the need for the climate change strategy to carry forward and coordinate activities in support of the Bali Action Plan. Subsequently, the Government has developed the Bangladesh Climate Change Strategy and Action Plan. The BCCSAP has been prepared through a fully consultative process involving government, civil society and development partners. Its main purpose is to articulate a strategy to

manage climate change and its impacts in Bangladesh leading towards an action plan of programmes addressing the needs for substantive interventions with a definitive timeline for their implementation. The Government of Bangladesh allocated resources of about 100 million US Dollars from the national budget for climate change activities. Operational modalities and procedures are at the final stage. The government is also working on setting up a Multi-Donor Trust Fund (MDTF) for receiving and disbursing adaptation funds. The priority needs of the country have been outlined in the strategy and action plans under six thematic issues as food security, social protection and health; comprehensive disaster management; infrastructure; research and knowledge management; mitigation and low carbon development; and capacity building and institutional strengthening.

71. Has your country identified any obstacles to developing and implementing legislation that would protect associated biodiversity?

The draft biodiversity act 2015 has been approved in the cabinet meeting which will be enacted in due course through the National Assembly Meeting. However, no legislation has been in place that has high priority in protecting associated bio-diversity. It has taken much long time to process the biodiversity draft act due to the non-agreement of various issues among the different stakeholders. Once the act will be in place and the rules to implement the act will be formulated, due attention might be given on the associated bio-diversity.

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
Wild food plants of hilly areas	Land tenure conflict in CHT and Delayed activities of land reform commission
Associated biodiversity of coastal areas	Land converted to shrimp culture ignoring rules related to shrimp culture
Associated biodiversity of all components	Enactment of Bangladesh Biodiversity Act Proper has been dealyed
Protection and conservation of local wild fishes	Delayed execution of Protection and Conservation of Fish Act-1950

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

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

As a signatory of the international treaty on Plant Genetic Resources we are committed to take measures with the aim of ensuring the access to its genetic resources should be subject to prior informed consent (PIC), however, this has not become operative due to lack of policy related to agro biodiversity for collection and conservation of biodiversity.

The farmers and tribal people who are still maintaining agro-biodiversity *in situ* were not aware of the importance of the genetic resources. Now a day, they are becoming conscious about the importance of these materials. Future collection programs might be carried out in those areas maintaining PIC and sharing benefits arising from their utilization after the implementation of the biodiversity act.

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.

No regulatory measures have been taken by Bangladesh for ensuring PIC and sharing benefits arising from the utilization of genetic resources collected from the indigenous and local communities.

5.3. 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.

Sectoral information for biodiversity is not quite enough for each sector. Moreover, the poor linkages among the sectors because of lack of any national body covering all sectoral representation is a major obstacle to form linkages between sector information systems. Some form of linkages is made ocassionally for fulfilling the requirement of CBD and FAO's Commission on genetic resources 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.

Farmer's data base
Government of Bangladesh has decided to issue Identity (I.D.) card to the fishermen community of the country through a project under DoF. Through this development project data base of genuine fishers will be developed.

NISM-GPA
Bangladesh has started Bangladesh National Institution Sharing Mechanism- Global Plant of Action to develop data base of the existing PGR already in gene banks and in breeding use of different public research institutes as well as different agricultural universities and private seed companies. A Report on the status of the conservation and utilization of PGR in the countries needs and priority for further work has been prepared. A final report on the process of establishing and strengthening of the National Information Sharing Mechanism on GPA Implementation has been published 2007. The second volume has been published in 2012. A data set with the information on the indicators and reporting format on GPA implementation has been collected though out the country and made accessible to all stakeholders and other interested parties.

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
Agriculture information system (AIS)	Associated biodiversity releated to Plants, Livestock, Fishes	Computer based information system developing by the Departments of the Government.
DLS website www.dgdls.bd	Livestock & Poultry vaccine	Report of DLS

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.

No information systems available to support and/or maintenance of traditional knowledge on biodiversity has been established.

5.4. 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.

Prokriti O Jibon Foundation

The foundation is formed with media personals, researchers, writers and journalists interested in nature conservation. The activities cover making documentary on nature and natural resources; publish books, magazines and weekly bulletin in dailies, carry out research and project activities on nature conservation. The foundation arranges nature fair, butterfly fair, publishes leaflets, posters and arrange seminar, symposium and other activities for creating awareness and conserving nature. The foundation has earned a number of national and international awards for its contribution in nature conservation.

Policy Research for Development Alternative (UBINIG)

UBINIG is a community led and community based policy and action research organization formed in 1984 to support people's initiatives to take command over their own lives and livelihood. UBINIG started as a study circle searching for alternatives to the mainstream development intervention and influence development policies to be more oriented to people's need, particularly for poor and marginal population. It is a policy research organization having grass root connections with farmers, weavers, fishers, artisans and crafts persons, community health providers, rural entrepreneurs and other rural communities. It is legally registered as a research and consultancy organization for social development issues.

