Diagnostic and a Baseline Study for Implementing Ecosystem-based Adaptation in Rural Landscapes of The Gambia

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Front cover photo: A Farmer nurturing tree seedling that will be planted next season. Photo Credit: L. Duguma.

Design and Layout: Tabitha Obara

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LIST OF ABBREVIATIONS AND ACRONYMS

AEWA	African-Eurasian Waterbird Agreement
ADB	African Development Bank
ANR	Agriculture and Natural Resources
ATEP	Association pour l'etude de la population
ATU	Appropriate Technology Unit
CBD	Convention on Biological Diversity
CBO	Community-based Organization
CC	Climate Change
CCSF	Community Controlled State Forest
CDA	Community Development Assistant
CDDP	Community Driven Development Project
CF	Community Forest
CFMA	Community Forest Management Agreement
CITES	Convention on Internal Trade in Endangered Species
CMS	Convention on Migratory Species
CPA	Community Protected Area
CRR-N	Central River Region North
CRR-S	Central River Region South
CSIP	Community Skills Improvement Project
CWR	Community Wildlife Reserve
D	Dalais
DoA	Department of Agriculture
DoCD	Department of Community Development
DoF	Department of Forestry
DoPWM	Department of Parks and Wildlife Management
DRM	Disaster Risk Management
EbA	Ecosystem-based Adaptation
ECOWAS	Economic Community of West African States
ES	Environmental Service
EuDASM	European Digital Archive on Soil Maps
EWS	Early Warning Systems
FAO	Food and Agriculture Organization of the United Nations
FGD	Focus Group Discussion
FTE	Full-time Equivalent
GADM	Global Administrative Area

GBoS	Gambia Bureau of Statistics
GCAV	The Gambia Commercial Agriculture and Value Chain Management Project
GCF	Green Climate Fund
GCM	General Circulation Models
GDP	Gross Domestic Product
GEAP	Gambia Environmental Action Plan
GEF	Global Environment Facility
GFMC	Gambian Forest Management Concept
GHE	Gambia Horticultural Enterprise
GMD	The Gambian Dalasi
GoTG	Government of The Gambia
GTTI	The Gambia Technical Training Institute
HH	Household
ICCCAD	International Centre for Climate Change and Development
ICRAF	World Agroforestry
INDC	Intended Nationally Determined Contribution
IPCC	International Panel on Climate Change
ISRIC	International Soil Reference and Information Centre
IUCN	International Union for Conservation of Nature
JATIFI	Jamorai Timber and Firewood Federation
JFPM	Joint Forest Park Management
JICA	Japan International Cooperation Agency
JRC	Joint Research Centre
KPI	Key Performance Indicator
KTB	Kenyan Top-Bar hive
KWNP	Kiang West National Park
LGA	Local Government Area
LRR	Lower River Region
MA&D	Market Analysis and Development
MECCNAR	Ministry of Environment, Climate Change and Natural Resources
MI	Moisture Index
MoE	Ministry of Energy
MoFEA	Ministry of Finance and Economic Affairs
MoFEN	Ministry of Forestry and the Environment
MPC	Multipurpose Centre
MTE	Mid-Term Evaluation
NAPA	National Adaptation Programmes of Action
NARI	National Agricultural Research Institute

NBR	North Bank Region
NBSAP	National Biodiversity Strategy and Action Plan
NDMA	National Disaster Management Agency
NEA	National Environment Agency
NFA	National Forest Assessment
NFF	National Forest Fund
NGO	Non-governmental Organization
NR	Natural Resource
NTFP	Non-Timber Forest Product
PAP	Priority Action Plan
PET	Potential Evapotranspiration
PIWAMP	Participatory Integrated Watershed Management Project
PMU	Project Management Unit
ppm	parts per million
PPME	Participatory Planning Monitoring and Evaluation
PROGEBE	Regional Project on Sustainable Management of Endemic Ruminant Livestock
RAINBIO	Mega database of Tropical African vascular plants distributions
RCDO	Regional Community Development Officer
RDI	Rural Development Institute
REDD+	Reducing Emissions for Deforestation and Forest Degradation
RPMEU	Research and Planning, Monitoring and Evaluation Unit
RWSSI	Rural Water Supply and Sanitation Initiative
SDF	Social Development Fund
SDG	Sustainable Development Goal
SFM	Sustainable Forest Management
SMART	Specific, Measurable, Attainable, Relevant, Timebound
TLU	Tropical Livestock Unit
UN	United Nations
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
URR	Upper River Region
USAID	United States Agency for International Development
USD/$	United States Dollar
USGS	United States Geological Survey
VISACA	The Village Savings and Credit Association
WRB	World Reference Base
WTTC	World Travel and Tourism Council
WWF	World Wildlife Fund

EXECUTIVE SUMMARY

A baseline study conducted for the project, "Large-scale Ecosystem-based Adaptation in The Gambia River Basin: Developing a climate resilient, natural resource-based economy", covered an inventory of 110 Community Forests (12,637 ha), 8 Community Protected Areas (20,500 ha), 825 farm inventories, 831 household surveys (5,561 ha) and involved interviews with the management committees of 118 CFs and CPAs, interviews with 16 MPCs, plus workshops and focus group discussions.

The study also included a climate change vulnerability analysis (using historical data and projections using global models) to gauge the interventions that could withstand future changes, if any. Policy analysis was conducted on 28 policies/strategies/plans to identify the extent of EbA integration. The sections below present the provisional results of the analysis conducted on the above different data sets.

EbA OPTIONS: Most of the proposed EbA options, both in forested areas and in agricultural landscapes, are feasible. However, a number of assumptions that were made in the project document need to be revisited to match the contexts within which the project is to be implemented. Some of the key issues include:

- The species that were presumed to have been used in the project need to include important wild edible trees which were confirmed to play a critical role during periods of food scarcity which are usually caused by drought-related crop losses.
- Assisted natural regeneration could be the most cost effective and resilient strategy to promote restoration of the forest and CPAs, especially if the area of such entities is big enough and does not impede access to forests and protected areas.
- The assumed local capacity on planting material production was found to be very low.
- The currently available species are largely fruit trees, with a minimal number of forest tree species.
- The project proposed one nursery per region. However, an assessment revealed that this is not sufficient to produce the seedlings required for the 7000 ha forest area planting and the 3000 ha agricultural land planting.
- Water management and provision emerged as necessary conditions for seedling development, as well as tree planting and management, given the confirmed moisture constraints the project region may continue to face.

Key recommendations based on our findings are as follows:

- Diversification and planting of diverse tree species is crucial to meet the multiple demands of the people and the ecosystem. Domestication of wild edible plants has to be given due consideration in this.
- Species choices for planting has to be supported by the bioclimatic modelling to ensure the species are planted in the right place and will thrive.
- Number of nurseries to be supported per region has to be increased from one to at least 3-5 nurseries.
- Water supply and management has to be part of the planning process for the tree planting.
- Assisted Natural Regeneration has to be one of the key interventions. This will work in CFs with large areas (probably more than 100 ha) and CPAs. The intention is to avoid restricting

access and use of forests by the community because with ANR use may be restricted till the plants reach a specific height.

- To ensure sustainability of the planted seedlings, management of fire outbreaks and other protection measures is crucial.

NATURAL RESOURCE-BASED BUSINESSES: We found that most enterprises proposed in the project generate substantial benefits financially, though some might have considerable ecological consequences unless proper safeguards are put in place. For example, timber harvesting and marketing may be very attractive for the communities as an enterprise, but most of the tree species to be used for timber are also protected by law (Forest Act 1998).

Such cases may require careful consideration of the pros and cons of the enterprises, with communities emphasizing illegal logging as one of the key challenges in and around the CF areas. Unless households are engaged in multiple enterprise types, it is highly unlikely that they will achieve the USD 330 per annum net benefit. Our computation from the firewood enterprises revealed that the benefit would be only about USD 180. Other enterprises such as beekeeping should be promoted to achieve these income levels.

Some of the proposed enterprises were not very familiar. For instance, food processing was less common, except for the local packaging of cashew. We also found that investment allocated for the enterprises as per the project document need to be revised. For instance, the finance proposed per enterprise for firewood in the project document is less by about USD 4000.

Despite high expectations, MPCs have very weak structures, and their engagement in activities related to EbA and NR businesses is low.

Key recommendations for implementation include:

- Value addition to forest and agricultural products could be a great area of engagement. However, investment is required, and market linkages have to be properly established.
- There is a need for a strategy to integrate EbA-related enterprises and NR businesses into MPC activities.
- Households should be allowed to engage in multiple enterprise types so that their net benefit can increase. Of course, this has to consider capacity and availability of labour.
- Food processing is not that common in the project regions. However, vegetable production was found to be common and the MPCs could make use of this as an enterprise.
- Tree nurseries could be one of the most important enterprises to be established as an enterprise so that women groups and the community could also raise seedling to be planted. This could also give the project an option of solving the problem of planting material scarcity. It might also be a way to involve players from the private sector.

