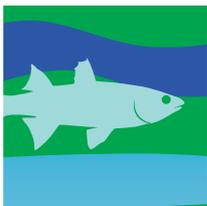
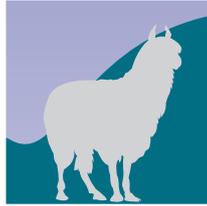


COUNTRY REPORTS



THE STATE OF **SIERRA LEONE'S**
BIODIVERSITY FOR FOOD AND
AGRICULTURE

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**BRIEF REPORT ON THE STATE OF THE BIODIVERSITY FOR FOOD AND
AGRICULTURE IN SIERRA LEONE**



SIERRA LEONE GOVERNMENT



Report compiled by the Forestry Division of the Ministry of Agriculture Forestry and Food Security

25th June, 2017

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Acronyms

| Acronyms | Representation |
|----------|---|
| MAFFS | Ministry of Agriculture, Forestry and Food Security |
| FD | Forestry Division |
| NPAA | National Protected Area Authority |
| EPA | Environmental Protection Agency |
| GRNP | Gola Rainforest National Park |
| OKNP | Outamba-Kilimi National Park |
| TCP | Technical Cooperation Programme |
| CBF | Community Based Forestry |
| FAO | Food and Agriculture Organization |
| UNDP | United Nation Development Programme |
| EU | European Union |
| USAID | United Stated Agency for International Development |
| WB | World Bank |
| EIA | Environmental Impact Assessment |
| EEZ | Exclusive Economic Zone |
| Ha | Hectare |
| MT | Metric Ton |
| NHFR | None Hunting Forest Reserve |
| PEMSD | Planning, Evaluation Monitoring and Statistics Division |

Acknowledgement

I wish to acknowledge the diverse roles and support provided by key players from different ministries, agencies, departments, partners, national and international donors, CSOs and the communities for serving as resource persons. The following departments and divisions such as the Forestry Division, National Protected Area Authority (NPAA), Livestock Division, Crop Division and Wildlife of the Ministry of Agriculture Forestry and Food Security (MAFFS) , the Fisheries and Aquaculture of the Ministry of Fisheries and Marine Resources, Food and Agriculture Organization of the United Nations (FAO), Environmental Protection Agency of the Ministry of Lands, Country Planning and the Environment all played significant and meaningful roles.

I wish to however specially appreciate the following for their invaluable contributions, Mr. Paul Bangura , Project Officer, Fishery and Aquaculture Unit – FAO for his input into the fisheries and aquaculture sector and Mr. Gbessay Ehlogima Sam Momoh, National Project Officer, Community Based Forestry –FAO for his input into the forestry sector and supporting the review of the entire report. Special thanks go to the FAO Representative Ms. Tipo Nyabenyi for her relentless effort in ensuring that this report is finalized. And finally but the least, Mr. Christian Schulze, the Natural Resource Management Officer F A O for editing this report.



Mr. William Bangura
Director, Forestry Division
MAFFS

Executive summary

Biodiversity comprises the variability of living organisms which includes terrestrial, marine and other aquatic species, their habitats and the ecosystem they live on. However, biodiversity is under threat among others from environmental degradation, pollution, war and industrial and chemical agriculture. Many species have already been lost. We are witnessing land degradation, loss of biodiversity, deforestation, ocean acidification, carbon emissions and alteration in biogeochemical cycles. The Stockholm Resilience Centre warns that the Earth's System as a whole is being destabilized to a new state of imbalance as a result of such activities. Years back, biodiversity and agriculture were classed as separate entity each with its own discipline and principles. The recent industrial search for goods and markets coupled with contemporary production system has resulted in the transformation of land and biodiversity loss for massive agricultural expansion. To meet the growing population demand for food, it is vital to incorporate innovative and acceptable way to integrate biodiversity conservation with food production. In Sierra Leone, it has been observed that many of the generic biodiversity remain outside of the protected areas, game reserves, national park or government reserves but are concentrated in complex multi-functional landscape occupied by people and their associated farming system. Many of the crops grown and animals reared in our communities have their counterparts in the wild. Our communities often associate their names with the bush example bush cow, bush fowl, bush goat, bush yam, bush kola, bush dog, bush hog etc. Scientists have been able to advance on the productive capacity of these plants and animals from research done on those grown in the wild. However, the rate of disappearance of generic plant and animal species is alarming. A quick Tree Change assessment was recently conducted in 4 FAO/FD/MAFFS CBF sites. It revealed a horrific picture of how species have disappeared within 30 years in these natural ecosystems.

The ministry and other partners have made tremendous efforts in promoting biodiversity conservation in line with food production. The ministry, SLARI, UN agencies and universities have embarked on crop production intensification to meet the current population pressure. Many fast growing crops have been experimented and are now planted by many farmers across the country. It is envisioned that these crops will in future reduce food scarcity and high dependency on imported food items. The genetic variation and diversity of crops, livestock, and fish have led to continued improvement in research on crops varieties and livestock breeds.

1. Introduction

Food production depends largely on biodiversity and on the services provided by ecosystems. The rich genetic pools of different species have served as the origin of different food varieties and animals in the world today. There is therefore direct relationship between food varieties and the genetic pools of plant and animals species from where these food crops originated. It could have been virtually impossible to have kept or reared livestock, fish or grow trees and other plants without the services delivered by the terrestrial and marine ecosystems and by biodiversity including the often invisible and unrecognized contributions from micro-organisms and invertebrates.

Sierra Leone has a natural fertile terrain which has supported biodiversity intensification and crops diversification. Most of these resources are held within the farming system and the extensive landscape provided in Sierra Leone. One of the major challenges responsible for the decline in food production in Sierra Leone is the depletion of natural resources, erosion of genetic diversity and biodiversity loss. To address food/protein insecurity and biodiversity loss, short, medium and long terms actions are required in the areas of institutional framework arrangements, legal and binding principles, laws and policies as well as political will to enforce the policies and laws. For Sierra Leone, addressing food security and biodiversity requires appropriate practices and adequate policies. The unsustainable use of the natural resources coupled with lack of alternative livelihood has led to drastic decline in natural forest cover of 80% in the late 70s to less than 10%. There are significant ways to enhance protein production and resilience of food systems by integrated management of farming, livestock and forestry at their different scales and integrated with other land uses. For instance, protected or community conserved forested areas within a landscape can provide significant ecosystem services for farmers, such as pollination, improved water supplies and regulation of local climate. Moreover, improved resilience of food production systems within a landscape can also contribute to reducing risks from weather related disasters such as floods, droughts and land-slides. In Sierra Leone Community-Based Forestry instituted and funded by FAO is piloted in four selected communities. If successfully piloted, it will be replicated to other areas nationwide. Many communities have the traditional knowledge and culture of community forest conservation but no basic knowledge in community based forestry management. Scaling up community based forestry concept across the landscape of Sierra Leone will lead a rapid increase in minimizing biodiversity loss, sustainable management of natural resources, wildlife protection and restoration of degraded areas.

2. Overview of biodiversity status for food and agriculture in Sierra Leone

2.1 The forestry sector

The role of the forestry sector is to sustain the management, utilization of forest resources and the preservation of the environment for biodiversity conservation, research and education. If forest resources are sustainably managed, they can contribute significantly to the socio-economic development of a country. Wood products from the forest have traditionally ranked as an income earner, while fuel wood, bush meat, medicinal plants and other non timber products have continued to contribute significantly to the welfare of most Sierra Leoneans. Forests also provide important environmental services such as watersheds, soil/crops protection, reduce top soil erosion, improve local, regional and global climates, protection of biodiversity.