Preserving environment and working on the issues of vulnerabilities due environmental degradations are highlighted in all their works. Defending lifestyles has also direct implication for communities and cultures dependent on forest. UBINIG works closely to conserve our forests and life and livelihood of indigenous communities. The climate change issues are particularly followed by promoting knowledge practices that contribute to adopting mitigational measures with regard to river erosion,

selection of appropriate seed for specific agro-ecological zone, conserving mangroves in the coastal areas.

Bangladesh Bird Club

The club was established in 1996 with the membership of the bird lovers. Now this club helps in bird observation, carries out research on various aspects of birds and their conservation. It organizes discussion on birds, seminar on the threats and ways of conservation of birds. It publishes books on birds. It has achieved many awards for conservation effort.

BMOs

DoF under WBRP has formed BMOs and made the communities aware of the importance of wetland biodiversity and its protection. The introduction of co-management approach for wetland and flood management through the engagement of BMOs ensured the participation of local communities.

Obirum Unnayan Sanghasta

It is situated in Noldanga, Natore. The society motivated people not to drive birds away from their private garden, implement awareness building programme, regular monitoring and patrolling to conserve wild life, conserve birds and wild life in the private bamboo clams and other trees of the village. The sanghasta got a national award for its conservation role.

BELA

It is a nonprofit legal organization established in 1992 to assist efforts to protect the environment. It has published many books on Environment Preservation and Law Enforcement for Environment. Besides that, BELA publishes BELA Newsletter in English and Bela Barta in Bangla. In 2003 is was placed on the Global 500 Roll of Honor' of the UNEP.

Bangladesh Poribesh Andolon (BAPA)

Bangladesh Poribesh Andolon (BAPA) is a common forum of citizens and organizations concerned with the environment of Bangladesh. A community-based group, called POROSH, was set up as such a forum concentrating on Dhaka only in 1997. This has virtually been transformed into BAPA in 2000 with nation-wide coverage and expanded dimension.

BAPA, acting as a pressure group against any kind of environment degradation, is trying to create a broad-based citizen's movement for protection and betterment of environment in Bangladesh. It organizes seminars, meetings, conferences and workshops to draw attention to general and specific problems in environment and educate the public on such issues. It holds rallies and demonstrations to build up public awareness and secure wide participation of people on environmental issues. It undertakes publications for education or mobilization of public opinion.

BYEI

Bangladesh Youth Environmental Initiative is established as a young nonprofit organization working to raise environmental awareness, build youth capacity, and nurture the next generation of leaders for socially inclusive and environmentally sustainable development of Bangladesh.

BYEI was established in 2009, as a group of university students keen to improve awareness and engagement among their peers. BYEI now has trained and engaged young people from all over Bangladesh, with BYEI chapters and Earth Clubs established at higher secondary and higher education institutions across Bangladesh.

Bangladesh Youth Environmental Initiative is an independent, non-partisan, and non-profit youth organization working with young Bangladeshis to address environmental issues. BYEI seeks to create

a new generation of enlightened young Bangladesh who have the knowledge, skills, awareness and networks necessary to provide leadership on environmental challenges and opportunities.

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.

- **Wetland Biodiversity Rehabilitation Project**
  This project of Department Fisheries, Bangladesh has been in implementation since 2009 and continued upto 2015. The project worked in the open flood plain wetland ecosystem of Padma-Jamuna delta region, comprising nine upazilas in 3 north-western districts of Bangladesh. With an objective of increasing fish production, this project helped to resolve wetland habitats and functions of the ecosystem thereby contributing to increased biodiversity, productivity of the resources, operating the sluicegates in agro-fish friendly manner and improving the livelihoods of the poor wetland people. Another core aspect of the project was the involvement of people in the integral natural resource management of the ecosystem.

- **Safe crop production project through Integrated Pest Management (IPM) Approach**
  This project belongs to the Directorate of Agricultural Extension which has started functioning from July 2013 and will continue upto June 2018. A number of Farmers Field Schools (FFSs) has been set to train farmers to strengthen safe crop production activities. IPM chubs are formed to enhance IPM activities for rice, vegetables and fruit production without damaging the environment. The project enhances the sustainable and environment friendly approaches for the increase of food production of the farmers. The project also encourages farmers to promote biological insecticide use for the production of sate food and to maintain the soil health.

- **Coastal and wetland Biodiversity Management Project (CWBMP)**
  The Department of Environment completed the project which comprised of two main activity areas-
  1) Conservation and sustainable use of globally significant coastal biodiversity at 3 sites which included Sonadia Island ECA, St. Martin Island ECA and Teknaf peninsula ECA and
  2) Conservation and sustainable use of wetland biodiversity at Hakaluki Haor.

