COUNTRY REPORTS

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

THE REPUBLIC OF THE GAMBIA

THE STATE OF THE GAMBIA BIODIVERSITY

FOR FOOD AND AGRICULTURE

2015

EXECUTIVE SUMMARY

With its characteristic Sudan Savanna woodland vegetation, The Gambia has the following main ecosystem types: forest ecosystems (close & open woodland ecosystem), agricultural ecosystems (arable and rangeland ecosystems), marine and coastal ecosystems, inland water ecosystems (wetlands) and terrestrial ecosystems (tree/shrub savanna). The Gambia is endowed with a high diversity of plant and animal species. The components of biodiversity embrace the wild fauna and flora and associated ecosystems as well as the domestic species, including plant varieties and land races of domestic animals that have been bred and developed for thousands of years by farmers, as well as species that are dependent on the agricultural systems developed and maintained by humankind.

The Gambia contains globally significant biodiversity. Although small in size, The Gambia harbors a wealth of terrestrial, coastal, marine and wetland habitats and species of local, national, regional and global significance. The coastal and marine environment is defined in the Gambian context as not only those areas that border the Atlantic but also those with brackish water that border the River Gambia, extending 200km inland. It is one of the areas identified as of particular importance in the GEAP and NBSAP. It is a natural resource rich area with particularly high biodiversity of national, regional and global environmental significance.

The Gambia's biological resources are vital to the populations' economic and social development. As a result, there is a growing recognition in the Gambia that, biological diversity is a global asset of tremendous value to present and future generations. At the same time, the threat to species and ecosystems has never been as great as it is today. Species extinction caused by human activities continues at an alarming rate. Recognizing the need to conserve its biological resources, the Government of the Gambia has made a commitment to conserve 10% of the land area and eventually hectares of coastal and marine habitats as conservation areas.

The Gambia's coastal and marine areas are under increasing pressure. A large proportion of the country's population resides in coastal areas and depends upon them for their livelihoods. Population growth and in-migration as a result of disrupted rainfall patterns and land degradation in the hinterland translates into growing pressure on coastal and marine resources. Anthropogenic pressures arising from subsistence and small-scale economic exploitation include sand mining, fishing, clearing of forest and mangroves for fish-smoking, use as domestic fuel, arable crop production, and pastoralism. There is also evidence of significant pressure on species of global and regional concern such as nesting and migratory birds and marine turtles, the eggs of which are frequently collected; sharks, harvested for their fins; and manatees, hunted for meat, as well as growing conflicts between the population and species such as hippopotamus as the two are increasingly forced to depend upon the same resources for survival. The coast also is the primary tourism attraction of The

Gambia, which alongside other economic development initiatives is increasing development pressure in this zone.

The FAO called upon country- Parties to develop to prepare the country report on Biodiversity for food and agriculture in the aim to compile a State of the World Biodiversity for Food and Agriculture (SOWBFA).

The report was prepared with the active participation of key stakeholders' in the area of Agriculture and Natural Resources sectors. Relevant government departments and agencies, Civil Society Organizations, the public sector were involved.

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ACKNOWLDGEMENTS

The State of the Gambian Biodiversity For Food and Agriculture report represent a collaborative effort, with a large number of contributors from all sectors and spheres of government, NGO's as well as civil society. Funding was provided by the Food and Agriculture Organisation (FAO) with the coordination of the Department of Parks and Wildlife Management [DPWM].

The Department of Parks and Wildlife Management would like to express its appreciation for the help of various local experts, DPWM personnel as well as the CBD National Focal Point as the Coordinator of the exercise. The Directorate expresses its appreciation to FAO and specially to Julie Beranger for the facilitation role.

ACRONYMS

ABS	Access and Benefit Sharing
AEWA	African Eurasian Water Bird Agreement
ANRWG	Agricultural and Natural Resources working Group
ATK	Associated Traditional Knowledge
BTF	Biodiversity Trust Fund
CBD	Convention on Biological Diversity
CFCs	Community Forest Committees
CITES	Convention on trade of Endangered Species
CMS	Convention on Migratory Species
CRR	Central River Region
CSO's	Civil Society Organizations
DOF	Department of Forestry
DOFISH	Department of Fisheries
DLS	Department of livestock services
DPWM	Department of Parks and Wildlife
DWR	Department of Water Resources
EEZ	Exclusive Economic Zone
EIA	Environment Impact Assessment
EDF	European Development Funds
FAO	Food and Agriculture Organisation
GDP	Gross Domestic Product
GEAP	Gambia Environment Action Plan
GEF	Global Environment Facility
GOTG	Government of the Gambia
GR	Genetic Resources
IAS	Invasive Alien Species
ICAM	Integrated Coastal Area Management
ICCA'S	Indigenous Community Conservation Areas
IDB	International Development Bank
ITC	International Trepanosaumiasis Center
LRR	Lower River Region
MDGs	Millennium Development Goals
MEAs	Multilateral Environment Agreements
MOE	Ministry of Energy
MOECCWW	Ministry of Environment, Climate Change, Water and Wildlife
MPA	Marine Protected Areas

NAP	National Adaptation Plan on Desertification
NAPA	National Adaptation Action Plan
NARICA	New Africa Rice
NBR	North Bank Region
NBSAP	National Biodiversity Strategy and Action Plan
NEMA	National Environmental Management Act
NFA	National Forest Assessment
NGO	Non Governmental Organisation
NTFP	Non Timber Forest Product
PAs	Protected Areas
PAGE	Programme for Accelerated Growth and Employment
PPP	Public Private Partnership
SLM	Sustainable Land Management
SOER	State of Environment Report
TKs	Traditional Knowledge's
TSN	Technical Services network
TVET	Technical Vocational Education and Training
UNCCD	United Nations Convention to Combat Desertification
UNDP	United Nation Development Programme
UNFCCC	United Nation Framework Convention on Climate Change
URR	Upper River Region
UTG	University of the Gambia
WCR	West Coast Region

CHAPTER 1: Process of the Preparation of Country Report

The Department of Parks and Wildlife Management (DPWM) as the focal and coordinating Institution of issues related to Biological Diversity has the institutional mandate to lead the national report preparation process. In view of the cross sectoral nature in dealing with biodiversity issues, an inter-sectoral group of experts designated by stakeholder institutions directly involved in the use and management of biodiversity, such as the department of forestry, the department of fisheries, the department of Water resources, the national environment agency, the department of parks and wildlife management, the livestock sector, representatives from the farmers plate form, the beekeeping association, and the Try (women oyster collector association) was also put in place. A steering committee was set up and charged with providing the technical guidance. The steering Committee met twice during the compilation period to provide guidance and technical input on the draft document.

The process of carrying out country studies and stocktaking exercises for the preparation of country report on Biodiversity for food and agriculture involved several desk studies and assessments with a highly consultative and participatory process that involved key stakeholders at various levels. As an initial phase, several desk studies were carried out aimed at establishing the current status of the biodiversity in the country. These studies were carried out with specific contribution from the NGO sector. Reports and findings from these studies carried out over a period of a month were subjected to the review and validation by the designated experts' steering committee and the directorate of the department of Parks and Wildlife Management.

It is important to highlight that contributors to the compilation of this report were drown from Agriculture and Natural Resources sector, the Media, statisticians, etc... . The following individuals participated meaningfully towards providing the information: Momodou L. Kassama, Ousainou Touray, Binta Sambou, Amie Touray, Baboucarr Dumbuya, Abdoulie Sawo, and Kawsu Jammeh (all from Department of Parks and Wildlife Management) ; SambouNget and Lamin Njie (Department of forestry); Abdoulie Danso and Anna Mbenga Cham (Department of Fisheries); Dr Ebrima Njie (University of the Gambia); Ismaila Senghor (Gambia Radio and Television Services); Abdourahman Sallah (Biodiversity Astion Journalist), Lamin Camara, Dawda Badjie (National Environment Agency); Lamin Jobarte and Momodou Njie (West African Bird Study Association); Ebrima Sonko (Department of Livestock); Lamin Mai Touray (Department of Water Resources) and Mbayang Njie (Ministry of Environment Climate Change Water, Forest and Wildlife) Fatou Janha (Try oyster Association, Mariama Bojang (Niumi Women oyster Famers Association) Issatou Sanyang and Awa Bojang (heads of shellfish monitoring programme in Niumi National Park. The report was compiled and finalised by Ousainou Touray assisted by Dr Ebrima Njie.

2- **General Overview of the Country**

The Gambia is a small Sahelian country**,** bordered by Senegal on all frontiers except for its Atlantic coastline on the Western Coast of Africa. The Gambia lies between 13.79^{o} and 16.82^{o} West longitude and entirely within 13^{o} North latitude. The country is a narrow strip of land enclosed by the Atlantic Ocean in the west and Senegal on the three remaining sides. Its land area of 10,000 km^{2} extends about 330 km from its eastern border to the coast and between 20 and 48 km along its north-south axis. The country's terrain is flat, with the highest point at 53 m above sea level. The country can be divided into three major biological regions – the marine system and coastal zone on the Atlantic Ocean in the west, the east-to-west running River Gambia and related freshwater and estuarine ecosystems, and the terrestrial ecosystems in the remaining stretches of land behind the coast and to the north and south of the river. The country is bisected by the River Gambia that originates from the Fouta Djallon highlands, forming the North and South banks. Despite its small size, the Gambia harbours biodiversity that is globally significant as well as biodiversity and natural resources of great significance at national and local level. In fact, the Gambia is dependent on its natural environment and ecosystem services (biodiversity) for its quality of life and its economic viability. The natural environment, in all its forms, is a valuable economic asset as it provides food and other necessities for Gambians.

The country is divided into five Administrative Regions (West Coast Region [WCR], North Bank Region [NBR], Lower River Region [LRR], Central River Region [CRR] and Upper River Region [URR]) and the two municipalities, namely, Kanifing Municipal Council (KMC) and Banjul City Council (BCC).

The geology of the Gambia is relatively recent from the Tertiary and Quaternary periods. The country is part of the Tertiary Continental Terminal Plateau with about 53% of its land area covered with alluvial deposits of the Quaternary period along the river. Occasional marine intrusions and deposits on the terrestrial sand and sandstone characterize the geological periods. The country is generally low-lying with altitudes mostly below 60 m above sea level.

The valley floor is the area immediately along the River Gambia and its tributaries. The area is characterized by poorly drained alluvial sediment formations which are subjected to regular seasonal flooding. The combination of low-lying topography, poorly drained soils and abundant water provides unique and diverse habitats. The valley makes up nearly 4,048 km^{2}, 39% of the land area. In the west, the valley broadens and seasonally inundated swamps appear on either side of the river. These swamps can extend for more than 2km away from the river. Therefore, the geomorphology of the Gambia is dominated by the River Gambia which divides the country into two strips of land no wider than 30 km.

The soils and vegetation on the valley floor are primarily influenced by the hydrology. In the western third of the country, where the river water is salty or brackish, the soils are clay and alluvium and heavily impregnated with salt. The only vegetation that thrives in such condition is mangrove forest. In the freshwater areas, the soils are often light alluvium and are more fertile and these have been used for rice production for centuries.

Upland Gambia is dominated by a dissected plateau with sand hills. This area is characterized by gentle rolling sand hills alternating with shallow valleys. In the coastal region, the soils are generally unconsolidated marine and Aeolian sand with intermittent low-lying sand dunes. Underlying these unconsolidated soils are the ferruginous sandstones, which form cliffs rarely more than 20 m high. In central and eastern Gambia the plateau is broken up by a few flattop laterite sandy hills. The eastern end of the country is enclosed by low, rocky sandstone hills, which extend into Senegal. These hills occupy about 4% of the total land area and are often unproductive rugged, uncultivated, and unvegetated[3].

The country has four major landscapes, namely; the flo*o*dplain, the colluvial slopes, the lower plateau and the upper plateau, with different soil types, ranging from clayey, loamy to sandy soils. The natural drainage is centered on the River Gambia and its tributaries, namely; Sand*o*ugou, Miniminyang, Baobolon, Sofaniama, and the BintangBolongs. The Ri**v**er Gambia, which Covers 1,130 km long, originates from the Fouta Djallon highlands in Guinea.

The Gambia has a Sudano-sahelian type of climate, with a short rainy season from June to October and a long dry season lasting from November to May. The average annual rainfall is 900 mm. There has been an average reduction of 27% in the annual average rainfall since 1951 with reductions in the length of the rainy season and increases in surface temperature making the atmosphere drier. The mean temperature is 25^{o}C.

In the dry season, north easterly winds dominate the flow, resulting in general cloudless skies and the presence of dust particles in the air. This wind flow pattern is at times deformed due to projections of extra-tropical weather systems across the Mediterranean into northwest Africa, which could give rise to unseasonal rainfall. During the wet season, south westerly monsoon winds, combined with heat on the continent, give rise to the formation of thundery activities, usually accompanied by strong winds, heavy downpours of rain and severe lightning flashes.

3- **Role of Biodiversity for Food and Nutrition**

With its characteristic Sudan Savanna woodland vegetation, The Gambia has the following main ecosystem types: forest ecosystems (close & open woodland ecosystems), agricultural ecosystems (arable and rangeland ecosystems), marine and coastal ecosystems, inland water ecosystems (wetlands) and terrestrial ecosystems (tree**/**shrub savanna). The Gambia is endowed with a high diversity of plant and animal species. The components of biodiversity

embrace the wild fauna and flora and associated ecosystems as well as the domestic species, including plant varieties and land races of domestic animals that have been bred and developed for thousands of years by farmers, as well as species that are dependent on the agricultural systems developed and maintained by humankind.

In the face of the looming effects of climate change and its attendant impacts on the ingredients forming both the basic and composite inputs into agricultural productivity, the prospects are that unless a radical reform of the Agriculture and Natural Resources (ANR) sector that factors in the conservation of natural biological resources is established, the general picture of the country's ability to adequately meet its requirements in annual food needs and production will be gloomy. This is more so with the traditional food crops of rice, millet, sorghum and maize and even groundnuts, which is basically a cash crop but a large amount of which is also consumed as direct food or food additives.

However, given the prospects of the additional food stuff collected from the wild to diminish rapidly, the advent of advancing biodiversity loss is a matter of grave concern. While some wild food sources will dwindle, the prospects of others disappearing totally cannot be ruled out. From edible fruits, stems, barks, leaves, flowers and tubers to fungi; small and large game to avian fauna and food producing insects like the honey bee, there are probabilities that our future generations could be oblivious of them ever existing if they are not preserved and conserved right now. This would obviously translate into an even more acute stress on present and future sources of food and food security in general. Moreover, it is an established fact that forest dependent communities do not only get a good portion of their annual food needs from the wild but also generate reasonable income, cultural and social benefits as well as natural attraction and symbiosis from it in order to meet some of their monetary demands in their livelihoods.

Food shortage in itself triggers a negative effect in the food value chain, as without adequate food in the growing season, farmers are affected by malnutrition to a level that they won't have enough strength for the labor that crop production requires. As poor and hungry people cannot afford to invest any monies in the least mechanization, they are more prone to produce lesser and lesser thus increasing their vulnerability to hunger and malnutrition and the vicious circle goes on and on.

Unfortunately, as human beings encroach on natural resources and jeopardize the natural equilibrium which hitherto existed, little do we realize that the havoc we wreck on these resources will haunt us back. The uncontrolled, unregulated and illegal fishing that goes on unabated in our waters is a clear indication for the irreparable damage done to marine biodiversity. Certain sea crustaceans which were once delicacies are difficult to catch today for that their populations have reduced drastically to the point that they are now seen nowhere in the markets. In the same vein, the oyster and certain fish species even if found,

are smaller in size or quantity, which all point to a reduction in the food base for the nation. In fact, according to the Fishery Co-Management Plan document for The Gambia Sole Complex (2012), a study has shown that there was a decrease in the length frequency of the red and black sole captured by gillnet in four landing sites (Kartung, Sanyang, Brufut and Gunjur) between July and November 2010. The highest length frequencies were found with the sizes ranging between 35 and 40cm while the lowest frequencies are for the sizes, 45 -50cm for the red sole. For the black sole, the more abundant length frequencies were with the sizes 30 - 35cm and the lowest fr\equencies with 40 -45cm fish length. In terms of quantities, according to the same reference document, the sole landing artisanal fisheries between 1990 and 2009 have for the decreased drastically from 2250 metric tons to 250MT. This decreasing tendency has remained the same for the sole industrial fisheries with records between 2000 – 2001 and 2007 – 2008 varying between 2250MT and 1000 – 1250MT.

Biodiversity which means the variety of life on Earth is vital to social and economic development and fundamental to human survival. Biodiversity for food and agriculture includes the biological diversity present in or of importance to agricultural, pastoral, forest and aquatic production systems. It encompasses the variety and variability of animals, plants and micro-organisms at the genetic, species and ecosystem levels that sustain the structure, functions and processes of production systems. This diversity has been managed or influenced by farmers, pastoralists, forest dwellers and fisher folk for hundreds of generations and reflects the diversity of both human activities and natural processes.

Conservation and sustainable management of biodiversity for food and agriculture requires a comprehensive understanding of the state and use of all components of biodiversity for food and agriculture. Protecting biodiversity in the ecosystems that support food production and fresh water, and preserving genetic diversity in our crops, are both critical to ensuring our ability to produce food with ever-shrinking terrestrial and aquatic resources as a result of population increase and the effect of strong negative factors in the fisheries, agriculture and forestry sectors. According to PAGE 2012-2015 Final Draft, the performance of the sector (Agriculture and natural resources) has fluctuated and is thus yet to reach its full potential, due primarily to following factors: erratic and reduced rainfall that lasts for three to four months a year; low quality and insufficient supply of inputs (seeds, livestock breeds, inorganic fertilizer, etc.) and mechanical implements ect.. Besides, the total forest cover of The Gambia is 300,000 ha (2010) but, on average, each Gambian uses 1kg of firewood daily. Finally from the same source (PAGE, 2012-2015), there is a growing concern over the observed declining state of fish resources and catches which is ascribed, among other things, to increases in fishing capacity in the industrial and artisanal (intensity) and irresponsible fishing practices by fishing trawlers and foreign artisanal fishermen. The demersal fish over the 500 marine fish species in the Gambia's fisheries waters are apparently being over-exploited and require more rigorous management.

Of the numerous species of plants and animals available for human consumption, modern agriculture uses only a few. According to the UN's Food and Agriculture Organization, only 12 plant species provide 75% of our total food supply, and only 15 mammal and bird species make up over 90% of livestock production

Furthermore, biodiversity in the Gambia represent an important storage area of food and other resources that can play a key role in contributing towards food security, especially if integrated into complex systems that are managed for multiple benefits.

From ants to elephants, moss to giant palms, and deserts to rainforests, the Gambia is rich in genetic, species and ecosystem variety. In fact, many different species of animals, plants, fungi and microorganisms inhabit this world, this biological diversity is critical to our survival. It provides a wide variety of nutrients in people's diets, resilience to unexpected crop failings, food and income for those who might otherwise go without, ingredients for medications, clean water, flood control, fertile soils, pollination and much more.

Biodiversity and food are intertwined and responsive to changes one within the other. In past decades, intensive food production in the Gambia has taken priority over biodiversity landscapes and species-rich ecosystems have been replaced with single species agricultural practices that concentrate on a small fraction of available foods and remove species considered weeds or pests.

The Gambia's biodiversity and wildlife products as well as wildlife based industries contribute significantly to both national and household food security either directly or through the generation of financial resources which can be used to purchase food or to develop and improve food production systems.

The main contribution of biodiversity to the Gambian micro-economies comes from wildlife-based tourism, recreation and associated industries. Although agriculture contributes for 44% of employment against 12% of GDP by the tourism sector (PAGE, 2012-15), the greater proportion of the country's income comes from tourism. However, it is also obvious that the tourist industry offers employment to a significant number of local people, thereby contributing to household income and access to food.

4. **Production Systems**

Sector	Code	Production System	Present Y/N
Livestock	L1	Livestock Grassland –base System: Tropics	N
	L2	Livestock grassland-based systems: Subtropics	Y
	L3	Livestock grassland-based systems: Temperate	N
	L4	Livestock grassland-based systems: Boreal and /or highlands	N
	L5	Livestock landless systems: Tropics	N
	L6	Livestock landless systems: Subtropics	N
	L7	Livestock landless systems: Temperate	N
	L8	Livestock landless systems: Boreal and /or highlands Forests	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	N
	F6	Planted forests: Subtropics	Y
	F7	Planted forests: Temperate	N
	F8	F8 Planted forests: Boreal and /or highlands	N
Aquaculture	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	N
	A7	Culture-based fisheries: Temperate	N
	A8	Planted forests: 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	N
	A15	Non-fed aquaculture: Temperate	N
	A16	Non-fed aquaculture: Boreal and /or highlands Crops	N
	C1	Irrigated Crops (Rice): Tropics	N
	C2	Irrigated Crops (Rice): Subtropics	Y
	C3	Irrigated Crops (Rice): Temperate	N
	C4	Irrigated Crops (Rice): Boreal/ 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	N

	C9	Rainfed: Tropics: TROPICS	N
	C10	Rainfed: Subtropics	Y
	C11	Rainfed: Temperate	N
	C12	Rainfed: Boreal and / or Highlands	N
	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
	O1	Others [please specify]	

TABLE 2. "Existing Production Systems in The Gambia"

Sector	Code	Production System
Livestock	L2	Livestock grassland-based systems: Subtropics: The population of cattle has been rose in 2014 and stood at 479,083. The population of goats too has been increasing and in 2014 it stood at 359,835. However, the population of sheep declined from 194,722 in 2009 to 49439 in 2014.
Forestry	F2	Naturally regenerated forests, Subtropics: - Main harvested species: *Andropogon* grasses and fodder trees such as *Pterocarpuserinaceus* and *Prosopisafricana*. - through the establishment of community forestry, and improvement of efforts to land tenure system, the general tendency is toward intensification of reforestation activities to boots rangeland carrying capacity and enhance soils retention Main species cultivated or harvested: - Combretum sp Pterocarpus erinaceus and Terminalia macroptera - less suitable or are other wise more adaptive and tolerant to annual bush fires. They are therefore found in all areas including farmlands. (ftp.fao.org). - Parkia biglobosa, Bombax buonopozense, , Acacia albida, and Adansonia digitata. Cordyla africana (Bush mango) and Elaeis guineensis (oil palm) - Provide lots of by-products (fruits, palm oil, palm wine) than the primary use of the wood. Such species are most often found on farmlands and are protected by local farming communities (ftp.fao.org). -
	F6	Planted forests: Subtropics: - Main species cultured or harvested: Cacia, Acacia and large leaves trees sp. to some extend Khaya senegalensis
Aquaculture	A2	Self-recruiting capture fisheries: Subtropics: - The artisanal fishery has a fleet of 1,785 canoes (both motorized and unmotorized) from 7-11m length over all (LOA) operating in both the marine areas and The Gambia River.

		- The artisanal fishery is the major source of raw fish materials for the fish processing establishments in The Gambia and the major supplier of fresh fish for The Gambian population. Main species captured: *Arius latiscutatus, Pomadasys jubelini, Pseudotolithus typus, Scomberomorus tritor, Cynoglossus senegalensis*, P. *senegalensis*, P. *brachynathus,* P. *elongates,* P. *elongates, Synaptura cadenati* - The two most important fishing gears employed in the artisanal fisheries operations in the Gambia are encircling/surround gillnet and bottom set gillnet. These gears are used in fishing operations all year round and are responsible for most fish landings
	A10	Fed aquaculture: Subtropics: * Fish Farming - Main fish species are native to the Gambia River and are easily cultured. Thus in addition to tilapia, other available species amenable to culture include: the Africa catfish, *Clarias gariepanus*, the African arowana, *Heterotis niloticus*, the African knife fish, *Gymnarchus niloticus* - In April 2010, 20 ponds were installed with a pond area of roughly 340m^2 - feeding undertaking: it is based on rice bran, peanut cake, wheat flour and a locally sourced fish meal in the form of pellets that are sun dried with vitamin, salt, and palm oil content. - Site operation: Sapu village and Kanilai * Shrimp Farming: it started around 1982 with 200ha area managed by Scan-Gambia Shrimp Ltd. Operation Site: South Bank of the lower estuary portion of the Gambia River - Production: it started in 1989-90 with 50mt (Fao,2011). The Company closed doors in 1992 (Jallow, 2009) - Following this experience, a new company owned by Gambian nationals re-incorporated the farm under the label West Africa Aquaculture (WAAq) Ltd with a surface area of 50ha. - Production with WAAq Ltd could not go beyond 25tons. Due to financial problems, WAAq Ltd ceased operations in 2008 *Mollusks Farming: Mostly, it is a work undertaken by women. - Cultured species: *Grassostrea tulipa* (*G. gasar*) - peration Site: Collection from mangroves in the lower Gambia River estuary with the bulk harvest in the Tanbi Wetland which is a mangrove-dominated wetland complex located at the south and west of Banjul along the Atlantic coast. - Harvest period: From March to April The common West African Blood Ark clam, *Anadara senilis* or cockle. It is also essentially exploited by women year round with a closed season during the rainy months
Crops	C2	Irrigated Crops (Rice): Subtropics: Rice cultivation in the country is intended to satisfy the needs of the population mainly in terms of food security as it is also the primary staple food for most Gambians. Two broad rice ecologies exist in the Gambia, namely: upland and lowland rice growing areas. Although the erratic rainfall experienced over the decade under review seriously affected upland rice cultivation potentials, its area increased significantly from 2,888 ha to 8,862 ha in 2003and 2013 respectively, indicating an increase of over 200%. This unprecedented increase was closely associated with the adoption by farmers of short duration rice varieties

		such as the recently introduced drought tolerant rice variety called the New Rice for Africa (NERICA), developed by the West African Rice Development Association (WARDA), for the uplands. Upland rice production increased from 3,661 metric tons to 8,862 metric tons showing about a two-fold increase. Lowlands are another rice growing ecology in the country and over the last decade, swamp rice cultivation suffered from two natural calamities; drought on one hand and floods on the other. The cumulative effects of these calamities resulted in an undesirable reduction of swamp rice cultivated area and production. To this end, the total area under swamp rice cultivation declined from 10,281 ha to 6,661 in 1994 and 2003 respectively indicating a reduction of about 35%. Similarly, about a 50% decline was registered for swamp rice production during the period under review.
	C6	Irrigated Crops (other): SUBTROPICS Horticultural products are very important to the domestic consumption basket of consumers in that they provide a relatively cheap, complementary source of nutritional food elements (vitamins) and another source of income for a large proportion of the population in agribusiness, particularly women farmers. It is also a major source of foreign exchange for exporters. Horticultural production (mainly fruits and vegetables), enhances improved food security principally through direct consumption and income generation for growers. The exports of horticultural products have increased to over D50 million during the last decade due to the contribution of government and its development partners. Two broad horticultural growers exist in the horticultural sub-sector: village vegetable garden schemes (mainly by women) and commercial farms (private sector-led), with the former assisted by government and its development partners. For instance, in response to the drought situation in 2002, government and the FAO formulated a Technical Cooperation Programme (TCP) to assist small-scale horticultural producers countrywide with garden equipment (watering cans, fencing materials, spades, etc.) and inputs (fertilizers, seeds, agro-chemicals, etc.). Consequent to this assistance and that provided by programme/project interventions, the sub-sector's overall performance has been encouraging to date. Since 1994, the sub-sector significantly contributed tangibly meeting nearly 85% of the requirements for fruits and vegetables in the tourist industry of the country; over 60% of women farmers are engaged in horticultural activities; more than 4,000 labourers are employed in the large commercial horticultural farms primarily in production for the export market. A total of 410 gardens have been established throughout the country (WCR 70, LRR 63, NBR 59, CRR/N 75, CRR/S 45 and URR 98). Yet still, market stalls have been established in four lumo (local market) sites such as in Kaur, Wassu, Brikamaba and Bureng to improve the marketing of produce and minimize post-harvest losses. A one-hectare fruit tree orchard has also been established in each of the six agricultural divisions well as the holing of several comprehensive farmer training sessions on improved horticultural crop production techniques such as integrated pest management (IPM), post-harvest handling, processing and preservation, marketing and storage and group management skills. In addition, live fencing materials were given to 20 garden schemes in both WCR and NBR.