Sierra Leone is globally recognized as a biodiversity hotspot being part of the Upper Guinea Rainforest. There are rich indigenous flora and fauna including important endemic species and internationally rare and threatened species.

Status of Forest Resources

Drastic changes in the forest cover have taken place in Sierra Leone during the past century. According to FAO's estimate, within 1990 – 2000, 36,000 hectares of forest cover was being lost annually. This amounted to an annual rate of 3% one of the highest in West Africa. At the beginning of the century about 70% of Sierra Leone was covered with mature close high forest but by 1975 the area of close mature forest has been reduced to barely 5% (Gordon et al 1979). The table below gives a classification of the forest types.

Table 1. Classification of Forest Types

| Forest Types | Area (ha) | Percentage of total area of Sierra Leone |
|----------------------------|-----------|--|
| Closed High Forest | 365,200 | 5.0 |
| Secondary Forest | 261,000 | 3.6 |
| Forest regrowth | 3,774,400 | 51.5 |
| Savannah Woodland | 622,600 | 8.5 |
| Mixed Tree Savannah | 732,000 | 10.0 |
| Lophira Tree Savannah | 264,600 | 3.6 |
| Coastal Woodland | 50,100 | 0.7 |
| Mangrove | 171,600 | 2.3 |
| Fringing Swamp Forest | 28,800 | 0.4 |
| Raphia Swamp Forest | 35,500 | 0.5 |
| Total Area of Forest Cover | 6,305,800 | 86 |
| Total Area of Sierra Leone | 7,332,600 | 100 |

Allan (1990)

The Forest estate as at 1985 was 352,205 hectares or 5.5% of the total forest cover and 4.8% of the national area made up as follows:

- i. Gazetted Reserves (285,229 ha) fully under the protection and management of the Forestry Division. They are made up of different categories of woody vegetation, 83% in closed high forest zones, 14% in the savannah woodlands and 3% in open areas and tall grass.
- ii. Proposed Reserves (33,953 ha) fully under the protection and control of the Forestry Division but not yet legally constituted.
- iii. Community Forest (33,023 ha) on chieftom lands. They consist mainly of strips of plantation along roads and the erstwhile railway tracts. They are protected and administered by the Forestry Division on behalf of the Chieftom owning the community forest.
- iv. Game Reserves (76,500 ha) mainly in Savannah woodlands. They are fully under the Protection and control of the Forestry Division. To date not all of this area has legally constituted. These are supplemented by non-hunting forest reserves which are mainly in closed forest areas.
- v. Plantations (about 9,800 ha) are mainly in small plots scattered throughout the country. The total plantation area is about 77% established before 1971. FAO, 1980, Allan, 1988 quote an original area of about 8,000 ha of which only 4,100 ha remains. The other 50% has been lost through encroachment and expanded agricultural activities. A survey of plantations carried out in 1988 (Koroma, 1988) showed that out of 7,600 ha planted before 1972, 5,775 ha of productive plantation still existed in 1982 and between 1982 and 1988, 3,270 ha have been planted. By 1990, it was estimated that about 100,000 ha of forest reserve and 65,000 ha outside of the reserve make up exploitative forests in Sierra Leone.

Table 2: Plantation Area (ha) by regions

| Location | Area planted (ha) | |
|-----------------|----------------------------|-------------------|
| | Before 1971 | After 1971 |
| Northern Region | 1221 | 464 |
| Southern Region | 3822 | 1556 |
| Eastern Region | 2198 | 108 |
| Western Area | 363 | 138 |
| Total | 7604 | 2267 |

Table 3: Current proposed network of protected areas in Sierra Leone**Terrestrial and wetland ecosystems**

| Protected area | Legal status | IUCN category | Area (hectares) | District |
|---|--|--|------------------------|----------------------------|
| Outamba-Kilimi National Park and Kuru Hills Complex | National Park (Declared 1995) | National Park | 110,900 7,001.21 | Bombali |
| Tiwai Island Sanctuary | Game Sanctuary (Gazetted Oct. 1987) | Game Sanctuary | 1,200 | Pujehun/ Kenema |
| Gola Forest Reserve | National Park (Declared 2011) | National Park | 75,000 | Kailahun, Kenema & Pujehun |
| Western Area Peninsula Forest Reserve | Non-hunting Forest Reserves 1916 FR, 1973 NHFR | National Park | 17,688 | Western Area |
| Loma Mountains Forest Reserves | Non-hunting Forest Reserves 1930 FR, 1973 NHFR | National Park | 33,201 | Koinadugu |
| Kangari Hills Forest Reserves | Non-hunting Forest Reserves 1930 FR, 1973 NHFR | Proposed Habitat/Species Management Area | 8,473.6 | Bo & Tonkolili |
| Tingi Hill (Sanka Biriwa) | Non-hunting Forest Reserves 1930 FR, 1973 NHFR | Proposed Habitat/Species Mgt. Area | 11,747.6 | Kono |
| Kambui Hills Forest Reserves | Forest Reserves | Proposed Habitat /Species Mgt. Area | 21,228 | Kenema |
| Sherbro River Estuary and Turtle Islands | No legal status | Proposed MPA | 99,854 | Bonthe |
| Scarcies River Estuary | No legal status | Proposed MPA | 13,007 | Kambia |
| Sierra Leone River Estuary | No legal status | Ramsar Site (Designated 1999) and Proposed MPA | 34,234 | Western Area |
| Yawri Bay | Non legal status | Proposed | 29,505 | Western Area and |

| | | | | |
|-----------------------|-----------------|------------------------------|-------|-----------|
| | | Ramsar Site and Proposed MPA | | Moyamba |
| Lake Sonfon Sanctuary | No legal status | Proposed Game Sanctuary | 5,180 | Koinadugu |
| Lake Mape & Mabesi | No legal status | Proposed Game Sanctuary | 7,511 | Pujehun |
| Mamunta-Mayosso | No legal status | Proposed Game Sanctuary | 2,027 | Tonkolili |

2.2: Wildlife

The wildlife of Sierra Leone is very diverse due to the variety of different habitats within the country. The primary piece of legislation that is the Wildlife Conservation Act of 1972 governing the protection of wildlife in Sierra Leone established three categories of land to be set aside for wildlife protection: strict nature reserves, national parks or game reserves, and game sanctuaries (Squire, 2001). The draft Conservation and Wildlife Policy of 2011 sets out five principles for wildlife management (sustainable management, rights-based governance, economic and social benefits, integrated wildlife conservation and culturally-sensitive, knowledge-based conservation) and recommends action in five areas (species management, conservation areas, research and monitoring, education and awareness, and capacity building). The new Conservation and Wildlife Act will replace the 1972 Wildlife Conservation Act and will increase protection for endangered species.

There are approximately 147 known species of wild mammals 172 known breeding bird species, 67 known reptile species, 35 known amphibian species, 750 species of butterflies including one of the largest butterflies the giant African swallowtail whose wingspan can be up to 25 and 99 known species of fish within Sierra Leone. Members of fourteen orders of placental mammals inhabit Sierra Leone. The endangered pygmy hippopotamus has territories around the islands on the Moya River and is widespread in the Gola Forest area. There are three species of wild pig that occur across Sierra Leone: the wart hog, the giant forest hog and the red river hog. *Earth Trends (2003)*.