- **Community Based Adaptation in the Ecologically Critical Areas through Biodiversity Conservation and Social Protection Project (CBA-ECA project)**
  It's a project of Department of Environment which has been undertaken towards establishing a community based adaptation process along with strengthening Biodiversity conservation as well as diversifying livelihood activities for the inhabitants of the ECAs. Identifications of endangered natural resources and innovative protection measures were the key activities which were carried out by the Village Conservation Groups (VCGs). Alternative income opportunities through community patrolling for protecting biodiversity are also introduced.

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.

Name of the Project	Duration	Implementing Institutions/Departments
1. Wetland Biodiversity Rehabilitation Project (WBRP)	2007-20015	DoF
2. Management of Aquatic Ecosystems through Community Husbandry (MACH)	2008-2010	DoF
3. Safe Crop Production Project Through Integrated Pest Management (IPM) Approach	July 2013-June 2018	DAE
4. Integrated Livestock and Crop Conservation Project (ILCCP)	2007-2012	BLRI, BAU and DAE
5. Exploration, Collection and Conservation of Rice Landraces in Bangladesh	January 2014-December 2016	BRRI
6. Aquaculture and Fisheries Management Project in Haor Area.	-	DoF
7. Climate Resilient Ecosystems and Livelihood Project (CREL)	-	DoF
8. Enhanced Coastal Fisheries Project (ECOFISH)	-	DoF
9. Establishment of Beel Nursery and Releasing of Fish Fingerling in Open Water Project	-	DoF

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	Extent
Ecologically Critical Area (ECA) Management	The initiatives have been taken by the DoE vested with the power under Bangladesh Environment Conservation Act, 1995 to declare 12 areas as Ecologically Critical Area (ECA) for sustainable environment management. These areas included 10 km periphery of the Sundarbans, Cox's Bazar-Teknaf Sea Beach (Teknaf peninsula), St. Martin Island, Sonadia Island, Hakaluki Hoar, Tanguar Haor, Marjat Baor, Gulshan Baridhara Lake, Buriganga River, Turag River, Balu River and Shitolakya River. For conservation of the nature, DoE has undertaken two projects. Coastland and Wetland Biodiversity Management Project (CWBMP) has been implemented to conserve the wetland area of Hakaluki Haor and Cox's Bazar coastal region. Another community based adaptation is being implemented by DoE in the ECAs through CBA-ECA project.	
Fish sanctuary	The massive siltation has threatened the existence of most of the island water bodies - rivers, flood plains, beels, haors and baors. Most of the water bodies are becoming empty of fish. Under the Development and Management Scheme and Projects of DoF 463 Fish Sanctuaries were established by 2007 (Ali *et al*., 2009) covering an areas of 1745 ha in 98405 ha water bodies and which raised to 500 by 2012 (DoF 2013). Fish sanctuary in Bangladesh was proved to be an important and efficient tool for management in protection and conservation of fishes and other aquatic organisms. The establishment of fish sanctuary has increased	

	140% of fish production (Azad, 2015).	
Wetland sanctuary	Conservation of aquatic and terrestrial animals and plants by creating safe habitat is enhanced through the establishment of wetland sanctuary. The participatory management of these sanctuaries have played a positive effect in increasing the biodiversity of fish and aquatic animals. In the sanctuaries different types of periphyton developed on the branches, bambooes etc. placed in the wetland. Different types of benthes, planktons, annalids and arthrpod larvae were grown in those areas. Some aquatic plants grew in the sanctuaries. Some of them were used as food of the fishes. In the sanctuaries, reproduction of fishes increased significantly.	
Projected Areas	Protected areas are core elements of national as well as regional conservation strategies. Bangladesh currently has 38 protected areas which includes 17 National Parks, 20 Wildlife sanctuaries and one marine protected area. These are declared as protected areas for enhancing conservation of biodiversity and the natural environment.	
Important Bird and Biodiversity Areas (IBAs)	There are 20 IBAs declared by Birdlife International. These IBAs lead to the protection and management of a network of sites which are important for the long time viability of wild bird populations across the geographical range of the bird species.	
Eco Parks and Safari Park	Government has established and declared several eco parks and one safari park to conserve biodiversity and genetic materials for research and other purposes. Both *in situ* and *ex situ* conservation strategies have been adopted here to maintain and keep biodiversity in sound condition.	
Marine Protected Area (MPA)	The MPA is in Bay of Bengal at Swatch of No-ground. It is declared as MPA on 27th October 2014 with an area of 1738 sq. km.	
Community Conserved Areas as Village Conservation Forests (VCF)	Many Village Conservation Forests are declared under two hilly districts-Rangamati and Bandarban. Under Rangamati districts 29 VCFs while in Bandarban 8 VCFs are declared as community conserved areas for the conservation of flora and fauna of these areas.	
Ramsar site	Recently DoE declared Sundarban Forest and Tanguar Hoar as Ramsar sites.	
East Asian Autralian Flywary Site	Recently DoE declared Nijhum Sonadia Island, Hakaluki Hoar, Hail Hoar, Tanguar Hoar has been declared as East Asian Autralian Flywary Site.	
World Heritage Site	About 1400 square kilometers of the Sundarban Research Forest was declared as a World Heritage Site by the UNESCO in 1997, of which 440 square kilometers is water.	
Breeding season of sweet water fishes like "Hilsha" & "Rohita" are protected by Law.	Fishing in Padma river and Halda river is prohibited during their breeding season of hilsa and rohita fishes.	