	C10	Rainfed: Subtropics: It is estimated that the total land area of the country is 1.1 million hectares of which 550,000 ha are classified as arable. Out of the 550,000 hectares, some 157,016 ha were cropped in 1994 by about 574,749 men and women farmers. By 2003, the total cultivated area increased to 284,792 ha grown by about 881,146 men and women farmers representing remarkable increases of 81% and 53% respectively. Furthermore, towards the realization of national food security, only 15% of the total arable land was allocated to cereal cultivation by 1994 but over the decade under review this figure increased to 32% in 2003. Cereals comprise of coarse grains (early and late millet, sorghum and maize) and paddy rice. Total area cultivated of coarse grains increased from 68,766 ha to 155,667 ha in 1994 and 2003 respectively representing a quantum increase of 126%. Of this phenomenal increase, 61% was allocated to the cultivation of early millet. For the rest of the coarse grains, over 40% each was allocated to their cultivation by 2003. During the decade under review, cereal yields slightly increased from 1,122 kg/ha in 1994 to 1,230 kg/ha in 2003 representing a rise of 9.6%. This moderate increase besides unfavorable weather conditions (mainly rainfall), is reflective of the poor state of the soils and the endemic unaffordability of chemical fertilizers by most farmers. Overall, cereals constitute the most important group of food crops consumed by households in the Gambia contributing over 50% of total energy food supply while animal protein, fats and edible oils constitute only 20% of the total energy food requirement. Since 1994, cereal production has witnessed a remarkable increase from 95,332 metric tons to 213,337 metric tons in 2003, an increment of 124% over the last 9 years. Much of the increase in cereal production constituted early millet representing 50%. Regarding national food self- sufficiency, the country produces only 50% (172,410 metric tons) of its food requirement and the remaining 50% is provided through food imports and aid. On account of national food security, taking into consideration the teeming population of about 1.8 million inhabitants at an annual growth rate of 3% and a per capital consumption of 175kg/GE/capita/year (including commercial food imports and aid), the cereal balance sheet for the country shows that the estimated total cereal requirements for 2003 stood at 245,400 metric tons showing a national food surplus of 45,480 metric tons. Groundnut is the major cash crop of the country and it is directly consumed as an important and cheaper source of protein particularly in rural diets. The cultivated area under groundnut has been fluctuating annually due to diverse factors effecting production such as the inadequacy of inputs and the erratic nature of rains upon which depends the crop. The lowest cultivated area was registered in 1996 of 64,413 ha and the highest in 2001 of 138,888 ha. Similarly, its production has also been fluctuating annually due to the variability in cultivated area, poor seed nuts, limited price incentives and

		inadequate or unaffordable chemical fertilizers. For instance, groundnut production was estimated at 151,069 metric tons in 2001 and 71,526 metric tons in the following year giving a 53% decline. A 30% increase in groundnut production was recorded between 2002 and 2003. Cotton, which is purely a cash crop, occupies less than 3,000 ha, on average. Other crops such as cassava and potato occupy about 1,500 to 2,000 ha in small garden and commercial schemes. Sesame is another increasingly important cash crop mainly grown by women groups members of the Sesame Growers Association (SGA). Like groundnuts, sesame cultivation has significantly increased since 1994.
Mixed	M2	Mixed systems (livestock, crop, forest and /or aquatic and fisheries): Subtropics The Gambia has begun to experience the appearance of invasive and alien species that have significantly impacted particularly the horticultural productions. Currently, fruit trees are under huge threats posed by fruit flies and mealy bugs. Yields and qualities of mangoes, guavas, sour and sweet sops and citrus have gone down as a result of the outbreak of these pests. The vegetables, on the other hand, are equally affected by several invasive and alien pests which are causing huge negative impact to vegetable production. Many vegetable crops such as the solanaceous crops (tomato, bitter tomato and eggplant), cabbage and other vegetables have significantly suffered from the red spider mites. Plant, insect and related-insect species constitute a significant representation of the alien species found in The Gambia. Of these, the prominent and the most notorious species include: invasive insects (mealy bugs, fruit flies, spiralling white flies), invasive red spider mites, invasiveweeds (wild rice, African bush tea, rattlebox, sedges) and invasive birds such as the Quelea

Table 3.

Code of Production System	Name of Production System	Area	Production Quantity	Contribution to Agricultural Sector Economy	Reference year
L2	Livestock grassland-based systems: Subtropics				
F2	Naturally regenerated forests: Subtropics	Forest Reserve Forest Park Community Forest	55.000ha 37.000ha 18.000ha		
F6	Planted forests: Subtropics				
A2	Self-recruiting capture fisheries: Subtropics		2973 mt		2014
A10	Fed aquaculture: Subtropics				

C2	Irrigated Crops (Rice): Subtropics	-8,862ha (upland rice) -6,661ha (lowland rice)			
C6	Irrigated Crops (other): SUBTROPICS				
C10	Rainfed Crops: Subtropics				
M2	Mixed systems (livestock, crop, forest and /or aquatic and fisheries): Subtropics				
O1	Others [please specify]				

CHAPTER 2: DRIVERS OF CHANGE

Effects of drivers of change on associated biodiversity

Effects of drivers of change on biodiversity for food and agriculture

Table 4a. Effect of drivers on sector biodiversity within Livestock grassland-based production systems in The Gambia by animal (AnGR), plant (PGR), aquatic (AqGR) and forest (FGR) genetic resources.

Production systems	**Drivers**	**Effect of drivers on sector biodiversity for food and agriculture** (2, 1, 0,-1, -2, NK, NA)			
		PGR	FGR	AnGR	AqGR
Code or name					
L2: Livestock grassland-based systems: Subtropics	Changes in land and water use and management	-1	-1	2	NK
	Over-exploitation and over-harvesting	-1	-1	1	NK
	Climate change	-2	-2	-2	-1
	Pests, diseases, alien invasive species	-2	-2	-2	-1
	Markets, trade and the private sector	1	1	2	NK
	Policies	1	1	1	NK
	Population growth and urbanization	1	-1	1	NK
	Other [*please specify*]				

DETAIL DESCRIPTION OF DRIVERS AND IMPACTS

Changes in land and water use and management.

It should be noted that apart from the ever locally known cattle “ndama” and “zebu peulh” races, the International Trypanosomiasis Center (ITC) has engaged in the late 90s into a cross-breeding program between the trypano-tolerant “ndama” race and a highly milk productive exotic cattle race to diversify the genetic resources of the livestock.

The Gambia has a considerable high livestock population with high stocking density. Livestock are reared on an extensive free range system in open grasslands and in rangelands. Due to the high stocking density and the incidence of annual bush fires which consumes most of the feed resources, there is always a scarcity of livestock feed during the dry months of the year. The convergence and concentration of livestock in and around isolated pockets of remaining grazing areas leads to range degradation with proliferation of unpalatable species and eventually loss of top soil[1].

[1] The National Biodiversity Strategy and Action Plan (2015-2020)

The use of more land for grazing has increased the population of cattle and goats and reduced plant and forest biodiversity for food. The effect of this driver of change on availability of plant is negative and its magnitude is assumed to be -1. Over the past ten-years, the impact of this driver of change on availability of forest was also negative with a magnitude of -1. An increase in grazing land supported the raising of more livestock (cattle and goats). This positive effect is given a magnitude of 2. The effect of land use change on livestock development and availability of aquatic life may not be direct. The impact of increased use of water by livestock and availability of aquatic animal may be direct but the magnitude is not known (NK).

Over-exploitation and over-harvesting. Overgrazing from livestock has reduced the quantity of food from plant and forests and sustained more livestock. The linkages between overuse of water by livestock, if there were any, and the availability of aquatic life is not known. Hence, PGR is -1, FGR is -1, AnGr is 1 andAqGR is NK.

Over grazing of range resources in The Gambia due inter alias to large livestock numbers is a major cause of land degradation. This process is accentuated by transhumance pastoralism which takes place between the uplands in the Senegal and the lowlands of The Gambia. During the wet season the livestock especially cattle are moved into the uplands mainly along the Senegambia borders. During the long dry-season the animals belonging to both Gambian and Senegalese farmers are moved down into the swamp areas of the river basin where some lusty forage and water are found. This seasonal pattern of livestock concentration and movement between the uplands and the lowlands in search of grazing and water has been partly responsible for accelerated habitat degradation and loss.[2]

Climate Change. Climate change over the past 10 years, in particular, lower average annual rainfall, has significantly reduced the availability of grasses used as pastures for livestock. Hence, PGR may be -2 to depict a strong negative impact of rainfall on the availability of pastures. Lower rainfall had encouraged encroachment into forest areas and even more fertile land in search of wood. Hence, FGR may be -2 to depict a strong negative impact of rainfall on the availability of forest area. Low rainfall has impacted on the reproductive health of livestock with an assumed negative impact in the order of -2. Low rainfall has shifted the saline front farther upstream this reduces the river-dependent watering points of livestock and impeded the development of livestock population. A strong negative impact is assumed which reinforced the strong negative effects arising from poor reproductive health. Reduction in livestock population has increased the demand for aquatic life with a subsequent reduction in its stock (-1).

[2] Final Draft National Action Programme for Combatting Desertification, Land Degradation and Drought, 2015

Pests, diseases, alien invasive species.

This driving force had got strong negative impacts on biodiversity for food and agriculture. Hence**,** PGR is -2, FGR is -2, AnGr is -2 and AqGR is -1.

According to the World Conservation Union, invasive alien species are the second most significant threat to biodiversity, after habitat loss. In their new ecosystems, invasive alien species become predators, competitors, parasites, hybridizers, and diseases of our native and domesticated plants and animals.

Pathways and Spread of IAS

Some invasive alien species have entered The Gambia through diverse and unknown pathways. However, trans-boundary movement of people and their commodities is apparently the cardinal cause of the introduction of some of the species presently established in the country. In general, one or more of the following pathways have enabled the entry of the invasive species currently in The Gambia:

- Natural and or trans-boundary movement of the species;
- Farming (with introduction of new plant species) by people;
- Landscaping (with introduction of some undesirable plant species like water hyacinth as ornamental, or use of non-native genotypes) by people;
- Discarding of infested materials (rubbish, or accidentally spreading seeds and plant fragments);
- Movement of infested commodities / goods, or their containers, or conveyors;
- Movement of people (by air, road, rail and sea transport); and
- Direct intentional or unintentional introduction of crops and livestock infested with pests and diseases by Agriculture and Forestry; Infrastructure development, pump and tidal irrigations through canals, runoffs of rain water[3]**.**

In The Gambia some important ecosystems such as the Manjie Kunda/Kololi stream is colonized by water hyacinth. Other important water bodies may fall victim under the spread of this typical invasive aquatic weed if no extraordinary steps are taken to contain the weed.

Markets, trade and the private sector: Because of increased domestic demand and deteriorating terms of trade the impact of external trade and private sector development on livestock development and its relationship with other sectors was un satisfactory. Thus, the impact of this driver may be assessed to have the following magnitude PGR (1), FGR (1), AnGR (2), AqGR (NK).

[3] The National Biodiversity Strategy and Action Plan (2015-2020)

Policies: The ANR sector policies support the development of the livestock sector by enhancing the availability of enough and quality pastures with a strong positive (1) impact, the use of forest for livestock development also had a strong positive (1) result. The subsequent increase in livestock population also had a strong positive (1) effect. However, the linkages between policies on the one hand and the development of the livestock and fisheries sector on the other hand is not known. This made PqGR to be NK.

Population growth and urbanization

The key pressures/problems contributing to the loss of plant or animal biodiversity are but not limited to, rapid increase in population from 1,038,145 in 1993 to 1,364,507 in 2003, with resultant implications for settlement, food, water, lack of clear land use and demographic policies, deforestation, attitudinal changes, low and uneven distribution of rainfall, lack of awareness and un coordinated and conflicting sector policies as well as unmitigated socio-infrastructural developments. Other key pressures include, illegal hunting and trafficking in wildlife and its products, life-tree felling as well as farming system/agricultural practices[4].

Table 4b.Effect of drivers on sector biodiversity within Naturally generated forests

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

DETAIL DESCRIPTION OF DRIVERS AND IMPACTS

[4] State of the environment report (SOER), 2008

Using less land and water for naturally regenerated forests had impact on the biodiversity of plant PGR(2), as forest land gave way to agricultural land, Forest land reduced as naturally regenerated forests reduced FGR(-2), and the diversity of wildlife increased as remaining forest are allowed to regenerate naturally AnGR(1). The impact of this driver on aquatic life is not quite obvious AqGR (NK) .

The impact of pollution of forest on biodiversity of plant , forest, animal and aquatic life is not known.

The impact of over exploitation and overharvesting of forests on plant, forest and animal biodiversity is evaluated as follows PGR (-1) for reduction in wild plants, FGR (-1) for reduction in forest area, AnGR (1) and AqGR(NK).

The impact of climate change on livestock development is evaluated as follows PGR (-2), FGR (-2), (AnGR (-2) and AqGR(NK). More precisely, low rainfall has a very strong negative impact (-2) on the availability of pastures for livestock, this encouraged encroachment into forest land with a very strong negative impact (-2) as forest area and diversity are reduced. Low rainfall also has a very strong negative impact on the reproductive health and population of livestock. Low livestock population can result in increase in the demand for fish whose stock may strongly reduce.

The impact of natural disasters on livestock development was realised through a strong negative impact on the availability of pastures and fodders (-2), which led to encroachment into forest with very strong negative impact (-2) on the area and diversity of trees in forest. Natural disasters caused the deaths of livestock with very strong negative impact (-2). This increased the demand for livestock with a strong negative impact on the availability of aquatic life (-2).

Pest, diseases, alien invasive species has a very strong negative (-2) effect on plant biodiversity resulting in the reduction of the quantity and quality of pastures. The subsequent encroachment into forest area by livestock also reduced the forest area and its biodiversity with a very strong negative effect (-2). The lack of palatable pastures had very strong negative (-2) impact on the livestock population. Reduction in livestock population has increased the demand for aquatic life with a subsequent reduction in its stock (-1).

The increasing involvement of the private sector in the marketing and trade of livestock had a strong positive (1) impact on the availability of pastures, strong positive impact (1) on managed forest for livestock development and a very strong positive (2) impact on livestock population. The linkages of this driving force with livestock and fisheries development is not quite obvious. Hence, AqGR is NK.

The ANR sector policies support the development of the livestock sector by enhancing the availability of enough and quality pastures with a strong positive (1) impact, the use of forest for livestock development also had a strong positive (1) result. The subsequent increase in livestock population also had a strong positive (1) effect. However, the linkages between policies on the one hand and the development of the livestock and fisheries sector on the other hand is not known. This made PqGR to be NK.

Population growth and urbanisation resulted in an increased demand for pastures and livestock. This resulted in strong positive (1) effect on plant biodiversity. The increased demand for pastures led to encroachment into forest and subsequent reduction in forest area. This negative effect is evaluate as strong negative (-1) effect. The subsequent increase in livestock population is evaluated as having strong positive (1) effect. The linkages of the increase in livestock and the availability of aquatic life is not known. Hence, AqGR is NK.

The impact of changing economic, socio-political, and cultural factors are evaluated as follows: PGR contributes a strong positive (1) effect. FGR contributing a strong positive (1) effect, AnGR contributes a very strong positive (2) effect. The relationship among this driver , livestock and fisheries development is not known.

The impact of advancements and innovations in science and technology is evaluated as follows: PGR contributes a strong positive (1) effect. FGR contributing a strong positive (1) effect, AnGR contributes a very strong positive (2) effect. The relationship among this driver , livestock and fisheries development is not known.

Table 4c. Effect of drivers on sector biodiversity within subtropical Planted forests

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

	technology				
	Other [*please specify*]				

In the 1980s the Gambia Government embarked on a major process of transformation of its traditional forest management approach to a more sustainable and adaptable system through a Technical Assistance Cooperation with the Federal Republic of Germany. A natural forest management model was piloted at Kafuta, West Coast Region, in BamaKuno and at Katelenge forest parks (State owned and gazzetted). At this time, most of the economically viable spp. (pterocarpus) wood type was utilized as firewood causing economic and ecological losses to government and local communities. A sawmill was also established and commissioned in 1985 to add value to officially timber extracted timber at Kafuta.

Description of Drivers and Impact on Production System (F6)

Using less land and water for planted forests had virtually no impact on the biodiversity of plant PGR(-2), as planted forest land occupied very small portion of land, planted Forest land reduced as naturally regenerated forests reduced FGR(-2), and the diversity of wildlife increased as remaining forest are allowed to regenerate naturally AnGR(1). The impact of this driver on aquatic life is not quite obvious AqGR (NK) .

The impact of pollution of planted forest on biodiversity of plant, forest, animal and aquatic life is not known.

The impact of over exploitation and overharvesting of planted forests on forest , forest and animal biodiversity is evaluated as follows PGR (-1) for reduction in wild plants, FGR (-1) for reduction in forest area, AnGR (1) and AqGR(NK).

The impact of climate change of planted forest on livestock development is evaluated as follows PGR (-2), FGR (-2), (AnGR (-2) and AqGR(NK). More precisely, low rainfall has no impact because water is available all time (2) on the availability of pastures for livestock, this encouraged encroachment into other forests land with a very strong negative impact (-2) this is an opportunity to increased forest area and diversity.

Pest, diseases, alien invasive species has a very strong negative (-2) effect on plant biodiversity resulting in the reduction of the quantity and quality of planted forest for timber production. The subsequent encroachment into forest area by planted forest also increased the forest coverage and its biodiversity (2). The permanent availability of water had very strong positive (2) impact. The introduction of alien species will affect badly Reduction the aquatic life with a subsequent reduction in its biodiversity (-2).

The increasing involvement of the private sector in the marketing and trade of planted forest had a strong positive (1) impact on the availability of pastures, strong positive impact (1) on managed forest for planted forest and a very strong positive (2) impact on livestock population. The linkage of this driving force with livestock and fisheries development is not quite obvious. Hence, AqGR is NK.

The Forestry Department is encouraging private sector's involvement by diversifying management regime with a strong positive (1) impact, the use of forest to increase national coverage also had a strong positive (1) result. The subsequent increase in planted forest also had a strong positive (1) effect. However, the linkages between policies on the one hand and the development of planted forest and fisheries sector on the other hand is not known (NK).

Population growth and urbanization resulted in an increased demand for fuel wood for energy and poles for fencing and construction. This resulted in strong positive (1) effect on plant biodiversity. The increased demand for fuel wood and charcoal led to encroachment into forest and subsequent reduction in forest area. This negative effect is evaluate as strong negative (-1) effect. The subsequent increase in planted forest is evaluated as having strong positive (1) effect even though the rate of proliferation of these private plantations is slow. The linkages of the increase in planted forest and the availability of aquatic life is not known. Hence, AqGR is NK.

The impact of changing economic, socio-political, and cultural factors is evaluated as follows: PGR contributes a strong positive (1) effect. FGR contributing a strong positive (1) effect, AnGR contributes a very strong positive (2) effect. The relationship between these drivers , Planted forest and fisheries development is not known.

The impact of advancements and innovations in science and technology is evaluated as follows: PGR contributes a strong positive (1) effect. FGR contributing a strong positive (1) effect, AnGR contributes a very strong positive (2) effect. The relationship among this driver, Planted forest and fisheries development is not known.

Table 4d. Effect of drivers on sector biodiversity within Subtropical Self recruiting capture fisheries

Production systems	**Drivers**	**Effect of drivers on sector biodiversity for food and agriculture** (2, 1, 0,-1, -2, NK, NA)			
		PGR	FGR	AnGR	AqGR
Code or name					
A2 Self Recruiting Capture Fisheries: Subtropics	Over-exploitation and over-harvesting	-1	-1	1	NK
	Climate change	-2	-2	-2	-1
	Pests, diseases, alien invasive species	-2	-2	-2	-1
	Markets, trade and the private sector	1	1	2	NK
	Policies	1	-1	-1	2
	Population growth and urbanization	-1	-1	-1	NK
	Changing economic, socio-political, and cultural factors	-1	-1	2	NK
	Advancements and innovations in science and technology	1	1	2	NK
	Other [*please specify*]				

The impact of over exploitation and overharvesting of fisheries products, forest and animal biodiversity is evaluated as follows PGR (-1) for reduction in wild plants, FGR (-1) for reduction in forest area, AnGR (1) and AqGR(NK).

The impact of climate change on fisheries is evaluated as follows PGR (-2), FGR (-2), (AnGR (-2) and AqGR(NK). More precisely, low rainfall has a very strong negative impact (-2) on the availability of fish stocks and will encourage the proliferation of illegal activities in the adjacent forest with a very strong negative impact (-2) as forest area and diversity are reduced. Low rainfall also has a very strong negative impact on the migration pattern of fish stocks. Low fish stock can result in increase in the demand for wild animal protein thereby impacting on the bushmeat and may strongly reduce the available wildlife.

Pest, diseases, alien invasive species has a very strong negative (-2) effect on fisheries biodiversity resulting in the reduction of the quantity and quality of fish and fisheries products. The presence of alien invasive species in the water bodies had very strong negative (-2) impact on the fish stock. The potential reduction in fish supply in the market may increase the demand for Bushmeat with a subsequent reduction on the wildlife population (-1).

The ANR sector policies support the development of the fisheries sector by enhancing the rational exploitation of the fish and fisheries stocks with a strong positive (1) impact, the use of IUU infrastructure by fisherfolks also had a strong negative (-1) result. The subsequent

increase in illegal fishing methods also had a strong negative (-1) effect. However, the linkages between policies on the one hand and the development of fisheries sector in relation to biodiversity management on the other hand is very positive (2).

Population growth and urbanization resulted in an increased demand for fish and fisheries resources. This resulted in strong negative (-1) effect on fisheries biodiversity. The increased demand for fish proteins led to encroachment into forest for fish preservation through smoking with logs and subsequent reduction in forest area. This negative effect is evaluate as strong negative (-1) effect. The subsequent increase in fish supply is evaluated as having strong negative (-1) effect. The linkages of the increase in fish supply and the availability of aquatic life is not known. Hence, AqGR is NK.

The impact of changing economic, socio-political, and cultural factors is evaluated as follows: PGR contributes a strong negative (-1) effect. FGR contributing a strong negative (-1) effect, AnGR contributes a very strong positive (2) effect. The relationship among this driver , forest and fisheries development is not known.

The impact of advancements and innovations in science and technology is evaluated as follows: PGR contributes a strong positive (1) effect. FGR contributing a strong positive (1) effect, AnGR contributes a very strong positive (2) effect. The relationship among this driver , forest and fisheries development is not known.

Table 4e Effect of drivers on sector biodiversity within Subtropical fed aquaculture

Production systems	**Drivers**	**Effect of drivers on sector biodiversity for food and agriculture** (2, 1, 0,-1, -2, NK, NA)			
		PGR	FGR	AnGR	AqGR
Code or name					
A10. Fed aquaculture: Subtropics	Pollution and external inputs	-1	-1	2	NK
	Over-exploitation and over-harvesting	1	-1	1	2
	Climate change	2	2	2	2
	Policies	2	2	2	NK
	Population growth and urbanization	2	-1	1	2
	Other [*please specify*]				

The impact of pollution of water bodies on biodiversity of plant, forest, animal and aquatic life is not known.

The impact of over exploitation and overharvesting of aquaculture species on plant, forest and animal biodiversity is evaluated as follows PGR (1) for reduction in wild plants, FGR (-1) for reduction in forest area, AnGR (1) and AqGR is positive (2).

The impact of climate change on aquaculture development is evaluated as follows PGR (2), FGR (2), (AnGR (2) and AqGR(+2). More precisely, low rainfall has a less negative impact (2) on the availability of fish in aquaculture because there is no much aquaculture development in the country, this encouraged the minimal exploitation of the forest resources (2).

The ANR sector policies support the development of aquaculture with a strong positive (2) impact, the use of aquaculture for fisheries development also had a strong positive (2) result. The subsequent increase in fish supply also had a strong positive (2) effect. However, the linkages between policies on the one hand and the development aquaculture and fisheries sector on the other hand is not known. This made PqGR to be NK.

Population growth and urbanisation resulted in an increased demand for fish products. This resulted in strong positive (2) effect on plant biodiversity. The increased demand for fish protein led to encroachment into forest and subsequent reduction in forest area. This negative effect is evaluate as strong negative (-1) effect. The subsequent increase in fish products is evaluated as having strong positive (1) effect. The linkage of the increase in aquaculture fisheries on the availability of aquatic life is evaluated as positive. Hence, AqGR is (+2).

Table 4f Effect of drivers on sector biodiversity within Subtropical irrigated crop (Rice)

Production systems	**Drivers**	**Effect of drivers on sector biodiversity for food and agriculture** (2, 1, 0,-1, -2, NK, NA)			
		PGR	FGR	AnGR	AqGR
Code or name					
C2. Irrigated Crops (Rice): Subtropics	Changes in land and water use and management	-1	-1	2	NK
	Pollution and external inputs	NK	NK	NK	NK
	Climate change	-2	-2	-2	-1
	Pests, diseases, alien invasive species	-2	-2	-2	-1
	Markets, trade and the private sector	-2	-1	-2	NK
	Policies	-1	-1	-1	NK
	Population growth and urbanization	1	-1	1	NK
	Changing economic, socio-political, and cultural factors	-1	-1	-2	NK
	Advancements and innovations in science and technology	-1	-1	-2	NK
	Other [*please specify*]				

Description of Drivers and Impact on Production System (C2)

Using less land and water for Irrigated Crops (Rice): had less negative impact on the biodiversity of plant PGR (1), as forest land gave way to agricultural land, Forest land reduced as naturally regenerated forests reduced FGR(-2), and the diversity of wildlife increased as remaining forest are allowed to regenerate naturally AnGR(1). The impact of this driver on aquatic life is not quite obvious AqGR (NK) .

The impact of pollution of Irrigated Crops (Rice) on biodiversity of plant , forest, animal and aquatic life is not known.

The impact of climate change on Irrigated Crops (Rice) development is evaluated as follows PGR (-2), FGR (-2), (AnGR (-2) and AqGR(NK). More precisely, low rainfall has a very strong negative impact (-2) on the availability of Irrigated Crops (Rice), this encouraged encroachment into forest land with a very strong negative impact (-2) as forest area and diversity are reduced. Low yield of Irrigated Crops (Rice) can result in increase in the demand for fish as reliable source of revenue of wich stock may strongly be depleted in the coming years.

Pest, diseases, alien invasive species has a very strong negative (-2) effect on Irrigated Crops (Rice) resulting in the reduction of the quantity and quality of yields. The subsequent encroachment into forest area for Irrigated Crops (Rice) also reduced the forest area and its biodiversity with a very strong negative effect (-2). The unreliable high yield production over the years had very strong negative (-2) impact on the forest area. Reduction in yield of Irrigated Crops (Rice) has increased the demand for aquatic life as source of revenue with a subsequent reduction in its stock (-1).

The increasing involvement of the private sector in the marketing and trade of Irrigated Crops (Rice) envisage with the success of the 2016 policy for rice production had a strong negative (-2) impact on the forest arera, strong negative impact (-1) on managed forest and a very strong negative (-2) impact on wildlife species population. The linkages of this driving force with Irrigated Crops (Rice) and fisheries development is not quite obvious. Hence, AqGR is NK.