Sierra Leone has 15 identified species of primates that include bush baby, monkeys and a great ape, the common chimpanzee which is Sierra Leone's largest primate. Chimpanzees are found across the country with the 2010 chimpanzee census estimated a wild population in

excess of 5500 more than double the number previously thought to live in the country. This is the second largest population of the endangered subspecies of western chimpanzee, after Guinea, with the largest density in the Loma area, 2.69 individuals per km², and the Outamba, with 1.21 individuals per km².

There are several species of whales and the African manatee in the waters of Sierra Leone. The manatee is an endangered species and lives in the rivers and estuaries of Sierra Leone especially around Bonthe. Mammals found in Sierra Leone include:

- Hippopotamus
- African bush elephant
- Bongo antelope
- Roan antelope
- African forest buffalo
- Diana monkey
- African leopard
- Olive baboon
- Guinea baboon
- Western chimpanzee
- Waterbuck
- Western red colobus
- Red colobus
- Green monkey
- Red river hog
- Warthog
- Spotted hyena
- Striped hyena

Sierra Leone has over 630 known species of bird ten of which are considered endangered including rufous fishing-owl and Gola malimbe. On the coastal area there are several important sites for migratory ducks and wading birds from the palearctic area. They include:

- African harrier-hawk
- Black-collared lovebird
- Blue-headed wood-dove
- Iris glossy-starling
- White-breasted guineafowl

- White-necked rockfowl
- North African ostrich
- Savanna sparrow

There are 67 known species of reptiles, three of which are endangered, in Sierra Leone including several large reptiles. There are three species of crocodiles, the Nile crocodile, the slender-snouted crocodile which lives in forest streams, dwarf crocodile found in mangrove swamps. All the species of sea turtles live in the waters of Sierra Leone with the green turtle and leatherback turtle laying eggs on the shores including Sherbro Island and Turtle Island. Common species of lizard include the large Nile monitor, the agama seen around settlements, the Brook's house gecko often lives inside houses, and chamaeleos.

2.3: Livestock

Livestock plays an integral role in the livelihood of both rural and urban communities in Sierra Leone. The major traditional livestock found in Sierra Leone are cattle, sheep and goats and to some extent, pigs and poultry. A recent survey by the Planning, Evaluation Monitoring and Statistics Division (PEMSD) of the Ministry of Agriculture Forestry and Food Security gives figures of 241,153 heads of cattle, 945,047 heads of sheep, 1,538,557 heads of goats, 12,781,575 chicken, and 1,122,301 ducks.

Cattle:

Cattle, which constitute, the biggest component of the livestock industry in Sierra Leone, is largely dominated by the Fullah ethnic tribe which resides predominantly in the Northern Province where, many share a common nationality with Guinea. The breed of cattle found in Sierra Leone is exclusively that of the N'dama, a small hump- less animal, which is trypanotolerant and, inspite of its poor productive quality in terms of carcass weight at slaughter, and poor milk yields, it is nonetheless relatively well-adapted to thrive successfully in the harsh humid tropical environment which is plagued with disease problems.

Cows produce their first calves at about four years of age and their reproductive life extends roughly about 12 years. The general mortality rate on the whole seldom exceeds 15 percent although the mortality rate among calves is often high, reaching a peak of 45 percent, mainly caused by heavy burdens of gastro-intestinal parasites, predominantly helminths.

Sheep:

Sheep occupy the second place in terms of livestock population density, and are of the Djallonke type, long-legged, with a thin tail, predominantly coloured black and white. Like cattle, they are trypanotolerant, but are more prone to foot conditions and often carry heavy burdens of gastro- intestinal parasites, particularly calves. Age at first lambing has been

recorded as between 15 to 18 months, and two lambings a year are very common. Prolificacy could be as high as 191 percent indicating a high fertility rate potential, but mortality could be equally high, especially among calves, often reaching a peak of 16 and 17 per cent.

Goats: Goats are even more widely spread than sheep as they are a favourite source of meat for barbecues and social gatherings, notably in the southern and eastern provinces. The type of goat found in the country is the dwarf type, which is short-legged and variously coloured. Like sheep and cattle, they are trypanotolerant, and well-adapted to the environment where they roam freely scavenging and feeding on anything available.

Poultry:

Although Poultry farming is predominantly dominated by backyard production on the free range, yet a successfully thriving commercial poultry industry had developed as early as in the 1960s, around the urban areas of the country, particularly in the Western Area, to the extent that by the late 1970, Sierra Leone was already almost self-sufficient in poultry and poultry products. This necessitated imposition of a ban on all poultry and poultry products with the exception of day old chicks, required for replacement. The civil war has, however, reversed all these gains, whereby Sierra Leone is now a net importer of almost all poultry products as is evidenced from the table provided.

2.4: Fisheries and aquaculture

Sierra Leone has a combined coastline stretching out over 510 km, and a continental shelf 100 km wide to the north, which shrinks down to 13 km southwards on the Liberian border and extends on a surface area of 30 000 km². Its coast is characterised by a luxuriant flora of mangroves, mostly *Rhizophora* sp. and countless streams and estuaries navigable over a short distance. The 200-nautical-miles EEZ covers an area of 157 000 km². Throughout history, fisheries have been the very basis of life and culture along the Sierra Leonean coast. The fisheries sub-sector plays a fundamental role in revenue generation and food security drive of the country. It contributes substantially to the economic development of society and demonstrates how important it is that Sierra Leone conducts its fisheries in a sustainable manner. Thus fishing nations have ratified a convention on the law of the sea which established a 200nm EEZ from their baseline of which they have exclusive sovereign rights to all natural resources.

Fish and fish products constitute a major source of income, food and recreation in the economy of Sierra Leone. Fish products are often obtained from two main sources: harvesting of wild fish (marine and freshwater) and aquaculture (rearing of aquatic

animals and plants in a confined environment). This sub-sector plays a significant role in the economy and food security of the country. It contributes about 10.2% to Gross Domestic Product (GDP) of the country (Awoko, 2017) and provides about 80% of total animal protein consumption for majority of Sierra Leoneans. It is the most important economic activity along the coastline of Sierra Leone. Fish resources also have a key role in maintaining and expanding employment levels in the country as the sector is estimated to provide employment and a source of livelihoods for over 500,000 people, mainly in coastal communities (Awoko, 2017). The Ministry of Fisheries and Marine Resources (MFMR) estimates that current total annual fisheries production is about 150,000 tonnes. With the marine artisanal fishing sub-sector, characterized by small-scale, inshore, low technology operations, accounting for the bulk of this catch (120,000t, valued at USD100 million per year) while the marine industrial fishing sub-sector accounts for an estimated 24,000t (valued at USD25 million per year). Both inland fisheries and aquaculture production are relatively small in comparison (Awoko, 2017). Annual fish exports are valued at USD2.5 million and fishing licence fees amount to USD2.5 million per year.

Although, the country is blessed with abundant marine and inland fisheries, the future of Sierra Leone's fisheries is however under immediate threat. A 2007 joint study carried out by the UK Department for International Development (DFID), the World Bank (WB) and United Nations Food and Agriculture Organization (FAO) identifies overexploitation from uncontrolled harvesting as the number one threat to the future of Sierra Leone's fisheries. The report presents a number of scenarios for future development to demonstrate the potential benefits of different management approaches that could be implemented in Sierra Leone. Conclusively, to harness the future benefits from fisheries in Sierra Leone, different management approaches as presented by these different bodies must be adopted.