5.5. 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.

No national co-ordination existing between sectors as no national body is in place. However, different programmes and policies are taken by the different sector organizations with very weak linkages among them.

82. How are ministries working together to meet Aichi Targets[33] as they may apply to the conservation and sustainable use of biodiversity for food and agriculture in your country?

DoE has been playing key role to meet the Aichi Targets involving representatives from different ministries and other stockholders.

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?

- In policy and planning processes importance of bio-diversity has already been incorporated to some extent. Some policies and plan of actions will be updated soon to meet the requirements of conserving and maintaining habitat and the ecosystem more effectively.
- The sanctuaries established through some foreign funded projects need to be maintained for longer periods. Local community people should be encouraged to continue community based conservation activities.
- Draft of Biodiversity Act has been approved by the cabinet. This act needs approval by the parliament. Then a broad based National Committee would be formed to make the conservation activities more effective by involving representative from different conscerved Ministries in common platform. Rules and regulations need to be framed to apply the act.
- For marine fisheries stock survey is under planning.
- Policies and programmes for protection and conservation of fisheries and aquaculture, though are in place, not adequately implemented. Specific policy and strong programmes will be undertaken in future.
- Coverage of protected areas in forest and marine will be increased to ensure mandatory biodiversity conservation.
- Land races of crops still remained uncollected will be collected.
- More thrust will be given to assess the state of associated biodiversity to maintain them effectively and efficiently.
- Traditional knowledge related to biodiversity will be documented.

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
Updating NBSAP	I	NBSAP 2004 updating	DoE
CoP 21	I	Attending and raiseing voice for Bangladesh	MoEF
Wetland biodiversity Rehabilitation Project	R	GIZ-DoF	DoE
GIZ based biodiversity in Khulna regions	R	GIZ-Khulna University	Khulna University
Avian influent virus control	I	USAID, WB, FAO	DLS, BLRI
PPR disease control	I	FAO, SAARC regional reference laboratory- at BLRI	DLS, BLRI
Rabbies control	I	WHO	DLS

5.6. 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?

Farmer Field School (FFS)
This is non-formal training program being carried out under the project of DAE- Safe Crop Production through Integrated Pest Management (IPM) Approach. Farmers are trained to produce safe food without hampering the environment and maintaining the soil biodiversity. The project aims to enhance the bio-control techniques by the farmers to maintain the ecological conditions of the crops. It helps to create a linkage among the farmers and to build awareness and take action to manage and maintain sustainable crop production through the eco-friendly crop husbandry techniques.

IPM club
A group or organization made by the farmers trained on IPM. The project of DAE enhances the IPM training among farmers and make groups to apply the knowledge effectively and collectively in the field. Through this IPM club, technologies are being desiminated, issues on IPM technologies are discussed, makes women's participation in the program.

Demonstration of Organic Agriculture and Biological Control Management
Farmers are trained to encourage use of organic culture techniques for their crop production. Through training they are made acquainted with biological control mechanisms. Demonstration plots are selected in various locations to allow them work together with the trainers and to show the benefits of organic culture and biological control. Active participation of the farmers in these activities make them interested to follow the techniques in their fields.

Integrated Natural Resource Management
DoF is implementing natural resource management system by local user contributors to conserve the biodiversity and livelihoods in the selected wetlands and flood plains in the Padma-Jamuna rivers delta region through a development project. Local users trained to make the resource management activity effective.

Community Based Organizations
In Bangladesh, the production of inland open water bodies is decreasing alarmingly. Initiative was taken to develop Sustainable Community Based open water management to increase the fish production in inland open water bodies of the county. 'Establishment of Beel Nursery and Fingerling Stocking in Inland Open Water' project is being implemented by the DoF to enhance the production of inland open water bodies. Through this project, CBOs are directly involved in production enhancing activities like establishing beel nursery, fingerling stocking in open water bodies. Sustainable open water management will ensure an additional 100000 MT of fish in inland water bodies.

Training of CBOs
Fishermen of Community Based Organizations are trained under the project 'Establishment of Beel Nursery and Fingerling Stocking in Inland Open Water' of DoF. In 2014-15, 297 batches of CBO members under 175 upazelas of 35 districts were trained.

Common Interest Groups (CIGs)

The NATP-DAE started forming Common Interest Groups (CIGs) under a project to improve farmer's knowledge and skills through training and demonstration. Upto 2013-15, 13450 CIGs have been formed throughout the country. They are now better organized and gradually emerging as viable 'Farmers Institution' at the grassroots with their own development plans and activities. CIGs farmers are trained to support successful implementation of the demonstrations and adoption of demonstrated technologies to enhance crop productivity and maintain ecosystem and biodiversity through good management practices.