The ANR sector policies support the development of the Irrigated Crops (Rice) by enhancing the availability of seeds, fertlizerand heavy machineries with a strong negative (-1) impact, the use of forest for Irrigated Crops (Rice) development also had a strong negative (-1) result. The subsequent increase in suitable lands for Irrigated Crops (Rice) also had a strong negative (-1) effect. However, the linkages between policies on the one hand and the development of

Irrigated Crops (Rice) and fisheries sector on the other hand is not known. This made PqGR to be NK.

Population growth and urbanisation resulted in an increased demand of rice for food. This resulted in strong positive (-1) effect on plant biodiversity. The increased demand for pastures led to encroachment into forest and subsequent reduction in forest area. This negative effect is evaluate as strong negative (-1) effect. The subsequent increase in livestock population is evaluated as having strong positive (1) effect. The linkages of the increase in livestock and the availability of aquatic life is not known. Hence, AqGR is NK.

The impact of changing economic, socio-political, and cultural factors are evaluated as follows: PGR contributes a strong negative (-1) effect. FGR contributing a strong negative (-1) effect, AnGR contributes a very strong negaitive (-2) effect. The relationship among this driver , Irrigated Crops (Rice) and fisheries development is not known.

The impact of advancements and innovations in science and technology is evaluated as follows: the proliferation of tractors in the country contributed immensely on the transformation of viergin forest lands to agricultural lands for rice production. PGR contributes a strong negative (-1) effect. FGR contributing a strong negative (-1) effect, AnGR contributes a very strong negative (-2) effect. The relationship among this driver , Irrigated Crops (Rice): and fisheries development is not known.

Table 4g: Effect of drivers on sector biodiversity within Subtropical Irrigated Crops (others)

Production systems	**Drivers**	**Effect of drivers on sector biodiversity for food and agriculture** (2, 1, 0,-1, -2, NK,NA)			
		PGR	FGR	AnGR	AqGR
Code or name					
C6. Irrigated Crops (other): SUBTROPICS	Changes in land and water use and management	2	-2	1	NK
	Pollution and external inputs	NK	NK	NK	NK
	Climate change	-2	-2	-2	-1
	Pests, diseases, alien invasive species	-2	-1	-2	NK
	Markets, trade and the private sector	1	1	2	-2
	Policies	1	1	1	2
	Population growth and urbanization	1	-1	1	NK
	Changing economic, socio-political, and cultural factors	1	1	2	NK
	Advancements and innovations in science and technology	1	1	2	NK
	Other [*please specify*]				

Using less land and water for Irrigated Crops (Horticulture) had greater impact on the biodiversity of plant PGR (2), as forest land gave way to agricultural land, Forest land reduced as naturally regenerated forests reduced FGR (-2), and the diversity of wildlife increased as remaining forest are allowed to regenerate naturally AnGR (1). The impact of this driver on aquatic life is not quite obvious AqGR (NK) .

The impact of pollution of Irrigated Crops (other) on biodiversity of plant, forest, animal and aquatic life is not known.

The impact of climate change on Irrigated Crops (other) development is evaluated as follows PGR (-2), FGR (-2), (AnGR (-2) and AqGR(NK). More precisely, low rainfall has a very strong negative impact (-2) on the availability of Irrigated Crops (other), this encouraged encroachment into forest land with a very strong negative impact (-2) as forest area and diversity are reduced. Low rainfall also has a very strong negative impact.

Pest, diseases, alien invasive species has a very strong negative (-2) effect on plant biodiversity resulting in the reduction of the quantity and quality of Horticultural production. The subsequent encroachment into forest area by horticultural gardens also reduced the forest area and its biodiversity with a very rather small negative effect (-1). The fencing materials for the gardens had very strong negative (-2) impact on the forest for the annual harvesting of poles for garden protection against domestic animal invasion.

Reduction in Horticultural production has increased the demand for aquatic life with a subsequent reduction in its stock (-1).

The increasing involvement of the private sector in the marketing and trade of Horticultural products had a strong positive (1) impact on the availability of seeds and inputs, strong negative impact (-1) on managed forest for Horticultural production and a very strong positive (2) impact on food security. The linkages of this driving force with Horticultural production and fisheries development are very obvious. Because in the decline of production, people tend to turn to the fisheries sector for alternative food and revenue generation Hence, AqGR is (-2).

The Government policies support the development of the Horticulture by enhancing the availability of quality seeds, garden materials for fencing and production, inputs such as pesticides and fertilisers with a strong positive (1) impact, the use of forest for livestock Horticultural production and development also had a strong positive (1) result. The subsequent increase in garden yields also had a strong positive (1) effect. Linkages between agricultural development policies and the development of fisheries sector on the other hand is is seriously improved. This made PqGR to be very important (2).

Population growth and urbanisation resulted in an increased demand for food and Horticultural products. This resulted in strong positive (1) effect on plant biodiversity. The increased demand for garden produces led to encroachment into forest and subsequent reduction in forest area. This negative effect is evaluate as strong negative (-1) effect. The subsequent increase in Horticultural outputs is evaluated as having strong positive (1) effect. The linkages of the increase in Horticultural products and the availability of aquatic life is not known. Hence, AqGR is NK.

The impact of changing economic, socio-political, and cultural factors is evaluated as follows: PGR contributes a strong positive (1) effect. FGR contributing a strong positive (1) effect, AnGR contributes a very strong positive (2) effect. The relationship among this driver, Horticultural production and fisheries development is not known.

The impact of advancements and innovations in science and technology is evaluated as follows: PGR contributes a strong positive (1) effect. FGR contributing a strong positive (1) effect, AnGR contributes a very strong positive (2) effect. The relationship among this driver, Horticultural production and fisheries development is not known.

Table 4h: Effect of drivers on sector biodiversity within Subtropical rainfed crops

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

Using less land and water for Rainfed Crops had impact on the biodiversity of plant PGR(2), as forest land gave way to agricultural land, Forest land reduced as naturally regenerated forests reduced FGR (-2), and the diversity of wildlife increased as remaining forest are allowed to regenerate naturally AnGR(1). The impact of this driver on aquatic life is not quite obvious AqGR (NK).

The impact of pollution of Rainfed Crops on biodiversity of plant , forest, animal and aquatic life is not known.

The impact of climate change on Rainfed Crops development is evaluated as follows PGR (-2), FGR (-2), (AnGR (-2) and AqGR(NK). More precisely, low rainfall has a very strong negative impact (-2) on the availability of high crop yields, this encouraged encroachment into forest land with a very strong negative impact (-2) as forest area and diversity are reduced. Low rainfall also has a very strong negative impact on Rainfed Crops. Low yield crops can result in increase in the demand for fish and forest recources whose stocks may strongly reduced due to income generation scheme.

Pest, diseases, alien invasive species has a very strong negative (-2) effect on plant biodiversity resulting in the reduction of the quantity and quality of pastures. The subsequent encroachment into forest area by livestock also reduced the forest area and its biodiversity with a very strong negative effect (-2). The lack of palatable pastures had very strong negative (-2) impact on the livestock population ,Reduction in crop yields has increased the demand for aquatic life with a subsequent reduction in its stock (-1).

The increasing involvement of the private sector in the marketing and trade of Rainfed Crops had a strong positive (1) impact on the availability of food security, strong positive impact (1) on managed forest for Rainfed Crops development and a very strong positive (2) impact on food availability. The linkage of low yield crops of this driving force with Rainfed Crops will impact seriously on fisheries development is very obvious. Hence, AqGR is very important (2).

The ANR sector policies support the development of the Rainfed Crops by enhancing food security with a strong positive (1) impact, the use of forest for Rainfed Crops development also had a strong positive (1) result. The subsequent increase in Rainfed Crops yields also had a strong positive (1) effect. However, the linkages between policies on the one hand and the development of the Rainfed Crops and fisheries sector on the other hand is not known. This made PqGR to be NK.

Population growth and urbanisation resulted in an increased demand for Rainfed Crops. This resulted in strong positive (1) effect on plant biodiversity. The increased demand for food led to encroachment into forest and subsequent reduction in forest area. This negative effect is evaluate as strong negative (-1) effect. The subsequent increase in Rainfed Crops yields and

products is evaluated as having strong positive (1) effect. The linkages of the increase in crop yield and the availability of aquatic life is not known. Hence, AqGR is NK.

The impact of changing economic, socio-political, and cultural factors are evaluated as follows: PGR contributes a strong positive (1) effect. FGR contributing a strong positive (1) effect, AnGR contributes a very strong positive (2) effect. The relationship among this driver , Rainfed Crops and fisheries development is not known.

The impact of advancements and innovations in science and technology is evaluated as follows: PGR contributes a strong positive (1) effect. FGR contributing a strong positive (1) effect, AnGR contributes a very strong positive (2) effect. The relationship among this driver , Rainfed Crops and fisheries development is not known.

Table 4i: Effect of drivers on sector biodiversity within Mixed systems (livestock, crop, forest and /or aquatic and fisheries): Subtropics

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

Agriculture has been and still continues to be the most reliable and viable source of food and income for most of the population as 75% of the labour force is engaged in this sector for their livelihood. The sector contributes between 25-30% to GDP and also generates about 40% of total export earnings; and an estimated two-thirds of total household income. These attributes make the sector prima facie choice for both public and private investments, if the nation's socio-economic development policy objectives of poverty alleviation and household food security are to be realized.

Livestock are essential part of fostering national food security particularly through direct consumption (meat, milk, broilers and eggs) and incomes earned from the sale of animals and animal products. It contributes about 24% of agricultural GDP with an annual growth rate of 3.3%. The government in collaboration with its development partners made significant project interventions in the livestock sub-sector. These interventions include the Integrated Rural Development Project for Livestock, Sheep and Goat Development Project (GAM 87/004), Pan-African Rinderpest Campaign, FAO Tele-food Projects, Rural Finance Community Initiatives Project and European Development Fund (EDF) Livestock programmes. The cumulative effects of these interventions impacted positively on the livestock sub-sector and resulted in increased livestock production and marketing.

Cattle, small ruminants (sheep and goats) and different species of poultry are raised to generate income and supplement diets. Cattle population has stabilized at around 300,000 heads while sheep and goat population fluctuated within a narrow margin averaging about 100,000 heads and poultry population has increased to 800,000 birds all species (Annex Table 3). At an estimated per capital meat consumption of 8 kg of milk and other dairy products (estimated at between 10 and 24 kg per caput per annum), national requirements had to be met from commercial imports because demand surpasses local supplies. Currently, annual milk production from the local herd is estimated at 12,700 tonnes and this quantity is considered low. The Department of Livestock Services (DLS) in collaboration with the International Trypanotolerance Centre (ITC), introduced the first generation F1 (local N'Dama and the Friesian cross-bred) cattle breed with a potential milk yield of 8 litres per day as compared to the local breed (N'Dama) which produces about 1 litre per day. With increasing income and a rapidly expanding urban population, demand for livestock products would certainly increase. To meet this anticipated increase in demand, strategies would have to be put in place to increase livestock productivity and increase the off take rate. In this connection, several rangelands, watering points, livestock owners associations, butcher association, milk pasteurization units, conservation of genetic resources, formation of small-scale farmers and rabbit breeders associations were developed. Furthermore, over 200 poultry and 250 small ruminant auxiliaries were trained and annual livestock shows and ram sales organized coupled with mass vaccination campaigns against PPR.

The issue of good quality and certified seeds as a constraint to increased agricultural production and productivity, is also accorded due recognition by government. Although Government maintains its position that farmers should keep their own planting material for immediate use during emergencies, its major pre-occupation now is the provision of certified seeds for multiplication by farmers. This will enhance agricultural production and productivity as well as increase farmers' incomes. Coarse grain marketing is also critical to ensure food distribution to households to ensure food security for all and raise income levels.

Small-scale processing of livestock products particularly milk is increasingly gaining momentum at village level. At the request of the government, FAO is currently funding a technical co-operation program [TCP/GAM/2802(A)] to assist mainly women farmers to improve village milk safety and incomes, using traditional village dairy system. The program trained women farmers on the processing of milk using simple and appropriate technology

through which milk is pasteurized into yoghurt, pure and colorized milk with additives (mainly sugar). Four village women groups are participating in the program and using the above mentioned simple technology. These village groups are from Kombo Central (KassaKunda, Penyem, Darsilameh and BrikamaDewru), Western Division. Two more advanced milk processing plants are located at the Department of Livestock Services (DLS) Abuko and the International Trypanotolerance Centre (ITC) for milk pasteurization.

In the area of storage, there are many village seed stores countrywide. These stores are used to keep cereals, fertilizers and seeds for later use. In fact to ensure national food security, the government is putting lot of efforts in the development of cereal banks. To this end, several cereal banks are built in many parts of the country to enhance food security. For horticultural produce storage, the construction of village vegetable stalls is being intensively pursued by two projects; the Rural Finance and Community Initiative and Peri-urban Smallholder Improvement projects. Government is also promoting the establishment of a proposed storage and processing plant for horticultural produce to be located at Yundum. This plant is expected to improve horticultural marketing constraints as well as add value to growers' produce.

Regardless of its dominating role in the economy, agriculture's contributions to exports and the GDP are still low. This is due to the cumulative effects of adverse climatic conditions, declining terms of trade for international primary commodity prices, low public and private investment in the sector, resource poor institutional support services to the sector particularly research and extension, limited credit access and facilities; inadequate water supply and availability of other essential inputs (seeds, fertilizers and agro-chemicals); inadequate infrastructure (transport, market, equipment, irrigation and processing facilities); inadquate access to farm mechanization, low production and productivity of crops and livestock, paucity of skilled manpower; unsatisfactory land tenure system making productive land inaccessible to potential additional users; the inherently low fertility/productivity of the land compounded by rapid development of acid sulphate soils, bushfires and salt water intrusion in swamps; over-dependency on rain fed agriculture, inadequate logistical support and, the lack of instituting and enforcing measures to militate against rapid population expansion.

. To militate against the numerous challenges, government and its development partners remain resolutely committed to rigorously pursue those production promotion policies and programs which will continue to emphasize the provision of an enabling environment for poverty reduction and greater private sector participation, diversification of the production base, promotion of the agricultural producer organizations, increasing domestic savings and investment, attraction of foreign investment, optimal programs/projects' outputs, increased use of irrigation and other water harvesting techniques, operationalization of an agricultural development bank/fund, increased use of appropriate agricultural technology/mechanization, regular annual vaccination of livestock, ensuring regular and timely supply of agricultural inputs (certified seeds, fertilizers, agro-chemicals, vaccines and veterinary drugs) on a sustainable basis with active private sector participation, provision of appropriate processing and storage facilities and gender (mainly women) mainstreaming in the development process.

Using less land and water for Mixed systems had impact on the biodiversity of plant PGR(2), as forest land gave way to Mixed systems of agriculture, Forest land reduced as naturally regenerated forests reduced FGR(-2), and the associated biodiversity increased as remaining forest are allowed to regenerate naturally AnGR (1). The impact of this driver on aquatic life is not quite obvious AqGR (NK) .

The impact of pollution of Mixed systems on biodiversity of plant , forest, animal and aquatic life is not known.

The impact of climate change on Mixed systems of agriculture development is evaluated as follows PGR (-2), FGR (-2), (AnGR (-2) and AqGR(NK). More precisely, low rainfall has a very strong negative impact (-2) on the availability of pastures for livestock, this encouraged encroachment into forest land with a very strong negative impact (-2) as forest area and diversity are reduced. Low rainfall also has a very strong negative impact on the reproductive health and population of livestock. Low livestock population can result in increase in the demand for fish whose stock may strongly reduce.

The impact of natural disasters on Mixed systems of agriculture development was realised through a strong negative impact on the improved food security principally through direct consumption and income generation for growers, which led to encroachment into forest with very strong negative impact (-2) on the area and diversity of trees in forest. Natural disasters caused the deaths of livestock with very strong negative impact (-2). This increased the demand for livestock with a strong negative impact on the availability of forest resources and aquatic life (-2).

Pest, diseases, alien invasive species has a very strong negative (-2) effect on mixed agricultural biodiversity resulting in the reduction of the quantity and quality of food, crop yields and garden produces. The subsequent encroachment into forest area by mixed agricultural practices and other agricultural products also reduced the forest area and its biodiversity with a very strong negative effect (-2). The lack of food , garden produces and high yield crops had very strong negative (-2) impact on the forest resources. Reduction in livestock population, crop yields and garden produces has increased the demand for aquatic life with a subsequent reduction in its stock (-1).

The increasing involvement of the private sector in the marketing and trade of livestock, crop yields and garden produces had a strong positive (1) impact on the availability of pastures, strong positive impact (1) on managed forest for livestock development, crop yields and garden produces and a very strong positive (2) impact on livestock population and agricultural produces. The linkages of this driving force with livestock , crop yields and garden produces and fisheries development is quite obvious. Its low status will drastically impact on the fisheries resources Hence, AqGR is highly negative(-2).

The sector policies support the development of the agricultural sector by enhancing the availability of enough and quality crop yields and garden produces with a strong positive (1) impact, the use of forest for agricultural development also had a strong positive (1) result. The subsequent increase in crop yields and garden produces also had a strong positive (1) effect. However, the linkages between policies on the one hand and the development of the agricultural and fisheries sectors on the other hand is not known. This made PqGR to be NK.

Population growth and urbanisation resulted in an increased demand for crop yields and garden produces. This resulted in strong positive (1) effect on biodiversity. The increased demand for crop yields and garden produces led to encroachment into forest and subsequent reduction in forest area. This negative effect is evaluate as strong negative (-1) effect. The subsequent increase in livestock population, crop yields and garden produces is evaluated as having strong positive (1) effect. The linkages of the increase in livestock, crop yields and garden produces and the availability of aquatic life is not known. Hence, AqGR is NK.

The impact of changing economic, socio-political, and cultural factors are evaluated as follows: PGR contributes a strong positive (1) effect. FGR contributing a strong positive (1) effect, AnGR contributes a very strong positive (2) effect. The relationship among this driver , livestock, agriculture and fisheries development is not known.

The impact of advancements and innovations in science and technology is evaluated as follows: PGR contributes a strong positive (1) effect. FGR contributing a strong positive (1) effect, AnGR contributes a very strong positive (2) effect. The relationship among this driver , livestock, agriculture and fisheries development is not known.

Effects of drivers of change on ecosystem services

12. **What have been the main drivers affecting, regulating and supporting ecosystem services in the country during the last 10 years? Describe, for each production system 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 5a. Major drivers and their effect on ecosystem services in Livestock grassland-based production systems.

Production systems	**Drivers**	**Effect of drivers on ecosystem services** (2, 1, 0,-1, -2, NK, NA)								
		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
L2: Livestock grassland-based systems: Subtropics	Changes in land and water use and management	-1	-1	-1	0	1	1	-1	-1	-1
	Over-exploitation and over-harvesting	-1	-1	-1	-1	-1	-1	-1	-2	-1
	Climate change	-1	-1	-1	-2	-1	-1	-1	-2	-1
	Pests, diseases, alien invasive species	-1	-2	0	0	0	0	0	-1	-1
	Markets, trade and the private sector	0	0	0	0	0	0	0	0	0
	Policies	1	1	1	0	1	1	1	2	1
	Population growth and urbanization	-1	-1	-1	-1	-2	-1	-1	-1	-1
	Other [*please specify*]									

Changes in land and water use and management:

As Livestock are reared on an extensive free range system in open grasslands and in rangelands, the use of more land for grazing has increased the population of cattle (479,083 heads in 2014) and goats (359,835 heads in 2014); concomitantly plant and forest biodiversity have reduced. In consequence, pollination as an ecosystem service is more or less limited to a reduced range of species of plant. Besides, with the unknown capacity of water surface storage that is limited mainly to seasonal ponds which are already subdued to climate change uncertainties, the effect of this driver of change on pollination is negative and its magnitude is accorded **(-1)**. On average, about 185,000ha of arable land has been used for livestock

grazing[5]. Rangeland occupies 40% or 400,000ha of the country's total area, of which about 60% or 240,000ha is used for pasture practicing and transhumance.

In terms of pests and diseases regulation, changes in land and water use management may disturb and destroy native ecosystems and create new ecological niches for eventual pests and pathogenic organisms. Hence the relevance of the Pan African Control of Epizootics project that aims at improving the health condition of transhumant livestock. As a score, the effect of this driver with regard to pests and diseases regulation is accorded **(-1)**.

With regard to water purification and waste treatment, the effect of changes in land and water use management on livestock grassland based system tend to diminish the forest capacity for water purification as the original forest ecosystem is getting turned into grassland with less trees, shrubs and other vegetation types that contribute a lot in water purification. For the waste treatment service, decomposition processes may be enhanced as grasslands are in general more exposed to sunlight than forest ecosystems but water availability should not be constrained. The overall score for the effect of driver on production system is **(-1)**.

The effect of changes in land and water use management for livestock grassland based system on natural hazards regulation is not yet assessed in the country as such the accorded score is (NK).

For nutrients cycling and soil formation and protection, the effect of the driver is for both ecosystem services **(1)** since decomposition processes as well as mineralogical processes are faster in grassland than in forestry ecosystems.

For water cycling, habitats provisioning and oxygen/gas production, the score is all over **(-1)** since forest ecosystems are more efficient for these ecosystem services than grasslands.

Over-exploitation and over-harvesting: Over grazing of range resources in The Gambia due inter alia, to large livestock numbers and the transhumant pastorals between the uplands in Senegal and the lowlands of The Gambia is a major challenge to all concerned ecosystem services and apart from the habitat provisioning which is completely out under over exploitation condition graded **(-2)**, the effect is negative for all other services. As more livestock free lands are turned to new over grazed grasslands, habitats and niches destruction may favor the appearance of new pests and disease; let alone the eventual contact with and exchange of pests and diseases that may happen through the seasonal transhumance between the Gambia and Senegal livestock. In this regard, over-exploitation and over harvesting is allocated **(-1)** as a score for pests and diseases regulation. It is evident that there is presently the project, Pan-African Control of Epizootics Project (PACE) that is aimed at enhancing national capacity for the control of epizootics to improve livestock health

[5] Common Country Assessment, 2001, Central Statistics Department

conditions, but with the increasing number of cattle and goats and the dare need of new and more grasslands, the project implementation has to be fasten.

Climate Change: Climate change over the past 10 years, in particular, lower average annual rainfall, has significantly reduced the availability of grasses used as pastures for livestock. Hence, pollination, pests and diseases regulation, water purification and waste treatment as well as nutrient and water cycling, soil formation and protection and production of oxygen/gas are all negatively affected with an assumed score of (-1). Natural hazard regulation and habitat provisioning are both strongly negatively affected since lower rainfall had encouraged encroachment into forest areas and even more fertile lands.

Pests, diseases, alien invasive species.

This driving force is allocated (-2) for ecosystem service such as pests and disease regulation since its impact on livestock grassland based system can reduce drastically the availability of palatable grasses which may pose grazing problems. In the Gambia, the presence of Ortheziasp (white fly) as introduced pest attacking a wide range of plant species (poacea included) and the invasive grasses not least of which the hyacinth aquatic grass and another yet unidentified terrestrial crawling plant are real dilemma to pest and diseases regulation.
Alien invasive species do generally find in their new environment favorable conditions for their development and expansion as these environments are without the right efficient controlling natural agents that can limit their growth. As such, their impact on livestock grassland based systems can be strongly negative before regulation system does justice on them.
For ecosystem services such as pollination, habitat provisioning and production of oxygen/gas, the driving force is allocated a score of (-1) for its limiting effect on the availability and diversity of plant species and consequently the lowering of ecological niches availability in ecosystems.

Markets, trade and the private sector (NA)

The impact of external trade and private sector development on livestock grassland based system is negligible or nil as there is no known private sector (apart the Kanilai Farm) that is involved in the management of this production system despite the increasing domestic demand as a result of high population growth. As score (NA).

Policies: Thanks to the many policies and programs such as the Gambia Environmental Action Plan (GEAP), the Gambia National……..Investment plan (GNAIP) and the Land Governance Assessment Framework (LGAF), which together stand to integrate environmental concerns of the different sub-sectors of the country into socio-economic development objectives and support resources (e.g. land, water, forests, etc.) management to combat resources depletion, soil degradation, climate change and unsustainable resources management and land tenure problems, the expectations are high for conducive ecosystem services. Beside,

the many stand-alone policies for the ANR sub-sectors specific needs like forestry, fisheries, wildlife, water, agriculture and land have also been tailored to mainstream and guide interventions in the most harmonious and feasible ways. From this perspective, the effects of the policies as driver of change on the livestock grassland based system in the Gambia is allocated (1) as score for all the given ecosystem services such as pollination, pests and diseases regulation, water purification and waste treatment, water and nutrients cycling, soil formation and protection and oxygen production/gas. The allocated score is (2) for habitat provisioning as with these policies and programs the main goal is to conserve the terrestrial and aquatic biodiversities as a whole.

Population growth and urbanization

The rapidly increasing population from 1,038,145 in 1993 to 1,364,507 in 2003 and 1,856,417 (50.8 percent females) in 2013, with a density of 174 persons per Km^2 coupled with a dynamic infrastructural development has not yet ended putting more pressure onto the development of livestock grassland based system since the demographic tendency still remains on the rise. As in all similar situations, especially where the population of cattle and goats is rising, the demand for livestock grassland based expansion will remain high which tends to encourage encroachment into forests lands and other fertile lands. Yet here in the Gambia, this tendency is faced with strong policy measures which nonetheless still need to be reinforce by the law so that the remaining forest cover of the country can be secured and be well conserved. For the many problems that may go along with these drivers on this particular production system, e. g.settlement hurdles for lack of clear land use and demographic policies, food and water availability, and deforestation etc… together within a reduced rainfall context, the proposed allocated scores of the effects on the different given ecosystem services are as follow: (refer to table 5a).

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

Production systems	**Drivers**	**Effect of drivers on ecosystem services** (2, 1, 0,-1, -2, NK, NA)								
		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
F2: Naturally Regenerated Forests: Subtropics	Changes in land and water use and management	-2	-2	-2	-2	-1	-2	-1	-2	-1
	Pollution and external inputs	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Over-exploitation and over-harvesting	-2	-2	-1	-2	-1	-1	-1	-2	-1
	Climate change	-2	-2	-2	-2	-2	-2	-2	-2	-2
	Natural disasters	-1	-1	-1	-1	-1	-1	-1	-1	-1
	Pests, diseases, alien invasive species	Nk	Nk	Nk	Nk	Nk	Nk	Nk	Nk	Nk
	Markets, trade and the private sector	-1	-1	-1	-1	-1	-1	-1	-1	-1
	Policies	2	2	2	2	2	2	2	2	2
	Population growth and urbanization	-2	-2	-2	-2	-1	-1	-1	-2	-1
	Changing economic, socio-political, and cultural factors	1	1	1	1	1	1	1	1	1
	Advancements and innovations in science and technology	1	1	1	1	1	1	1	1	1
	Other [bush fires]									

In the production system F2: Naturally regenerated forests in the Gambia, the main drivers affecting ecosystem services are climate change, population growth and urbanization, bushfires, over-exploitation and land use changes; as proposed allocated scores, refer to table 5c. With the forest products increasing demand as a result of population growth and urbanization, pollination, pest and diseases regulation as well as habitat provisioning and water purification and waste treatment are strongly negatively affected. This tendency remains still strongly negative for all the given ecosystem services with the effect of climate change that is essentially characterized by a decrease in rainfall. Yet with the political

orientation of the country, and the changing socio-political and cultural factors, the effects on the ecosystem services are positive to strongly positive as mentioned in the table. In terms of advancements and innovations in science and technology, the effect on ecosystem services is positive for huge efforts are being done to find alternative energy sources or for more appropriate exploitation of forest. In this regard, the enhanced stoves, or the use of solar energy constitute visible examples. For pollution and external inputs, even if the driver exists, its effect the given ecosystem services is not known.