Overview of resources

Sierra Leone is home to huge stocks of fishery resources, which may be a major asset to help reduce poverty and boost economic well-being. However, overexploitation of some species, particularly juveniles, illegal fishing and inefficiency in implementing fishing laws and regulations all constitute threats to this potential. Like in most countries in the sub-region, illegal, unreported and unregulated fishing is a menace. For instance, the annual value of illegal fishery catches in Sierra Leone is estimated at US\$30 million.

Table 4 : Total Fishery Production in MT, 1991-2006 (Jalloh, 2009).

| | The Industrial Fishery | | | | | | | | Artisanal Fishery | Total |
|------|-------------------------------|----------------|-------------|-------|---------------|---------------|-------|------------------|---------------------------------|------------------------|
| Year | Shrimp | Lobster & Crab | Cuttle fish | Snail | Sha rks & Ray | Demersal fish | Tunas | Pelagic by catch | Mixed fish mainly small pelagic | Industrial & Artisanal |
| 1991 | 1241 | 21 | 202 | | | 5045 | 3173 | 65555 | 48071 | 123308 |
| 1992 | 2484 | 47 | 644 | | | 15790 | 3644 | 31424 | 47477 | 101510 |
| 1993 | 2425 | 427 | 858 | | | 14655 | 2463 | 1000 | 46928 | 68756 |
| 1994 | 2010 | 186 | 885 | | | 11386 | 3358 | 516 | 46779 | 65120 |
| 1995 | 2420 | 278 | 658 | | | 9416 | 3029 | 299 | 46708 | 62808 |
| 1996 | 2443 | 353 | 1069 | | | 10612 | 1011 | 1109 | 46673 | 63270 |
| 1997 | 1989 | 197 | 557 | | | 5905 | 2010 | 479 | 46656 | 57793 |
| 1998 | 1317 | 111 | 398 | | | 5344 | 4980 | 467 | 46648 | 59265 |
| 1999 | 1483 | 157 | 537 | | | 9442 | 3662 | 537 | 46420 | 62238 |
| 2000 | 1505 | 298 | 308 | | | 11127 | 0 | 1061 | 45910 | 60109 |
| 2001 | 1277 | 337 | 1169 | | 120 | 10993 | 6166 | 2536 | 30050 | 62548 |
| 2002 | 1119 | 194 | 3562 | | 126 | 7315 | | 1405 | 55659 | 69380 |
| 2003 | 1541 | 215 | 4598 | | 150 | 9549 | | 1112 | 65458 | 82623 |
| 2004 | 1445 | 127 | 1596 | 1266 | 175 | 8011 | | 1611 | 106216 | 120447 |
| 2005 | 1378 | 106 | 2017 | 1883 | 135 | 7756 | | 2522 | 116614 | 132411 |
| 2006 | 1354 | 159 | 982 | 1065 | 143 | 8526 | | 1413 | 120490 | 134132 |

Total aquaculture production for the Republic of Sierra Leone (tonnes)
Source: FAO FishStat

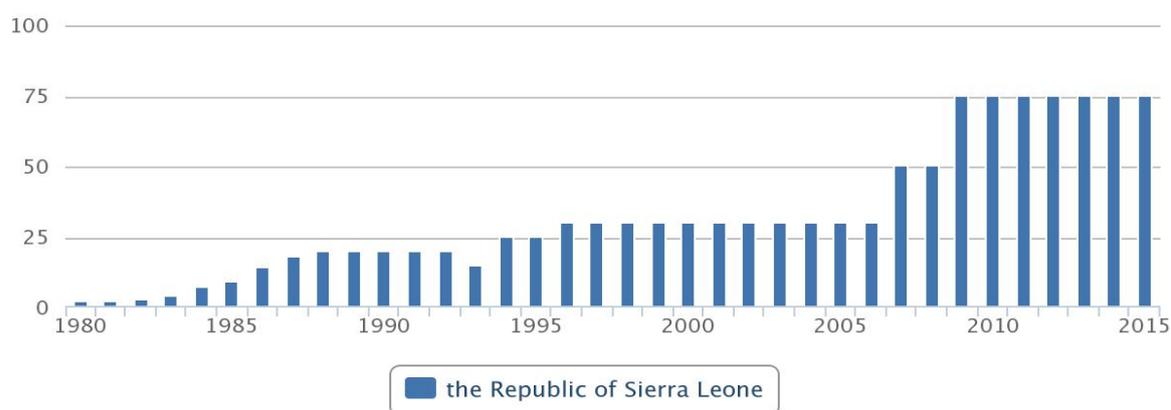


Figure 1 Total aquaculture production for the Republic of Sierra Leone (tonnes) 1980-2015 FAO FishsStat 2016

Artisanal fishing

The Ministry of Fisheries and Marine Resources has delegated the issuance of artisanal fishing licences to the Local Councils since the 2004 Local Government Act. The Local Councils work closely with the two officially-recognised fishermen’s associations in awarding licences, and act together to foster responsible fishing under the supervision of the Ministry of Fisheries.

There is a high mortality rate amongst clupeids (herrings, shad, sardines, etc), ascribable to the growing number of driftnets with an unauthorised mesh size. This is compounded by a worrisome presence of sardinellas spp. and bonga shad juveniles.

The small scale artisanal fishery sector in Sierra Leone is a significant source of employment, and is characterised by diverse fishing vessels and gears in operation, making fishing the major activity in the coastal districts. It is a common property resource and still remains an open access fishery (Jalloh 2009). The artisanal fishery is conducted in six coastal districts with a total of more than 7600 boats operating at 641 fish landing sites. Five main types of artisanal fishing vessels operate in Sierra Leone. One man using handlines or castnets normally operates the Kru canoe, propelled by a paddle. The Std 1-3 boat has a crew capacity of 1 to 3 persons and is also propelled by a paddle and uses the same gear. Some Std 3-5 are propelled by a paddle and some are powered by an outboard engine and they have a crew capacity of 3 to 5 persons. The Std 5-10 are boats powered by an outboard engine with a crew capacity of 5 to 10 persons.

The Ghana boat, usually the largest, is powered by a 40 horse power engine and has a crew capacity of more than 10 persons (Jalloh, 2009). The motorised boats use a variety of gear like gillnets, driftnets, ringnets, longlines and handlines (Seisay 2008).

The clupeids (*Ethmalosa fimbriata* and *Sardinella maderensis*) constitute about 60% of the total artisanal fishery production of which 30% of the catch are juveniles (Seisay 2008). Jalloh (2009) reported that about 40% of the artisanal fishing gear is surface driftnets targeting juveniles of pelagic species.

Most of the artisanal fishing activities occur around the estuaries of the Sierra Leone River, and Yawri Bay in the Western area district. Over 100,000 metric tonnes of fish are produced yearly by the artisanal sector, thus contributing immensely to the enhancement of livelihood in coastal communities and mitigating the problem of malnutrition in remote rural communities throughout the country. The artisanal landings are dominated by the clupeids, mostly *E. fimbriata* (Bowdich, 1825), *S. maderensis* (Lowe, 1838) and *Ilisha africana* (Bloch, 1795) (Seisay 2006).

Industrial fishing

The industrial fisheries mainly exploit demersal stocks and shrimps. It is mainly comprised of trawlers, shrimpers, purse seiners, etc. As concerns industrial fishing, any vessel seeking to operate in Sierra Leone must obtain a fishing licence from the Ministry of Fisheries and Marine Resources. Although there is no regulatory requirement limiting catches, the fleet of industrial vessels has contracted globally. Fishing licences to industrial vessels and midwater trawlers for semi-pelagic species are issued by the Ministry of Fisheries. Twin-trawling is forbidden for midwater demersal and pelagic species.