POLICY SUPPORT, INSTITUTIONAL STRENGTHENING AND KNOWLEDGE GENERATION: The EbA integration scores of most of the existing policies are very low. Out of the 28 policies the team reviewed, only five scored above average score (5 out of 10) with the National Adaptation Plan Agriculture and Natural Resources Policy having the top scores for EbA integration. Current level of policy awareness by the local community stands at less than 25%; this implies the need for sensitization on policies and strategies.

The local capacity for climate change was found to be low, only scoring above average in two attributes with the remaining three capacity attributes being below average. Existing data on spatial attributes of CFs and CPAs is point and not polygon data. This implies that it is difficult to clearly identify the boundaries of most CFs from the existing information. Moreover, the project focuses on village level development

plans though there is no spatially explicit detail for villages. This underscores the need for comprehensive information platforms for CFs and CPAs.

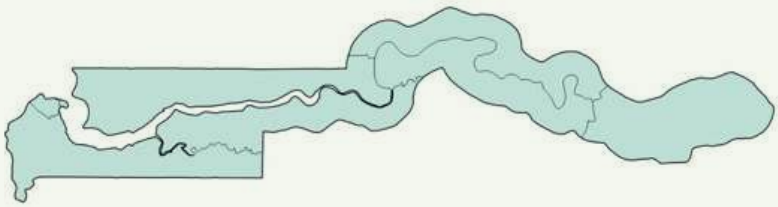
Key recommendations based on our assessment include the following:

- As proposed in the project design, it is important to increase the integration score of some of the policies directly related to EbA.
- Local communities should be made aware of existing policy issues relating to EbA.
- It is important to make areas of CF and CPA spatially explicit by collecting field data and developing maps that can be monitored for changes during the project lifespan.
- Capacity building sessions should be conducted for personnel from the DoF and DoPWM. This should be prioritized considering that the two departments will be working on the CFs and CPAs.

CHAPTER 1

GENERAL INTRODUCTION

THE GAMBIA



1.1 INTRODUCTION AND PROJECT OVERVIEW

This publication presents the baseline study results for the project, "Large-scale Ecosystem-based Adaptation in The Gambia River Basin: Developing a climate-resilient, natural resource-based economy". It sets out the starting points on various project outcomes, outputs and targets via a number of indicators, thereby setting up project monitoring and success measurements. It also sets out the context and assumptions around and along which success and lack of it will be interpreted, explained and judged.

1.1.1 The EbA project: an overview

The project, "Large-scale Ecosystem-based Adaptation in The Gambia River Basin: Developing a climate-resilient, natural resource-based economy" (EbA project) is one of the large-scale ecosystem-based adaptation projects in The Gambia. It aims to support the growing need for communities to adapt to the adverse effects of climate change within a period of six years. Most of the population in the country is poor, hence their capacity for resilience is very low. To hasten implementation of the resilience agenda, it is important to build national, regional and local capacities to ensure that the adaptation process is effective and sustainable.

The Government of The Gambia has recognized these problems and has begun developing various policies and strategies to enhance the adaptive capacity of the community and economy. The EbA project is among a range of initiatives which aim to support the ongoing processes of making the economy and the population resilient to the challenges of climate change.

The goal of the project is to build the climate-resilience of rural Gambian communities and facilitate the development of a sustainable natural resource-based (green) economy by implementing large-scale EbA within and adjacent to agricultural areas, community-managed forest reserves and wildlife conservation areas of The Gambia. The project intends to achieve the overarching objective by restoring and building the country's natural resource base in transformed agricultural landscapes and degraded ecosystems (including deciduous and semi-deciduous forests, savanna woodlands and mangroves) using climate-resilient tree and shrub species

across an area of at least 10,000 hectares. This investment in EbA will be complemented by the establishment of natural resource-based businesses managed by local communities. These businesses will stimulate economic activity in The Gambia's rural areas and facilitate the transition of the country towards a green economy based on sustainable use of natural resources.

The project has three major components:

- **Component 1:** Large-scale Ecosystem-based Adaptation (EbA) to build a climate-resilient natural resource base across The Gambia.
- **Component 2:** Establishment and strengthening of natural resource-based businesses in The Gambia.
- **Component 3:** Policy support, institutional strengthening and knowledge generation to support large-scale implementation of EbA in The Gambia.

The project aims to achieve the following targets:

- Total area of degraded ecosystems restored by the project's EbA interventions:
    - **7,000 hectares** of degraded forest, woodland, savanna and mangrove; **3,000 hectares** of agricultural land.
- Expected total number of direct and indirect beneficiaries (reduced vulnerability or increased resilience); number of beneficiaries relative to total population (adaptation only) – **11,550 direct beneficiary households** (50% women) supporting ~46,200 dependent household members (indirect beneficiaries). The cash benefit to the direct beneficiary household per year is **US$ 330 per beneficiary household per year**, assuming **11,550 beneficiary households**. This adds up to a cash return from the businesses of at least US$ 75 million/20 years. The business engagement should also generate about US$ 11.3 million/20 years to the National Forest Fund in taxes and licensing fees.
- Expected increase in generation and use of climate information in decision-making:
    - Identification and integration of climate change adaptation priorities into village/community management plans for **at least 125 Community Forestry (CF) and Community Protected Areas (CPAs);** and integration of EbA, including priority actions and strategic options, into **at least three national-level policies and strategies including the updated ANR policy,** Vision 2020 and proposed National Climate Change Strategy and Action Plan.
- Increased capacity of MoE staff, including regional-level DoF and DoPWM extension staff, to identify, prioritize, design and implement an EbA project. The project will aim to increase the technical capacity of these stakeholders to design, implement and monitor large-scale EbA projects relative to a baseline score measured using capacity assessment questionnaires. This captures building capacity of **at least 40 regional-level extension staff in DoF and DoPWM increased to at least 8/12,** relative to a baseline score of 4/12, measured using Capacity Assessment scorecards.
- Degree to which national policies, plans and processes are strengthened to identify, prioritize and integrate adaptation strategies and measures for the integration of climate change into planning. Sectoral policies, plans and processes for decentralized management of natural resources and community development that are in the process of being modified through the GCF project have **an EbA integration score of at least 6.**

1.2 SPECIFIC PURPOSES OF THE BASELINE STUDY

The baseline study had three key objectives:

- Refine and define the indicators and sub-indicators that will be monitored to indicate project progress and achievement of targets
- Develop starting values for each of the indicators and sub-indicators specified
- Validate and scrutinize the assumptions within which project targets and the implementation processes were defined.

The underlying goal here is to examine the extent to which the field realities and contexts match assumptions in the project document. This is important, given that project commencement is coming close to three years after the project design in 2015. The country context could have changed during this period.

1.3 INDICATOR SPECIFICATION AND MONITORING

With the project targets described in Section 1.1.1, it was important to first identify practical and easy-to-understand indicators that could be aggregated to reflect the project targets. We conducted an extensive identification and validation exercise during a two-day workshop attended by 42 people drawn from the key stakeholders of the project: DoF, DoPWM, DoCD, DoA and MECCNAR. The objective here was to define sub-indicators and ensure that they are specific enough to be measured in the field. Table 1 presents the agreed sets of indicators and sub-indicators that were extracted from the project document based on the targets set and inputs from the workshop participants.

Table 1: **EbA project indicators and sub-indicators**

Key performance indicators	Sub-indicators
Number of females and males benefiting	Number of households benefiting from the project
	Gender representation in the management committee
Total area of degraded ecosystems restored by EbA interventions	Area planted with trees (ha)
	Mortality rate of trees planted
	Area of agricultural land developed (ha)
	Area of forest restored (ha)
	Number of trees planted in different planting arrangements
	Number of incidents of illegal extraction
	Number of uncontrolled fire incidences in CFs/CPAs
	Area of fire belt established (ha)
	Frequency of patrolling CFs/CPAs per month
	Number of awareness creation events supported
	Number of technical staff trained (including extension staff)

Key performance indicators	Sub-indicators
Livelihood improvement for rural Gambian households	Income per household (US$)
	Number of direct jobs created through natural resource-based enterprises
Number of enterprises based on a climate-resilient natural resource base	Number of NR-based enterprises in CFs, CPAs and MPCs
	Investments in NR-based businesses (US$)
	Investments in MPCs (US$)
	Investments in nursery development (US$)
	Revenue from NR-based businesses (US$)
	Number of communities trained on NR-based enterprises
EbA integration score of policies, strategies, plans and processes	Number of policies, strategies and plans integrating EbA
	Number of EbA protocols developed
	Number of national and regional level policy dialogues held on EbA
Number of local management plans integrating EbA protocols developed Number of assessments and strategic policy recommendations developed to support integration of large-scale EbA into sectoral policies and plans	Number of management plans updated to include EbA Number of EbA-related policy recommendations developed
	Number of assessments conducted on the different policies, strategies and plans related to EbA
Contribution to National Forest Fund to facilitate effective forest management in the country	Amount of tax and license fees collected from NR-based businesses (US$)

1.4 COUNTRY CONTEXTS

1.4.1 Geography

The Republic of The Gambia is located on the West African coast and stretches over 320 km inland from west to east on either side of the River Gambia, varying in width from about 50 km near the mouth of the river to about 24 km upstream. The country is surrounded to the north, south and east by the Republic of Senegal and to the west with a short Atlantic Ocean coastline. The River Gambia, runs the entire length of the country from the Fouta Djallon highlands in Guinea, Conakry to the Atlantic Ocean, dividing the country's land area of 11,295 square kilometres almost equally into two halves: The South Bank and the North Bank (Gambia Bureau of Statistics (GBoS) 2012, Jaiteh and Baboucarr 2011). Major tributaries include the Sandougou, Nianija, Sofaniama, Miniminiyang, Bao and Bintang "bolongs" (creek in Mandinka).