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

Production systems	**Drivers**	**Effect of drivers on ecosystem services** (2, 1, 0,-1, -2, NK, NA)								
		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
F6: Planted Forests: Subtropics	Changes in land and water use and management	1	1	0	1	1	1	1	1	1
	Pollution and external inputs	NK	NK	NK	NK	NK	Nk	Nk	NK	NK
	Over-exploitation and overharvesting	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Climate change	-1	-1	-1	-1	-1	-1	-1	-1	-1
	Natural disasters	-1	-1	-1	-1	-1	-1	-1	-1	-1
	Pests, diseases, alien invasive species	NK	NK	NK	NK	Nk	Nk	NK	Nk	NK
	Markets, trade and the private sector	-1	-1	-1	-1	-1	-1	-1	-1	-1
	Policies	1	1	1	1	1	1	1	1	1
	Population growth and urbanization	0	0	0	0	0	0	0	0	0
	Changing economic, socio-political, and cultural factors	1	1	1	1	1	1	1	1	
	Advancements and innovations in science and technology	1	1	1	1	1	1	1	1	1
	Other [*please specify*]									

In the production system F6: Planted forests in the Gambia. In the first place, there is need to know that the area of planted forest is very limited in the country (Nyambai and Kabafita

forests). Yet there are community forests which are for most essentially natural forests under strong community management. The main drivers affecting positively the ecosystem services with this production system are change in land and water use management (1), policies (1), changing economic, socio-political and cultural factors (1), and advancements and innovations in science and technology (1). The effect with climate change and natural disaster is negative on all ecosystem services as a result of rainfall decrease in the country over the last 10 years or more. The same effect stands for markets, trade and the private sector (-1) as a result of illegal logging for most of the time just economic gain.

Table 5e. Major drivers and their effect on ecosystem services in Self-recruiting capture fisheries production systems.

Production systems	**Drivers**	**Effect of drivers on ecosystem services** (2, 1, 0,-1, -2, NK, NA)								
		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
A2 Self-recruiting Capture Fisheries: Subtropics	Changes in land and water use and management	0	0	-1	0	-1	NA	0	-1	-1
	Pollution and external inputs	-1	0	-1	NA	-1	NA	0	-1	-1
	Over-exploitation and over-harvesting	-1	0	-1	-1	-1	NA	0	-1	-1
	Climate change	-1	-1	-1	-1	-1	NA	--1	-2	-2
	Natural disasters	0	0	-1	0	-1	NA	NK	0	0
	Pests, diseases, alien invasive species	NK	NK	NK	0	0	NA	0	0	0
	Markets, trade and the private sector	0	0	-1	0	-1	NA	-1	0	0
	Policies	1	1	1	1	1	1	1	1	1
	Population growth and urbanization	-1	-1	-1	-1	-1	-1	-1	-1	-1
	Changing economic, socio-political, and cultural factors	1	1	1	1	1	1	1	1	
	Advancements and innovations in science and technology	1	1	1	0	1	0	1	2	2
	Other [*please specify*]									

In the production system A2: For self-recruiting capture fisheries: (Artisanal fisheries and shell fish collectors) in the Gambia, the main drivers affecting negatively ecosystem services are climate change, overexploitation and population growth and urbanization which for most ecosystem services register a score of (-1). Climate change is accorded (-2) for services such as habitat provisioning and production of oxygen/gas for that these last ten years have given chance to huge mangrove dieback as a result of low rainfall and consequently increased salinity to extremes that were lethal to this plant species in some areas. As a result, the habitat provisioning service and the production of oxygen/gas have reduced in capacity. The score allocated for the effect of drivers such as policies, change economic, socio-economic and cultural factors is positive (1) for most ecosystem services (ref. table). The effect of population growth and urbanization is negative for all given ecosystem services (-1).

Table 5I. Major drivers and their effect on ecosystem services in irrigated crops (rice) production systems.

Production systems	**Drivers**	**Effect of drivers on ecosystem services** (2, 1, 0,-1, -2, NK, NA)								
		Pollination	Pest and disease	Water purification	Natural hazard	Nutrient cycling	Soil formation	Water cycling	Habitat provisioning	Production of oxygen/
C2 Irrigated Crops (Rice): Subtropics	Changes in land and water use and management	NK	NK	0	0	-1	-1	0	-1	-1
	Pollution and external inputs	NK	NK	-1	0	-1	-1	0	-1	-1
	Over-exploitation and over-harvesting	NA	-1	NA	NA	-1	-1	NK	-1	NK
	Climate change	-1	-1	-1	-1	-1	-1	-1	-1	-1
	Natural disasters	NK	NKL	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	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	Nk	-1	NK	-1	-1	Nk
	Changing economic, socio-political, and cultural factors	1	1	1	1	1	1	1	1	1
	Advancements and innovations in science and technology	2	2	2	2	2	2	2	2	2
	Other [*please specify*]									

Irrigated Crops (Rice) Production System: The drivers affecting most irrigated crops particularly rice are policies (1), the changing economic, socio-political and cultural factors (1) as well as the advancements and innovations in science and technology which score a strong positive contribution (2) for all ecosystem services. In fact with the general aim of the country's policies on agriculture is essentially focused on improvement of agriculture production as can attest one of the most strong and famous policies such as the executive directive issued in May 2014 for increased rice production and a reduction of rice importation to zero by 2016. With regard to the changing economic, socio-political and cultural factors, efforts are put on increased awareness and attitudinal change for more sound agricultural practices through increased collaboration with agriculture extension agents. Beside these endeavors, support and backing are provided by a strong contribution through the advancements and innovations in science and technology thanks to the effort of the engineering unit which is making available numerous tools such as rice threshers, the row-markers for planting upland crops in rows the harvesting and post harvest equipments (traditional sickles for rice harvesting, iron threshing tables for rice). The agricultural engineering unit also made available some low cost water lifting devices such as pedal pumps, hand chain pumps, rope and washer pumps which are well significant for the irrigated crops. Climate change effect on the production system is registered with a negative (-1) on all ecosystem services since low rainfall tends to maintain the saline frontline in the river further upstream which reduces availability of freshwater at westward irrigated rice stations. The population growth and urbanization registers a negative impact for most of the ecosystem services like pollination, water purification and wastes treatment, nutrient cycling and habitat provisioning as a result of land reduction and wastes dumping which tend to affect the quality and performance of the production system.

Table 5j. Major drivers and their effect on ecosystem services in Irrigated crops (other) production systems.

Production systems	**Drivers**	**Effect of drivers on ecosystem services** (2, 1, 0,-1, -2, NK, NA)								
		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
C6 Irrigated Crops (others): Subtropics										

	Changes in land and water use and management	1	1	NA	NA	1	0	0	0	1
	Pollution and external inputs	-1	-1	NK	NA	-1	0	0	0	-1
	Over-exploitation and over-harvesting	-1	-1	NK	NA	-1	NA	NA	NK	NK
	Climate change	-2	-2	NK	NA	-2	NA	NA	-1	-1
	Natural disasters	-2	-2	NK	-2	-2	NA	NK	-2	-2
	Pests, diseases, alien invasive species	-1	-1	NK	NA	-1	0	0	0	0
	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	NK	-1	-1	-1	-1	-1	-1
	Changing economic, socio-political, and cultural factors	1	1	1	1	1	1	1	1	1
	Advancements and innovations in science and technology	2	2	2	2	2	2	2	2	2
	Other [*please specify*]									

C6: Irrigated crops (others). In the Gambia, apart from the driver of change: markets, trade and the private sector which is not applicable to the given ecosystem services, all the other drivers mentioned do have an effect but with variable magnitude. For instance, pollination and external inputs will be negatively affected but its effect on soil formation and protection, water cycling and habitat provisioning is zero (0). The same observation stands for pest, disease and invasive aliens species with the difference that its effect for soil formation and protection, water cycling, habitat provisioning and production oxygen/gas is nil or unknown (0/NK). Policies and advancements and innovation in science and technology have positive (1) and strongly positive (2) effect respectively as a result of the pertinence of the many policy provisions (which need full implementation) and the concrete involvement of the engineering unit in the search making and vulgarizing of more adaptable agricultural tools.

Table 5k. Major drivers and their effect on ecosystem services in Rain fed crops production systems.

Production systems	**Drivers**	**Effect of drivers on ecosystem services** (2, 1, 0,-1, -2, NK, NA)								
		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
C10 Rain fed Crops: Subtropics	Changes in land and water use and management	-1	-1	-1	-1	-1	-1	-1	-1	-1
	Pollution and external inputs	-1	-1	-1	0	-1	-1	-1	-1	-1
	Over-exploitation and overharvesting	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Climate change	-2	-2	-2	-2	-2	-2	-2	-2	-2
	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	-1	-1	-1	-1	-1	-1	-1	-1	-1
	Policies	1	1	1	1	1	1	1	1	1
	Population growth and urbanization	-1	-1	-1	-1	-1	-1	-1	-1	-1
	Changing economic, socio-political, and cultural factors	1	1	1	1	1	1	1	1	1
	Advancements and innovations in science and technology	2	2	2	2	2	2	2	2	2
	Other [*please specify*]									

C10: Rain Fed Crops production system. The following drivers of change: change in land and water use management, pollution and external inputs, climate change, natural disasters, pest, diseases and alien invasive species, as well as markets, trade and the private sector and the population growth and urbanization are all with negative (-1) impact for the concerned ecosystem services or strongly negative (-2) impact as it is the case with the climate change effect. The logic supporting this bleak picture is that with the inappropriate use of fertilizers and other chemicals by farmers, the soil chemical composition is disturbed which hampers on the right development of crops. As a result, all the ecosystem services directly or indirectly linked to the plant development and luxuriance become negatively (-1) affected. This condition of soil chemical composition distortion affecting the soil fertility tends to promote change in land use and management which overtime would go affecting negatively (-1) the

directly or indirectly ecosystem services associated with plant development. The same effect (-1) stands for these ecosystem services with regard to drivers such as population growth and urbanization which is presently taking place with a high intensity (rate of population increase 3.8% in 2013), the pests and diseases regulation capacity, the impact of the natural disasters (flood and locusts) and the markets, trade and private sector which is are demotivating due to the unfavorable economic conditions imposed to farmers. For the drivers such as changing economic, socio-political and cultural factors and the advancements and innovation in science and technology, the contribution is positive (1) to strongly positive (2) for all ecosystem services mentioned since the tendency is a more commitment to agriculture as result of the famous slogan "return to the land" and "eat what you grow and grow what you eat" put by the Head State.

Table 5: Major drivers and their effect on ecosystem services in Fed Aquaculture production system

Production systems	**Drivers**	**Effect of drivers on ecosystem services** (2, 1, 0,-1, -2, NK, NA)								
		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
A10 Fed Aquaculture: Subtropics	Changes in land and water use and management	1	NK	-1	-1	NK	NK	1	-1	0
	Over-exploitation and over-harvesting	-1	-1	-1	-1	NK	-1	-1	-2	0
	Climate change	-2	-2	-2	-2	-1	-2	-2	-2	-2
	Pests, diseases, alien invasive species	NK	NK	0	0	0	0	0	0	0
	Markets, trade and the private sector	NK	1	-1	0	-1	0	-1	0	0
	Policies	1	1	1	1	1	1	1	1	1
	Population growth and urbanization	-1	-1	-1	-1	-1	-1	-1	-1	-1
	Advancements and innovations in science and technology	1	1	1	1	1	1	1	1	1
	Other [*please specify*]									

A10: Fed Aquaculture in the subtropics (Gambia).

The major drivers change on this production system is climate change allocated (-2) as for its impact for all ecosystem services and over-exploitation accorded (-2) for ecosystem service as habitat provisioning which also is negatively affected by change in land and water use and management (-1) since new lands are being used which tends to go along with more habitats destruction. Policies and advancements and innovations in science and technology are both favorable (1) for their effects on all ecosystem services due the many positive political orientations and contribution of the engineering unit (efficient water pumping systems). Population growth and urbanization has a negative effect for the high demographic trends that claim more land for human.

Table 5: Major drivers and their effect on ecosystem services in Mixed systems (livestock, crops, forests and/or aquaculture and fisheries) production system

Production systems	**Drivers**	**Effect of drivers on ecosystem services** (2, 1, 0,-1, -2, NK, NA)								
		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
M2 Mixed Systems (livestock, Crops, Forests and/or Aquatic and Fisheries): Subtropics	Changes in land and water use and management	-1	-1	-1	-2	1	-1	-1	-2	1
	Over-exploitation and over-harvesting	-1	-1	-1	-1	-1	-1	-1	-1	1
	Climate change	-2	-2	-2	-2	-1	-2	-2	-2	-2
	Natural Disasters	-1	-1	-1	-1	-1	-1	-1	-1	-1
	Pests, diseases, alien invasive species	-1	-2	0	0	0	0	0	0	0
	Markets, trade and the private sector	-1	-1	-1	-1	-1	-1	-1	-1	-1
	Policies	1	1	1	1	1	1	1	1	1
	Population growth and urbanization	-1	-1	-1	-1	-1	-1	-1	-1	-1
	Advancements and innovations in science and technology	1	1	1	1	1	1	1	1	1
	Other [*please specify*]									

The production system M2: mixed systems. (Livestock, Crops, Forests and/or Aquaculture and Fisheries)

SUMMARY: DRIVERS AND IMPACTS ON ECOSYSTEMS

Using more land and water for livestock production changes the ecosystem functions of biodiversity in land used for cattle rearing. The following impacts on ecosystem services were noted: (a) reduction in pollination, showing, negative impact (-1); (b) pest and diseases of plant and animals increased, showing, a negative impact of (-1); (c) grassland and rangeland had less water purification and waste treatment function, showing a negative impact of (-1); (d) grassland and rangeland the land provides lesser natural hazard protection, showing negative impact of (-2); (e) cattle dung restored soil nutrient, showing a positive impact of (1); (f) in grassland and rangeland the land becomes more susceptible to erosion and the resulting lack of soil formation and protection showed a negative impact of (-1); (g) the water recycling functions of a pasture and rangeland is much less with the resulting impact being negative (-1); (h) natural habitats of plant and animals were destroyed on land converted for use as pasture and range land, this had a strong negative impact of (-2); and (i) grassland and rangeland had positive impact (1) on production of oxygen and gas. In fact, the acquisition of more land for livestock production going along with the turning of native forest land into grassland and rangeland, the direct consequence is a lowering of the number of plant species that used to grow in these areas

The impact of pollution of grassland, from the application of agricultural inputs, are (a) the effect on pollination is not known, hence the impact is rated as (NK); (b) the effect on pest and diseases of plant and animals is not known, hence the impact is rated as (NK); (c) the effect on pasture and rangeland is also not known, hence the impact is rated as (NK); (d) the effect on natural hazard protection is not known, hence the impact is rated as (NK); (e) cattle dung restored soil nutrient, showing a positive impact of (1); (f) in the land becomes more susceptible to erosion and the resulting lack of soil formation and protection showed a negative impact of (-1); (g) the impact on the water recycling functions of a pasture and rangeland is not known, , hence the impact is rated as (NK); (h) the impact on the natural habitats of plant and animals is not known, hence the impact is rated as (NK); and (i) the effect on production of oxygen and gas is not known, hence the impact is rated as (NK).

The impact of overgrazing on ecosystem functions are (a) the effect on pollination is not known, hence the impact is rated as (NK); (b) the effect on pest and diseases of plant and animals is not known, hence the impact is rated as (NK); (c) the effect on pasture and rangeland is also not known, hence the impact is rated as (NK); (d) the effect on natural hazard protection is not known, hence the impact is rated as (NK); (e) cattle dung restored soil nutrient, showing a positive impact of (1); (f) in grassland and rangeland the land

becomes more susceptible to erosion and the resulting lack of soil formation and protection showed a negative impact of (-1); (g) the impact on the water recycling functions of a pasture and rangeland is not known, , hence the impact is rated as (NK); (h) the impact on the natural habitats of plant and animals is not known, hence the impact is rated as (NK); and (i) the effect on production of oxygen and gas is not known, hence the impact is rated as (NK).

impact of climate change on ecosystem functions are (a) reduction in pollination, showing, a strong negative impact (-2); (b) pest and diseases of plant and animals increased, showing, a strong negative impact of (-2); (c) pasture and rangeland land had less water purification and waste treatment function, that is, less filtering functions of vegetation cover, soil and aquatic biota, showing a strong negative impact of (-2); (d) pasture and rangeland land provides lesser natural hazard protection, showing strong negative impact of (-2); (e) Smaller quantity of cattle dung restored soil nutrient, showing a negative impact of (-1); (f) in grassland and rangeland the land becomes more susceptible to erosion and the resulting lack of soil formation and protection showed a negative impact of (-2); (g) the water recycling functions of a pasture and rangeland is much less with the resulting impact being strongly negative (-2); (h) natural habitats of plant and animals were destroyed on land converted for use as pasture and range land and lack of rainfall slowed down natural forest regeneration , this had a strong negative impact of (-2); and grassland and rangeland had strong negative impact (-2) on production of oxygen and gas as there were less green leaves for photosynthesis that releases oxygen.

The impact of natural disasters on ecosystem functions are (a) reduction in pollination, showing, a strong negative impact (-2); (b) pest and diseases of plant and animals increased, showing, a strong negative impact of (-2); (c) pasture and rangeland land had less water purification and waste treatment function, that is, less filtering functions of vegetation cover, soil and aquatic biota, showing a strong negative impact of (-2); (d) pasture and rangeland land provides lesser natural hazard protection, showing strong negative impact of (-2); (e) Smaller quantity of cattle dung restored soil nutrient, showing a negative impact of (-2); (f) in grassland and rangeland the land becomes more susceptible to erosion and the resulting lack of soil formation and protection showed a negative impact of (-2); (g) the water recycling functions of a pasture and rangeland is much less with the resulting impact being strongly negative (-2); (h) natural habitats of plant and animals were destroyed on land converted for use as pasture and range land and lack of rainfall slowed down natural forest regeneration , this had a strong negative impact of (-2); and grassland and rangeland had strong negative impact (-2) on production of oxygen and gas as there were less green leaves for photosynthesis that releases oxygen.

Pest, diseases, alien invasive species on ecosystem functions are (a) reduction in pollination, showing, negative impact (-1); (b) pest and diseases of plant and animals increased, showing, a negative impact of (-2); (c) The availability of pest, diseases and alien invasive species in

rangeland land had almost no impact on water purification and waste treatment function, showing a zero impact of (0); (d) The availability of pest, diseases and alien invasive species in pasture and rangeland land had no noticeable impact on natural hazard protection, this shows, a zero (0) impact; (e) The availability of pest, diseases and alien invasive species shows zero (0) impact in restoring soil nutrient; (f) The availability of pest, diseases and alien invasive species shows zero (0) impact in soil formation and protection; (g) The availability of pest, diseases and alien invasive species shows zero (0) impact on water recycling functions of a pasture and rangeland; (h) The availability of pest, diseases and alien invasive species shows zero (0) impact on natural habitats of plant and animal since pasture and range land are themselves not natural habitats; and (i) The availability of pest, diseases and alien invasive species shows zero (0) impact on production of oxygen and gas by pasture and rangeland.

The increasing involvement of the private sector in marketing and trade has the following impact on ecosystem functions (a) reduction in pollination, showing, a negative impact (-1); (b) pest and diseases of plant and animals increased, showing, a negative impact of (-1); (c) pasture and rangeland land had less water purification and waste treatment function, showing a negative impact of (-1); (d) pasture and rangeland land provides lesser natural hazard protection, showing negative impact of (-1); (e) Less cattle dung and leaves to restore soil nutrient, showing a negative impact of (-1); (f) in grassland and rangeland the land becomes more susceptible to erosion and the resulting lack of soil formation and protection showed a negative impact of (-1); (g) the water recycling functions of a pasture and rangeland is much less with the resulting impact being negative (-1); (h) natural habitats of plant and animals were destroyed on land converted for use as pasture and range land, this had a negative impact of (-1); and (i) grassland and rangeland had negative impact (-1) on production of oxygen and gas.

The impact of Population growth and urbanisation on ecosystem functions are (a) reduction in pollination, showing, negative impact (-1); (b) pest and diseases of plant and animals increased, showing, a negative impact of (-1); (c) pasture and rangeland land had less water purification and waste treatment function, showing a negative impact of (-1); (d) pasture and rangeland land provides lesser natural hazard protection, showing negative impact of (-1); (e) cattle dung restored soil nutrient, showing a positive impact of (-1); (f) in grassland and rangeland the land becomes more susceptible to erosion and the resulting lack of soil formation and protection showed a negative impact of (-1); (g) the water recycling functions of a pasture and rangeland is much less with the resulting impact being negative (-1); (h) natural habitats of plant and animals were destroyed on land converted for use as pasture and range land, this had a strong negative impact of (-1); and (i) had positive impact (-1) on production of oxygen and gas.

The impact of changing economic, socio-political, and cultural factors on ecosystem functions are (a) reduction in pollination, showing, positive impact (1); (b) pest and diseases of plant and animals decreased, showing, a positive impact of (1); (c) pasture and rangeland had improved water purification and waste treatment function, showing a positive impact of (1); (d) pasture and rangeland land improved natural hazard protection by planting tree tracking for livestock , showing positive impact of (1); (e) cattle dung restored soil nutrient, showing a positive impact of (1); (f) in grassland and rangeland the land becomes less susceptible to erosion and the resulting soil formation and protection showed a positive impact of (1); (g) the water recycling functions of a pasture and rangeland improved resulting positive impact (-1); (h) natural habitats of plant and animals improved showing positive impact of (1); and (i) grassland and rangeland had positive impact (1) on production of oxygen and gas.

The impact of advancements and innovations in science and technology on ecosystem functions are (a) improvement in pollination, showing, strong positive impact (2); (b) pest and diseases of plant and animals decreased, showing, a strong positive impact of (2); (c) pasture and rangeland land improved upon water purification and waste treatment function, showing a strong positive impact of (2); (d) pasture and rangeland land had improved natural hazard protection, showing a strong positive impact of (2); (e) cattle dung restored soil nutrient, showing a strong positive impact of (2); (f) in pasture land and rangeland the land soil formation and protection improved showing a strong positive impact of (2); (g) the water recycling functions of a pasture land and rangeland improved showing a strong positive impact of (2); (h) natural habitats of plant and animals were improved and the impact was positively strong (2); and (i) grassland and rangeland had positive impact (1) on production of oxygen and gas.

Effects of drivers of change on wild foods

14. **What were the main drivers affecting the availability, knowledge and diversity of wild foods during the last ten years in the country? In Table 6, indicate the major drivers affecting availability, knowledge and diversity of wild foods, and if the effects are strongly positive (2), positive (1), negative (-1), strongly negative (-2), no effect (0), not known (NK), or not applicable (NA).**

Table 6. Drivers affecting availability, knowledge and diversity of wild foods.

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

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.

Over-exploitation and over-harvesting of wildlife has been in the increase over the years. This driver enabled the collection of wild fruits such as *Saba senegalensis*, *Azadiracta Indica*, and several other wild fruits for commercialization. This situation has exacerbated conflict between human and wildlife all over the country. The hippo grazing areas were transformed into rice fields and escaladed into this conflict for the past decades. The World Bank, UNDP and several other institutions supported the government during the past five to ten years to remedy the situation by negotiating with the farmers to establish buffer zones between the rice field and the grazing areas of the hippos and erect a fence for protection. To this effect more than 25 km of fence has been erected over the years to reduce this recurrent conflict situation. Awareness raising and sensitization programs have contributed to halt the rampant collection of wild fruits thereby preventing starvation of the wildlife species in the forest. This has tremendously reduced conflict between the baboon population and villagers in Central River Region.

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

In answering questions 16 to 18, describe the major drivers that have had an impact in the last 10 years and include where possible indicators used to measure change, and sources of information.

16. **Which drivers have had the most significant effect on the involvement of women in the maintenance and use of biodiversity for food and agriculture?**

- Policy of gender equality and poverty allegation

Gambian women constitute 78 percent of the economically active population working mainly in agriculture, compared to just 57 percent of men. The majority of Gambian farmers are unskilled, annual agrarian subsistence farmers and they are responsible for about 40 percent of the total agricultural production in the country. The massive contribution of women to agriculture does not translate to their improved social status. While their productive activities are mainly subsistence-based, a good portion goes for income generation but there again, for meeting urgent family needs and for augmenting the nutritional quality of the family diets. Women are generally involved in food and horticultural production. Women farmers raise and manage most of the small ruminants, as well as poultry. They are also engaged in fisheries as fish off-loaders, middle-people and fish processors. In forestry, women are engaged in planting seedlings and woodlots.

Despite the critical role they play in agricultural production, women lack access to, as well as control and ownership of productive resources (farm inputs, implements, land and capital) resulting in low productivity and quality of rice (the staple food) and other crops. This affects food self-sufficiency and food security and constrains the ability of women to move from subsistence to commercial farming to maximize their income. Furthermore, women lose up to 50 percent of their agricultural production because of lack of access to markets, proper storage and transportation facilities. This reduced productivity and income of women increases their health risks, and reduces their ability to engage in other productive ventures.

Women play a critical role in biodiversity and food security in this region by fulfilling their role as food providers. There are 3 basic variants of household food production systems in Sub-Saharan Africa and the Gambia is no exception:

1) Women are responsible for production of all or most food crops. In this variant, food plots are considered women's plot.
2) Men and women jointly cultivate staple food crops in fields controlled by male household heads. In this type, male household head controls the output.
3) Men are responsible for food production, while women specialize in food processing.

It is clear that in the Gambia there is a rigid division of labor by gender in agriculture. This division may be based on types of activities performed on the farm or type of crops grown by

men and women. The division of labor is based on patriarchal norms that typically require women to care for the quality of the food needs of members of the households while men are involved in bringing cash income.

Though women mainly grow food crops for household consumption, if there is any marketable surplus they sell it in the market. However, women's primary responsibility is to feed the family and it is only after this that they can engage in other income earning activities .The distinction between crops is sometimes not very clear especially in the case of rice which is a staple crop in the Gambia and several Sub-Saharan African countries as well as a cash crop. With the introduction of the high yielding New Variety of Rice for (NERICA), the distinction now is that the high yielding varieties tend to be men's crops and the local varieties, women's crops. This pattern has been observed in areas where local varieties of rice are women's crop while hybrid varieties are cash crops cultivated by men. The logic is the same: high yielding varieties provide large amount of marketable surplus which allows men to provide cash income while women continue with varieties that provide enough for subsistence consumption.

Women play a vital role in biodiversity conservation and food security by engaging in oyster and cockle research, breeding, harvesting and marketing which also greatly contributes to income generation, household consumption and ecological equilibrium. The TRY oyster women association and the Women oyster farmers association in the Niumi are very good examples of women groups working with the department in the management of the resources in the national parks of the country. The Niumi women association is collaborating with the DPWM in the mo nitoring exercise of the shellfish exploitation in the Niumi National Park. This project is sponsored by MAVA Foundation for Nature under the BioCos initiative.

There is increased recognition of the value of indigenous knowledge, as well as women's and men's roles as innovators regarding biodiversity conservation and farming techniques. Experience has shown the need to build on such knowledge and to ensure the participation of local women and men (as innovators and end users) in order to improve tools and techniques aimed at combating desertification. Therefore, involving rural communities in biodiversity conservation, resource management and in decisions regarding environmentally sound practices and techniques aimed at combating desertification (such as rainwater harvesting, insect control, post-harvest storage, etc.) is a powerful way to mitigate the conditions and the impact of land degradation and to ensure a sustainable base for food and nutrition productivity and security.

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

From 2000 to 2008**,** food security at both household and national level, not only became the flagship policy approach for the sector, but was also the yardstick of the sector's contribution to the macro-economic priority of poverty reduction and economic growth. Between 2009 and2015**,** a new vision for the ANR Sector sharpened focus on the transformation of the

sector from a traditional, low output, subsistence economy with centralized structures, to a modern, market-led sector with efficient value chains, a diversified production base and effective, decentralized structures. As recently as May 2014, an Executive Directive, "Vision 2016," called for increased rice production, a reduction of rice imports to zero by 2016 and divestiture of the nation's general food base, all aimed at attaining not only national food sufficiency but also an avenue for economic gains through food surplus exports.