Mackerel landings rose to 119.74 tonnes (in 2007) and *Decapterus* spp. to 951.40 tonnes (in 2007). It should be noted that *S. maderensis* are overexploited. Overfishing and illegal fishing have been identified as crucial environmental problems in Sierra Leone. There had been unprecedented increase in number of foreign and more sophisticated vessels.

Aquaculture

Aquaculture in Sierra Leone is concentrated in Bo and Tonkolili District with *Oreochromis niloticus* (Nile Tilapia) as the main cultured species. Generally, aquaculture farming system is basically extensive and semi-extensive with total production of

around 60 metric tons/year. Nowadays the farmers do just collect fingerlings from the natural habitat and nurse them in established ponds before selling to other farmers. Aquaculture could be best described to be at the conceptual stage in the country.

There used to be functional hatchery in the Bo and Makali fish farming stations in the South and North but was destroyed during the ten years rebel war. With support from USAID there is now a functional Hatchery with Fingerling production. The government through the Ministry of Fisheries and Marine Resources has now developed plans to rehabilitate these facilities and make it operational once again to march up with the present trend in aquaculture technology. Therefore, with the continued support by the government and her development partners, there are plans to develop the aquaculture sector. Early analysis suggests that aquaculture production, particularly focussed on African catfish and Nile tilapia culture in ponds and tanks, could contribute significantly to fish production in Sierra Leone within 10 years with appropriately targeted investment based on low input commercial practices.

The political climate has been generally unstable in Sierra Leone until 2002 and this negatively affected the fisheries sector, as evidenced by an ever-changing stewardship authority and lack (until 2003) of effective fisheries policy instruments (MFMR 2003). For over ten years (1991-2002), the country was torn apart by a civil war that paralysed its economy, crippled its public sector, destroyed its infrastructure and rendered its public authorities heavily challenged to implement management measures to the fullest. Since the end of the armed conflict, the humanitarian situation has gradually improved and in recent times the economy has started recovering, with annual growth rates ranging from ranging from 13% in 2013 to 19% in 2015. The fisheries sector has a huge potential to contribute to poverty reduction and the overall development of the economy. However, the stock biomass of the country's fisheries has not been fully estimated in recent years – calling for a comprehensive independent stock assessment to ensure effective management measures and foster resource sustainability. The sector however, lacks the capacity of enforcing well drafted management rules, especially in the areas of Illegal, unreported and unregulated fishing. Also the institutions for input supply, marketing and establishing ownership over the resources remain weak.

3. Biodiversity for food and agriculture interventions

3.1 Forestry Management interventions

Efforts in mobilizing funds

Funding available to support Forest management is woefully scarce in relation to the level of need and hard to secure. For fiscal years 2010 and 2011, 416 and 498 million Leones respectively were allocated for forest management and conservation activities which provided only for goods and personnel emolument. The degree to which allocated budget is physically available is a matter of conjecture. Most forestry programmes have been supported from donor funding. The major donor partners are EU, World Bank and FAO

Efforts in Policy formulation

After a peaceful and democratic election in 2007, the current government identified the management of Sierra Leone's environment and natural resources as a key peace and development option in its 2007 Poverty Reduction Strategy Paper (PRSP II).

A policy on timber development, exploitation and trade was prepared and approved by cabinet. The new policy specified seven criteria for qualification for a timber license:

1. The production of a land lease agreement stating cooperate social responsibility in the case of a community forest and signed by the Landowners, Paramount Chiefs and the Local Council;
2. A comprehensive forest management plan;
3. An annual operational plan;
4. An Environmental Impact Assessment Report and an Environmental Management Plan;
5. A performance Bond guarantee;
6. Payment of Land lease rent;
7. Support to the Forestry Division to monitor activities.

The 2008 policy was therefore overhauled and replaced with a comprehensive short to medium and long term policy that addressed the gaps in timber exploitation.

In the short term, the export of round logs was banned. Timber production was therefore to satisfy the domestic market. In the medium term companies wishing to invest in logging is to set up processing facilities to add value to the raw material before export. This policy was aimed at allowing the domestic market to grow while at the same time creating job opportunities for Sierra Leonean youths.

The long term goal was to encourage investors to invest in large scale commercial plantations that would sustain their investment. The establishment of large commercial plantations has the added advantage of benefitting from carbon credits if sustainably managed.

Sector Development efforts

In 2009, the Forestry Division had embarked on an Urban Greening in Freetown and planted 450 acres in degraded areas in the Western Area Peninsular Forest Reserve and 1,750 acres in the districts.

In view of the current emerging issues, the sector in 2010 developed Forestry and a Wildlife Policies aimed at addressing the multiple demands on the sector and incorporating international best practices. The two documents were ratified by cabinet.

The sector has also completed the development of a verification system for sustainable forest management. The main components of the system are developing a Chain of Custody and establishing the definition of legal timber. The ultimate goal is to develop a Legality Assurance System through a Voluntary Partnership Agreement with European Union (EU) through FAO for timber destined for export from Sierra Leone to EU countries.

At the regional level, Sierra Leone is collaborating with neighbouring countries within the Mano River Union (MRU) to develop a Transboundary Forest Management System. Protocols are being developed for cross border patrols and movement of forest personnel. Steps have also been taken to harmonize legal frameworks and policies for forest management in the sub-region.

Sierra Leone is part of the Forest Dialogue for West Africa and is currently taking part in the development of a convergence plan for sustainable forest management in ECOWAS member countries.

The country successfully hosted the 5th Ministerial Conference on the Fouta Djallon Integrated Natural Resource Management Project as a member state of the eight river basin countries of the Fouta Djallon Highlands. The Minister of the Agriculture, Forestry and Food Security was appointed as Chairman of the Ministerial Conference for two years.

Efforts towards Green House Gas Emission Reduction

Sierra Leone has opted for Reduced Emission from Deforestation and Degradation (REDD) as a strategy for reducing Green House Gas Emission (GHG). REDD projects have been acknowledged to be a highly cost effective way of reducing GHG emission and has the potential to offer significant reduction fairly quickly and without need for new technology. Hence, developing properly implementable and verifiable forestry projects that reduce carbon dioxide emissions or increase its sequestration over time can access revenue sources through the generation and monetization of carbon credits.

Given the socioeconomic realities that face the country, Sierra Leone has yet to keep pace with other African countries in the development of its national REDD strategy. In Cancun, the

country expressed its overwhelming support for REDD and is pushing hard to be included in the next round of Forest Carbon Partnership Facility (FCPF).

The Ministry of Agriculture, Forestry and Food Security in whose domain the REDD strategy falls is developing two sub-national projects at different levels of development:

1. The Gola National Park and the Greater Gola Area carbon project has now been finalized for carbon credit. The final assessment of the project in a series of milestones to be met and able to sell the carbon credit was done in 2015. So far the prospects for a carbon sale are expected to be good.
2. The Western Area Peninsular National Park (WAPNP) carbon project is still pending. Similarly, the WAPNP Project in the Western Area has completed preliminary work on a carbon project. The project is soliciting additional funding to continue the process.

Efforts towards National Protected Area Systems management

In 2003, government following the provisions of article 6 and 8 of the United Nations Convention on Biodiversity Conservation, carried out a country study and elaborated the National Biodiversity Strategy and Action Plan (NBSAP).