The Gambia is a low-lying country with over 48% of the total land area below 20 m above mean sea level and nearly one-third of the country, at or below 10 m above mean sea level. Only 4% of the country's land area is above 50 m (Figure 1). River ecology is divided into two different zones, estuarine and freshwater, which in turn largely determine the vegetation pattern. The area adjacent to the river (48% of land area) is characterized by poorly drained alluvial sediment formations which are subjected to regular seasonal flooding. In the western area of The Gambia, the river water is salty or brackish,

the soils are clay and alluvium within which mangrove forests thrive. The natural vegetation in this area is dominated by swamps, grass and marshes. Swamp rice is also cultivated in this area. Beyond the mangrove are the freshwater areas where soils are often light alluvium and are more fertile. On the relatively higher grounds (plateaus), the natural vegetation occurs along a precipitation gradient, ranging from trees and shrub savannah in the northeast to multi-story tropical forest in the southwest. A few pockets of the indigenous vegetation of the plateau areas remain; however most have been converted for cropland expansion, settlement, and timber collection. The plateau is the centre for groundnut (the country's leading cash crop) and coarse-grains (millet and sorghum) production.

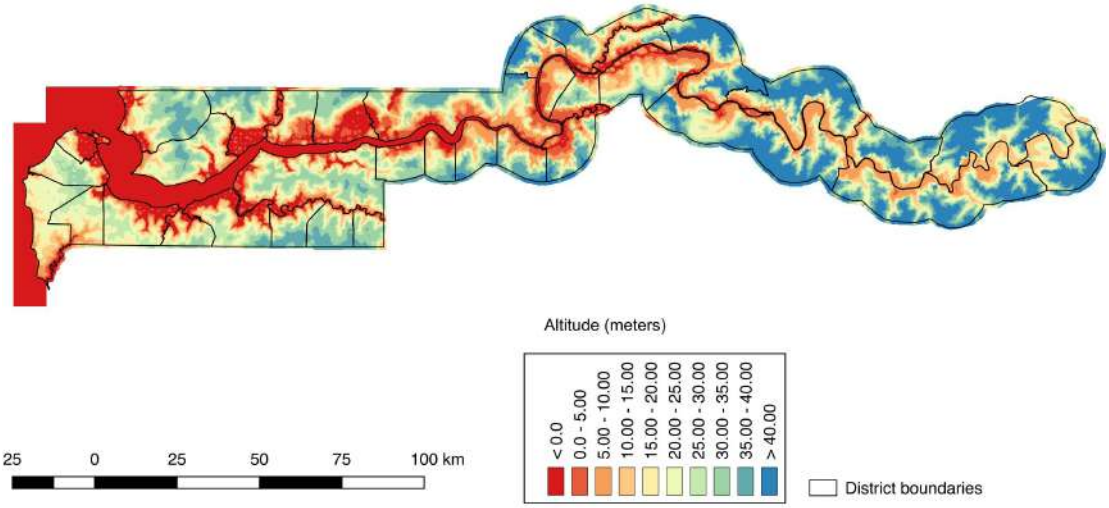


Figure 1: **Elevation map of The Gambia (Source: World Agroforestry 2018)**

1.4.2 Demography

In 2017, The Gambia's population was estimated at 2.16 million with a population density of 214 people per square kilometre, making it one of the most densely populated countries in Africa. There is a significant growth from 1.3 million in 2003 with an accompanied rise in population density, from 127 persons per square kilometre. The annual population growth rate is about 2%. Despite having very little land area, The Gambia's population continues to grow due to a high fertility rate averaged at 5.6 births between 2010-2013. The country's population is also very young, with 65.4% below 25 years. Additionally, persons aged 65 years and above account for only 2.3% of the population. In 2015, 59.6% of the population lived in urban areas; this was a substantial increase from the 28.4% recorded in 1980 (Economic Commission for Africa 2017) (Figure 2). It is evident that there is a sharp increase in the urban population in the country – from 10% of total population in the 1960s to more than 60% in 2017.

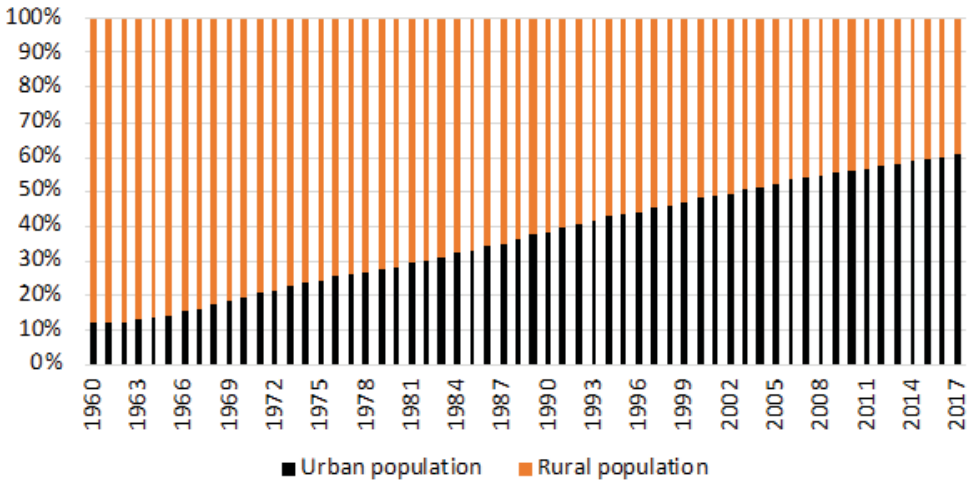


Figure 2: **The urban-rural population trends of The Gambia (Source: Authors' compilation and computation based on data from the World Bank database)**

The capital of The Gambia is Banjul. It has a city population of 35,000. The Greater Banjul area has an estimated population of 380,000 with an urban population density of 3,800 people per square kilometre. The Gambia's largest city, Serekunda, has a population of 350,000. There are many ethnic groups in the country. The largest is the Mandinka (42%), followed by the Fula (18%), Wolof (16%), Jola (10%), Serers, Serahule and the Bianunkas. The Krio are one of the smallest ethnic groups in the country. There are about 3,500 foreigners living in the country (Economic Commission for Africa 2017, Population Reference Bureau 2017).

Most of the population lives below the international poverty line of US$ 1.25 per day. The per capita GDP of the country is about US$ 428. The Gambia is ranked 151st out of 169 countries on the Human Development Index (MoFEA 2016). The national poverty incidence level is about 48% and was reported to be decreasing (Economic Commission for Africa 2017).

1.4.3 Ecology

The Gambia is geographically located between the arid Sahara Desert and humid rainforests in the south. All these, combined with the extensive wetland systems along the River Gambia, result in a wide range of habitat types supporting a diversity of plant and animal species. There are an estimated 1,005 flowering plants, 126 species of mammals, 627 species of fish, 576 bird species, 784 species of insects, 77 species of reptiles and 27 species of amphibians known to be native to The Gambia (GoTG 1998; 2014). It has several protected areas including six national parks and game reserves (comprising 4% of the total land area), 66 forest parks and one Ramsar site, which promote in-situ conservation. There are only a few ex-situ facilities, including the animal orphanage of Abuko Nature Reserve and the Botanical Gardens at Bakau.

Climate in The Gambia is characterized by a long dry season from October to early June and a short rainy season from mid-June to early October. Average annual rainfall ranges from 850 mm to 1,200 mm and average temperatures range from 18°C to 33°C. Relative humidity is around 68% along the coast, 41% inland during the dry season and generally above 70% throughout the country during the wet season. In the dry season, north easterly winds dominate while during the wet season, south westerly monsoon winds, combined with heat

on the continent, give rise to the formation of convective thunderstorms, usually accompanied by strong winds, heavy rain and severe lightning. Latest assessments revealed that the amount of annual rainfall is decreasing drastically. This is creating changes in the way livelihood activities are practised in the country. There is a growing concern that the erratic rainfall and its decreasing quantity is putting pressure on agricultural practices in the country (Dunsmore et al. 1976, Jaiteh and Baboucarr 2011).