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.**

Bush fires are key threats causing the loss of wildlife habitats and the reduction of genetic resources, species and ecosystem diversity (including loss of crop plant genetic resources). According to the Department of Parks and Wildlife Management (DPWM) of The Gambia, out of the 180 species of wild animals known to have occurred in The Gambia, 13 are now extinct and a similar number are threatened with extinction. The degradation of ecosystems results in the reduction of species and genetic diversity.

The Gambia is believed to be one of the Sub-Saharan African countries most seriously affected by land degradation. The quantity and quality of the grasses, herbs and woody species found in the country's grasslands, woodlands and forests are decreasing as a result of deforestation (for fuel wood, and construction), overgrazing by the sizable quantities of livestock, particularly cattle and the frequent occurrence of annual bushfires during the dry season.

The Gambia's soil resources have declined in productivity as a result of soil erosion, low soil nutrient content and adverse changes in their biological, chemical, physical, and hydrological properties. Water erosion has specifically led to the erosion of high amounts of sand and silt from the uplands and deposits in the low land areas (which are the most suitable sites for tidal and rain-fed rice cultivation in the country), thereby rendering these low land areas unsuitable for rice cultivation. The cultivable land area of The Gambia is estimated at about 430,000 Ha, or 38 percent of the total land area of the country. In 2002, cultivated land was estimated at 250,000 Ha, while 5,000 Ha were under permanent crops. This shows a huge gap which if filled, could positively turn the country's food balance sheet around.

CHAPTER 3: The state and trends of biodiversity for food and agriculture

The state of diversity between and (where any information exists) within species with respect to biodiversity and wild foods

More than 1,000 plant species (of which 124 are trees) have been recorded from the Gambia including several globally threatened and near-threatened taxa. These include the dry zone mahogany (*Khayasenegalensis)* and the African rose wood (*Pterocarpuserinaceus)*. However, due to continuous degradation of the forests the country has been losing most of its biodiversity. From the 124 tree species recorded in the Gambia only 9 are most common according to 2009/10 National Forest Assessment (NFA) which are: *Terminalia macroptera, Daniella oliveiri, Combretumglutinosum, Khayasenegalensis, Parkiabiglobosa, Elaeisguinness, Combretumnigrans, Pterocarpuserinaceus and Cordylaafricana*. Other key species which exist and are important in terms of timber and Non-Wood Forest Product (NTFP) extraction- are *Detariumsenegalensis, Elasisguinersis, Parinariexcelsa, Borassusaeithiopum, Vitex grandiflora, Ziziphusmauritaniana and Saba senegalensis*.

The degree of biodiversity of the tree species in the Gambia was assessed through Shannon's Diversity Index which is a mathematical measure of species diversity in a community. The results show that the highest levels of diversity are found in North Bank Region (NBR) and West Coast Region(WCR) while Lower River (WCR) has the lowest diversity values for trees species (NFA, 2009).

In terms of animal species, 125 mammals, 576 birds, 74 reptiles, 33 amphibians, 627 fishes, 78 dragonflies and 173 butterflies have been recorded. Of the known bird species, 13 are near-threatened and 10 globally threatened. Some 25% of Gambian bird species are Palaearctic migrants, with Gambia's wetlands being an important stepping stone of the East Atlantic Flyway and wintering ground.

Despite its small size, the Gambia has three major ecological regions, the marine and coastal zone ecosystems on the Atlantic Ocean in the west, the east-to-west running River Gambia with its related freshwater and estuarine ecosystems, and the terrestrial ecosystems in the remaining stretches of land behind the coast and to the north and south of the river. Each of these ecosystems has its own functional biodiversity characteristics.

The terrestrial ecosystems

These are mainly characterized by forests which can be classified into open and closed woodlands, with closed and open woodland accounting for not more than 10% and the remainder consisting of Savannah woodland (Sillah, 199). Despite the above categories of open and closed woodlands, further distinction can be made based on composition and structure. The Sudanian woodland type mostly dominates while the Guinea woodland is

confined primarily to the south western part of the country. Guinea woodland now appears in small relic patches, which have considerable biodiversity value for numerous species of flora and fauna.

The importance of the different components of associated biodiversity in relation to ecosystem services

Forest biodiversity provides a wide range of goods and services to humankind including economic, social, cultural, aesthetic and environmental values. Forests are crucial to the maintenance of life-supporting ecological systems, micro-climate regulation, maintenance of the water cycle, watershed protection, recycling of mineral nutrients, and provision of habitats for wildlife including migratory species.

Forests are an important economic and ecological resource for The Gambia. The forests also support most of the country's biological diversity. A large percentage of plant and animal species in the country are found in forest areas. Forests are important in maintaining the watersheds, regulating water flow and controlling floods which are crucial to agricultural production and therefore food security. Also the existence of Rhizobium, one of the most important bacteria for soil fertility (transforming gaseous nitrogen into nitrates accessible to plants) whether on farm or in the wild can be underlined as microbial contribution within the context of forests contribution to associated biodiversity for food and agriculture. Honey production within the mangrove ecosystems is another not less important product that is exploited by many different stakeholders for either personal consumption or commercialization.

Various species of fish and fisheries products (bonga, tilapia, shellfish and cockles…) are daily harvested and contribute tremendously in the country's food basket. Various mangrove ecosystems (Tanbi, Niumi) are heavily exploited by women oyster collectors (Try women oyster collectors) for monetary and nutritional values.

Fish drying and smoking are other methods used to boost utility of the sea resources.

The main factors influencing the state of genetic diversity with an emphasis on threatened and endangered species and resources

The past three decades have witnessed the ecosystems biological diversity resources being subjected to misuse and over exploitation by man. Similarly, environmental changes due to land degradation have triggered the attention on ecosystems biological diversity as a consequence of the unprecedented loss of forest cover, species and their habitats.

The high rate of land degradation of forest coupled with the impacts of a growing human population with increasing demands for resources and an overall decline in annual average rainfall of 25-30% as well as increasing poverty have been the main driving force for loss of

biodiversity which have been seriously influencing the state of species and genetic diversity in the country. Many species related to Biodiversity for food and agriculture (such as elephant, African buffalo, giraffe, roan antilopes, etc…) have now become rare or locally extinct and a once biologically diverse country in the last three decades the Gambia has become much less diverse in terms of species and ecosystems. Over the past few decades, the country has lost 13 species of mammals and an unknown number of plant species (NBSAP, 2014).

The state of activities and of the development of monitoring and information systems on the state of biodiversity for food and agriculture

The National Forest Assessment (NFA) of 2009/10 process has set up a monitoring system for future assessments of the forest and tree resources. A network of permanent sample plots has been established on the ground and well referenced in the records of the Department of Forestry (DoF) for easy relocation in future therefore providing a foundation for long term natural resource monitoring. The NFA has followed a harmonized approach to forestry resources monitoring and assessment [….] thereby, putting the Gambia at the same level in scope, quality and format of information with other countries collaborating with FAO […]. With repeated assessment in the permanent plots, the NFA will capture information related to the change in the extent, the state and use of forest and trees outside forests. Additional parameters can be included in future measurements if deemed relevant to capture other information on the state of biodiversity for food and agriculture in all the production systems in the country.

The state of any specific conservation actions that target associated biodiversity and wild foods

The concepts of Community Forest Management (CFM) have been introduced and implemented in The Gambia since the early 1990s by the DoF through donor supported forestry projects notably from the Federal Republic of Germany. These Community Forestry concepts evolved as a response to the failures of conventional forest management approaches which excluded local communities from playing an active role in managing forest resources. Since 1990, when Community Forestry was first piloted in WCR, it has gradually spread to all parts of the country. Currently, 458 communities country-wide are now participating in Community Forestry management in different phases or stages of the process, managing a total area of 31,682.32 hectares (ha.) of natural forestland (Jaiteh, 2014).

The Gambian CFM approaches attempts to fully involve the local population in the sustainable management and utilization of surrounding forest resources by vesting in them legal ownership of both land and trees. Gambia's CFM concept stipulates that, in the future, most of the country's natural forests should be owned and managed by the local population in the form of Community Forests (CF), affording local communities a greater share of the benefits coming from forests and giving them an increased stake in the management of that natural resource. This approach creates incentives for communities to protect […] the forests around them from destruction and to utilize them sustainably.

Major gaps in the information available and opportunities and priorities for improving knowledge of state and trends of biodiversity for food and agriculture

- Loss of local traditional knowledge on species and their uses
- Lack of current data
- Weak enforcement of environmental laws and implementation of policies
- Poverty

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	-1	-1	-1
F2	NK	1	1	1
F6	NK	NK	NK	-1
A2	NK	1	NK	0
A10	NK	1	NK	0
C2	NK	1	NK	1
C6	NK	1	-1	1
C10	NK	1	-1	1
M2				

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.**

According to the National Forest Assessment (NFA), 2009, The forest area comparisons between 1981/82 and 1997/98 inventories and the National Forest Assessment of 2009/10 illustrate that the 1981/82 indicated 505,300 ha total forest area, or 44% of the total area of Gambia (1,130,000 ha); whereas the NFA 2009-2010, estimated a forest cover of only 423,000ha, or 37% of the total area of The Gambia. This means that since 1983, 7% of the forest cover has been lost. One of the most significant losses (accounting for 73% of the overall forest loss) has occurred in mangroves, which were previously estimated to be approximately 67,000ha and are now estimated to be 35,700ha – a loss of roughly 47% of their previous cover. This translates to 1,080 ha of mangroves lost each year, an alarming

rate of decline over the last 30 years. These results therefore indicate that there is a net decrease of 97,000 ha of forest and other wooded land from 1997/98 to 2009/10 with the species composition being narrowed even further. In spite of some uncertainty regarding data accuracy, NFA results show a process of continuing forest degradation and biodiversity drain in the last 10 years which are mainly attributed to: agricultural expansion, bushfires, drought, settlement/encroachment and road construction (NFA, 2009).

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)**									
	Pollination	Pest and disease regulation	Water purification and waste treatment	Natural hazard regulation	Nutrient cycling	Soil formation and protection	Water cycling	Provisioning of habitat	Production of oxygen/ Gas regulation	Others
L2	NA	1	NA	NA	1	1	NA	NA	NA	
F2	1	NK	NK	-1	-1	-1	2	2	1	
F 6	1	NK	NK	1	1	1	1	1	1	
A2	NA	NA	NA	NA	NA	NA	NA	NA	NA	
A10	NA	-1	NA	NA	1	NA	NA	NA	NA	
C2	2	2	NK	NA	NK	2	1	1	NK	
C6	1	1	NA	NA	NA	NA	NA	NA	NA	
C10	1	1	NA	NA	NA	NA	NA	NA	NA	
M2	1	2	NA	0	0	1	2	2	1	

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.**

More than 1,000 plant species (of which 124 are trees) have been recorded from the Gambia including several globally threatened and near-threatened taxa. These include the dry zone

mahogany (*Khayasenegalensis)* and the African rose wood (*Pterocarpuserinaceus)*. However, due to continuous degradation of the forests the country has been losing most of its biodiversity. From the 124 tree species recorded in the Gambia only 9 are most common according to 2009/10 NFA which are: *Terminaliamacroptera, Daniellaoliveiri, Combretumglutinosum, Khayasenegalensis, Parkiabiglobosa, Elaeisguinness, Combretumnigrans, Pterocarpuserinaceus and Cordylaafricana*.

Other key species which exist and are important in terms of timber and Non-Wood Forest Product (NTFP) extraction- are *Detariumsenegalensis, Elasisguinersis, Parinariexcelsa, Borassusaeithiopum, Vitexgrandiflora, Zizipusmauritaniana and Sabasenegalensis*.
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In terms of animal species, 125 mammals, 576 birds, 74 reptiles, 33 amphibians, 627 fishes, 78 dragonflies and 173 butterflies have been recorded. Of the known bird species, 13 are near-threatened and 10 globally threatened. Some 25% of Gambian bird species are Palaearctic migrants, with Gambia's wetlands being an important stepping stone of the East Atlantic Flyway and wintering ground (NBSAP, 2014).

The past three decades have witnessed the ecosystems biological diversity resources being subjected to misuse and over exploitation by man. Similarly, environmental changes due to land degradation have triggered the attention on ecosystems biological diversity as a consequence of the unprecedented loss of forest cover, species and their habitats.

The high rate of land degradation of forest coupled with the impacts of a growing human population with increasing demands for resources and an overall decline in annual average rainfall of 25-30% as well as increasing poverty have been the main driving force for loss of biodiversity which have been seriously influencing the state of species and genetic diversity in the country. Many species have now become rare or locally extinct and a once biologically diverse country in the last three decades the Gambia has become much less diverse in terms of species and ecosystems. Over the past few decades, the country has lost 13 species of mammals and an unknown number of plant species (NBSAP, 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 systems	**Changes**	**Impact of changes in biodiversity for food and agriculture on ecosystem services** (2, 1, 0,-1, -2, NK, NA)								
		Pollination	Pest and disease regulation	Water purification and waste	Natural hazard regulation	Nutrient cycling	Soil formation and protection	Water cycling	Habitat provisioning	Production of Gas oxygen/
L2	Changes in animal genetic resources	NA	1	NA	NA	NA	NK	NA	NA	NA
F2	Changes in crop genetic resources	NK	1	NA	1	1	NK	NK	NA	NK
F6	Changes in forest genetic resources	NK	NK	-1	1	-1	-1	NK	-1	-1
A2	Changes in aquatic genetic resources	NA	NK	NA	NK	NA	NA	NA	NA	NK
A10	Changes in micro-organism genetic resources (associated biodiversity)	NA	NK	NA	NA	NA	NK	NA	NA	NA
C2	Changes in invertebrates genetic resources (associated biodiversity)	NA	NK	NA	NA	NA	NK	NA	NA	NA
C6	Changes in vertebrates genetic resources (associated biodiversity)	NA	1	NA	NA	NK	NK	NA	NA	NA
C10	Changes in plants genetic resources (associated biodiversity)	NK	1	NA	1	1	NK	1	NA	NK
M2	Mixed									

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.**

In The Gambia changes in genetic resources of associated biodiversity have mainly been done within the livestock and crop production sectors and the impacts of these changes on the ecosystem services have been more on pest and disease regulations for higher production.

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 melifera) bees	F2,F6,C2,C6,C10, M2	Y	NARI, NBAG
Pest and disease regulation	Cattle , NARICA, Maize	L2,C2,C6,C10, F6	Y	ITC, NARI,
Water purification and waste treatment	NA			
Natural hazard regulation	(Mangroves) such as Rhizophora sp and avecennia sp.	F2, F6	Y	DoF, DPWM
Nutrient cycling	Wetlands	F2, F6, M2	y	DoF, DPWM
Soil formation and protection	Mangrove	F6,M2, F 2	Y	DOF, DPWM
Water cycling	Wetlands	F2	Y	DoF, DPWM
Habitat provisioning	Wetlands	F2, F6, A10, M2	Y	DoF, DPWM
Production of oxygen/ Gas regulation	Wetlands	F2, F6, A10, M2	y	DOF, DPWM, NARI

28. **Does your country have monitoring activities related to associated biodiversity? If yes, describe these. Where possible provide information on the components of associated biodiversity that are monitored and on the geographical coverage of the monitoring system (local, regional, national, global). Include references to the sources of information, if possible.**

The National Forest Assessment (NFA) of 2009/10 process has set up a monitoring system for future assessments of the forest and tree resources. A network of permanent sample plots has been established on the ground and well referenced in the records of the Department of Forestry (DoF) for easy relocation in future therefore providing a foundation for long term natural resource monitoring. The NFA has followed a harmonized approach to forestry resources monitoring and assessment thereby, putting the Gambia at the same level in scope, quality and format of information with other countries collaborating with FAO. With repeated

assessment in the permanent plots, the NFA will capture information related to the change in the extent, the state and use of forest and trees outside forests. Additional parameters can be included in future measurements if deemed relevant to capture other information on the state of biodiversity in the country.
The series of national reports to the secretariat of the CBD and other Biodiversity related convention are used as a monitoring framework in comparing the trends on the status of the biodiversity at the national level. The CBD national report, the Biosafety national report, the CITES report, the AEWA and CMS reports are all providing necessary information on the status and trend of biodiversity in the country. The recent review and update of the NBSAP also has served as a monitoring tool to ascertain progress and to devise new approaches for better management of the country Biological resources.

At local level, the Department of Parks through its numerous projects, is implementing periodic monitoring exercises on targeted species (fauna and flora) for informed decision making on the conservation of the species involved. The development and frequent review and update of the protected areas management plans is another tool for monitoring success. On top of all, each project has its own monitoring programme.

Species of associated biodiversity at risk of loss

In this section the objective is to identify species of associated biodiversity within the country that are at significant risk of loss, degradation or extinction.
According to the latest Hippo count organized by the department of Parks and Wildlife Management in June 2011, A total of 91 individual hippopotami were counted in 15 sites. The best sighting were recorded at Old site 1 and 2 where 32 individuals were counted. River Gambia National Park represented 62.5% of all hippopotami counted in 2011. The remaining 37.5% were recorded in counts between 1 and 6 individuals mostly in the Upper River Region.

With this rather small population size and confronted with the lost of grazing land to agricultural expansion, the species is alarmingly threatened in its ecological niche. The human Wildlife conflict in the CRR and URR region is getting higher and higher.

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 Criteria18. 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 (indicate)	References or sources of information if available
Mangroves	Moderate	Over exploitation, hyper salination of part of the river Gambia	Department of Forestry, DPWM
Borassusaethiopum	High	Over exploitation, bushfires	Department of Forestry
Elaeisguineense	High	Over exploitation	Department of Forestry
Pterocarpuserinaceus	High	Over exploitation, bushfires	Department of Forestry
Khayasenegalensis	High	Over-exploitation, bushfires,	Department of Forestry
Green turtle	moderate	Over-exploitation	DPWM
Trichechus senegalensis	high	Over-exploitation	DPWM
Hippopotamus	high	Conflict, lost of graze land	DPWM

Conservation of associated biodiversity

This section collects information on the state of conservation of components of associated biodiversity providing ecosystem services within production systems in your country.

30. **Does your country currently have any *ex situ* conservation or management activities or programmes for associated biodiversity for food and agriculture? These may include, for example, culture collections, collections of pollinators, etc. If so, list these in Table 12.**

Table 12.*Ex situ* conservation or management activities or programmes for associated biodiversity for food and agriculture.

Components of associated biodiversity	Organisms, species and sub-species (where available) conserved	Size of collection	Conservation conditions	Objective(s)	Characterization and evaluation status
Micro-organisms	Rhizobium sp	Low	Fair	Conservation of soil fertility	Medium
Invertebrates	Fish (Tilapia, Catfish, mullet)	High	Fair	Food security and nutrition improvement	Medium
Vertebrates	Nk				
Plants	Anacardium.sp	High	Good	Commercial activities	Medium

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 conserved**	**Site name and location**	**Production system(s) involved (code or name)**	**Conservation objective(s)**	**Specific actions**
Micro-organisms	NK	All protected areas	F2; F6;A2;A10; M2	Biodiversity conservation	Species management
Invertebrates	Wildlife species (dacus vertebrates, bactrocera sp.) and habitats	All Protected areas	F2; F6;A2;A10; M2	Fauna conservation	Species management
Vertebrates	Wildlife species (antelopes sp. crocodile sp. water birds, bush pigs, doves , bonga, tilapia, sole fish, oysters, and habitat	All Protected areas	F2; F6; M2	Biodiversity conservation	management
Plants	Trees(adansonia digitata, balanites ethioptiaca, mangifera indica, shrubs, mushroom,	Bijilo & Pirang Forest Parks	F2; F6; M2	Ecotourism/ Conservation	Protection against illegal activities
Micro-organisms	Spirulina (*Arthrospira fusiformis*) Rhizobium sp,	Lake X Lake Y and Lake Z	Self-recruiting capture fisheries: Tropics	To conserve micro algal diversity in alkaline water ecosystem for future	Construction of physical and biological conservation structures around the

				utilization.	lakes harbouring the microorganisms and reduction of human interference through community participatory action.

32. **What activities are undertaken in your country to maintain traditional knowledge of associated biodiversity? Has traditional knowledge of associated biodiversity been used to inform conservation and use decisions in your country? Please share best practices and lessons learned.**

The activities undertaken to maintain traditional knowledge on biodiversity for food and agriculture in The Gambia have been studies on species identification and uses with assistance from the local communities (Hallam, 1979) and the promotion of community forest management which aims at transferring state forest ownership to the local communities for sustainable management and use.

Besides; the country has recently ratified the Nagoya Protocol on Access and Benefit Sharing and is looking forward to implement the road map. This entails the elaboration and establishment of the legal framework, establish legal authorities to management abs in the country. The recent establishment of an association of traditional healer is a giant step towards the management of the traditional knowledge in the country.

33. **Provide any available information on gender dimensions with respect to the maintenance of and knowledge about associated biodiversity. These may include differences in the roles and insights of women and men with respect to maintaining particular resources, monitoring their state, overseeing their management at different stages of production or ecosystem management.**

The formulation of the National Gender and Women Empowerment Policy 2010- 2020 encourages community women participation in the management and accessibility to environmental resources as well as agro- forestry for land conversation. The framework incorporates the interest of other stake holders to reduce or avoid conflict. This represents a shift in the environmental management system as a result of the introduction of environment management strategies that recognize the role of women in the sustainable management of the natural resources which is crucial for the reduction of both biodiversity loss and poverty.

Women are actively involved in harvesting of Non-Timber Forest Products (NTFPs) such as fuel wood, fruits and nuts, leaves etc. They are also involved in conservation of plants species particularly the ones used for food through planting and protection. On the other hand, men's activities are related more to harvesting of industrial wood and production charcoal and medicinal plants.

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
Kaba	Saba senegalensis	F2, F6,M2	2	N	DOF
Chinese date	Ziziphusmauritiana	F2, M2	-2	N	DOF
Tallow	Detariumsenegalense	F2,M2	-2	N	DOF
Bush mango	Cordylapinnata	F2, M2	-2	N	DOF
Velvet Tamarind	TamarindusIndica	F2, M2	-2	N	DOF
	DialiumGuineense	F2	-2	N	DOF
Folay	LaudolphieHeudelotii	F2, M2, F6	-2	N	DOF
Cashew	AnacadiumOccidentalis	F2, F6,M2	2	N	DOF
Ginger bread plum	ParinariMacrophylla	F2, M2	0	N	DOF
Kutofingo	Vitexdoniana	F2, M2	-2	N	DOF
Wonko	Hannoa undulate	F2,M2	-2	N	DOF
Locust bean	Parkiabiglobosa	F2,M2	-2	N	DOF
Batio	NaucleaLatifolia	F2,M2	-2	N	DOF
Grey plum	Parinariexcelsa	F2, M2	-2	N	DOF
Tabo	Cola Cordifolia	F2,M2	-2	N	DOF
Tallow	DetariumSenegalensis	F2,M2	-1	N	DOF
Mendiko	PsudospondiasMicrocarpa	F2, M2	-2	N	DOF

Baobab	AdansoniaDigitata	F2, F6,M2	-1	N	DOF
Swamp date	Phoenix reclinata	F2, M2	-2	N	DOF
Oil palm	Elaeisguineense	F2,M2	-2	N	DOF
Custard Apple	Annona senagalensis	F2,M2	-2	N	DOF
Bushbuck antelope	Tragelaphusscriptus	F2,F6,M2	-1	N	DPWM
Sitatunga	*Tragelaphusspekii*	F2,F6,M2	-2	N	DPWM
kuntangho	*Philantombamaxwellii*	F2,F6,M2	-2	N	DPWM
Bottlenose dolphin	*Tursiopstruncatus*	A2	-2	N	DPWM
African Manatee	*Trichechussenegalensis;*	A2	-2	N	DPWM
Hipopotamus	*Hippopotamusamphibius*	A2	0	N	DPWM
Crested porcupine	*Hystrixcristata*	F2, F6, M2	-1	N	DPWM
Gambian sun squIrrel	*Heliosciurusgambianus*	F2, F6, M2	0	N	DPWM
Aardvark	*Orycteropusafer*	F2, F6, M2	-2	N	DPWM
Scrub hare	*Lepus saxatilis*	F2, F6, M2	2	N	DPWM
Giant pouched rat	*Cricetomysgambianus*	F2, F6, M2	2	N	DPWM
Banded mongoose	*Mungos mungo*	F2, F6, M2	0	N	DPWM
Marabout stork	*Leptoptiloscrumeniferus*	F2, F6, M2	1	N	DPWM
White backed vulture	*Gyps africanus*	F2, F6, M2	-2	N	DPWM
Helmeted Guineafowl	*Numidameleagris*	F2, F6, M2	0	N	DPWM
Double spurred francolin	*Francolinusbicacartus*	F2, F6, M2	0	N	DPWM
Spur winged goose	*Plectropterusgambensis*	F2, F6, C2, A2, M2	0	N	DPWM
Laughing Dove	*StreptopeliaSenegalensis*	F2, F6, M2	2	N	DPWM
Village weaver	*Ploceuscucullatus*	F2, F6, M2	2	N	DPWM
Stone partridge	*Ptilopachuspetrosus*	F2, F6, M2	2	N	DPWM
Speckled pigeon	*Columba guinea*	F2, F6,M2	1	N	DPWM

Wild food resources at risk

In this section the objective is to identify uncultivated and wild species used for food within the country that are at significant risk of loss.

35. **List in Table 15 any wild food species for which there is evidence of a significant threat of extinction or of the loss of a number of important populations in your country. Specify the degree of threat according to the classification in use in your country or following the IUCN Red List Categories And Criteria19. 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**
Wulokononyambo	high	Fires	DOF
Sabasenegalensis	moderate	Bushfires, over-exploitation, deforestation	DOF
Ziziphusmauritiana	High	Bushfires, over-exploitation, deforestation	DOF
Datariumsenegalensis	High	Over-exploitation, drought, deforestation, bushfires	DOF
Parkiabiglobosa	high	Over exploitation, deforestation, bushfires	UTG, Dprt Nat. &Ph. Sciences
Solomsolom*	high	Deforestation, bushfires	UTG, Dprt Nat. &Ph. Sciences
Tamarindusindica	high	Bushfires, deforestation	UTG, Dprt Nat. &Ph. Sciences
Eleisguineens	high	Overexploitation, bushfires, deforestation	UTG, Dprt Nat. &Ph. Sciences
Kony*	high	Overexploitation, bushfires, deforestation	UTG, Dprt Nat. &Ph. Sciences
Cordylapinnata	high	Overexploitation, bushfires, deforestation	UTG, Dprt Nat. &Ph. Sciences
Berr*	Very high	Overexploitation, bushfires, deforestation	UTG, Dprt Nat. &Ph. Sciences
Ndex*	high	Deforestation, encroachment	UTG, Dprt Nat. &Ph. Sciences
Manpata*	High	Deforestation; bushfires	UTG, Dprt. Nat.Phy.Sc.
XuriJengjeng*	High	Deforestation; bushfires and encroachment	UTG, Dprt. Nat. &Ph. Sci
Balanitesaegyptiaca	High	Deforestation, bushfires	UTG, Dprt. Nat. & Ph. Sc
Parinarimacrophylla	High	Deforestation; Bushfires	UTG, Dprt. Nat.