The document provided the basis for the creation of a net work of protected areas in representative ecosystems across the country for the conservation of approximately 80 – 90% of Sierra Leone’s biological diversity. Sierra Leone has decided to create 15 Protected Areas in both the Terrestrial and Wetlands ecosystem covering 441,723.41 hectares about 6.1% of the total land area (Table 3)

Efforts towards Gola Rainforest Project management

In 1990, the Gola Forest Programme (GFP) was established as a collaborative effort by the Royal Society for the Protection of Birds (RSPB), the Conservation Society of Sierra Leone (CSSL) and the Government of Sierra Leone (GoSL) with the aim to protect the Gola Forest while providing benefits to local communities. In 2002, just after the civil unrest, RSPB and CSSL resumed activities signing the “Gola Conservation Concession Framework.” In the agreement, the GoSL stated its intention to convert the entire GFR into a National Park. In 2007, a “Community Benefits and Payment Agreement” established a mechanism whereby local government, land owners and communities are compensated in exchange for foregoing their rights to farming, hunting, mining, logging and other activities that can damage the forest. However, funding for the Gola Forest Programme, which includes both the management of the reserve and compensation payments, was secured only for the period 2007-2012, primarily through a grant from the European Union.

Efforts towards Transboundary Forest Management

At the regional level, Sierra Leone is collaborating with neighbouring countries within the Mano River Union to develop a transboundary forest management system. Protocols are being developed for cross border patrols and movement of forest personnel. Steps have also been taken to harmonize legal frameworks and policies.

Efforts towards Western Area Peninsular Forest Reserve management

The Western Area Peninsular of Sierra Leone is also a part of the Upper Guinea Forest Ecosystem and is home to roughly 1 to 1.5 million people (20% of the country's total population, including the capital city of Freetown). The Forest Reserve occupies the centre of the Peninsular and covered 17,000 hectares of closed forest at the time of declaration. It was one of the first areas to be declared a forest reserve in 1916 and gazetted as a non hunting area in 1973. The Capital City, Freetown, and the Peninsular depend on the catchment areas of this reserve for moderating water supply from the Guma and Congo dams. The current demand for water in the Western Area is reported to be 26 million gallons per day but only 14 million gallons or a little over half (53.8%) are supplied leaving a deficit of 12 million gallons.

Efforts towards Wetland Ecosystems management

Most of the coastline and inland wetlands apart from the rapidly transforming sections of the Peninsular remain physically intact and is of high nature conservation value although human activity has significantly reduced populations of rare marine species including turtles and manatee which are hunted for food.

Government has identified the urgent need to establish effective systems for conservation management of wetland ecosystems in Sierra Leone. Seven areas have been proposed for conservation (Table 3). Currently, the World Bank has provided support for the establishment of effective conservation planning and management in two of the areas (a) Sierra Leone River Estuary and (b) Mamunta Mayonso complex.

To consolidate the efforts made thus far parliament last year approved the bill creating a National Protected Area Authority and a Conservation Trust Fund. The Authority will serve as an oversight body and to monitor protected area management in Sierra Leone as well leverage funding for protected area management.

3.2 Wildlife management interventions

No reliable post-war estimates of population size and distribution of any endangered species exist. Protection of endangered species still appears only symbolic, with only limited circumstances. It is difficult to see reliable data on which habitat appears to be restricting the hunting of endangered species. Fines and punishment associated with protecting endangered species are neither sufficient nor enforced throughout the country. Most of the wildlife populations are significantly depleted outside of protected areas as a result of over-hunting and habitat destruction.

With the transfer of Wildlife Division to NPAA, efforts are being galvanized to strengthen and empower this division.

3.3 Livestock management interventions

Establishment of the Livestock Division of MAFFS

The present Livestock Services Division is currently restructuring the original Veterinary Department to cater for the multi – disciplinary mix of animal health specialists and those specialising in livestock improvement involved in overall livestock development and production.

The new Livestock Division therefore, consists of an Animal Health Branch and an Animal Production Branch in order to make room for career development and the upward mobility of those who are not Veterinarians as originally was the case. The Division now has the responsibility to provide animal health coverage and livestock improvement programmes and proper animal husbandry coverage. The Division, regrettably, currently lacks the requisite trained manpower especially the Animal Health Branch where the proposed privatisation of the professional staff has not yet been implemented.

The Division also suffers from the lack of drugs, equipment and the expected back-up from the laboratory to provide the diagnostic facilities for effective and efficient disease detection and prevention. Salaries are poor and staff in general lack the motivation to undertake any meaningful statutory obligations, even though the Division has technical staff distributed to almost all parts of the country.

Policies, institutions and capacity

In the colonial era, the then livestock policy was to create a Veterinary Department to provide animal health services geared towards prevention and control of animal diseases. The laws and regulations empowered a number of authorities to carry out the responsibility of preservation of animal health as a result of the few number of veterinary personnel in the

country. Furthermore, the colonial government delegated the responsibility of protecting humans from animal diseases to the medical profession. Even now, the health inspectors are refusing to hand over post-mortem activities of food animals to the veterinary division. There is also need to update the Animal Disease ordinance Cap.191 of 1946, for which a proposed draft exists but not yet submitted to Parliament to be passed into law.

The main thrust of the livestock development policy, like the other sub-sectors of the Ministry of Agriculture, Forestry and Food Security, such as crops, is the attainment of self-sufficiency in food production and, in the case of livestock production, self sufficiency in domestic animals and animal products. This objective is to be achieved by the efficient integration of animal husbandry into a sound system of agriculture with a view to improving livestock productivity by adopting better breeding techniques, nutrition and effective disease control.

Regrettably, only few of these policy objectives have been partly implemented whereas many have not been addressed. Proposals highlighted in this report will accelerate achievement of some of these objectives.

Several tertiary institutions have included animal science in their curricula. These include the Njala University College, the Northern Polytechnic, Milton Margai College of Education, and Eastern Polytechnic. In all these institutions, Animal Sciences are part of a general degree in Agriculture or part of a Higher Diploma, Higher Teachers' Certificate, Ordinary National Diploma or Teachers' Certificate. The Teko Livestock Training Centre established in 1984 for the training of intermediate level manpower for the Livestock Division, provided training in the related disciplines of livestock before the outbreak of the civil war. This centre has now been incorporated into the Northern Polytechnic as a department of Animal Health & Production with an advanced curriculum wherein students can pursue the HND or OND rather than the previous Certificate in animal health and production. All the facilities of this centre were completely vandalised during the conflict and are yet to be rehabilitated. The FAO has established farmer field schools where farmers are trained on livestock health and production techniques

Local, national, regional and international partnership and cooperation

Immediately after the war, there was a proliferation of NGOs both local and international embarking on livestock restocking with a view to replenishing the numbers that were depleted during the war. Most of the interventions were unsuccessful due to several factors, one of which was lack of technical capacity in most cases. Presently, only a limited number of international NGOs have small livestock components in their operations. Heifer International

Sierra Leone, which is predominantly engaged in promoting livestock production in rural communities, has recently started operating in the country.

There are few Community Based Livestock Organisations in the country. Most notable is the Pig and Poultry Farmers' Association, which unfortunately, has not been active recently due to administrative reasons. Other Associations include the Cattle Traders' Association, and the National Butchers' Federation. The organizations, unfortunately, are more effective in name than in function, and need to be encouraged and given sufficient boost by Government so that they form the essential vehicle through which the much needed credit can be channelled. The desired objective is that these future Cooperatives, societies and Associations would have the necessary muscle and authority to act as intermediaries or guarantors for the individual group associations' to receive credit for the implementation of projects, particularly to the rural poor, by lending institutions.