Fisher's Co-operative Society

Community Based Fisheries Management approach by the Fisher's Co-operative Society in Beelkumari beel by the DoF have been proved to be beneficial to conserve Small Indigenous Species (SIS) as well as other endangered fish species. With the introduction of DoF project support, fisher's groups were formed, rendered training to them, released fingerlings and the society of the fishermen was monitored. These contributed positive impact on augmenting fish production and enriching fish biodiversity.

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.

In Bangladesh, B. Sc. honours programme is usually offerred by the Universities in 8 semesters each of 6 months.

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

Institution	Programme	Semester No.
Khulna University	B.Sc. in Fisheries	6
	B.Sc. in Forestry	7
	B.Sc. in Agro technology	8
Chittagong University	B.Sc. in Botany	7
	B.Sc. in Zoology	6
	B.Sc. in Forestry	8
Rajshahi University	B.Sc. in Botany	7
	B.Sc. in Zoology	7
	B.Sc.Ag in Genetics and Plant Breeding	6
Jahangir Nagar University	B.Sc. in Botany	7
	B.Sc. in Zoology	7
	B.Sc. in Environmental Science	8
Sylhet Agricultural University	B.Sc. Fisheries	3 & 4
University of Dhaka	B.Sc. in Disaster Management	6
	B.Sc. in Fisheries	7
	B.Sc. in Soil Science and Environment Management	8
	B.Sc. in Botany	8
	B.Sc. in Zoology	8
	B.Sc. in Geography and Environmental Science	7
Bangladesh Agricultural University	B.Sc. in Fisheries	7
	B.Sc. in Animal Husbandry	6
	B.Sc. in Agriculture	7
Sher-e-Bangla Agricultural	B.Sc. in Agriculture	6, 7

University		
Patuakhali University of Science and Technology	B.Sc. in Agriculture	7
	B.Sc. in Disaster Management	8
Hajee Mohammad Danesh University of Science and Technology	B.Sc. in Fisheries	7
	B.Sc. in Agriculture	7
Bangabandhu Sheikh Mujibur Rahman Agricultural University	B.Sc. in Fisheries	8
	B.Sc. in Agriculture	8

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

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

Bangladesh Agricultural Research Institute (BARI)
BARI is the largest and most diversified of the research agencies. The primary responsibility is to carry out research in oilseeds, pulses, wheat, tobacco, cotton, citrus, maize, other coarse grains, potatoes, and wide ranges of vegetables and horticultural crops. It collected, evaluated and maintained germplasms for these crops, and used them to develop improved and resistant varieties. Multidisciplinary studies are organized for many crops. There are a Potato Research Centre, a Spices Research Centre, a Vegetable Research Centre, a Wheat Research Centre, a Pulses Research Centre and a Tuber Crop Research Centre as Special Projects under BARI.

BARI is also conducting research on fundamental topics, such as land use, cropping systems, fertilizer requirements of crops, water management, disease and pest control, crop utilization, food technology, production economics, farm management, and other factors involved in improved packages of practices and the development of farm implements and machinery. The on-farm trials division is an important aspect of the work, cooperating annually with several hundred farmer locations.

BARI has four Regional Agricultural Research Stations (RARS): Ishurdi, Jamalpur, Jessore and Hathazari, Chittagong. They varied in size from 75 acres at Jessore to 200 acres at Ishurdi and Jamalpur. Each RARS specialized in the crops and cropping systems of its locality. In addition, there are five special crop stations of BARI. Mango is the specialization at Kajla, Rajshahi; and citrus at Jaintiapur, Sylhet. There are 3 to 5 researchers assigned to each of these stations. BARI also has 18 sub-stations located throughout the country. They are charged with research in the local adoption of crops and cropping systems.

BARI is conducting research on about 300 crops. Plant Genetic Resources Centre (PGRC) of BARI acts as a national depository of the BARI mandate crops, namely cereals (except rice), pulses, oilseeds, spices, vegetables, fruits, tuber crops, flowers, ornamentals and medicinal plants. The PGRC currently maintains 10,085 accessions of 137 different agri-horticultural crops in the gene bank and in the field gene bank. In addition, 9975 accessions of cereals, pulses, oilseeds, tuber crops, vegetables, fruit plants, spices are maintained at 5 research centers of BARI.

Bangladesh Rice Research Institute (BRRI)
BRRI has the leadership responsibility for research for the most important food crop in the country. It organizes and conducts multidisciplinary research and training programmes to develop and transfer

improved rice production technology. BRRI has developed and maintained an outstanding collection of rice germplasms.