			&Ph. Sc
Daliumguineensis	High	Deforestation; bushfires	UTG, Dpt. Nat. & Ph. Sc
sitatunga	High	Illegal hunting, deforestation,	DPWM , UTG
Green turtles	High	Illegal hunting	DPWM
Roan antilope	High	Illegal hunting	DPWM
dolphins	High	Illegal hunting	DPWM
manatees	High	Illegal hunting	DPWM
Crowned crane	High	Illegal hunting	DPWM
Thiof (fish)	High	Over havesting	Fisheries department

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

Many wild food species that used to be very abundant in the country have gone under huge pressure so much so that, even if they are still found among the local forest biodiversity, their contribution to the livelihoods of the populations and the rural population especially has become very poor. As part of their contribution to community livelihoods, some of these species were as food supplements (*P. biglobosa*), some others for juice production (*DT. Indica*) or medicine (*B. aegyptiaca*). In many cases, plant species with both food and medicine importance were also present and as such, were given due recognition which used to conduce their preservation and thus conservation. Thanks to their availability, communities were in a position to keep going many of their traditional food receipts which had a tangible strengthening effect on our tradition and beliefs. Today with their massive loss, communities are obliged to turn on new items (much of the time, with industrial origin) to supplement their diet. As a result they become more subjected to market rules let alone the loss of much of the traditions. On a general scale, the loss of wild food species as loss of food ingredients goes beyond the limits of human being kingdom since biodiversity becomes also affected. In fact, trophic relations are very important for both human and animals and as such, many animal species for example birds and other invertebrates that used to find their food supply supported by these lost plant species are now condemned to turn on something else if available or; to purely and simply migrate for better pastures.

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**
Honey	high	fair	Food supplement, brewerage, income generation, biodiversity conservation	Abundantly found in all the regions.
Oyster , cockles and shelfish	High	Fair	Food supplement and commercialization	Found in all mangrove ecosystems.

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**
Oyster	Tanbi Wetland National Park, Niumi National Park	Size not yet determined]	Biodiversity conservation and livelihood improvement	Site Demarcation sensitization, formation of an association for oyster collection and processing
Honey	Tanbi, Niumi, Abuko, Nyambai forest, bolongfenyo, Kiang West National Park, ...	Not yet determined	Biodiversity conservation and livelihood improvement Food supplement	Establishment of associations. Funding for bee-keeping activities, sensitization , fight against recurrent bush fires.

Table 18. Natural or human-made disasters that have 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)
Drought	L2; F2; F6; C2; C6; M2	-1	-2

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.

Not available

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.

Not available

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)
Not Available			

Biodiversity for food and agriculture provides a wide range of goods and services to humankind including economic, social, cultural, aesthetic and environmental values. In addition to a modest contribution of about 1% to the GDP in The Gambia, the forests provide 85% of the domestic energy requirements in the form of firewood and charcoal, 17% of the timber need of the population and serve as important source of wild food for consumption, poles for construction as well as medicine and forage for livestock.

Results confirm that the population of The Gambia obtains a variety of products from the forest. Among the most harvested products from the forest are: Fuel wood (19%), Plants food

(17%), Construction material (15%), Tea/herbs (11%) and Medicinal plants (10%). The forest also provides a number of services to the Gambian people. The most important include: Windbreak, Grazing and Shade and Soil and Water conservation. These results yet again show the importance of forests to the livelihood of local communities (NFA, 2009).

From the socio-economic perspective therefore they hold great significance to rural livelihoods. Dryland forest ecosystems provide supporting services (e.g. soil formation and conservation), regulating services (e.g. water and climate regulation), and provisioning services (e.g. food, fuelwood, medicines). Specifically, the provisioning services play a direct role in sustaining rural livelihoods, for example, *Spondiasmombin* and *Ziziphus Mauritania* are used for food and medicine, *Vitexgrandiflora* is used for food and timber.

Wild fruits and nuts and wild honey are collected from forests for self-consumption and in a few cases for sale, thus contributing to food security and nutrition. Detariumsenegalense is among the most utilized species for their fruits. Forests also provide fodder for livestock. Animals graze in forest understory during the rainy season.

The Gambia's environmental policy measures are supported by various biodiversity-related sectoral laws; for example, the National Environment Management Act (NEMA) 1994 ensures the integration of environmental considerations in all development strategies and related activities. The Biodiversity and Wildlife Act 2003 under the purview of the Department of Parks and Wildlife Management is currently being revised to further enhance the implementation of the NBSAP, other conventions and protocols. The Forest Act, 1998 and Regulations involve the communities in forest management. The NBSAP is being implemented in collaboration with other natural resource sectors (Agriculture, Forestry, Fisheries, Livestock, Water Resources and the National Environment Agency among others). The Fisheries Act 2007and its attendant Regulations (2008) have provisions covering efficient management of the artisanal and industrial fisheries as well as the development of aquaculture;. Together, these different stakeholders interact to address the issue(s) at the level of Agriculture and Natural Resources working group (ANRWG). In this regard, and to address conflicts and inter sectoral policy inconsistencies the Agriculture and Natural Resources Working Group serves as the clearing house mechanism and a policy conflict resolution forum.

Unfavorable factors to forest contribution to food security and nutrition	**Favorable factors to forest contribution to food security and nutrition**
- Inadequate knowledge on trees - Inadequate agronomic practices - forests limit arable land for crop production - Low soil productivity as a result of erosion caused by run-off - Reduction of predatory species - Proliferation of crop pests	- Enhances soil and water conservation - stabilizes river banks - grazing area for livestock - provide habitats for wildlife (bush meat) - mitigate the effect of climate change - Provide timber and bio-energy - help sustain agricultural production and productivity

- Continuous degradation of forest cover due to human interference - Impact of climate change - Prolonged gazeting of community forestry ownership - Conflicting agriculture and foestry policies over land use - Agro-forestry not adequately practiced - Limited knowledge and skills on forest management at local level - Policies not enforced and considered - Knowledge gap in entrepreneurship - Inadequate incentive for patrols - Lost of indigenous species in the forests (plants and animals) - Low awareness of communities in forest management and livelihood - Illegal lumbering - Bushfires - Low rainfall - Lack of proper control - Overgrazing - Limited sensitization on the effect of foresting - Inadequate data on forestry - Deforestation - Erratic rainfall - intensive logging - limited sensitization of farmers at the community level	e.g. vision 2020 - Provide social benefits to communities -- Source of medicinal herbs - Source of income - Contribute to rainfall - Provision of wild food - Breeding place for wild animals - Help in day to day feeding - - Timber for furniture - Non wood products - Forests serve as educational ground - provide oxygen

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?
- Low availability of qualified staff for information and knowledge gathering, processing, analysing and storage.
- Low opportunities for capacity building in the area of information and knowledge management.

b) What are the main capacity or resources limitations?
- Skills for information gathering
- Financial support to gather and manage the information and knowledge.

c) What are the main policy and institutional constraints?
- Building personal and institutional capacity

- Establish legal framework that are conducive to Biodiversity for food and agriculture.

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

- Review and update existing legal framework
- Assess capacity need and gaps
- Design and implement capacity building plan

49. With respect to the state, trends and conservation of wild resources used for food:

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

- Low availability of qualified staff for information and knowledge gathering, processing, analysing and storage.
- Low opportunities for capacity building in the area of information and knowledge management.

f) What are the main capacity or resources limitations?

- Skills for information gathering
- Financial support to gather and manage the information and knowledge.

g) What are the main policy and institutional constraints?

- Building personal and institutional capacity
- Establish legal framework that are conducive to Biodiversity for food and agriculture.

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

- Review and update existing legal framework
- Assess capacity need and gaps
- Design and implement capacity building plan

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?

- Low availability of qualified staff for information and knowledge gathering, processing, analysing and storage.
- Low opportunities for capacity building in the area of information and knowledge management.

b) What are the main capacity or resources limitations?

- Skills for information gathering
- Financial support to gather and manage the information and knowledge.

c) What are the main policy and institutional constraints?

- Building personal and institutional capacity
- Establish legal framework that are conducive to Biodiversity for food and agriculture.

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

- Review and update existing legal framework
- Assess capacity need and gaps
- Design and implement capacity building plan

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?

- Low availability of qualified staff for information and knowledge gathering, processing, analysing and storage.
- Low opportunities for capacity building in the area of information and knowledge management.

b) What are the main capacity or resources limitations?

- Skills for information gathering
- Financial support to gather and manage the information and knowledge.

c) What are the main policy and institutional constraints?

- Building personal and institutional capacity
- Establish legal framework that are conducive to Biodiversity for food and agriculture.

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

- Review and update existing legal framework
- Assess capacity need and gaps
- Design and implement capacity building plan

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

Production system Forestry			
Management practices21	**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**
Integrated Plant Nutrient Management (IPNM)	NK	NK	NK
Integrated Pest Management (IPM)	NK	NK	NK
Pollination management	NK	NK	NK
Landscape management (community forestry)	13%	1	Protection and sustainable utilization of forest resources
Sustainable soil management practices	NK	NK	NK
Conservation agriculture	NK	NK	NK
Water management practices, water harvesting	NK	NK	NK
Agroforestry	NK	1	This improves biodiversity for food by promoting different production systems at a unit area
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

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

Production system: Forestry			
Diversity based practices	**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)**
Diversification		NK	NK
Base broadening		NK	NK
Domestication		1	1
Maintenance or conservation of landscape complexity		2	2
Restoration practices		2	2
Management of micro-organisms		2	2
Polyculture/Aquaponics		1	1
Swidden and shifting cultivation agriculture		1	1
Enriched forests		2	2
Others [*please specify*		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.

The Action Programme is made up of the following program components:

A. Development and Promotion of Sustainable Agricultural Practices

- Integrated Soil Fertility Management
- Integrated Pest Management
- Improvement of Irrigation System Management

B. Livestock and rangeland management

- Carry out carrying capacity studies
- Provide effective animal health coverage
- Establish farmer cooperatives
- Promote homestead forests of species with high forage and soil conservation values

- Encouraged intensive production of small ruminants and poultry especially local species
- Provision of bore holes along the riverine areas

C. Conservation, Rehabilitation and Sustainable Use of Forest Resources

- Forest Fire Management
- Sustainable Production and Utilization of Forest Resources
- Rehabilitation of Degraded Forest Lands
- Participatory Forest Management

D. Wildlife

- Achievement of a number of CBD targets by increasing the coverage of the national PA system;
- Strengthen institutional capacity to enable expansion and decentralization;
- Development or updating of protected area management and business plans;
- Undertake studies to identify hotspots for country-wide coverage of park management.

E. Fisheries

- Inland fisheries;
- Aquaculture;
- Sustainable Management of Fisheries Resources.

F. Climate change

- Implementation of NAPA and NAMA
- Disaster Risk Reduction and Management;
- Land Use Suitability and Land Tenure Security;
- EWS

G. Strengthening Systemic and Institutional Capacity

- Policy and Legislation Development;
- Institutional Development;
- Information, Advocacy and Education for Policy and Public Support;

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

Types of practices	Major practice (Y/N)	Description	Reference
Over-use of artificial fertilizers or external inputs	N	Low affordability of fertilisers	(NARI) 2015
Over-use of chemical control mechanisms (e.g. disease control agents, pesticides, herbicides,	N	Low affordability of chemical	NARI 2015

veterinary drugs, etc.)			
Inappropriate water management	N	Very few irrigation facilities	
Practices leading to soil and water degradation	Y	Forest degradation, encroachment, overgrazing	GBoS 2013, DoF 2015
Over-grazing	Y	High concentration of livestock at particular areas and the effect of transhumance	NAP, 2015
Over-use of artificial fertilizers or external inputs	N		
Uncontrolled forest clearing	Y	Clearing of forest for farm land, settlement and road construction	NFA, 2009
Fishing in protected areas	N		
Overharvesting	Y	Unsustainable exploitation of forests for timber and fire wood	NFA, 2009
Others [*please specify*]			

The contribution of biodiversity for food and agriculture

Forest biodiversity provides a wide range of goods and services to humankind including economic, social, cultural, aesthetic and environmental values. Forests are crucial to the maintenance of life-supporting ecological systems, micro-climate regulation, maintenance of the water cycle, watershed protection, recycling of mineral nutrients, and provision of habitats for wildlife including migratory species. In addition to a modest contribution of about 1% to the GDP, the forests provide 85% of the domestic energy requirements in the form of firewood and charcoal, 17% of the timber need of the population and serve as important source of poles for construction as well as medicine and forage for livestock.

Results confirm that the population of The Gambia obtains a variety of products from the forest. Among the most harvested products from the forest are: Fuel wood (19%), Plants food (17%), Construction material (15%), Tea/herbs (11%) and Medicinal plants (10%). Results are shown below and are expressed in terms of percentage of weight. Similarly to the products mentioned above, the forest also provides a number of services to the Gambian people. The most important include: Windbreak, Grazing and Shade and Soil and Water conservation. These results yet again show the importance of forests to the livelihood of local communities (NFA, 2009).

From the socio-economic perspective therefore they hold great significance to rural livelihoods. Dryland forest ecosystems provide supporting services (e.g. soil formation and conservation), regulating services (e.g. water and climate regulation), and provisioning services (e.g. food, fuelwood, medicines). Specifically, the provisioning services play a direct role in sustaining rural livelihood, for example, *Spondiasmombin* and *Ziziphus Mauritania* are used for food and medicine, *Vitex grandiflora* is used for food and timber. The regulating and supporting services are significant in a larger context. Strong and healthy ecosystem services

are important for continued progress in sustainable agricultural and livestock production in the country (especially taking into account the country's vision 2016- attaining self-sufficiency in rice production).

Wild fruits and nuts and wild honey are collected from forests for self-consumption and in a few cases for sale, thus contributing to food security. *Detariumsenegalense* is among the most utilized species for their fruits. Forests also provide fodder for livestock. Animals graze in forest understory during the rainy season.

The state of the sustainable use of biodiversity for food and agriculture

According to the National Forest Assessment (NFA), 2009, the forest area comparison between 1981/82 and 1997/98 inventories and the National Forest Assessment of 2009/10 illustrate that the 1981/82 indicated [from] 505,300 ha of total forest area, or (44% of the total area of Gambia (1,130,000 ha)); whereas the NFA 2009-2010, estimated a forest cover of only 423,000ha, or 37% of the total area of The Gambia. This means that since 1983, 7% of the forest cover has been lost. One of the most significant losses (accounting for 73% of the overall forest loss) has occurred in mangroves, which were previously estimated to be approximately 67,000ha and are now estimated to be 35,700ha – a loss of roughly 47% of their previous cover. This translates to 1,080ha of mangroves lost each year, an alarming rate of decline over the last 30 years. These results therefore indicate that there is a net decrease of 97,000ha of forest and other wooded land from 1997/98 to 2009/10 with the species composition being narrowed even further. In spite of some uncertainty regarding data accuracy, NFA results show a process of continuing forest degradation and biodiversity drain that started in the early 1970s indicating unsustainable use of our biological diversity including for food and agriculture.

The proposed national policy and strategic programmes will specifically address environmental and forest deterioration and degradation, adaptation to climate change, soil and water conservation technologies, extension, farmer and institution strengthening and capacity-building activities.

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

Production system	Biodiversity component for which diversity is lacking	Extent of problems (2,1)	Effect on food security and nutrition	Effect on livelihood	Reference
NA					

The current off-take of biological resources for food and agriculture is unsustainable. Forest resource use patterns, especially in areas not covered by community forests and national

parks. is leading to serious forest degradation. As a significant part of rural population of the Gambia depends on forests and forest products for their daily income, fuel wood, construction materials, and traditional medicines, the forest biodiversity is increasingly being threatened.

Some Major interventions in the country

Title: Improvement of Fresh Water Availability
Sector: Water Resources
Project Area: All Regions
Beneficiaries: Rural communities with inadequate and unsafe drinking water supply

Rationale: Adverse climate change manifests itself in water resources in terms of too little, too much, and/or poor temporal distribution of rainfall. Shortfalls in aquifer recharge and base flow in particular are expected to affect water availability for domestic and agricultural uses. Water shortage in these sectors risks increasing poverty, and downgrading living conditions of rural communities.
Objectives:The overall objective of the project is to ensure adequate supply of fresh water and the reduction of the negative impacts of natural disasters.

Specific objectives:
· Reducing drought impacts on domestic water supply and uses in Agriculture
-Accessibility of water for rural women

OUTCOMES:
· Greater water accessibility for communities achieved
· Increased protection of infrastructure from extreme climate events developed

Title: Diversification and Intensification of Agricultural Production, Processing, and Marketing
Sector: Agriculture
Project Area: Central River, North Bank, Upper River, Lower River, Western Regions
Beneficiaries: Nationwide
Objectives:: The main objective of the project is to enhance food security, nutrition and socioeconomic livelihoods through agricultural diversification and intensification under increasing concentration of greenhouse gases in the atmosphere

Specific objectives:
· Increasing and diversifying agricultural production and productivity
· Establishing food processing and preservation plants
· Addressing the issue of infrastructural deficits
· Reducing demand and supply disequilibria of traded products
· Making agriculture a profitable economic activity

RESULTS:

- 14 (2 to 3 hectare size) vegetable gardens at 2 schemes per agricultural region (7)
- 60-hectare established tidal irrigated facility
- Increased multiplication and dissemination of root crops (cassava, yam,taro, sweet potatoes), NERICA, *findo*and short-cycle groundnut varietiesin 12 villages
- Strengthened crop evaluation and suitable crop variety dissemination capacities of the National Agricultural Research Institute (NARI)
- Reduced post-harvest losses of crops using appropriate technologies such as solar drier, cassava grater, and threshers, mills, etc.
- Strengthened and expanded outreach programme of the Food and Nutrition Unit
- Two established central fruit and vegetable processing plants

OUTCOMES*:*

- Sustainable increased production of vegetables and household foodsecurity;
- Rural-urban drift has been minimized
- Reduced importation of food
- Yam cultivation has been promoted and adopted in the target communities
- Increased diversified cropping systems and extensive adoption of suitablecrop varieties realized in project sites
- Improved nutritional standards and increased household food security andIncome realized in project intervention sites

Title: Expansion of Community Participation in the Management of Forests and Protected Areas
Sector: Forestry
Project Area: North Bank, Lower River, Western, Upper River and Central River Regions
Beneficiaries: Communities within project area of influence
Objectives:: The global objective of the project is to enhance the management of forest resources for continuous supply of products for sustainable livelihood

Specific objectives:
· Maintaining and improving productive functions of forest and woodlandecosystems
· Improving and maintaining biological diversity in forest and woodlandecosystems
· Minimising soil desiccation and soil movement caused by water and winderosion
· Empowering communities over/in their forest resource management.
· Enhancing capacity of local communities in forest management

RESULTS:

· Nine communities with management plans developed and adopted forsustainable forest management in project intervention areas
· 15 established district nurseries for the production of multipurpose treespecies for enrichment planting
· 162 knowledgeable villages in nursery production and management
· 162 equipped villages for fire-fighting and control

OUTCOMES:
· Sustainable forest resource exploitation strategies were adopted
· Ownership over the forest and its resources by the participatingCommunities was legalized
· Earning capacity of participating communities was boosted
· Well established network of community nurseries for large scale treePlanting in all the intervention sites
· Supply in forest resources increased by the end of the project
· Large areas of forest cover were regenerated while variety offorest resources became more available

Title: Expansion and Intensification of Agro-forestry and Re-forestation Activities
Sector: Forestry
Project Area: North Bank, Lower River, Western, Upper River and Central River Regions
Beneficiaries: Communities within project area of influence
Objectives:
The global objective of the project is to enhance the contributions of properly restored forest ecosystems to forest-based poverty alleviation and more broadly to other national economic goals; reduce the vulnerability of the affected stakeholders and increase their resilience to cope with climate change.
Specific objectives:
· Promotion and adoption of appropriate agro-forestry systems andreforestation
· Maintenance and improvement of the productive functions of forest andwoodland ecosystems
· Improvement and maintenance of biological diversity in forest andwoodland ecosystems,
· Slowing down topsoil degradation (desiccation, and transport) by waterand wind
RESULTS:

· 162 communities were enlightened in the value of agro-forestry and reforestationin the five participating regions
· Repertoire of 33 identified agro-forestry technical packages for adoptionin 11 villages within three (3) regions
· Agro-forestry technical packages for 11 villages within three (3) regions were developed
· 15 district nurseries for the production of multipurpose treespecies seedlings were established
· 162 villages were trained in nursery production and management

· 162 villages were equipped with fire-fighting and control gazettes
· 162 forest areas were identified
· An agro-forestry research unit was equipped

OUTCOMES:

· Widely-adopted agro-forestry and reforestation systems in 162 villages
· Multipurpose domesticated tree species and reforestation planting materials were supplied to intervening communities
· Large areas of forest cover were regenerated resulting to the availability of wide varietyof forest resources
· Capacity established on the production of tree seedlings for planting
· Conflicts and disputes reduced on resource ownership and use
· Scientific knowledge and information on agro-forestryand the state of the national forest cover has become more available

Title: Improved livestock and rangeland management for food security and environmental sustainability
Sector: Livestock
Project Area: North Bank, Lower River, and Upper River Regions
Beneficiaries: Farmers, Women, Community organizations, Extension services, Non-State actors (up to 41, 000 participants/dependents)

Rationale: Beef and dairy cattle as well as small-ruminant production in The Gambia is predominantly based on the free-range pastoral system. Accordingly, a substantial reduction in the productivity of natural pastures due to climate factors calls for the adoption of new approaches to livestock production.
Objectives:: The overall objective is to enhance livestock-based livelihoods to counter the threat from climate change.
Specific objectives:
· Preserving eco-systems
· Reducing poverty
· Increasing livestock productivity
RESULTS:
· Awareness was created through community training on livestock production systems
· Increased production of poultry meat and eggs for consumption andincome generation
· Increased soil fertility through organic fertilizer use
· Disease incidences were reduced
· Species diversification in terms of production was promoted
OUTCOMES:
· Food security improved and poverty reduced
· Improved nutrition of children and mothers
· Biodiversity conservation and reduced conflict between crop and animalfarmers
· Genetic improvements of local livestock species

· Land regeneration and reclamation of marginal lands

Title: Increasing fish production through aquaculture and conservation of post harvestfishery products
Sector: Fisheries
Project Area: Coastal and inland zones
Beneficiaries: Fishing communities along the Atlantic seaboard, fish consumers inurban areas and provincial towns and villages provisioned by theartisanal fisheries sub-sector
Objectives:: The main objective of the project is to make a positive contribution to povertyreduction, livelihood security and national food security.
Specific objectives:
· optimal exploitation of resources
· reducing climate/weather hazards and making fisheries a profitableeconomic venture
· reducing demand and supply disequilibria of fish and fish products
· exploring alternative measures of fish production
· produce fish for rural consumption through aquaculture

RESULTS

· Reduced pressure on capture fisheries
· Improved fresh fish quality through icing and chill storage,
· Reduced pressure on fuelwood resources,
· Improved fish availability and affordability,
· Increased economic activity for rural population,
· Increased economic activities at fish landing sites including non-fishingrelated activities such as restaurants, petty trading, etc.
OUTCOMES:
· Sustainable increase of fish supply,
· Environmental awareness and protection,
· Improved health condition of rural communities,
· Increased private investment in fish production through aquaculture,
· Stability of fish prices,
· Improved livelihoods security and personal safety at sea

A number of other donor-assisted programmes and projects are being implemented in the crop sub-sector, which includes: AfDB/IFAD/GOTG-supported PIWAMP, NEMA, FASDEP, and SLMP, which focus on enhanced land productivity, halt or reduce and reserve soil erosion through enhancing upland and lowland crop production ecologies by promoting lowland watershed management schemes, and improving upland conservation management.
Completed projects include the FMRIP, mainly co-financed by the AfDB and GOTG, focused mainly on rice production to enhance food and income security of the target beneficiaries through land preparation, tidal and pump irrigation. The GALDEP, co-financed by the IDB and GOTG, is involved in the preparation of the inland valleys of the nine districts of the West

Coast Region (WCR) for the production of rice and horticultural crops in a drive towards food and income security.
The GNAIP Programmes 1 and 5 and ANRP seek to complement and scale up as appropriate these interventions and utilize opportunities to expand suitable land and water management practices. The implementation of these national and strategic programmes will facilitate ANR sector development activities to adhere to environmental safeguards, and involve relevant international programmes and processes to mitigate and/or adapt to the impact of climate change, notably agricultural development. Present successful adaptation and mitigation options will be further deepened and have the potential to attract funding from the Biodiversity Convention, Global Environment Facility (GEF) and the UN-REDD Programme (Reducing Emissions from Deforestation and Forest Degradation), and Nationally Appropriate Mitigation Actions (NAMA) agreed at the Copenhagen Agreement under the UN Framework Convention on Climate Change (UNFCCC).

Application of an ecosystem approach

Most of the Gambian institutional frameworks promote an ecosystem approach to natural resources management. The Gambia Environmental Action Plan (GEAP-II, 2009-2015) calls for "the protection of existing forest and vegetative cover and the conservation of coastal wetlands". The Agricultural and Natural Resources Policy (ANRP, 2009-2015) which has amongst its four strategic objectives, food security, sustainable and effective management of natural resources is advocating for a multi-focal approach to natural resources management. The National Climate Change Adaptation Plan of Action (NAPA, 2007) recognises the need to promote and strengthen integrated management of the coastal and terrestrial zones and to preserve biological diversity and ecological assets. The Gambia Biodiversity Policy 2003 and National Biodiversity Strategy and Action Plan (NBSAP, 1999) and the National Action Programme (NAP, 2015) to combat desertification amongst both seek to "discourage uncontrolled extension of agricultural land into virgin forests, wetlands, marginal areas and other environmentally sensitive areas" and " the development of sound grazing management systems".

More importantly, because forestry activities are closely interrelated with that of other stake holders, collaboration with relevant institutions in the area of agriculture and natural resource management has become a high priority for the department of forestry. Such institutions (Agriculture, Fisheries, Livestock and Parks and Wildlife Management Departments) are recognised in view of developing synergy between them for efficient and effective program/activity implementation.

Table 24. adoption of and importance assigned to ecosystem approaches in production systems in the country

Production systems Code or name	Ecosystem approach adopted (name)	Extent of adoption (2,1,0,NA)	Importance assigned to the ecosystem approach (2,1,0,NA)
L2	IPM	2	2
C6	IPM	2	2
F6	agroforestry	1	1
M2	Mixed rice cultivation and aquaculture	1	1

61. LESSONS LEARNED

Host of Lessons were learnt in the implementation of the mentioned programs and plans which include but not limited to the need for effective coordination and the establishment of synergy in the different sector responses to the national biodiversity action plans for food and agriculture..The following have been important lessons noted from country initiatives towards implementing biodiversity and natural resource management activities:

1. Efficient use of Web-based electronic messaging, and data exchange is found to be key in successful coordination of multidisciplinary effort and the productivity of contributors
2. Inadequate (physical, biological, technical, economic) data as a serious challenge to sector monitoring, evaluation and data analysis programmes
3. The need for an effective multi-disciplinary National Technical Committee to provide effective leadership for the preparation and implementation of country programmes and initiative

Gaps and Priorities

62. The problem of access to information and also innovations combined are among the constraints for sustainable land management, in addition to the difficulties in accessing information concerning regulatory texts by the affected principal rural actors. The literacy rate as concerns western education is another hindrance. Especially worth noting among others are:

- The insufficiency of quality personnel and adequate infrastructure responsible for the diffusion of adaptive innovations in the field
- Proper communication in translations, as texts are formulated in an official language different from all the local languages

- Absence of or inadequate common information, education and communication strategy on SLM and likewise the monitoring and evaluation strategy, mainly due to the following constraints:
    - ✓ Insufficient qualified technicians;
    - ✓ insufficient financial and material resources;
    - ✓ Problem of governance at all levels.
- Though sectoral activities including on-the-job capacity building continue, but the field implementation of the Rio Conventions capacity building at the country level in general is seriously checked by financial and capacity constraints.
- Private sector involvement in resource conservation and -management is almost non-existent, presumably because it has not been adequately or appropriately promoted.
- Efforts to mobilize capital flows from domestic resources needs to be supported.
- About one third of the overall external development support to SLM is already administered by NGOs. The coordination of NGO activities should ensure complementarities.
- Coordinated implementation of the Rio Conventions capacity building at the country level is a necessity.
- Awareness raising programmes on DLDD that target the land owners, policy and other senior decision-makers, community/opinion leaders, CBOs on DLDD issues are needed.
- There is need for a coordination mechanism to oversee the implementation of the NAP and the strengthening of institutions and systems working in the area DLDD.