The Livestock Division in collaboration with the Sierra Leone Agricultural Research and the Njala University have been working on projects to conserve the country's national breeds. In the process of commercializing livestock production, the genetic material of most species is being diluted with the introduction of exotic breeds. Adaptive characteristics for the harsh tropical conditions are being gradually replaced by higher productive but less adaptive characteristics.

The Livestock division has close collaboration with the Economic Community of West African States (ECOWAS) , The United Nations Food and Agriculture Organization (FAO), the African Union Interafrican Bureau for Animal Resources (AU-IBAR) and the International Animal Health Organization (OIE).

3.4 Fisheries and aquaculture interventions

The Government has recently reviewed its Fishery Act, Regulation and Policies to meet and address the current situation and challenges facing the fishing industry. The World Bank recognizes the challenges Sierra Leone faces in managing its natural resources. The Bank remains fully committed to supporting the government in ensuring that the fisheries sector is sustainable and profitable and has therefore supported \$60 million USD project for supporting fisheries in the country. World Bank urged the government to repatriate some of the monies generated by the sector to the Joint Maritime Committee (JMC) to be able to augment their finance needs. The US Government recently provided coastal radar, a shipment transponder identification system, and technological upgrades to the computer system at the JOC.

Another effort instituted so far is the establishment of the Sub Regional Fisheries Commission in 1985 to harmonize Fishing Policies and Legislations of its Member States. It has developed various tools such as the CMA Convention in 1993, which was to provide minimum conditions of access to the EEZ of Member States for foreign industrial fishing fleets. This Convention has seen many obstacles that impeded its implementation.

Coastal biodiversity is largely threatened by activities such as: Fishing, Agriculture, Industrial activities (Textile, Chemical, and Brewing), Mining and Mineral exploitation, Tourism, Marine Transportation, Marine and Coastal Infrastructure, Waste dilution and domestic use of water, Urbanization and development which has resulted to increase in anthropogenic activities and pollutant introduction into the coastal zones. All these affect the complex food web and ecological relationships thus adversely affecting the biodiversity. The recent report of the Environmental Protection Agency (EPA, 2014) on the Convention on Biological Diversity (CBD) revealed that fishing and other human activities have grossly affected the aquatic ecosystem.

Regional and international cooperation

The fisheries and aquaculture sub-sector has close collaboration with the United Nations Food and Agriculture Organization (FAO), West African Regional Fisheries Programme (WARFP), World fish, the Institute of Marine Biology and Oceanography (IMBO), IDCR, DFID, USAID, ADB, World Bank etc.

Institutional framework

The fisheries policy outlines the sectoral policy objectives and corresponding strategies for sustainable aquaculture development in Sierra Leone. The Ministry of Fisheries and Marine Resources is the government agency with the legal mandate to undertake all fisheries management and development activities. The Fisheries Management and Development Act, 1994, is the legal basis for the Ministry's functions and provide the guidelines for the management of all aquatic resources including fisheries and fishing industries.

The exclusive management and control of fisheries and other aquatic resources within the fishery waters is vested on the government. Management and control may be exercised directly by the government or by the Minister, the Director of Fisheries or any other authorized officer. The Ministry of Fisheries and Marine Resources is headed by a Minister (political head), a Permanent Secretary (administrative head), and a Director of Fisheries (the professional head who must have expertise in fisheries).

The Ministry of Fisheries and Marine Resources is the sole government agency with the legal mandate to promote aquaculture activities in the country. The Ministry's overall responsibility is the control, development and conservation of all aquatic organisms, including marine and freshwater environments. Its specific role in aquaculture development is the promotion of sustainable aquaculture through research and extension, focusing in particular on: construction of community ponds in identified rural communities; maintenance of an aquaculture tool bank for hire to fish farmers and associations; provision of technical support to private fish farmers; identification and awarding of aquaculture research contracts to the university.

The Ministry has a separate unit in charge of inland fisheries and aquaculture. This unit is headed by an Assistant Director of Fisheries, supported by a Principal Fisheries Officer and a team of intermediate and junior technical field staff.

Regulations

The National Fisheries Sector Policy is aimed at fostering responsible fishing practices and sustainable development of the nation's fisheries amongst the stakeholders. A recently ratified national fisheries policy (2003) focuses on the following broad objectives:

- To improve national nutrition and food security through responsible fishing and the reduction of spoilage and wastage.
- To increase employment opportunities.
- To raise socio- economic status of the people in the fisheries sector including women.
- To improve the skills of the fishing communities and increase export earnings in the industrial fisheries.

The fishery policy for the artisanal fisheries sector is mainly geared towards poverty alleviation through the promotion of sustainable livelihoods and enhanced nutritional, socio-economic conditions. These policy objectives sometimes do overlap with the industrial sector where there is added emphasis on revenue generation. At present, licensing functions of fishing canoes of the artisanal fisheries sub-sector have been devolved to Local Government Authorities (since 2004).

The Fisheries Regulations pertaining to aquaculture forbid the following:

- Introduction of exotic species in aquaculture system without clearance from the Ministry.
- Undertaking of any aquaculture activity without clearance from the Ministry.
- Unauthorized fish processing activity.
- Utilization of unsuitable sites for reasons of environmental degradation.

Research, Education and Training

Several tertiary institutions have included Fisheries and Aquaculture in their curricula. These include the Njala University College and the Institute of Marine Biology. The Ministry therefore contracts fisheries related researches to these institutions.

4.0: Threats and challenges to biodiversity and causes of food and agricultural decline

4.1: Threats and challenges to forest management

The challenges to forest management in Sierra Leone have direct linkage to economic development. Managing a post war economy with high levels of poverty and unemployment means that natural resources become central in government's drive to revamp the economy, create jobs, support livelihoods and raise revenue either through mining, agriculture, logging, fisheries or other natural resources. These Challenges are summarized below:

- **Mining**

Significant mineral deposits – including gold, diamond, rutile, bauxite and iron ore - are located either in protected areas or close to protected areas causing environmental degradation and subsequent ecological problems through clearing and excavating vast areas of forested land. Similarly, sand mining in coastal areas has resulted in coastal erosion and a rise in sea level to coastal lands affecting resident populations and mangrove forests along the coast.

- **Conflicting Mandates**

There are weak links with other institutions and a lack of coordination between government agencies at national and local levels to resolve conflicting policies, mandates and land use practices. This has contributed to ambiguity in land tenure, conflicting land uses, and unsustainable management practices

- **Inadequate funding**

For the past three years, budgetary allocation for forest management and wildlife conservation has not exceeded Le 5 million covering barely personnel emolument and creating no provision for development work in the field. The reforestation account which was created by an act of Parliament to support reforestation and other forestry activities was taken over by the Ministry of Finance. To date the Ministry of Agriculture, Forestry and Food Security has no control over the account and the manner in which funds from the account are utilized.

- **Inadequate logistics and technical skills**

The forestry division is under resourced, field equipments are inadequate and there is a shortage of technical skill.

- **Weak law enforcement**

Laws, policies and regulations have been enacted to address forestry issues in Sierra Leone. The enforcement of these laws, policies and regulations however remain a bottle neck for the government.

• **Population pressure**

The population of this country has increased over the years from 5 million to 7 million in space of ten years, indicating annual growth rate of 2% with 2000 birth per year. As more people are born, the pressure on the fixed natural resources increases as well. This has had negative impact on the use of the available resources. Unsustainable use of the forest resources could also be attributed to population pressure.