Seventeen per cent of total land area is covered by wetlands consisting of mangroves, barren flats and freshwater swamps; the remaining 83% is under various Sudanian-Guinean savanna[1] woodland formations. The Gambia has abundant water resources which comprise seasonal rains, storage in ephemeral ponds and depressions, the River Gambia and two aquifer systems underlying the entire country. Surface water is comprised of the Atlantic Ocean and the River Gambia and its tributaries. The River Gambia and tributaries occupy 1300 square kilometres permanent surface water area. However, during the flood season, inland surface water including the river, can extend over 1,965 square kilometres, covering about 18% of the total area of the country. These water resources provide the basis for sustaining life and promoting socioeconomic development. The estuary is fully mixed with no evidence of stratification. There is, however, a moving interface separating the saline/brackish water from the freshwater mass along the river. As a result of seasonal low flows, the interface can shift from a maximum penetration of 250 km upriver in the dry season to less than 100 km upriver in the rainy season (GoTG 1998; 2012; 2014, Jaiteh and Baboucarr 2011).

1.4.4 Agroecology

The Gambia has three distinct agroecological zones. See Table 2.

Table 2: **Agroecological zones of The Gambia**

Zone	Name	Average Rainfall (mm)	Length of growing season	Major vegetation types
I	Sahelian	<600	< 79	Open savannah
II	Sudano-Sahelian	600-900	70-119	Savannah
III	Sudanian	900-1100	120-139	Woodlands savannah
IV	Guinea	>1100	140-150	Woodlands

Source: http://www.capacity4food-project.eu

According to our computation using the http://www.capacity4food-project.eu project, The Gambia has 347,700 ha of savannah woodlands with trees and shrubs, 83,500 ha of woodlands (forest), 66,900 ha of mangroves, 102,000 ha of fallow land or bush, and 274,800 ha of upland crop area. The country has about 62,000 ha of saline swamps.

[1] West Sudanian savanna: a band of interlaced forest, savanna, and grassland running east to west and dividing the tropical moist forests near the coast from the of the interior. It extends 673,600 square km from western Senegal to eastern Nigeria, and including portions of Gambia, Guinea Bissau, Guinea, Sierra Leone, Côte d'Ivoire, Ghana, Togo, and Benin.

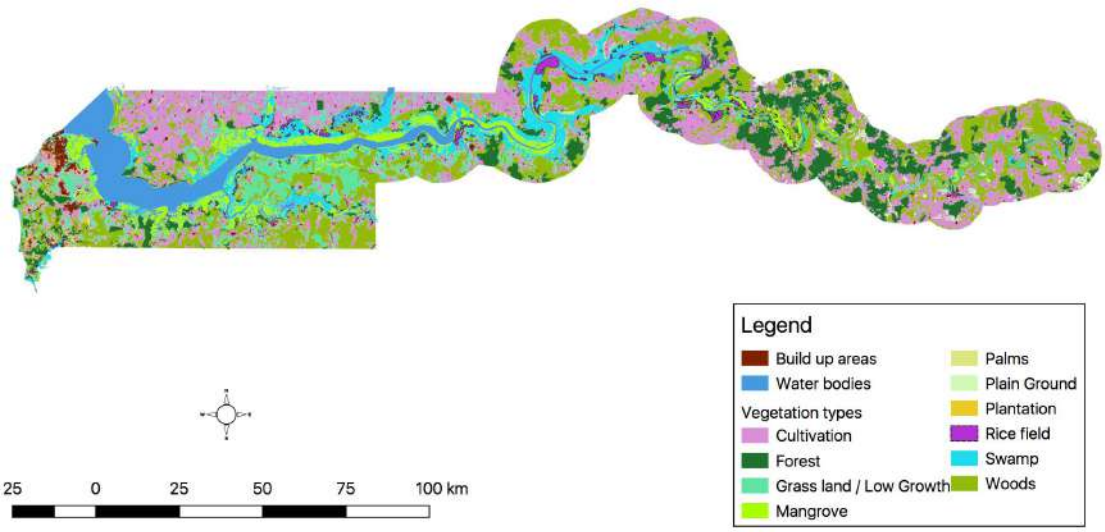


Figure 3: **Vegetation map of The Gambia (Source: World Agroforestry 2018)**

Gambia's economy is predominantly agrarian, with agricultural use accounting for approximately 20-30% of land area. Agriculture contributes 26% of the GDP, employing 45% of the country's population and is the major source of food. It is estimated that 320,000 ha (57% of total arable land of 558,000) was cultivated annually, between 2000 to 2010 (Jaiteh and Baboucarr 2011, GBoS and ICF 2014, GoTG 2003). Cash crops, oil seeds, groundnuts and sesame occupy 48.4% of the arable land, while cereals make up about 51.6% of this area. Agriculture in The Gambia is almost entirely rain-fed and is highly dependent on the amount and distribution of seasonal rains.

The biggest currency earners of agriculture in terms of total exports are groundnuts with 32.7%, cashew nuts with 20.6%, and fish products with 13.6% (Economic Commission for Africa 2017).

1.4.5 State of forests in The Gambia

According to NFA 2008-2010, The Gambia lost about 97,400 ha of forest between 1997 and 2009. This is close to 8,000 ha of forest lost every year. However, if the timeframe is pushed back to the 1940s, the extent of deforestation is even higher. According to UNDP (2012) in 1946, forest cover was about 81.2% which subsequently decreased to 42.55% in 1993. The important aspect of this deforestation is that the closed forest of the country has almost disappeared from the map of the nation. The same report stated that it declined from 60.1% in 1946 to 0.7% in 1993. Within the same timeframe, the population density of The Gambia increased three-fold – from 35/km^2 to about 108/km^2. Figure 4 clearly indicates the relationship between population increase and expansion of total arable land area. With the expansion, people resort to clearing forests to create farms. Today, The Gambia hardly has any closed forest, except some patches in protected areas and others in accessible parts of the country. The large part of the disappearance of the closed forest is due to an increase in cultivated areas. This is largely due to the shrinking fallow periods and decreasing fertility of soils used for food production (Danso 2001). The other part of the forest where shrinkage was observed was the mangrove areas where significant deforestation took place.

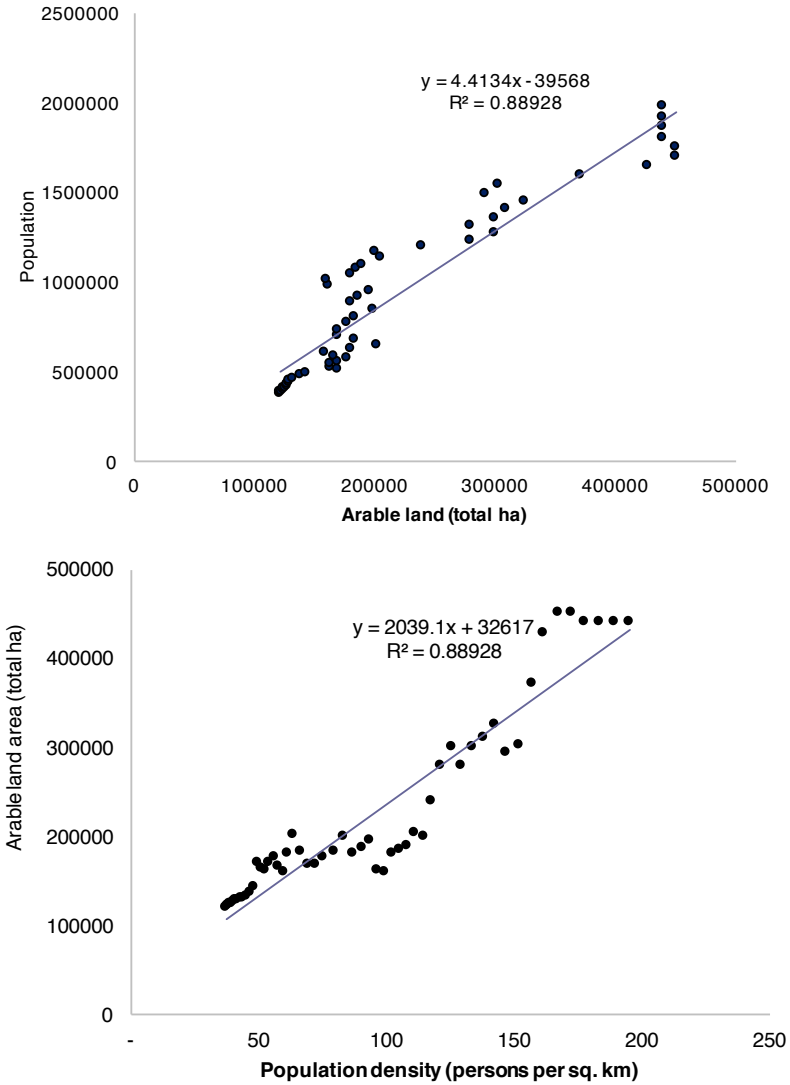


Figure 4: **The relationship between population and arable land area between 1961-2015 (Source: Authors' computation from the World Bank database)**

However, the biggest threat to forest resources in The Gambia is not the deforestation aspect, but rather forest degradation (UNDP 2012). In the early 2000s, from what is considered a forest (or gazetted as a forest), 78% comprises degraded forest and savannah. The major drivers of forest degradation include extraction of firewood for energy use, wood extraction for construction and making of household furniture that are used at home and sold on the market.