The policy and legislation governing the conservation and use of biological diversity in the Gambia is sector based in nature, most of which are obsolete, too rigid and/or formulated in a top bottom in approach. Although National Environment Management Act (NEMA), seeks to put in place a general framework for the conservation of biodiversity, its provisions are too general to serve that purpose. Provisions for public participation is virtually absent in the sector legislation, The regulatory regime is also riddled with gaps and serious legal conflicts. The situation is exacerbated by poor enforcement due to lack of trained staff, logistics, funds and other resources. The apparent gaps in the legislation include lack of explicit provisions for: ex-situ conservation, control of alien species and risks from genetically modified organisms, protection of threatened species and populations, regulation of access to genetic resources, protection of indigenous knowledge and intellectual property rights of local people and joint development and transfer of relevant technologies that use genetic resources

By and large, the existing sector legislation for biodiversity are not effective to assure successful conservation and sustainable use of biodiversity under the prevailing socio-economic circumstances There is need to overhaul the present sector legislation. Two options exit. One is to review the various sector legislations and replace them with new ones: the second option is to develop new framework of legislation on biodiversity, which are currently being pursued by the National Environmental Acts and other National protocols such as the NAP, NAMA, GAMSIF, NBSAP etc.

Chapter 5: The state of interventions on conservation and use of Biodiversity for food and agriculture

Current Institutional Set – up for collaboration

Presently, six line Ministries and their technical departments are of particular importance for UNCCD implementation. These are the Ministry of Agriculture, the Ministry of Local Government and Lands, the Ministry for Fisheries and Water Resources, Ministry of Forestry, Ministry of Parks Management the Environment and the Ministry for Trade, Industry and Employment.

Among the Government technical institutions, six have been in the forefront of sustainable natural resource conservation during the last years:

- ★ National Environmental Agency is designated to coordinate implementation of policy decisions on natural resources and environment.
- ★ The Department of Forestry, responsible for the sustainable management of all categories of forests in particular gazetted forest parks, spearheading initiatives to introduce community forestry and to transfer management responsibilities for State Forest to village-based organizations. Also Focal Institution for UNCCD.
- ★ The Department of Agricultural Services, responsible for the promotion of sustainable farming practices, agricultural extension and soil and water conservation.
- ★ The Department of Parks and Wildlife Management, the custodian of nature reserves, protected areas and wildlife in The Gambia. Also Focal Institution for UNCBD.
- ★ The Department of Livestock Services, being charged with responsibilities for rangeland management and maintaining a sustainable equilibrium between carrying capacities and stocking rates, and
- ★ The Department of Fisheries
- ★ The Department of Community Development, which serves as interface between rural population, social services, and the NGO -community.

All departments, in spite of remarkable efforts in the past, are constrained by severe budget problems, lack of qualified staff and responsibilities not being well defined or overlapping. With the majority of operational funds being provided by Donors and projects, Central Government finds itself amidst the well-known “dependency trap” for SLM according to The Roadmap. Reduced efficiency, in-sufficient outreach to the field-level and varying priorities according to the availability of (external) funds are the logical consequence in SLM.

At present, Local Government administrative structures fall under the responsibility of the Ministry of Regional Administration and Lands. The eight councils are empowered to raise local revenues, execute infrastructure and development projects, including environmental preservation. The role and function of Local Administration is well defined in the 2002 enacted Local Government Act. The goal of the Act is to entrench the principles and practices of good governance and multi-party democracy. Since its enactment, The Gambia

Government has undertaken a wide range of activities aimed at ensuring peoples participation in democratic pluralism, community development and natural resource management through the election of the councils. The Act provides for the creation of Natural Resources Management Committees to be established by each authority to enhance the decentralization of natural management including the implementation of the Rio Conventions. The Committees proper are yet to be established; though each region has a natural resources and environment working group. The Regional Coordinating Committee (RCC) is at the centre of decentralized development planning and is designated to assume a coordinating role in natural resource management and protection.

Non- Government Organizations/ Autonomous Agencies

The involvement of NGOs in natural resources management has been on the increase in recent years. To date, about one third of the overall external development support to SLM is already administered by NGOs. At the national level the NGOs are coordinated by the Non-Governmental Affairs Agency of the Ministry of Interior (MOI) and at sector level they are coordinated by The Association of Non-Governmental Organizations (TANGO). A fairly large number of NGOs implement projects in the agriculture and natural resources sector and thus impact on desertification and/or its control. Key among them are:

1) Action Aid The Gambia (AATG), three of whose seven sectoral programmes – Water, Agriculture and, Environment and Natural Resources – are direct tools to combat land degradation and induce sustainable land management and thus to combat poverty alleviation;
2) Catholic Relief Services (CRS) three of whose four major programme areas are central to SLM – Agriculture, Education and Micro-Finance, in particular gender issues in resource management;
3) Islamic Relief Association (ISRA) whose main programme, community-base Agriculture and Teaching Islam and the Environment, has a direct impact on desertification and/or its control;
4) Campaign for Development and Solidarity (FORUT) has a farmer training programme in agro-forestry and water resources;
5) Association for the Development of Women and Children (ADWAC) implements programmes in natural resource management and livelihood improvement at grass-root level, the NGO presently broadens its activities to neighbouring countries;
6) Natural Resources Consulting (NACO) implements programmes in natural resource management and training on forest management with government institutions;
7) Future in Our Hands and Stay Green Foundation are also both involved in promoting grass-roots participation in tree planting particularly with women and schools;
8) Freedom From Hunger Campaign (FFHC) implements programmes in agriculture and natural resource management with mainly women farmers and youths.

9) Association of Farmers, Educators and Traders (AFET)
10) National Association of Cooperative Credit Unions The Gambia NACCUFAC
11) Child Youth Support and Rural Development Agency (CYSARDA): Programme in Soil Erosion Control with government institutions.
12) National Beekeepers Association The Gambia Involved in promotion of beekeeping and agro forestry activities

In an effort to mobilize the rural communities to assume increasing responsibilities for their own development, the Government encouraged and facilitated the creation of a number of community - based institutions.

External Development Partners

As in all developing countries in the world, donor partners play the key role in the socio-economic development of The Gambia. The profile of The Gambia's development donor partners includes the international donor agencies, bilateral donors and Non-Government Organizations (NGOs).

The international donor partners include the United Nations agencies and Non-United Nations system partners. The most prominent donor partners of The Gambia are the Bretton Woods Institutions, African Development Bank (ADB), United Nations Capital Development Fund (UNCDF), the European Union (EU), the European Development Fund (EDF), United Nations Development Programme (UNDP), International Fund for Agricultural Development (IFAD), the World Health Organization (WHO), United Nations Educational Scientific Cultural Organization (UNESCO) and the United Nations Children Fund (UNICEF). Principal among the country's bilateral donor partners are Great Britain, United States of America, The Netherlands, Italy, Switzerland, Belgium, Commonwealth countries, AU States, Japan, the Federal Republic of Germany and Taiwan.

71, has your country identified any obstacles to developing and implementing legislation that would protect associated Biodiversity? List and describe initiatives in table 25.

Table 25 : obstacles to developing and implementing legislation that would protect associated Biodiversity in the country Not available

Components of associated biodiversity	Obstacles to legislation for protection of associated biodiversity
	NA

To our Knowledge, there is no obstacle to developing and implementing legislations in the Gambia. The legislations are available and are implemented. The financial aspect of the periodic review and updating might be the major hindrance .

Policies, programmes and enabling frameworks governing, exchange, access and benefits.
The Gambia has ratified the Nagoya Protocol on ABS on the 21st of May 2014 and becoming the 46th country party to the protocol. A road map for the implementation of the protocol was prepared and validated. With the following mission:

- To conduct resource inventory as well valuation of the genetic resources of the Gambia.
- To document the Traditional knowledge associated with the GR and
- To enhance the livelihood of the local people

Presently the country is working with its partners to secure funds to put in place required legislative framework that will ensure the smooth implementation of the protocol.
Tableau 26 : Policies and programmes governing the access to its genetic resources of associated biodiversity established in the country.

Component of associated biodiversity	Intended use (eg: any use, research and development, commercial use)	PIC and Benefit sharing required (y/n)
	Not yet available	N

Information management

74. list and describe any linkages between sector information systems of Biodiversity for Food and Agriculture at national level. Where possible provide examples of best practices or lessons learned.
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 system
The Biodiversity clearing house	All components	This is the CBD clearing House of the Department of Parks www.chm-gambia.org or www.thegambiawildlife.com
IMS at the National Environment Agency	All components	An integrated system for data collection , processing and storage at the NEA Headquarters for future use by all stakeholders

76. has your country established information systems intended to support maintenece of traditional knowledge on biodiversity for food and agriculture including associated biodiversity?

No

Stakeholder participation and ongoing activities that support maintenance of Biodiversity for Food and Agriculture

77. list the most stakeholder groups , including groups or associations of farmers, forest dwellers, fisherfolks and pastoralists, NGO's or other civil society organization active in the conservation of Biodiversity for food and agriculture. Briefly summarise their scope, objectives and any outcomes to date. Where possible provide examples of best practices or lessons learned.

- Forest- Farmers platform
- Women rice growers association
- Fishermen and fish mongers association
- Gambia Herders association
- Food and Agriculture Organisation and other UN bodies (UNDP, UNICEF,…)
- TRY women oyster association.

78.**Describe any incentive or benefit 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 extends and the stakeholders involved (including provisions on gender balance if any). Indicate any lessons learned or planned development incentives.**

Numerous projects implemented or presently ongoing have intervened in supporting the community livelihood components geared towards improving the living condition of the rural poor especially women. Projects such as Integrated Coastal Aand Marine Biodiversity (ICAM) I & II, Gambia Biodiversity Management and Institutional Strengthening (GBMIS), Country Portofolio Agreed Program (CPAP), GEF- Small Grant Program (SGP) , West African Agricultural Project (WAAP) (I,II & III) and several others have provided seed money for the women Banking initiative in the North Bank Region, enforced bee-keeping programmes and re-orient oyster harvesting techniques. The local communities of Gunjur, Abuko, Lamin, Fagikunda, Niumi and other oyster collection hotspots are benefiting on the schemes established for oysters plantation and mangrove regeneration in the Tanbi, Niumi and Bao Bolong national parks and reserves.

Biodiversity and food security are important as they are relevant for the socio economic development, and women's role as primary land resource managers are crucial for the attainment of the set targets. For example women account for 60-80% of all production in the Gambia. According to the 2003 census Data 45% of the 482,439 economically active populations are women occupying 61.9%of the unskilled labour force and 16.45% in the fishing sector. They also form almost 90% of the oyster and cockle harvesting and production but lack the appropriate skills and techniques to properly process, package and market their products.

Women constitute 70% of the world's poor. They are often responsible for household food and energy production, family nutrition and health, the management of natural resources, and the maintenance of biodiversity. However women are very often disadvantaged in employment, wages, resource ownership, access to credit, education, health, sanitation, and other government services

Women are also a huge untapped, or underutilized, asset in the conservation andsustainable use of biodiversity. Not only do they compose roughly 50% of the population, they are also parents, educators, healers, farmers, leaders, innovators, and organizers, and as such can be extremely useful in advancing the cause of biodiversity.

79. list up to 10 major projects (either in progress or completed in the last 5 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 component of Biodiversity, the production system and area covered and the results , outcomes and lessons learned. Project describe in sector reports needs not be describe here.

(please refer to major intervention project on page 68)

80. list in table 28 up to 10 major landscapes based initiatives to protect or recognised areas of land and water in your country of particular significance for Biodiversit for Food and Agriculture.

Table 28: Landscape based initiatives to protect or recognize areas of land and water of particular significance for biodiversity for food and agriculture.

Landscape based initiatives	Description of sites and their characteristics of relevance to Biodiversity for food and agriculture	Extend (ha)
Abuko Nature Reserve	1968 The first Protected area in the Gambia	134
Kiang West National Park	1987 This includes the Extension	19,051
Niumi National Park	1986 First transboundary RAMSAR Site in Africa (Niumi-Delta)	7,758
Boa Bolong Wetland Reserve	1993 Was designated a RAMSAR site in 1996	22,000
Tanji Bird Reserve	1993	612
Tanbi Wetland National Park	Declare a RAMSAR site December 2002	6034
River Gambia National Park	managed as a project	589
Jokadou National Park	In the process of designation	15028
BolongFenyo Community Wildlife Reserve	The first community owned reserve established	320
Bamako Community Conservation Area	In process Process framework virtually completed	1032 ha
Barrow Kunda Community Conservation Area	In process	359 ha

Badari Community Conservation Area	In process	2ha
DembaKunda Community Conservation Area	In process	7ha
Kass Wolof Community Conservation Area	In process	24ha
Chamen Community Conservation Area	In process	32has
FarabaBantang Community Conservation Area	In process	502 ha
PakauNjogu Community Conservation Area	In process	59ha
Kassagne Community Conservation Area	In process	132ha
Kanuma Community Conservation Area	In process	47ha
Tintiba and Dumbuto Community Conservation Area	In process	172.3ha
Berefet Community conservation Area	In process	984.9 ha
Bintang Community Conservation Area	In process	1184.9ha

81. Collaboration between institutions and organizations

Conservation, management and development of natural resources have been the shared responsibility of a multitude of actors since the passing of the Banjul Declaration in 1977. The main players include Governmental and Non-Governmental Organizations along with numerous projects and programmes, supported by external Donors and Financing Agencies. Noteworthy is the almost complete lack of private sector involvement, may be due to limited commitment both from the side of the authorities and the private sector.

Inter-sector staff agencies and coordinating councils have been introduced with a view to streamlining and strengthening environmental activities at central and local government levels which cut across sector boundaries. The NEMC has overall responsibility for environmental policy making and coordination at the national level. The Agriculture and Natural Resources Working Group (ANR-WG) is responsible for the coordination and harmonization of all cross-sector natural resources development issues and is therefore of immediate importance for desertification control and SLM. A second, sector specific coordinating body under NEMC is the National Water Resources Council (NWRC). NWRC is specifically responsible for overseeing the national water resource development policy and related projects. The present institutional setup as concerns the implementation of UNCCD

and similar to the other Rio Conventions is demonstrated in figure 7 with considerations of institutional framework endorsed in NAP 2000.

At the decentralized regional level, the indicated ministries are represented by their respective institutional regional heads and include the Council/Municipal Chairperson/Mayor in the Regional/Municipal Advisory Committees (RAC/MAC), which is chaired by the Regional Governor/Mayor. The RACs like the ANRWG has also established sub-committees such as the environment sub-committee.

Central Government Agencies

On the side of Government, sustainable natural resources management is been dealt with at three levels:

- Line Ministries and their technical departments,
- Local Government organizations, and
- Inter-sectoral staff agencies and co-ordinating councils.

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

2011-2020 Biodiversity Strategic Plan and Aichi Targets

The CBD Strategic Plan for Biodiversity 2011-2020 and its Aichi Targets adopted in October 2010 (Decision X/2) is an ambitious new plan that provides an overarching framework for all the biodiversity–related conventions and biodiversity issues at national level. The Gambia NBSAP sets the National Biodiversity vision for the five strategic goals.

For the implementation of these global strategic goals, the Gambia has adopted the 20 Aichi Targets. For each Goal, a set of Targets have been defined and provide the orientation to identify actions which will enable the redress of specific issues that contribute to the loss of biodiversity. The action plan adopts a flexible approach. Ecosystem-based specific targets are not in exclusion of the general targets but ensure that specificities of ecosystems are taken into consideration. Priorities for the Strategic Goals and Targets, also set a flexible stage for sector-based intervention based on the specificity of each sector, and give the responsibility to each sector to lead in a highly consultative manner, in the process of defining sector based priorities. Again, the targets provide a context for developing large and medium size projects with a focused orientation in addressing key challenges of biodiversity.

In a systematic approach, priority actions have been identified for each target. While the actions identified may not be exclusive for intervention, these actions constitute the high priority and medium priorities for interventions that will enable a significant contribution to the realization of the goals within the defined time frame for the plan. The actions have also been translated into a matrix to enable an effective determination of the time frame for action, performance indicators and the actors/organizationsresponsible for the implementation.

In compliance with milestones set in the implementation strategy, setting the time frame for intervention seeks to be in coherence with both national and global processes. The time frame by 2020 for all targets is the preferred option and is compliant with the commitments made under the Convention on Biological Diversity and enables coherence with the timeframe of the 2011-2020 Strategic Plan for the Convention and the Aichi Targets for Biodiversity.

THE IMMEDIATE GAMBIA BIODIVERSITY NATIONAL TARGETS, derived from the convention's Aichi biodiversity targets are as follows. This will be the guideline for action for the future implementation of the convention.

- By 2020, 50% of Gambia's population are aware of the values of biodiversity
- By 2020, biodiversity values are integrated 100% into national and local development and poverty reduction planning processes and national accounts
- By 2020, 50 % Governments, business and stakeholders have plans for sustainable production and consumption and keep the impacts of resource use within safe ecological limits
- By 2020, the rate of biodiversity loss, forest fragmentation and land degradation is reduced by 50%
- By 2020, 60% of all fisheries stock within spawning areas are protected, while the use of wrong gears regulated 40%
- By 2020, 50% of areas under agriculture, aquaculture and forestry are managed sustainably, ensuring conservation of biodiversity

- By 2020, 50% of pollution, including waste and agro and industrial chemical has been brought to levels that are not detrimental to ecosystem function
- By 2020, reduced occurrence and introduction of invasive species by 50%.
- By 2020, communities dwelling in flood prone and watershed areas are reduced by 50%
- By 2020, all vulnerable ecosystems impacted by climate change minimized at least 20%
- By 2020, at least 5 per cent of terrestrial and inland water, and 15 percent of coastal and marine areas are conserved through systems of protected areas
- Target 12: By 2020, 35% of known threatened and rare species has been prevented from extinction and 50% extinct species reintroduced or restocked
- By 2020, 35% of the genetic diversity of cultivated plants and farmed and domesticated animals and of wild relatives is maintained
- By 2020, poverty would be reduced by 10% of poverty driven communities to reduce pressure on natural resources significantly
- By 2020, ecosystem resilience and the contribution of biodiversity to carbon stocks has been enhanced, through conservation and restoration, including restoration of at least 50 per cent of degraded ecosystems,
- By 2020, the Nagoya Protocol on Access and Benefits Sharing is in force and operational
- By 2015 The Gambia would have adopted as a policy instrument, and has commenced implementing an effective, participatory and updated NBSAP
- By 2020, the traditional knowledge, innovations and practices of indigenous and local communities and their customary use, are respected.
- By 2020, knowledge, the science base and technologies relating to biodiversity, its values, functioning, status and trends, and the understanding of consequences of its loss, are improved, widely shared and transferred, and applied

- By 2020, the mobilization of financial resources for effectively implementing the Strategic Plan for Biodiversity 2011-2020 from all sources,, should increase substantially by 35% through the Agriculture and Natural Resources Working Group.

83. Future actions planned to support efforts in addressing Aichi Targets as they may apply to the conservation and sustainable use of biodiversity for food and agriculture

NBSAP priority project ideas could not be translated into bankable project proposals for funding. Finally, the NBSAP was not considered a policy document but rather a strategy.

However, the revised NBSAP ~~i~~nvisages to mainstream biodiversity issues into sectoral and cross sectoral policies, programs and plans, that will enable the acceptance and adoption of the concept of mainstreaming of issues of biodiversity and ecosystem services for human well-being into national or local plans, policies and programmes. All the issues that prevented the full implementation of the NBSAP (1999) are being analyzed objectively with the full participation of all stakeholders.

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
Programme Regional Pour la Conservation Marine	**R**	**Partnership for the conservation of coastal and Marine resources in west Africa**	**www.prcmarine.org**
Reseau des Aires Marine Protegees De L'Afrique de l'Ouest	**R**	**A network of marine protected in west Africa**	**www.rampao.org**
Convention of Biological Diversity	**I**	**Convention of Biological Diversity**	**www.cbd.int**

CILSS	**R**	**Interstate committee to combat drought in the Sahel**	**NK**
CCD	**I**	**Convention to Combat Desertification**	
SRFC	**R**	**Sub regional Fisheries Commission**	

Capacity development

Education

The Gambia Education Sector Strategic Plan (2006-2015), which is derived from the National Education Policy 2004-2015, has been a significant guiding document for the provision and management of education in general in The Gambia. The Strategic Plan spells out the basic and secondary education sector's priorities, goals, achievements and outlines the strategies and activities that should be implemented to achieve the overall objectives of the education sector. The plan also identifies indicators and tracking mechanisms for monitoring and evaluating the implementation of the six programme areas, namely: basic education, secondary education, quality assurance, higher education, technical vocational education and training (TVET) and sector management.

Before the establishment of Ministry of Higher Education, Research, Science, and Technology (MoHERST) in 2007, the National Education Policy 2004-2015 provided the framework for educational development in The Gambia, with a section on tertiary and higher education matters. With the creation of the Ministry of Higher Education, Research, Science, and Technology (MoHERST), tertiary and higher education has been defined in different ways based on the contextual environment of various educational systems. However, there are few public tertiary and higher education institutions in The Gambia, and only one public university (University of The Gambia) offers degree programmes. As a result, the country continues to grapple with the need for trained human resources at all levels and in all sectors, including the Agriculture and Natural Resource (ANR) sector. Furthermore, it is essential to harness public-private partnerships, while ensuring that the much needed human resource base is built.

85. Training and extension programmes, or elements of programmes, at all levels that target the conservation and sustainable use of associated biodiversity

Research and training are important tools for in the conservation and sustainable use of biodiversity. The importance of research, identification and monitoring of biodiversity is highlighted in preamble and articles 7 and 12 of the CBD. [n The Gambia, research and

training in areas related to biodiversity has been low. Almost all agencies responsible for the conservation of biodiversity in The Gambia lack the required human resource capacity to effectively and efficiently manage their various sectors. Training of personnel in the various biodiversity sectors is therefore a key priority. This should not be limited to staff on the professional cadre, but should extend to administrative and enforcement officers as well as local communities in biodiversity conservation. On the other hand, legal and policy provisions for research on biological diversity are non-existent in most of the relevant sector legislation and conservation programmes. NEMA has few general provisions on research which should be implemented by the NEA. It is important that such provisions be included into the various sector legislation as it greatly helps the identification and monitoring requirements under the convention.

Strategies:

· Carry a training needs assessment for professionals and extension staff in all the sectors responsible for biodiversity conservation.

· Develop a biodiversity training programme in the critical areas including; taxonomy, assessment and monitoring methodologies, conservation and ecosystem management techniques, economic valuation of biodiversity, policy analysis and integrated resource planning.

· Establish and equip biodiversity research institutions and strengthen the research and information dissemination programmes.

· Identify research priorities and design and implement targeted research programmes

Higher education programmes that target the conservation and sustainable use of associated biodiversity genetic resources

Institution	**Programme**	**Level**	**Enrolment**		
			Total	Male	Female
University of the Gambia	**Agriculture/Environment**	**Bsc.**	**251**	**130**	**121**
University of the Gambia/ WASCAL	**environmental sciences / climate change**	**Msc**	**10**	**5**	**5**

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

Major institutions directly involved in research on the conservation and sustainable use of associated biodiversity.

National Agricultural Research Institute (NARI):

Institutional mandate: Created in 1993 to take over the activities of the former Department of Agricultural Research and Agricultural Engineering Unit, is presently responsible for research on agriculture and natural resources which include livestock, forestry, fisheries etc. The broad mandate requires the reorganizing of the existing research programme to incorporate the other components

University of The Gambia:

Institutional mandate: Training, Research and awareness programmes in environmental education while producing graduates in multifaceted disciplines including agriculture, medicine/health, social sciences and management

Gaps and priorities on information, capacity, and policy, institutional constraints and required actions

The conservation of biodiversity in The Gambia is hampered by several constraints that are common to all the sectors. The major constraints include the following; lack of equipment andother logistics - transport, fuel, office supplies, etc; limited trained manpower and under staffing;inappropriate and outdated laws and policies; poor institutional arrangements; lack of adequate funding; and poor infrastructure- roads, communication facilities.

1. **Lack of data**: The biggest gap to the conservation and sustainable use of biodiversity in The Gambia is perhaps the lack of data and information on the status and distribution of biodiversity.
There is no up to date data on the structure, taxonomic composition and distribution of most of the components of biodiversity. This has significantly hampered effective planning and rational decision making. Likewise, there is no biodiversity assessment and monitoring system in place

2. **Lack of community involvement**: The second major gap is lack of community participation. Most of the conservation activities, save the community forestry initiative, are still government
driven, with little or community involvement in terms of management responsibili**ty** and benefit sharing. There is low participation of NGOs and citizen groups in conservation activities

3. **Low awareness**: The other gap relates to the lack of awareness of the utility value of the genetic resources and thus undervaluation of biodiversity in the national accounting system. There is little understanding of the contribution made by genetic resources to the social and economic development of the country and the methodologies for determining the economic value of biological resources. The lack of awareness is reinforced by lack of technical expertise already mentioned

4.**Inadequate overall legal, policy and institutional framework for biodiversity conservation:** There is inadequate policy and/or legislation on biodiversity. Biodiversity is managed under several sector laws. However, certain key areas such as bio-safety, access to genetic resources, control of alien species and others are not covered in the existing sector legislation and policy frameworks

5. **Poor coordination**: Although many institutions are involved in biological diversity related to activities, there is poor coordination in so far as conservation and utilization of biological resources are concerned. Biodiversity conservation is still a piecemeal activity undertaken by the traditional sector agencies- wildlife, forestry, fisheries, etc. Each institution seems to follow its own sector mandate with the result that there is duplication of work and inefficient use of the scarce resources. There is no integrated land use planning or ecosystem approach to conservation.

PRIORITY ACTIONS

Priority actions will contribute to the achievement of the Strategic Plan for Biodiversity (2011-2020) as well as address the set national biodiversity targets.

1 To promote research to enhance ecosystem management and protection with special emphasis on science policy linkages
2. To review and update the existing pieces of legislation, and harmonize these with non-forestry legislation and ensure compliance
3. To ensure the full and active participation of traditional authorities, landowners, communities and other stakeholders in the management of protected areas

4. To strengthen education and awareness creation at all levels of society, especially among those whose livelihoods depend on the protected areas and forests
5. To strengthen, ensure and promote networking and partnership between stakeholder institutions, the private sector and civil society.
6. To introduce appropriate environmental management and monitoring tools to measure changes
7.. To empower grass roots administrative structures to enact bye-laws for the management, use and protection of biological resources and biodiversity
8. To promote economic and social incentive measures that contribute to environmental sustainability

89. Stakeholder participation and ongoing activities that support maintenance of biodiversity for food and agriculture and collaboration between institutions and organizations:

-Major gaps in information and knowledge

-M**ain capacity or resources limitations**

-Main policy and institutional constraints

-Actions required and the priorities

Whereas inadequate technical and human capacities are some of the hallmarks of widespread poverty and underdevelopment in LDCs, on-going and projected climate change is likely to place further strain on the Gambia's already over-stretched resources.The only way out of this difficult situation is to strengthen capacity at different levels of social organizations, and in both public and private sectors. The true extent of the human capacity deficit is not known with any accuracy, but a National Self-Assessment Capacity Study by Jallow and Gomez (2003) provides an insight into the technical, management, leadership skills needed within the public sector for effective management of natural resources. If used as a tool for NAPA implementation, its scope would have to be re-defined and capacity development in the informal and private sector assessed. Government could assist people to build/strengthen their adaptive capacity through participatory planning/multi-stakeholder processes, which favour the kind of proactive learning needed for continuous assessment of climate risks, and effectiveness of measures deployed.