BRRI has a number of sub-stations specializing in adapting rice to the agroclimatic conditions unique to their localities. Barisal and Char Chandia are testing salt water tolerant varieties; Habiganj is conducting research on deep water and boro rice; Rajshahi is screening varieties for drought tolerance; and Comilla was doing local testing of rice varieties and techniques.

BRRI scientists started collection, conservation and characterization of rice germplasm form various parts of the country. The BRRI gene bank is conserving 8044 accessions of which 1049, 4802l, 1667, 60 are Aus, T. Aman, Boro, rice for all seasons respectively. This centre has 277 hill rice and 42 Deep water rice as well.

Bangladesh Jute Research Institute (BJRI)

BJRI is the research base for the crop which was the nation's leading export commodity. BJRI is concerned with production, processing and regulation of marketing of jute. Attention is given to the broad agronomic elements of jute production, especially variety testing for higher yields and better fiber quality as well as tolerance to drought, water logging, and salinity. The Institute organizes the production, testing and supplying of improved seed, multiplication and distribution to growers.

The BJRI headquarters at Sher-e-Bangla Nagar in Dhaka, includes administrative offices and a small research area. The Central Research Farm is 100 acres at Jagir. The two seed multiplication farms have large facilities: 833 acres at Nasirpur and 400 acres at Chitla. There are six sub-stations: Faridpur (34 acres) and Rangpur (47 acres), for agronomic, plant protection, breeding and variety screening trials; Tarabbo (14 acres) for seed multiplication and breeding; and various aspects of research at Kishoreganj (47 acres), Chandian (27 acres), and Jessore (22 acres).

BJRI is the international depository of jute genetic resources. At present a total of 6,012 accessions are conserved here comprising 4,180 accessions of *Corchorus* (15 species), 1461 accessions of *Hibiscus* (22 species), 252 accessions of 15 allied genera and 119 accessions of inter specific hybrid derivatives.

Bangladesh Fisheries Research Institute (BFRI)

BFRI conducts research as well as is concerned with administering various regulatory and development activities. It has reseach facility at Chandpur. It has two substations. BFRI is developing informal technologies for breeding and management of different species of fishes. There has been rearch to develop low cost fish feed formulation.

Bangladesh Livestock Research Institute (BLRI)

BLRI is involved in improving the genetic constitution of local breeds; control of diseases and improvement of feed including fodder crops for increased meat and milk production. The National Livestock Research Institute at Savar and the Veterinary Research Institute at Dhaka contributing substantially in cattle and poultry breeding. Vaccines are produced for the control of some of the most important livestock diseases.

Bangladesh Forest Research Institute (BFRI)

BFRI works in forest management (growth and production of primary wood products) and forest products (technology of wood products). These responsibilities include a large afforestation programme; developing high quality seed sources for major plantation species; improving the productivity of non-timer products like rubber, oilplam, cashwenut, bamboo, cane, spices, and medicinal herbs and plants; protecting forests and forest products from pests and fungal diseases; improved wildlife protection and management practices; and improved management of the Sundarban Forest.

The major BFRI research centre are at Chittagong. There are several additional experimental stations in the forest regions of Sylhet, Khulna, Tangail and Dinajpur.

Bangladesh Tea Research Institute (BTRI)
BTRI is the scientific arm of the Bangladesh Tea Board. The main research facility is served in Srimangal and the three sub-stations in the Sylhet district. The Institute serves the country producing another major export crop. It provides agronomic research in fertilizer response, disease control and management practices. Other activities include selection and introduction of high yielding vegetative clones and seed lots, and rehabilitation of older soils. The Institute maintains nurseries to produce clonal plants and supplied rooted and fresh cuttings to the tea estates. BTRI has long been involved in collecting and maintaining tea genetic resources. A total of 516 tea germplasm have been maintained in *ex situ* conditions in BTRI.

Bangladesh Institute of Nuclear Agriculture (BINA)
BINA is a part of a world-wide system established by the International Atomic Energy Agency. It is a service unit applying nuclear technology to assisting research on plant breeding, plant genetics, soil science, plant nutrition and physiology, plant protection, and irrigation and water management. Emphasis has been given to mutation breeding of new crop varieties and the efficiency of fertilizer use. Cereals, fibers legumes and oilseed crops have received the most attention. The Institute is located at Mymensingh on 36 acres inside the BAU campus. The site includes research plots and a modern research facility. BINA has been maintaining genetic resources of different crops.

Bangladesh Sugarcrop Research Institute (BSRI)
BSRI is located near Ishurdi. It is a part of the Sugar and Food Industries Corporation of the Ministry of Industries and Commerce. The Institute develops sugarcane varieties that are fertilizer responsive, acclimated to regions, insect-resistant, and adapted to local conditions. It is working on insect and disease control methods for sugarcane as well as the fertilizer requirements for optimum production. New varieties are developed with varying maturities to ensure a continuous and uniform supply of ripened cane for the mills. The Institute conducts research on cultural and cropping patterns, notably for intercropping and relay planting. BSRI has 1132 accessions of sugarcane genetic resources maintained at the field gene bank. Out of these 990 accessions are from *Saccharum officinarum* and 43 from S. *spontaneum* (wild).