1.4.6 Soils of The Gambia

Soils of The Gambia are mostly ferralitic and ferruginous tropical soils in the uplands while alluvial/colluvial soils are dominant in the lowlands. The upland ferralitic soils are very deep, very permeable, and are often uniformly colored, while ferruginous soils are often red but are normal in depth. These soils, used for groundnuts and coarse grain production, are slightly acidic (pH 5.5-6.5), moderately well-structured but with moderate and declining

characteristic fertility. In The Gambia, they are also referred to as 'continental terminal soils' (Dunsmore et al. 1976, Young 1974). In the lowlands where alluvium has been deposited on the floodplains of the River Gambia and its tributaries, the soils are loose, unconsolidated and often highly stratified. Alluvial soils are characterized as hydromorphic due to the temporary or permanent waterlogging of the soil pores which causes a lack of oxygen over a long period. They have an extremely well-developed structure with pH ranging from 6.0-7.0. Rice is mainly grown in alluvial soils which are fine textured usually with more than 80% silt clay content, while colluvial soils where vegetables are grown, are found countrywide (Jatta 2013).

Continental Terminal: These soils are formed by weathering products of the underlying Continental Terminal acid complex sandstone and dissected by the River Gambia and its tributaries (Jatta 2013). It is a highly weathered sediment made up of layers of clayey sandstone of various colors with discontinuous beds of quartz gravel, sand and clay. Its structure is comprised of quartz and clay, with a small percentage of other resistant minerals. Despite being well drained, the soil is of low chemical fertility and hard to very hard consistency when dry, with organic carbon not more than 0.3-0.4% in the surface horizon. Their available phosphorus is extremely low, usually 3-6 ppm and a high bulk density of most soil horizons ranging from 1.65 to 1.85g/cm, a level normally associated with severely impeded root growth. The surface horizons are usually coarse textured, made of sand and loamy sands, and subsoil horizons are mostly sandy clays. The severe impacts of climate change are felt in no small measure in the utilization of upland soil. Short duration rains coupled with poor water retention capacity and low inherent fertility have drastically reduced the productivity of these soils (Dunsmore et al. 1976, Jatta 2013).

Alluvial soils: Found in the River Gambia and its tributaries' floodplains. They are developed on alluvial material deposits, and cover approximately 30% of The Gambia. However, the expanse drops gradually from west to east. Most of the alluvial soils comprise 80% silt plus clay, are hydromorphic and often affected by wet conditions. In contrast to the soils of the Continental Terminal, many of the alluvial soils have an extremely well-developed structure. They are also of moderate or low base status except for a calcareous deposit in the eastern end of the country near Walli Kunda, which have a pH in the range 4.5-6.0 due to leaching. In moist or wet conditions, these fine-textured soils are sticky and plastic; however, when dry they may be extremely difficult to break down and are very hard or hard. Alluvial soils are commonly dark grey or dark greyish brown when dry, becoming very dark grey or brown or black when wet. However, surface horizons are darker than underlying horizons because of incorporated organic matter. The surface horizons organic carbon commonly constitutes 0.3-0.4% of the soil mass. This value decreases in the immediate subsurface horizon to a value commonly between 0.2 and 0.3% (Dunsmore et al. 1976, Young 1974, Jatta 2013). It is important to note that there is a complex pattern of alluvial deposits within the flood basin. This is greatly influenced by saline water intrusion. The saline-affected soils are covered with mangrove or, where accretion has raised the soil level above the limit of tidal flooding, barren flats. In the eastern part of the country, elevated embankments border the river course. These embankments become progressively lower and less defined towards the west, disappearing almost completely in the brackish water zone of the river. Thus, soils in the lowlands are either affected by salinity or are under the influence of potential acid sulfate conditions. Soils outside the real delta and its tidal influence are only used for rice cultivation during the rainy season when the fresh water flush pushes down the salinity level in the river waters and in the soil profile (Dunsmore et al. 1976, Jatta 2013).

The evident variation in soils dictates the occurrence of vegetation in The Gambia. This

includes different predominance of tree species in areas with certain edaphic factors and soil types. The map and chart present the variation of the soil in The Gambia which could provide information on the suitability of these areas for restoration activities. Understanding of edaphic factors is important for vegetation management and restoration. Table 3 represents some dominant tree species (including those from the EbA baseline) edaphic factors, regions and regional soil groups.

Table 3: **Tree species and their regional distribution in The Gambia based on soil groups and edaphic characteristics of the specific regions**

Edaphic factor	Region	Common soil group	Tree species
Woodlands (Relatively closed, trees and shrubs or savanna with varying area and composition in the regions)	Lower, Central River Regions, and Upper River Regions	Acriosol Ferric, Glysol umbric, Solonchok gleycic, (LRR) Leptosol lithic, Plintosol, Regosol drystic, Acrisol ferric (URR) Regosol drystic, Lixisol ferric, Leptosol lithic (CRR)	*Daniella oliveri, Khaya senegalensis, Pterocarpuserinaceus, Terminalia albida, Parkia biglobosa, Prosopis Africana, Piliostigma thionnigii, Combretum micranthum, Bombax buonopozense, Aformosaloxifora*
Riparian woodlands	Lower, Central River Regions, and Upper River Regions	Acriosol ferric, Glysol umbric, Solonchok gleycic (LRR) Regosol drystic, Lixisol ferric (CRR) Leptosol lithic, Plintosol, Regosol drystic, Acrisol ferric, Leptosol lithic (URR)	*Khaya senegalensis, Detarium senegalensis, Pterocarpuserinaceous, Parinari excelsa, Dialiumguinense, Parkia biglobosa, Erythrophleum guinense, Elaesis guinenses, Terminalia albida, Cassia sieberiana, Lannea vulentina*
Disturbed/open woodlands	Vary in all regions depending on intrusion by human activities	Acriosol Ferric, Glysol umbric, Solonchok gleycic (LRR) Regosol drystic, Lixisol ferric (CRR) Leptosol lithic, Plintosol, Regosol drystic, Acrisol ferric, Leptosol lithic (URR)	*Combretum micranthium, Terminalia albida, Cordyla africana, Cassia sieberiana, Oxytenanthera abyssinica, Sterculia setigera*
Mangrove	River Gambia banks and tributaries in the Lower and Central River Regions	Soils in mangrove areas are difficult to study because of the considerable difficulties involved Nevertheless, soils exhibit common characteristics: fine texture, silt, clay loam or silt loam. pH ranges from 4 to 6 These soils have differing salinity due to the changes along the river	*Rhizophora racemose, Avicennia africana*

Source: Jones 1994, Bonjang 1995 in Danso 2001, Columbia University 2008, Dewitte et al. 2013

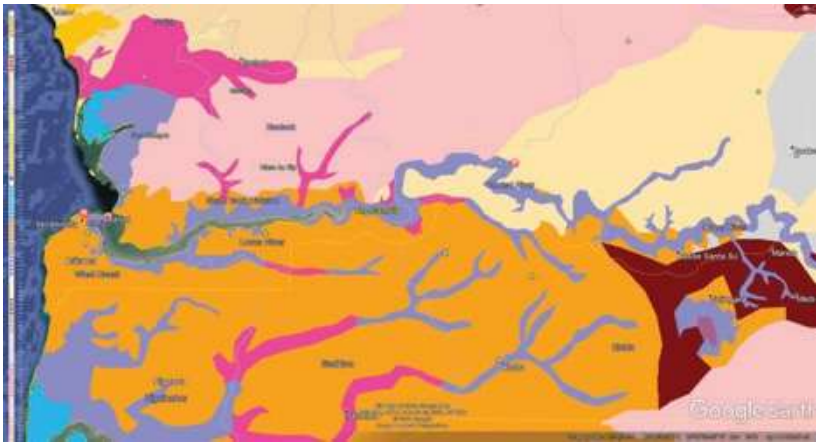
A Google Earth map extract (Figure 5) further presents regional distribution of soils in The Gambia, by specific groups and by region. This classification is used to identify common soil groups. The spatial visualization is also available online through a link provided[2] (on request)

[2] https://esdac.jrc.ec.europa.eu/content/soil-map-soil-atlas-africa

by the Joint Research Centre of the European Commission. The related spatial data, the Soil Atlas of Africa and its associated Soil Map can also be accessed upon request.