91. Knowledge generation and science for the management and sustainable use of biodiversity for food and agriculture: -Major gaps in information and knowledge Main capacity or resources limitations , Main policy and institutional constraints Actions required and the priorities

Poorly documented/researched changes in natural vegetation cover types (gallery forest, closed woodland, herbaceous/grassland savannah, etc.) species composition and die-back phenomena associated with climate variability and change could benefit immensely from biome modeling to substantiate current assumptions, and also incorporate human influence on forest cover. Wetland and mangrove destruction on estuarine productivity and fisheries production also command a high priority

Considering that forest and rangeland resources are central to biodiversity conservation, ethnomedical practice, livelihood security, and quality of life for a significant part of the population, a well-designed and executed national forest survey/inventory is also in order. Species abundance, endemicity, and direct threats would logically determine conservation priorities. Agriculture, energy, and forest policy interactions should also be investigated for tradeoffs and synergies. _ Research conducted to date also suggests the need to move away from the narrow concept of food security based on crop production to a nutrition-based assessment. Thus, policies/adaptation options in food production sectors (e.g., fisheries and livestock) should be cross-compared for synergies and tradeoffs. Other dimensions including equity, sustainability, and international trade also need to be factored in such assessments.

CHAPTER 6: Future agendas for conservation and sustainable use of biodiversity for food and agriculture

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:

This Action Program enshrined in the National Action Programme (NAP) draws its fundamental essence from the country's overarching development philosophy of Middle Income Country. It shall first and foremost contribute to the objective of environmental sustainability whilst also directly or indirectly contributing to poverty alleviation, food security, economic growth, and human safety.

INSTITUTIONAL STRENGTHENING

The NAP also incorporates the strategy for Current institutional capacity development with ways and means of improving capacity and operations of institutions. Against this backdrop, the NAP proposes the following plans and actions:

a. Develop the human resource capacities needed for sustainable land management (SLM) through training in satellite imagery interpretation and GIS, and to use it for monitoring and analyses related to SLM.
b. Identify equipment and resources needed to develop a regulatory framework
c. Identify mechanisms for inter-sectoral collaboration between the public and private sectors including CSOs.
d. Planning strategic objectives, developing procedures, conducting baseline surveys and work plan preparation
e. Develop and adopt a land and soil conservation manual.

PUBLIC EDUCATION AND AWARENESS

Combating land degradation and steps towards rehabilitation will require strong public support. Accordingly, the following public education and awareness have been proposed:

a. Schools will be targeted by the public and private sectors as well as the CBO community to educate the youth about the processes of Desertification, Land Degradation and Drought(DLDD). Additionally, the school curriculum on the environment will be enhanced by focusing on ecosystem and biodiversity issues.
b. Tailor special programmes for adults by relating land degradation concerns to the everyday economics and livelihood of the population.
c. Specific target groups (for e.g., those who cut wood for charcoal and, farmers) will receive special awareness building and sensitivity training.
d. Appropriate pieces of legislation will be strengthened and upgraded.
e. Establish collaboration with other UN Environmental Conventions particularly, Biodiversity and Climate Change.

STAKEHOLDER INVOLVEMENT

Conservation, management and development of natural resources have been the shared responsibility of a multitude of actors since the passing of the Banjul Declaration in 1977. The main players include Governmental and Non-Governmental Organizations along with numerous projects and programmes, supported by external Donors and Financing Agencies. Noteworthy is the weak stakeholder involvement which may be due to limited commitment both from the side of the authorities and the stakeholder community. Hence the following actions were proposed in the NAP:

a. Provide clear guidelines for environmental management and the rehabilitation of land.

b. Introduce community management of open land spaces used for pasturing.

c. Provide training in pasture and rangeland management and animal husbandry.

PRIORITIZATION OF ACTIONS AND TARGET AREAS

Given that a number of studies on climate change adaptation, biodiversity conservation and SLM have been done in The Gambia, antecedents were established to help prioritize ecosystems and target areas for SLM interventions. In particular, SLM options have been recommended by technical studies, proposed by all biodiversity stakeholders, and validated through various national programmes and reports. Available frameworks provided clear indications of stakeholder priorities on a sector basis, as well as potential/desirable project intervention areas.

Among the areas of concern are the mangroves in BintangBolong and Jokadu National Park which have a high mortality. The Bintangbolong estuary, being a shared water body meandering between Foni Districts and Kiang West in The Gambia and Casamance in South Senegal, suffered serious degradation due to development of two blockades across it. As a result, hyper-salinity increased and mangrove mortality increased, the biodiversity of the water body was degraded, and fish stock disappeared. Communities depending on these resources have been devastated, and many former residents of the area have migrated.

Prioritization was also based on the present status of ecosystems in the country. Project profiles prepared recently by the Forestry Department with the execution of FAO, indicated that degraded agro-ecosystems in NBR and Gimara are of great concern.

Almost 90 percent of the NBR is suffering from land degradation, while 10 percent is undergoing serious deforestation. The productivity of the soil is declining annually, resulting in poor crop yield. In response, many people smuggle persistent organic pollutants across the border with Senegal to increase crop yield. Land productivity is being reduced gradually, and

some intervention is needed to increase soil fertility, control erosion and sedimentation and siltation of wetlands.

Along the Atlantic coast, coastal and marine ecosystems and littoral forest of The Gambia are negatively impacted by climate change and the influences of urbanization. As urban settlements expand, the littoral forest is disappearing at a faster rate. Presently, the most serious issue is coastal erosion which is eroding the islands of Jinack, Niumi National Park, Brufut Beach (opposite Bijol Island, the coastal beach from the Senegambia Hotel to Banjul, and the KartongAllahein River. For this reason, numerous programmes are presently being developed to initiate interventions that will help to mitigate the rate of erosion.

The freshwater ecosystem along the River Gambia is also constrained by Stalinization and over flooding of wetlands. Most inland water bodies have dried up changing the land form. Land degradation on the edge of the river is causing erosion and siltation, and as such massive replanting of the freshwater ecosystems is necessary.

In view of the dearth of up to date data on the severity and extent of land degradation in the country, activities that will be implemented as part of this Preliminary GAMSIF will not be based on a prioritization of the various Regions and/or AEZs of the country. Instead, the interventions will be based on local assessments of land degradations, and prioritized according to the national guidelines developed. Furthermore, data generated from the GAMSIF surveys of the country's land and other natural resources will help prioritize interventions of the subsequent SLM investment frameworks.

Actions required

1. Intensify restoration of degraded Mangrove ecosystems
2. Prevention of soil acidification and its effects on the biodiversity of Tanbi Wetlands Complex through efficient urban waste management
3. Mitigate forest cover loss and land degradation through restoration and designation of community managed protected areas in the NBR and Gimara
4. Modeling of conservation tillage is important to promote sustainable soil conservation

Gambia Sustainable Investment Framework (GAMSIF) PLAN

The GAMSIF has planned actions for the next 5 years (January 2016 – December 2020) and will be implemented in two phases:

> ***Phase 1 (January 2016 – December 2018)*** will focus on developing the SLM knowledge base, creating the necessary enabling policy, legal, institutional and financial environment, and building the capacity of the advisory and other support service providers. It will also initiate the process of planning and implementing area-based investment projects for the promotion and scaling up of SLM within those areas identified as in immediate need of attention.

Phase 2 (January 2019 – December 2020) will build on experience gained from Phase 1 to review, and further improve, the enabling environment and institutional capacity, while expanding the area managed according to the concepts and principles of SLM through the planning and implementation of additional area based SLM investment projects in those areas considered as next in need of priority attention. Phase 2 will also address the remaining knowledge, policy, legal, institutional and financial barriers and bottlenecks, and continue the process of promoting and scaling up SLM through the planning and implementation of area based SLM investment projects for the future full-blown GAMSIF priority areas.

Derivation of prioritization criteria

GOAL	OBJECTIVE	CRITERIA	UNIT	PRIORITIZATION CATEGORY
Improve the livelihoods and economic well-being of the country's farmers, herders and forest resource users (*by scaling up SLM practices*)	Greater financial security (reduced household poverty)	Productive investments	GMD/Year	Economic
		Savings		Economic
		Annualized benefits		Economic
		Forced sale of assets	Nominal	Economic
		Food security	Months/Year in which there is food security	Economic
	Increase in employment opportunities	Employment rate	percent of population	Economic
		Off-farm employment	percent of labor force	Economic
		Out-migration	Percent of population	Social
	Lesser dependence on emergency relief/assistance	Strength of dependency (on emergency relief)	Ordinal	Social
	Reduction of resource-use conflicts	Overt cases of land use conflict	Cases/Year	Social
Rebuild the Gambia's natural capital assets (*by overcoming the causes, and mitigating the negative impacts, of land degradation on the structure and functional integrity of the country's*	Preservation of forest cover	Loss due to construction	Ha/Year	Environmental
		Conversion to farmland	Ha/Year	Environmental
		Species availability	Ordinal	Environmental
		Gallery forest	Km^2	Environmental
	Restoration of soil health	Decrease in rate of degradation	Ha/Year	Environmental
		Land suitability (for crop production)	Development costs (GMD/Ha)	Economic

ecosystem resources)	Maintain and improve landscape and ecosystem services	Rangeland productivity	g C/m^2	Environmental
		Population pressure	Users/Ha	Environmental
		Maximum abstraction/extraction rate	Abstraction/Year (e.g. MT/Year)	Environmental
	Increase in recreational opportunities	Recreational activities	Activities/Year Participants/Year Women and Youths/Year	Economic

SOURCE: GAMSIF

As GAMSIF forwarded cross cutting priority actions to implement the sustainable investment framework on biodiversity for food and agriculture, NAPA developed comprehensive sector based projects to address the top six adaptation options in relation to crop production, water resources management, and forest woodland management, coastal zone management, marine resources management, livestock production, energy, and health sectors.

The projects are to address the following priority intervention areas

- Impairment of ecosystem goods and services
- Amplification of adverse effects of climate change by human factors
- Food security and sustainable livelihoods
- Poverty reduction and equity
- Technology acquisition, innovation, and diffusion
- Inadequate strategies for dealing with moving target (incremental effects of climate change).

National Biodiversity Targets

The Gambia Biodiversity National Targets, derived from the Aichi targets will be the guideline for action for the future implementation of the convention. The Gambia has developed 20 Biodiversity Targets that will expect to be attained from 2015 to 2020.

- ❖ The Targets were developed through a participatory process involving various stakeholders such as Government institutions, civil society organizations, Local authorities and communities, private sectors, individual entrepreneur among others. Such processes enabled the analysis of existing realities of the country such as level of threats, Government priorities, existing capacity, lessons from the implementation experiences on the three pillars of the CBD, and associated global provisions of the Strategic Plan 2011-2020.

In a logical framework, the Biodiversity Strategic Goals and Targets have been translated into general actions for interventions with specific ecosystem priorities identified for each Strategic Goal following key guidelines of the ecosystem approach under the CBD; with due consideration to the following issues:

- Focus on mainstreaming biodiversity into national/sub national development policies and programs.
- Strengthen the implementation of other MEAs and related protocols/agreements
- Enhance benefit-sharing.
- Use adaptive management practices.
- Carryout management actions at Protected Area level.
- Ensure inter-sectoral collaboration and harmonization
- Ensure participation of stakeholders especially local communities

STRATEGIC GOALSAND TARGETS

Strategic Goals as defined in the previous chapters provide the five major areas for intervention. These areas are aimed at redressing the drivers of ecosystem degradation and biodiversity loss (Strategic Goal A); the consequences of the drivers on the physical and ecological environment (Strategic Goal B); the consequences on the socio-economic environment (Strategic Goal C); strengthening the capacity measures to managing biodiversity loss (Strategic Goal D) and Enhance implementation through participatory planning, knowledge management and capacity building (Strategic Goal E).

TARGETS

For the implementation of the global strategic goals, the Gambia has domesticated 20 Aichi Targets. For each Goal, a set of Targets have been defined and provide the orientation to identify actions which will enable the redress of specific issues that contribute to the loss of biodiversity. The action plan adopts a flexible approach. Ecosystem-based specific targets are not in exclusion of the general targets but ensure that specificities of ecosystems are taken into consideration. Priorities for the Strategic Goals and Targets, also set a flexible stage for sector-based intervention based on the specificity of each sector, and give the responsibility to each sector to lead in a highly consultative manner, in the process of defining sector based priorities. Again, the targets provide a context for developing large and medium size projects with a focused orientation in addressing key challenges of biodiversity.

ACTIONS TOWARDS THE IMPLEMENTATION OF THE STRATEGIC PLAN FOR BIODIVERSITY 2011-2020 AND ITS AICHI BIODIVERSITY TARGETS

The Gambia has endeavored to improve on full and effective participation at all levels to foster the contributions of women, indigenous and local communities, civil society organizations, the private sector and stakeholders from all the other sectors. Site Management Committees have been put in place in all the protected areas in the country to address diverse governance strategies and to improve on the ownership aspect for the local people. A guideline for private sector involvement has been developed and paved the way for the establishment of a private game reserve and joint private government-led management of Abuko Nature Reserve with the full involvement of Eagle Heights. The establishment of bye-laws with the adjacent communities for the rational exploitation of the resources has yielded benefits in the form of revenue generated for the local communities (thatch grass, fuel-wood, ecotourism programmes). A tourism package involving four business ventures is in place to boost revenue for the Tanji Bird Reserve and the surrounding communities. During a meeting with the implementation of the NBSAP review project, the country developed and adopted a national set of targets derived from the Aichi Biodiversity Targets and its Strategic Plan. This set of goals and targets will be the benchmark for the implementation of the Global Strategic Plan 2011-2020.

The country endeavors to mobilize every possible opportunity for the utilization of resources provided through the Strategy for Resource Mobilization. Presently The Gambia has exhausted its allocation under the RAF 5 and is anxiously waiting for the new allocation. Projects and programmes have been developed and are being funded through the Special Climate Change Fund and the LCDF. The review, revision and update of the national NBSAP is in progress. This exercise aims to align the updated NBSAP with the Global Strategic Plan. During the exercise, the national targets will be integrated into the revised and updated NBSAP, which will be adopted as a national policy instrument for the biodiversity sectors. After the review, the updated NBSAP will serve as an effective instrument for the integration of biodiversity targets into national development and poverty-reduction policies and strategies, national accounting, economic sectors and spatial planning processes as appropriate, by the government and the private sector at all levels. A coherent monitoring plan will be drawn as part of the review process of the implementation of the revised NBSAP using the already developed national targets and the set of indicators to gauge success in the future.

93. 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.

Biodiversity concerns are being integrated into relevant national, sector, cross-sector plans, programmes and policies. This is a result of PAGE and the high priority being accorded to the environment, including climate change initiatives in the country. It should however be recognized that all the sectors have a biodiversity footprint (positive or negative) to a great extent (livestock, agriculture, fisheries and the environment constitute the foundation for

nation-building and livelihood development) and, to a lesser extent (e.g. health, education& security). Therefore, biodiversity conservation needs to be integrated across all the sectors.

The Gambia recognizes the importance of mainstreaming and integrating biodiversity considerations and issues into sector and other stakeholder support. This has to be done in a manner that ensures that those very environmental concerns are addressed and are part of the evolving policies and laws, project design and practical implementation. For mainstreaming to be successful, EIA and SEA should be developed and used in planning, policy development and data collection processes. Notwithstanding the recognition, relevance and positive steps taken for environmental mainstreaming, the following hurdles continue to present problems:

1. Decision-making process is not decentralized
2. Weak or inadequate application of EIA
3. Inadequate capacity (human and financial) to apply SEA and EIA
4. EIA recommendations often overruled by other considerations
5. Inadequate extension officers and logistics at the local level
6. Biodiversity conservation is not well understood and recognized as an income-generating activity and, as such, it is not given the priority it deserves as a sector compared to health, agriculture and education.

The major information and knowledge gaps that remain to be addressed and options that exist to address them.

Biodiversity and food security issues contribute to our knowledge in ways that are both informative and transformative. Knowledge about the components of biodiversity and food security is valuable in stimulating technological innovation and in learning about human biology and ecology. Experiencing and increasing our knowledge about biodiversity and food security transform our values and beliefs. In addition, such services in biophysical and economic terms characterize the institutional mechanisms needed to generate incentives for sustainability in all aspects.

Some aspects of biodiversity and food security issues are valued directly; while others are valued for their contributions to ecosystem support and, hence, to sustainable production of things that are valued directly. The economic value of biodiversity and food security has its place in the policy-making and implementation process. Although biodiversity and food security might well have substantial economic value, nutritional and security benefits, etc. compared with alternative consumptive resource uses, the above mentioned values does not tell us everything we need to know about the value of biodiversity and food security but rather there are endless of benefits including poverty reduction, participation, etc.

Challenges , gaps and opportunities

Biodiversity conservation and sustainable food security requires ensuring maintenance and management of floral and faunal species within the ecosystems, that's water and landscape they inhabit. The gaps and weakness in biodiversity conservation and food security varies ranging from insufficient financing, human and material resources, intellectual capacity,

demotivating staff remuneration, insufficient park facilities and infrastructure and non-decentralised system.Furthermore, this is exacerbated by inadequate knowledge on improve and sustainable agricultural production by farmers, low private sector investment in agricultural productivity as well as inadequate agricultural extension advice to farmers.
Meanwhile, the department has endeavoured to improve the status quo by establishing biodiversity trust fund for sustainable financing, promoting private sector involvement such as Eagle Height Project, and training of personnel at all levels, PA infrastructural development, plans initiated for restructuring DPWM into an Authority by GAWA and GBMIS to address staff demotivation, remuneration and system decentralization among other activities.

94. Planned actions and future priorities with respect to implementing ecosystem approaches for the various components of biodiversity for food and agriculture. ***Improving stakeholder involvement and awareness***

The NBSAP recognizes the CBD Strategic Plan for Biodiversity 2011-2020 and its Aichi Targets adopted in October 2010 as an ambitious new plan that provides an overarching framework for all the biodiversity and food security related conventions at national level. Setting the National Biodiversity and food security vision, the five strategic goals, 20 General Targets, In translating the provisions to national realities the NBSAP provides an appropriate national orientation for effective response to the increasing loss of biodiversity and food security, land degradation and climate change.
The Gambia Biodiversity National Targets, derived from the Aichi targets will be the guideline for action for the future implementation of the convention.The Gambia has developed 20 Biodiversity Targets that will expect to be attained from2015 to 2020.
The Targets were developed through a participatory process involving various stakeholders such as Government institutions, civil society organizations, Local authorities and communities, private sectors, individual entrepreneur among others. Such processes enabled the analysis of existing realities of the country such as level of threats, Government priorities, existing capacity, lessons from the implementation experiences on the three pillars of the CBD, and associated global provisions of the Strategic Plan 2011-2020.Biodiversity Targets are outlined under the five Strategic Goals of the Global Strategic Plan. Indicators and actions of the Gambian Biodiversity Targets are presented in the following action plan.

95. 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.

For the implementation of the global strategic goals, the Gambia has domesticated 20 Aichi Targets. For each Goal, a set of Targets have been defined and provide the orientation to identify actions which will enable the redress of specific issues that contribute to the loss of biodiversity. The action plan adopts a flexible approach. Ecosystem-based specific targets are not in exclusion of the general targets but ensure that specificities of ecosystems are taken into consideration. Priorities for the Strategic Goals and Targets, also set a flexible stage for sector-based intervention based on the specificity of each sector, and give the responsibility to each sector to lead in a highly consultative manner, in the process of

defining sector based priorities. Again, the targets provide a context for developing large and medium size projects with a focused orientation in addressing key challenges of biodiversity.

In a systematic approach, priority actions have been identified for each target. While the actions identified may not be exclusive for intervention, these actions constitute the high priority and medium priorities for interventions that will enable a significant contribution to the realization of the goals within the defined time frame for the plan. The actions have also been translated into a matrix to enable an effective determination of the time frame for action, performance indicators and the actors/organizations responsible for the implementation. The implementation of NBSAP, including the determination of priorities and selection of options, will be guided by the following principles;

- Biodiversity in The Gambia belongs to Gambians, and its conservation and sustainable use is a responsibility of all Gambians.
- The conservation and sustainable use of biodiversity is the responsibility of all citizens and residents of The Gambia.
- Community participation and informed stakeholder involvement in the planning, implementation and decision making processes are a prerequisite for effective conservation and sustainable use programmes.
- The best way to conserve species is to maintain their habitats. Therefore, in-situ conservation, preferably within protected area systems using an ecosystems approach, is fundamental to the effective conservation of biological diversity and the protection of threatened species.
- Biodiversity within protected areas can be conserved when at the same time the peripheral natural habitats are used sustainably and profitably by the surrounding local communities through innovative management approaches such as community conservation, collaborative forest management, etc.
- Reliable and up to date data and information underpin rational decisions and appropriate actions for effective conservation and sustainable use of biological diversity.
- Successful conservation of biological diversity requires incorporation of the conservation and sustainable use concepts into the relevant decision making and management processes including; resource allocation and management, development appraisals and decisions and sector and cross-sector policies
- The loss of biological diversity cannot be effectively slowed down without addressing the underlying causes which include, inter alia, population size and distribution densities, level of resource consumption, market factors and policies that provide incentives for resource depletion, under valuation of environmental goods and services, inappropriate laws, policies and institutions and negligence about the roles of biodiversity, its status and the rate at which it is lost.
- Conservation and sustainable use efforts need to incorporate best practice models and cost-effective approaches and forge partnerships in action to maximize the comparative advantages of the various actors.
- Successful conservation and sustainable use of biodiversity requires appropriate supportive policies and institutional arrangements;

- An integrated approach, rather than sector based approaches, is essential key to successful conservation programmes.
- A key ingredient to effective long term action is capacity building at all levels, community level, field, policy and decision making levels.
- Biodiversity conservation cannot succeed unless local communities assume a greater role in the planning and management of natural resources and receive a fair share of the accruing benefits.

SOME OF THE MAJOR CHALLENGES INCLUDE BUT ARE NOT LIMITED TO THE FOLLOWING:

- Inadequate resources (human, material and financial) in ensuring effective implementation and management of natural resources
- Inadequate livelihood choices for greater number of people thereby giving them the option to conserve, respect and adhere to existing policies in combating biodiversity loss
- Inadequate agricultural extension advice and support to farmers to adapt improve and sustainable approaches that seeks to promote conservation and food security
- Weak sector and inter-agency collaboration and partnership on matters relating to promotion conservation and food security
- Inadequate measures in reducing the effects of climate change for vulnerable people thereby reducing their resilience as well as poising severe pressure on the available resources most especially natural resources and the environment.

96. 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.

Habitat loss can be addressed through conservation of habitat and restoration of degraded areas. The emphasis of this target will rely on preventing the loss of high-biodiversity value habitats, such as primary forest and wetland areas. Reduction in the rate of loss and degradation of natural habitats can be achieved by adopting technologies and innovations that increase productivity of small holder farmers. This will help in increasing yields and value of crops per unit input which will result in a decrease in requirements for new agricultural lands. The other scheme is creating alternative source of livelihoods for local communities to drive off pressure from the natural habitats. There is a need to develop a wetland policy to adequately address wetland conservation and livelihood issues. Facilitating the designation of more RAMSAR Sites in order to enhance biodiversity conservation is urgent.

The country has already established a 1 nautical mile from the coastline as a fisheries protected zone and DPWM is currently managing 53,000 ha of mangroves set aside as nursery and spawning ground. To ensure sustainability of these functions there is a need to reforest or restore dieback areas affecting these wetlands through community participation. Coastal engineering is also a strong option to address coastal erosion. Engaging fisher folks and local communities to police fisheries resources and discourage the use of wrong fishing gears. Likewise programs that help to provide appropriate fishing gears and appropriate gears in exchange for wrong mesh size for fishermen will be promoted.

The government of the Gambia is piloting a bio-right program for local communities living around Protected Areas in the form of bee-keeping, village banking, community woodlots and oyster culture. This initiative is meant to provide alternative livelihood to reduce pressure on natural resources. This target will contribute towards the establishment of sustainable financing mechanism for the benefit of local communities. It will assist in improving soil productivity and enhance biodiversity conservation. The DPWM will pilot conservation tillage in the North Bank Region in order to promote agro-forestry and prevent the use of mechanized agricultural practices. Discourage the use of chainsaw.

97. 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. Including major challenges that will need to be overcome.

Gambian women constitute 78 percent of the economically active population working in agriculture, compared to just 57 percent of men. The majorities of Gambian farmers are unskilled agrarian wage earners and are responsible for about 40 percent of the total agricultural production in the country. The massive contribution of women to agriculture does not translate to their improved social status, while their productive activities are mainly subsistence-based, and for home consumption. Women are generally involved in food and horticultural production. Women farmers raise and manage most of the small ruminants, as well as poultry. Women are also engaged in fisheries as fish off-loaders and fish processors. In forestry, women are engaged in planting seedlings and woodlots.

Despite the critical role they play in agricultural production, women lack access to, as well as control and ownership of productive resources (farm inputs, implements, land and capital) resulting in low production and quality of rice (the staple food) and other crops. This affects food self-sufficiency and food security, and constrains the ability of women to move from subsistence to commercial farming to maximize their income. Furthermore, women lose up to 50 percent of their agricultural production because of lack of access to markets, and proper communication, storage, and transportation facilities. This reduced productivity and income of women increases their health risks, and reduces their ability to engage in other productive ventures. Girls' education is also reduced because in the Gambia, a girl child may be required to support their mothers in their domestic chores.

There is increased recognition of the value of indigenous knowledge, as well as women's and men's roles as innovators regarding biodiversity conservation and farming techniques. Experience has shown the need to build on such knowledge and to ensure the participation of local women and men (as innovators and end users) in order to improve tools and techniques aimed at combating desertification. Therefore, involving rural communities, especially the "voiceless," in biodiversity conservation, resource management and in decisions regarding environmentally sound practices and techniques aimed at combating desertification (such as rainwater harvesting, insect control, post-harvest storage, etc.) is a powerful way to mitigate the conditions and the impact of land degradation.

Gender mainstreaming in biodiversity planning is intended to bring the diverse roles,
needs and knowledge of women and men to bear on national strategies to reverse the loss and unsustainable use of biodiversity. Gender mainstreaming is "the process of assessing the implications for women and men of any planned action, including legislation, policies or

programmes, in all areas and at all levels. It is a strategy for making women's as well as men's concerns and experiences an integral dimension of the design, implementation, monitoring and evaluation of policies and programmes in all political, economic and societal spheres so that women and men benefit equally and inequality is not perpetuated. As with "biodiversity mainstreaming" into national development, gender planning and sectoral planning, gender mainstreaming has to be a two-way process. It is not only about integrating gender into biodiversity planning, it is also about integrating biodiversity into national policies and programmes.

MAJOR CHALLENGES THAT NEED TO BE OVERCOMED INCLUDE BUT NOT LIMITED TO THE FOLLOWING:

- Low economic status of women including their lack of user rights over land as a factor of production which impedes women's socioeconomic advancement.
- Inadequate public-private sector partnership in biodiversity and food security issues thereby improving the overall resource allocation including national budgetary allocation to agricultural productivity
- Heavy dependence on rain-fed agriculture exacerbated by erratic rainfall pattern which increases farmers especially women's vulnerability leading to limited livelihood choices
- Inadequate research and development issues relating to biodiversity and food security as well as limited publicity of fewer on-going researches targeting farmers especially women farmers in the rural areas
- Inadequate extension advice to farmers especially women farmers who are often concerned with subsistence farming activities which are critical aspect of household food security
- Inadequate legal and regulatory framework and implementation on issues relating to biodiversity and food security thereby leading to ineffective policy implementation in general as well as weak staff capacity to supervise as well as enforce such policies of government at all lev

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