Bangladesh Agricultural University (BAU)
BAU conduct research on a part of the 1,000 acres of its campus and research farm at Mymensingh. This includes the development of new crop varieties; research on land use, cropping systems, fertilizer requirements, water management, disease and pest control; and studies on crop utilization, food technology, production economics and farm management. BAU has been conserving genetic resources of fruits collected from the home and abroad.

5.8 Gaps and priorities

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

a) What are the major gaps in information and knowledge?
No base line information is available regarding existing bio-diversity of the various sectors of agriculture.

b) What are the main capacity or resources limitations?

- Lack of trained personeel.
- Lack of fund to continue the conservation programmes

c) What are the main policy and institutional constraints?

- No common national policy is in place for ensuring biodiversity conservation activities for food and agriculture.
- No single authority is responsible for the maintenance of agro-biodiversity of the country.
- No single national Institute is in operative for conservation of biodiversity for food and agriculture.

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

- More conservation programmes should be formulated.
- The rules of the act should be formulated to implement the acts.
- More funds should be allocated to continue the smooth conservation activities.
- More training to the different stakeholders should be carried out.

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?

- There are sectoral differences in the collection and maintenance of information. No common national formate is available for the collection of data on biodiversity for food and agriculture.
- Information flow is not uniform
- No easy flow of knowledge among the different sectors

b) What are the main capacity or resources limitations?

- Inadequacy of financial resources
- Dearth of resource persons

c) What are the main policy and institutional constraints?

- No national strategy for bringing all sectoral stakeholders under a common umbrella
- Lack of coherent national programme

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

- Need a common national platform to involve representative of all stakeholders in decision making
- Exchange of knowledge among the different stakeholders through consultation, seminar, symposia, workshop etc.
- Planning programs with common goal of maintenance of genetic resources in all sectors.

90. With respect to capacity development:

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

- Courses on biodiversity collection, conservation and maintenance of different sector of agriculture are very much lacking at the undergraduate level programs of different Universities.
- No agricultural degree programs cover both agriculture and environmental issues in a program

b) What are the main capacity or resources limitations?

- None identified

c) What are the main policy and institutional constraints?

- None identified

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

- Developing courses giving due importance to biodiversity and environment
- Inclusion of courses at the degree programs that create awareness on biodiversity for food and agriculture and provide technological habitat and environment for sustainable use of biodiversity.

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?

- Need more research to generate knowledge for sustainable use of biodiversity

b) What are the main capacity or resources limitations?

- Lack of adequate fund to carry out more research
- Lack of adequate trained staff for carrying out activities smoothly.

c) What are the main policy and institutional constraints?

- Lack of enough co-ordination among the different disciplines to carry out the job effectively.

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

- During prioritization of research, more thrusts should be given to biodiversity for ensuring sustainable use
- Programmes should be developed giving due priority to biodiversity.
- More staffs should be trained to make the programme successful.

CHAPTER 6
FUTURE AGENDAS FOR CONSERVATION AND SUSTAINABLE USE OF BIODIVERSITY FOR FOOD AND AGRICULTURE

6.1. Enhancing the contribution of biodiversity for food and agriculture

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.

- Scientists of public research Institutes are collecting local plant genetic resources when fund has become available under some projects. More emphasis has been on the characterization of the genetic material to ensure the utilization of the valuable materials for variety development program. Utilization of the conserved genetic resources would be increased because of the diversified need of the varieties due to climate change effect.
- Most of the OP varieties of vegetable crop of Bangladesh have been released in Bangladesh through collection and selection of local land races from different parts the country. Similarly, most of the fruit varieties of the country are the results of collection and evaluation of the local materials for the purpose of release. These varieties are contributing to the increased production of vegetables and fruits of the country. They are playing important role in providing food and nutritional security of the people.
- Fishes and aquatic associated biodiversities conserved in the fish sanctuaries by the involvement of different stockholders have played significant positive effect on the production of indigenous fish species. That has increased the livihood status of the poor fishers depended on the availability of fishes in the open water.
- Conservation of some high demanding local cattle breeds viz. Red Chittagong Cattle has been initiated. Conservation has been started for Black Bengal goat, Hilly Chicken and Flocks. The initiative has opened the opportunity of availability of these FAnGR for further increase to meet the demand of the people.
- Under social forestry programmes in almost all districts of Bangladesh, forest coverage has been increased.

6.2. Strengthening the conservation and management of associated biodiversity and 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.

No planned actions and concerted efforts are in place to support conservation and management of the components of associated biodiversity and wild foods. DAE, DoF, DoL and DoE have their own project based programmes to support components of biodiversity in project areas of the country. However, the monitoring programmes are not upto the mark and there is still lack of databases of the different components of associated agro biodiversity.