An R script is a useful technique for identifying the soil group in a specific location based on four coordinates (Hengl et al. 2014). Further, the link, http://rest.soilgrids.org/query?lon=-4.7589&lat=10.6308, can be used in a standard browser, where the longitude and latitude change depending on the place of interest. For example, an output for this location includes the fields "TAXNWRBMajor": "Haplic Luvisols", which identifies the major soil groups in the location as per the ISRIC – World Soil Information.

Hard copies of soil maps were also developed to further zoom in on the regional soil groups. The soil maps are generated from the European Digital Archive of Soil Maps (EuDASM) developed by the Joint Research Centre (JRC) of the European Commission (Italy) and ISRIC – World Soil Information. These techniques are proposed to help in identification or estimation of specific soil types and their characteristics that are necessary in restoration activities. The various techniques will inform, compare and estimate the suitability of tree species in specific locations.



Map color	Soil group
	Acriosol Ferric
	Gleysol umbric
	Solonchak gleycic
	Regosol dystric
	Plithosol
	Lixisol ferric
	Leptosol lithic

Figure 5: **Map and color ramp indicating the distribution of soil groups in The Gambia regions based on the FAO WRB Reference Soil Group.**

Table 4 describes the characteristics of the soil groups[3, 4, 5, 6]

[3] http://www.fao.org/docrep/w8594e/w8594e0a.htm#umbric%20horizon

[4] http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.646.8186&rep=rep1&type=pdf

[5] https://www.britannica.com/science/soil/Soil-classification#ref214853

[6] http://www.fao.org/soils-portal/soil-survey/soil-classification/fao-legend/key-to-the-fao-soil-units/en/

Table 4: **Common soil groups in The Gambia and their characteristics**

Soil Group and qualifiers (FAO System)	Characteristics
Acriosol Ferric	Acrisol characteristics are usually defined by organisms, time and climate. These soils occur mainly in the dry humid tropics. The natural vegetation occurring in the soils is woodland. Have low nutrient levels due to leaching, excess aluminum and high erodibility. Agriculture in these soils is problematic. The natural vegetation is woodland and savanna in brunt areas.
Gleysol umbric	Gleysols are formed under waterlogged conditions at shallow depth resulting from groundwater. They occur in waterlogged lowlands. In the tropics cultivated for rice and after drainage for trees and field crops. Depicted by chemical and visual evidence of iron reduction. The umbric nature of these soils implies they are thick, dark colored and rich in organic matter. To maintain the nutrient pool of gleysols there is need for establishment of adequate crop management.
Solonchak gleycic	Solonchaks are defined by climate, organisms and time. The principal defining characteristic is salt accumulation within 30 cm depth. They are formed from a saline parent material under occurrence of high evaporation in warm or hot climates. These soils need drainage and irrigation prior to agricultural activity. The gleyic characteristic indicates the soils are developed in excess moisture conditions, within 50 cm of the surface, which affects aerobic factors in soil making.
Regosol dystric	Regosols are mainly defined by topography. These soils feature shallow and fine textured parent material. This parent material may have an alluvial origin. They usually occur under their original natural vegetative cover or where there has been limited dryland cropping.
Lixisol ferri	Occur mainly in the driest humid tropics. They are formed in old landscapes in tropical areas with long dry seasons. They include low nutrient levels, are highly erodible, therefore making agriculture impossible if inorganic fertilizers are applied. In addition, minimal tillage and soil erosion may aid in cultivating in these soils. This characteristic implies that perennial crops are more suitable for these soils.
Leptosol lithic	Mainly a characteristic of eroded uplands. These soils have a low shallow profile depth and contain large amounts of gravel. They occur under natural vegetation and are susceptible to erosion and waterlogging depending on topography and climate. The soils depict a low water holding capacity. This is due to the inherent shallowness and gravel feature. This also contributes to their poor agricultural potential.
Plithosol	These soils are mainly defined by time, climate and organism activity. Another feature associated with these soils is a fluctuating water table. They occur in a wide range of climatic and topographic characteristics. The soils are characterized by a hardened layer that restricts the usefulness in forestry and grazing. The hardened nature is however, useful for road building.

The basis for most of the EbA interventions is the soil. Though there was an initial assumption that we would be able to get enough information on the soils from the different departments, this was not possible. It is difficult to define effective EbA options without understanding the state of the soil. In addition to the soil identification suggestions listed above, ICRAF is proposing to deploy its land health surveillance techniques to sample soils from the CFs, CPAs and agricultural areas to be analyzed and also be an input to the design of the protocols. This laboratory-based approach could be completed with local knowledge of the soil conditions by the respective communities where interventions take place.

CHAPTER 2

BASELINE METHODOLOGY

This chapter describes the methods, tools and processes deployed to collect data, analyse it and develop the baseline report.

2.1 METHODOLOGY

2.1.1 Broad schematic of the methods applied

Numerous strategies of data acquisition and interpretation were put together to access the appropriate data that was used to conduct this baseline study.

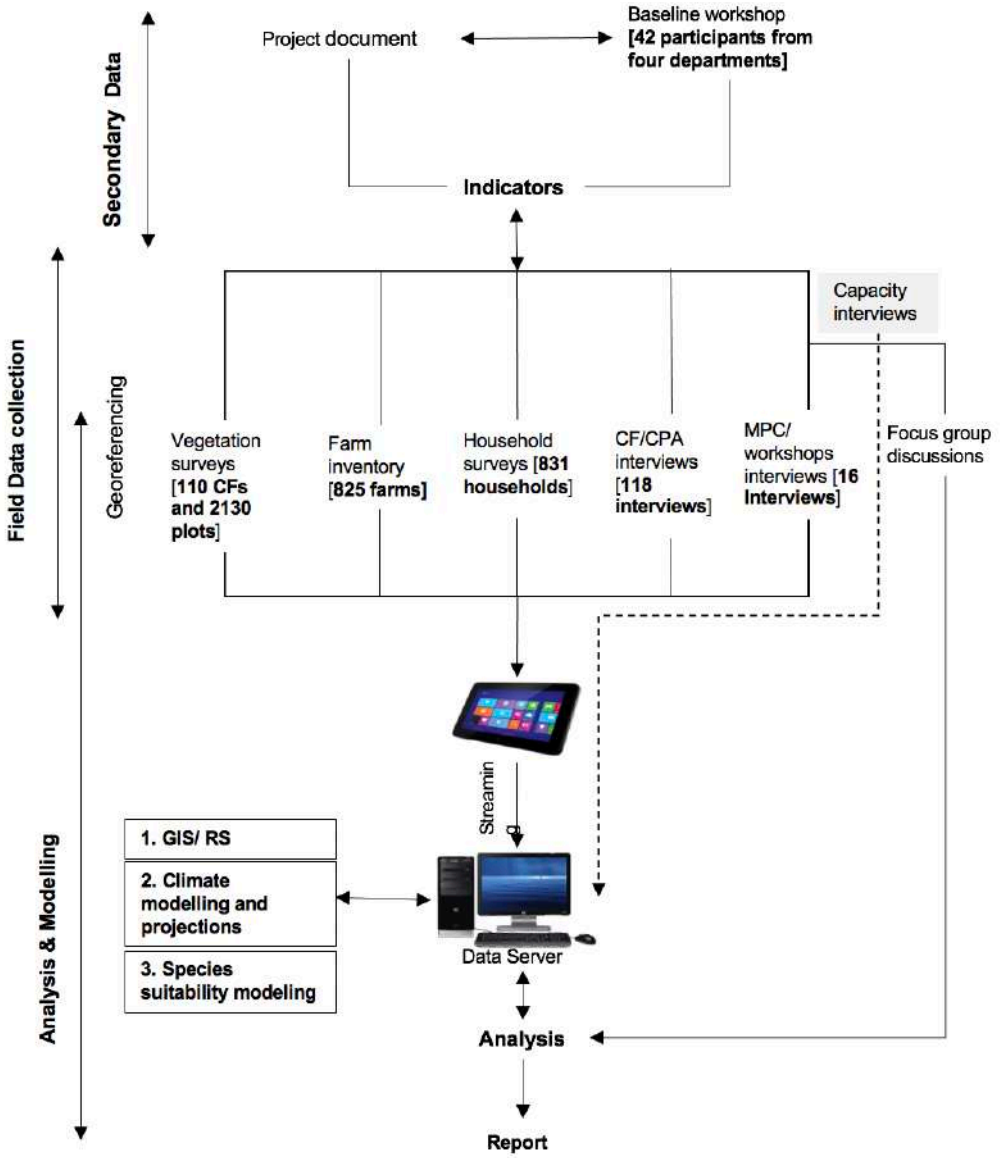


Figure 6: **Schematic for the methodology applied during the baseline work. Note: In-depth woody plants inventory was carried out on farms of 332 HHs**

2.2 SITE SELECTION

2.2.1 Specification of the project regions

The baseline study, as per the specification in the project document, focused on three administrative regions of The Gambia – Lower River Region (LRR), Upper River Region (URR), Central River Region North (CRR-N) and the Central River Region South (CRR-S). River Gambia separates CRR-N and CRR-S (Figure 7).