• **The preference for alternative land uses such as agriculture and grazing**

Alternative land use in the fields of agriculture and grazing has created a vacuum in the management of forest resources. Forest edge communities depend on the forest land for grazing and agriculture. The massive improvement in mechanized farming has led to a rush from overseas companies in search of fertile land for agriculture in Sierra Leone. As a result, many communities have leased their entire land for meagre sum to these companies due to their inability, poverty status and lack of technical know-how to cultivate these parcel of land.

• **Illegal harvesting**

Illegal harvesting of forest products and non-timber forest products has resulted in drastic forest degradation. The rush to extract forest resources for commercial gain have resulted in Sierra Leone losing 75% of its typical forest regime.

• **Urban expansion**

One major challenge facing Sierra Leone's rapid population growth is the increase in urban migration. Many people in search of greener pasture have rushed to the cities to escape the poverty and lack of opportunities envisaged by the rural poor. This mass exodus of rural people to the cities have added more pressure on the available resources and increased in demand for forest resource utilization such as charcoal, firewood, timber etc.

4.2: Threats and challenges to wildlife management

Wildlife management and protection depend to a large extent on the continued preservation of vegetation cover and habitats. If the habitats are threatened, wildlife survival will be at stake and many will forcefully migrate to other habitats. The major threats facing wildlife management in Sierra Leone include:

- Disease
- Global Warming
- Habitat Loss

- Invasive Species
- Mining
- Overexploitation
- Pollutants

Degradation of the natural resource base, exacerbated by increasing pressure of population the absence of suitable methods and. The country's wildlife population is declining due to commercial hunting. In the absence of wild game hunt, the herders are forced to slaughter their animals at an unsustainable rate. Other economic developments such as mining are a further threat, grazing areas are destroyed or migration patterns are disrupted.

4.3: Threats and challenges to livestock management

Threats to livestock production in Sierra Leone include natural disasters, disease outbreaks, and other emergencies.

Natural disasters and emergencies have the tendency and potential to devastate livestock populations in a short period of time. In Sierra Leone, flooding and erosion have often destroyed livestock and their habitats.

Production systems can be affected not only by demands in local markets, but also by trends at the international level (FAO, 2005a).

4.4: Threats and challenges to fisheries and aquaculture management

Substantial challenges to fisheries governance, lack of infrastructure, and weak enforcement capacity to exclude illegal actors explain the numerical gap. "While Sierra Leone's authorities are actively fighting illegal fishing, structural and financial limitations represent major threats to the country's fisheries sustainability. These threats further compound existing challenges to food security, livelihoods, and economic growth in a country ranked as one of the poorest in the world and still recovering from a deadly civil war and a recent Ebola epidemic. Local officials are also striving to know more about the state of their fisheries, and are considering incorporating the catch reconstruction method into their statistical system.

Another major challenges facing Sierra Leone's fishing is inadequate capacity and capability to effectively surveillance its fisheries waters and implement fishing laws to the fullest. Capacity gap has widened and has negatively impacted the fishing industry. Many of the staffs in the industry have very little knowledge in providing technical skills.

Other challenges include:

1. Poor governance which covers lack of policy enactment and implementation by policy makers and those in governance for the impoundment or ban of unregistered foreign vessels and those registered but use unregulated industrial scale vessels which not only deplete the stock but also prevents local fishermen from carrying out their vocation

2. Weak surveillance and monitoring system;
3. Conflicts between the artisanal and the industrial fisheries with the resulting damage of fishing gear primarily for the former;
4. Inadequate fisheries statistical data;
5. Both the industrial and artisanal fisheries are hampered by poor infrastructure on land. This applies to landing facilities, the availability of refrigeration and freezing storage, the availability and reliability of electricity, roads and other communication infrastructure.;
6. Corruption;
7. Licence, royalties and transshipment fees from the industrial fishery constitutes an important source of revenue for the Government of Sierra Leone and the main source for the Ministry of Fisheries and Marine Resources (MFMR);
8. Lack of government support for local Sierra Leoneans fishing companies;
9. Challenges facing the aquaculture segment is overreliance on marine capture;
10. Extensive network of rivers and lakes in the country increases reliance on wild fisheries;
11. Inadequate government funding is also a serious challenge facing the aquaculture segment

5.0: Recommendations

5.1: The forestry division

- i. create a platform where key stakeholders whose activities impact on forestry can meet and discuss issues with a view of finding solutions to conflicting mandates.
- ii. carry out an inventory of the forest resources of the country with the objective of preparing a national sustainable forest management plan.
- iii. work with other key stakeholders in preparing a sustainable land use plan
- iv. set up a national land use committee
- v. develop a National Reforestation Programme

5.2: Wildlife division

To effectively protect the diverse wildlife population in Sierra Leone, national and international partners need to:

1. Strengthen the division with modern equipments and materials;
2. Build the capacity of the division's staff and other partners;
3. Conduct a comprehensive wildlife survey throughout the country;
4. Setup and support Community-based wildlife protection committees at chiefdom level;
5. Support in reviewing the Wildlife Act of 2011.
6. Mobilize donor funding in this neglected but important sector

5.3: Livestock division:

To enhance livestock productivity and reduce protein deficiency in the country, the division is hereby proposing the following:

- a) increase the country's meat supply through the improvement of overall productivity in the indigenous livestock population within the shortest possible time. This is achievable through effective disease control and through the utilisation of genetic production potentials by appropriate selection within and between improved breeds.
- b) strengthen the institutional capability of the veterinary services both in terms of Human Resources Development and infrastructural facilities
- c) encourage the integration of crop and livestock production
- d) promote the activities of the Work oxen
- e) promote public and private sector participation in livestock development
- f) upgrade the existing facilities in the meat industry
- g) promote the sale of livestock and livestock products

- h) upgrade production in the various livestock sectors including controlled cross breeding of indigenous livestock with improved breeds with a view to improving the performance of the off-spring, while maintaining desirable traits such as thriftiness and trypano-tolerance for example.

5.4: Fisheries and aquaculture division

The need for training of middle level staff became apparent in order to improve data collection and analysis for sound fisheries management as well as to improve the well being of the fishing communities. It is therefore recommended that the following be urgently addressed in order to upgrade this sector:

1. A total review of the Fishery Act, Regulation and Policies is needed to empower local people;
2. Strengthen the capacity of Artisanal fishing groups and individuals and providing them with financial support to compete with international fishing companies;
3. Strengthening the Fishing Patrol Team to patrol and monitor the territorial waters;
4. proper fishery legislation and regulations be established and whenever possible be harmonized with those of adjacent coastal States jointly exploiting the resource;
5. Also, for issues relating to poor implementation of fisheries regulations, a national forum should be set up to include the resource users to discuss these issues and the way out of them;
6. To save the inshore fisheries from collapse due to destruction of the spawning grounds for a lot of species and put an end to the frequent conflicts between the artisanal and industrial fisheries, laws restricting of inshore trawlers to fishing only in areas of depth over 20 -30 m should be adopted;
7. sophisticated surveillance and monitoring system should be put in place;
8. Although, there are few data on the status of the Sierra leone fisheries but yet much work is still needed to be done in the aspect of fisheries data. There is a need to update the inventory of all aspects of the countries fisheries in terms of canoes, vessels, gears, number of fishermen, etc including aquaculture. Precise documentation on migration patterns of important commercial species harvested by both the artisanal and industrial fleets is needed;
9. Creation of Marine Protected areas and financing of the definitive withdrawals of fishermen from these areas;

10. Adequate funding and support by Government for local Sierra Leonean fishing companies and aquaculture;
11. Encourage aquaculture and enact laws and regulations that will reduce total reliance of the populace on marine capture.

6.0: Annexes

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6.2: Annex 2: References

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