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

Different Government Departments and Divisions under different Ministries have their own programs and project based activities in implementing ecosystem approaches for the various components of agro-biodiversity.

Actions by DoF

- Enforcement of laws for protecting fishing in the sanctuaries in a participatory way
- Imposing ban on use of illegal fishing gears
- Enhancing mechanism to link conservation with livelihood
- Following guidelines for agro-fish friendly sluice gate management for enhancing both agriculture and fisheries.
- Facilitation of fish culture in flood plain through Community Based Management that is helping increased fish production and biodiversity.
- Execution of various projects funded by GoB and/or donors for implementing various ecosystem approaches.

Action by DAE

- Encourages safe crop production through IPM approach by
  - forming farmers' field school for rice, vegetables and fruit cultivation
  - providing training to trainers and farmers
  - organizing workshop/seminars to make farmers aware of highly damaging insects.
  - farming IPM club to disseminate IPM approach in the field
  - demonstrating organic agriculture and biodiversity of pests.
- Encourages farmers to produce vermicompost for application in the field to maintain soil health and to help the growth and reproduction of soil micro-organisms.
- Execution of projects funded by GoB and/or donors for the implementation of various ecosystem approaches.

6.3. Improving stakeholder involvement and awareness

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.

- Social forestry is playing a vital role in conserving biodiversity of some selected species by the participation of poor, landless, destitute women, poor indigenous people and poor forest villagers with the rights of the participants to enjoy the full benefit from plantation. During the period of 1981 to 2006 with the assistance from ADB, Forest Departments established 9955 woodland plantation, 860 km strip plantation and raised 11.51 lakh seedlings under different projects. During the same time period, Tk. 2922.00 lac was distributed among 3765 beneficiaries as their

share under social forestry programme. Till date, about 5 lakh beneficiaries are involved with social forestry activities (BER, 2014).

- DoE has implemented CWBMP and is currently implementing CBA-ECA Project following the Community Based Adaptation. Raising awareness in the community people and involving them in the conservation process in the main objective of the two projects. Seventy four VCGs are formed consisting of the local people for the identification of endangered natural resources and innovative protection measures.
- World Fish Organization in collaboration with DoF has become successful in increasing fish production, maintaining biodiversity and supporting poor people's family nutrition through CBOs. CBO management through holding regular meeting and informing all the activities to the general members have become effective for sustainable fish management in flood plain.
- DAE has been carrying out IPM approach through a project since July 2013 in 275 upazillas of the existing 64 districts of the country. The project aims to increase crop production through Farmers Field Schools and IPM clubs without hampering the environment. It discourages the use of harmful pesticides and encourages organic farming.
- The community based adaptation and village community group approach should be continued for better management and conservation of flood plain, wet land, mangrove and other forests.
- Cross sectoral interaction among the Government departments, organizations and interest groups should be strengthened.

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 are not being emphasized in the national policy for conservation of activity of PGR. However, often in different parts of the country farmers grow some land races of different crops every year for their own consumption and for local and international market. By doing so they are utilizing and maintaining some land races. In hilly areas, tribal people grow every year their own saved seeds of different locally selected varieties of different crops in jhum cultivation. Future priorities should be given to provide some incentives to the farmers who are growing valuable land races in their farmlands. Farmers, groups can be formed in the localities where land races or wild foods are mostly available to enhance conservation activity through awareness building and training.
- Quite a good number of projects have been undertaken to involve fisher folkes and other rural people in the conservation of fish habitat and fish species along with their associated diversity through community based conservation programmes. These programmes should be continued and expanded in other areas as well.
- Rural women have been rearing local poultry breeds since long in their houses. The women are not very interested now to rear poultry in their houses as their economic condition has been uplifted. Some form of incentives could be provided and awareness could be developed to encourage them to continue in- house local poultry rearing to meet their nutritional requirement.
- Forest dwellers are being encouraged in social forestry where every stakeholder is the beneficiary of the programme. Moreover, some alternative earning facilities have been created through different projects.

- Indigenous people are maintaining many local land races of many crops in the hilly areas which they use frequently in jhum cultivation. They should be involved in the conservation activities giving them incentives for their efforts.

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.

- Women are being engaged in the community based conservation of aquatic and fish biodiversity. They are also being involved in the social forestry programmes run under DoF. The women are trained on Integrated Management Programme for the cultivation of vegetables and fruit crops. Recognition of women's contribution in the conservation and use of different components of biodiversity can be ensured through-
    - Creating awareness among the women involved in various sectors of agriculture
    - Providing training to them for efficient management of bio-diversity
    - Forming women's conservation group that might ensure women's recognition
    - Women should be provided some form of incentives to rear local poultry and duck breeds to maintain the biodiversity and ensure nutritional security.

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Preparation of the Country Report

1. Provide a description of the process that was followed in preparing the Country Report, preferably providing the names (with affiliations and addresses) of the participants, including all stakeholders consulted, in an annex.

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