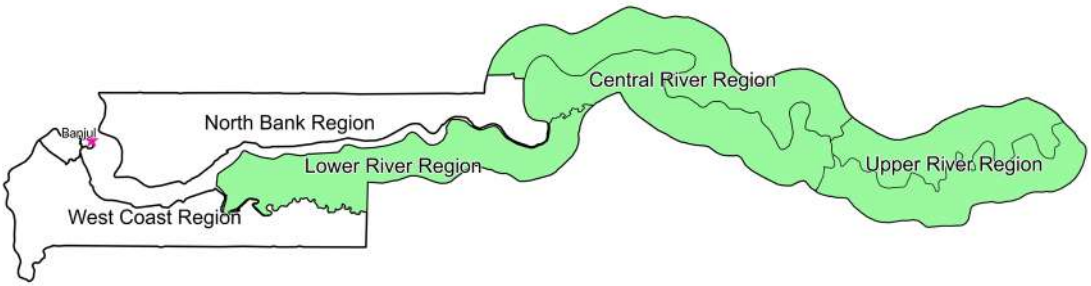


Figure 7: **Administrative regions of The Gambia that the project is focusing on. The colored administrative regions indicate where the EbA project will work**

In each of the selected regions, the project targeted Community Forests (CFs), Community Protected Areas (CPAs), Multipurpose Centres (MPCs) and rural households (HHs). Data was collected from each of these different units.

2.2.2 Community forests included in the project

Two groups of CFs were included in this project: new CFs that were established in the year 2015 and those that were in operation before 2015. Sixty-eight of the CFs were new. Table 5 describes the distribution of CFs by region and their associated villages. The new ones were already specified during the project proposal development phase, while the old ones were specified by the project management unit based in Banjul together with other stakeholders such as the Department of Forestry (DoF) at the MECCNAR. See Annex 1 for details.

Table 5: **CF and household selection process for the baseline study**

Region	Number of CFs	Total area of CFs selected	Number of villages/ settlements	Number of HHs in the villages/ settlements	Number of HHs randomly selected for the study
CRR-N	6	387	43	1,584	238
S	31	96	40	1,698	257
LRR	2	3,151.59	28	1,395	215
R	21	1,897.20	22	844	131
TI	0	12,636.62	133	5,561	831

2.2.3 Community Protected Areas

Coming up with specifications on which CPAs to include in the project was done. In-depth consultations were conducted with the Department of Parks and Wildlife (DoPWM). Table 6 presents the selected CPAs. Though the project document puts emphasis on CPAs, Kiang West National Park is also included in the wildlife protected areas that need to be part of the initiative. This is because of the emphasis put on this park by DoPWM as a result of the increasing pressure that the facility is currently facing.

Table 6: **CPAs selected for the baseline study**

Regions	Selected CPAs	Area (ha)	Remarks
LRR (Lower River Region)	Kiang West National Park	19,051	State-owned
	Kiang Bamako Community Wildlife reserve	1,032	Community-managed
	Barrow Kunda Community Wildlife reserve	359	Community-managed
CRR (Central River Region)	Chamen Nianija Community Wildlife Reserve reserve	32	Community-managed
	Kass Wolof Community Wildlife reserve	7	Community-managed
	Genji Wolof Community Wildlife reserve	10	Community-managed
URR (Upper River Region)	Demba Kunda Community Wildlife reserve	7	Community-managed
	Badari Community Wildlife reserve	2	Community-managed
	Total	**20,500**	

2.2.4 Households and agricultural areas for the baseline study

The agricultural areas targeted by the project are owned by smallholder farmers; hence, there is a strong link between the households' selection and agricultural areas to be used during project implementation. The procedure followed in specifying the number of households to be interviewed for the baseline study:

- Identified villages and settlements associated with CFs and CPAs based on data from the DoF and DoPWM.
- In each settlement, the number of households were defined using data from the 2013 national census.
- From the total number of households in the selected villages, at least 10% of them were randomly sampled (Table 5). This was important to accommodate the survey within the time allocated for the study with the required level of quality for statistical validity.
- Gender consideration was embedded in the interview process to ensure that there was a representative share of women respondents.
- In total, about 831 households were sampled for the study, with 58% of them being from the CRR.

2.3 MULTI-PURPOSE CENTRES

In the regions selected for project implementation, there are 11 MPCs and 5 workshops. For the baseline study, total sampling was used since 21 is quite low. The workshops are lesser forms of MPCs. Despite the project document mentioning 21 MPCs as initial targets, only 11 MPCs and 5 workshops were identified, hence the adjustment in the figure.

2.3.1 Types of data and methods of collection

This baseline study comprised four different data sets that were collected from a range of complementary sources.

- **Data from CFs and CPAs:** This data relates to the operations of the CF and CPAs selected for the study, associated benefits (financial and non-financial) originating from the activities within the CFs, challenges and problems that the CFs and CPAs are facing, and possible enterprise opportunities in the operational zones of such entities. Method used was key informant interviews with CF, CPA management committees and members.
- **Data from MPCs and workshops**: These include types of activities undertaken, benefits generated from the activities, future plans in relation to tree-based interventions that could be implemented within their operational mandates and challenges and opportunities. Method used to collect the data was key informant interviews with MPCs and workshop management committees and members.
- **Data from HHs**: This largely focused on HH attributes such as demography, livelihoods, climate-related shocks and resilience strategies, ambitions for tree planting and preferences for species, types of support required, etc. This data was collected using questionnaire-based household interviews. Respondents comprised heads of households or their legitimate representatives.
- **Data from vegetation**: Data from these assessments was the rate of degradation of woody biomass, the potential for tree planting and restoration strategies, identification of areas where different EbA interventions could take place, etc. For data collection procedures please see the section on *Vegetation Inventory Protocol*.
- **Data from farm survey**: Data from this approach included farm area, farm status, areas of restoration or rehabilitation, state of woody plants, ambitions of tree planting, issues touching on food security, state of production, etc. The woody vegetation inventory in the farms was only conducted in 332 households. Within the timeframe set aside for the project, it was not possible to cover all that 831 households.

2.3.2 Vegetation inventory protocol

The vegetation assessment in the CFs included a representative assessment of the state of vegetation in the sampled areas within each of the CFs. The key parameters of interest that were assessed as part of this undertaking are:

- **Trees:** Number per ha, types of trees, sizes of trees (diameter at breast height and total height), rate of harvesting, population structure as at now, potential for domestication, stump attributes and density, etc.
- **Shrubs:** Number per ha, types, sizes (diameter and total height), rate of harvesting, population structure, potential for domestication, stump attributes and density, etc.
- **Saplings:** Species, number per ha, size distribution (diameter and height), etc.

The sampling protocol depended on the size of the CF. This was done to ensure that the data collection process was efficient and captured a representative sample to support management of the CF. Below is the detailed insight into the sampling area.

To collect vegetation-related data, we used circular plots which are easier to lay out than rectangular or square plots. With circular plots, data collectors have to properly fix the centre and use the radius as the critical dimension. In four-sided plots, data collectors have to deal with four dimensions which are prone to human error

of plot layout unless high-tech instruments are available. Figure 8 describes the circular plot layout in a cluster of plots at any sampling point.

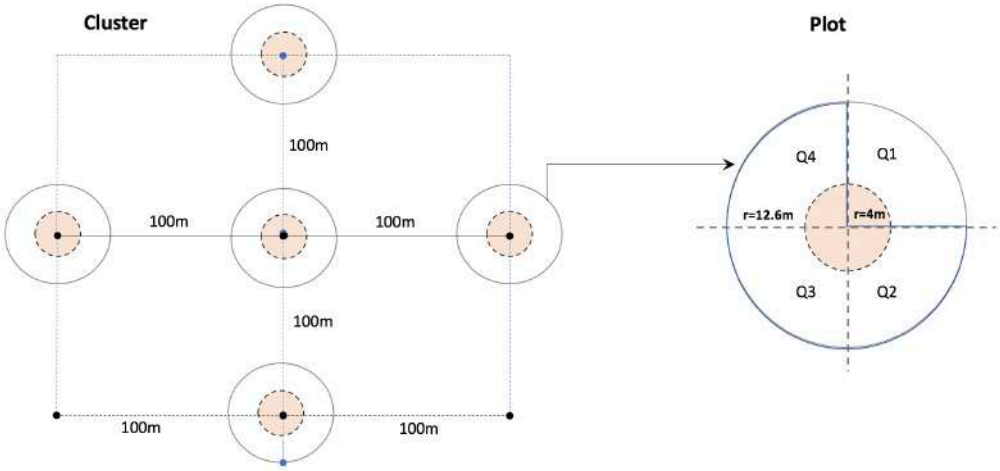


Figure 8: **Cluster design and plot alignment for a single sampling point. Shaded inner circle is used for sapling assessment**

Each plot has two different levels of measurement. The bigger circle with a radius of 12.6m (499 m^2) is used to assess all trees and shrubs above 5 cm dbh (diameter at breast height). The small inner circle with a radius of 4 m (area of 50.27 m^2) was used to measure sapling attributes (density, size (root collar diameter and height)).

The sampling approaches vary depending on the number of clusters that were sampled to cover a representative area that could help one make informed decisions. The main reason for the variation in the sampling protocol is to ensure collection of data from representative sample plots. In general, the variation is largely due to the significant variability in the CF areas, and hence one method was not sufficient for all sizes. Sampling protocols were crafted based on previous experiences of the experts involved in dryland ecosystems in Africa. Figures 9-12 depict the sampling approaches for different CF sizes.

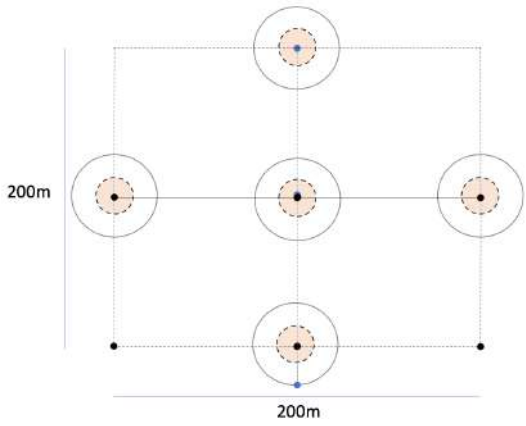


Figure 9: **Sampling design for CFs with areas <=12ha**

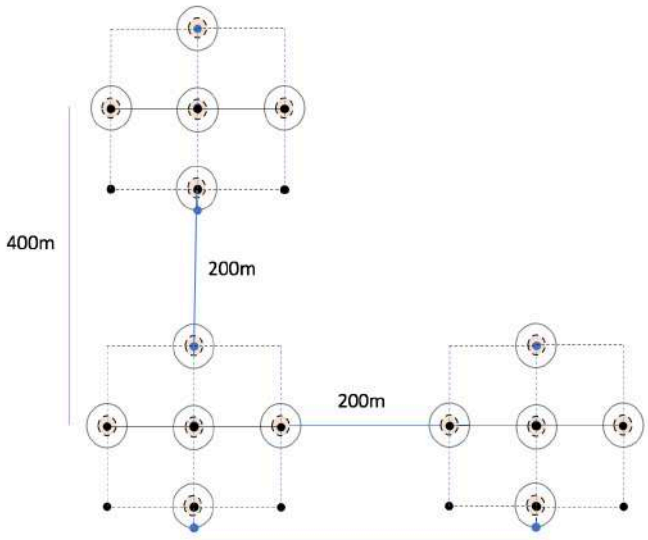


Figure 10: **Sampling design for CFs with areas between 12ha and 36 ha**

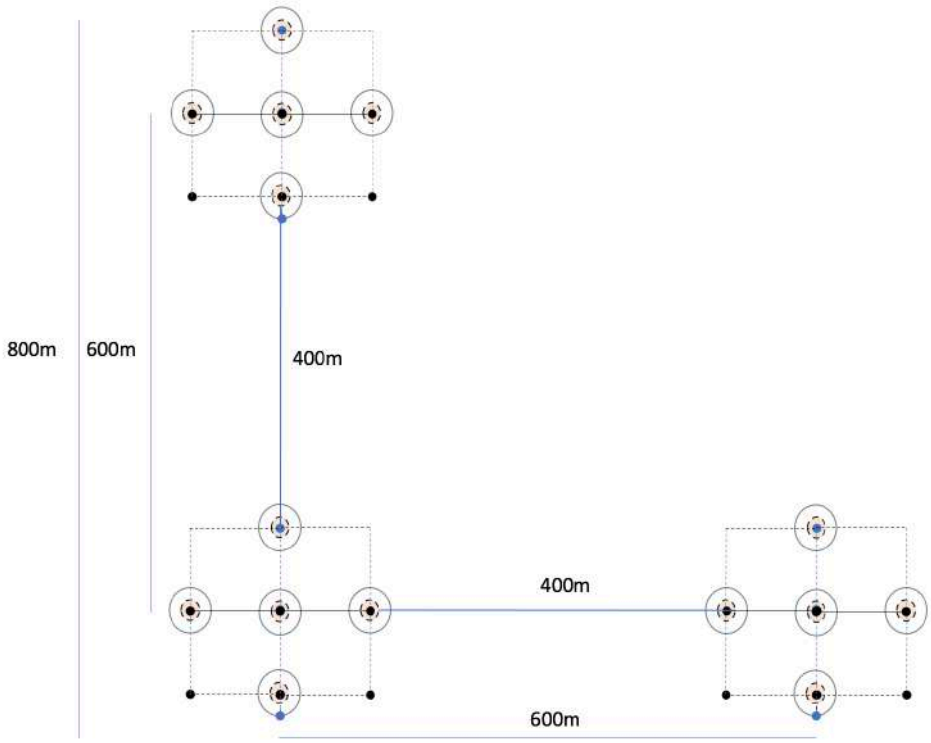


Figure 11: **Sampling design for CFs with areas between 36 ha and 64ha**

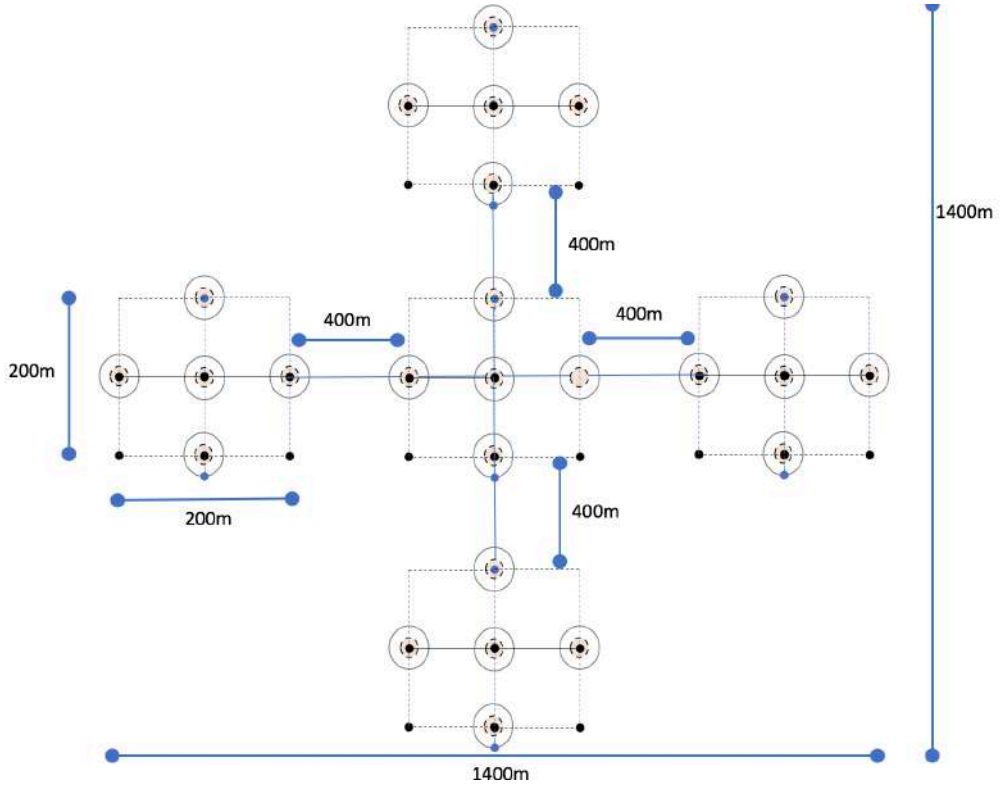


Figure 12: **Sampling design for CFs with areas greater than 64ha**

In the field however, sometimes the plot layout may not be on a straight-line path as shown in the sampling scheme above. This may be due to irregular shapes of CF boundaries or impediments such as deep valleys or rocky outgrowths. Under such conditions, the field team made the necessary adjustments without decreasing the sampling area.

2.3.3 Stakeholders' consultation

During the planning process, a two-day consultation workshop was held in Banjul, The Gambia. The main aim of this event was to bring stakeholders on board. Some of the groups present included:

1. Department of Forestry, including regional forestry staff
2. Department of Parks and Wildlife
3. Department of Agriculture
4. Department of Community Development
5. MECCNAR
6. Technical staff from World Agroforestry
7. UN Environment programme staff

Besides the workshop, visits were made to each of the entities listed above to ensure that their interests and responsibilities were included in the framing of the project baseline and indicators. The main outcome of the consultation was to agree on the appropriate framework of the baseline and SMART (Specific, Measurable, Attainable, Relevant, Timebound) indicators that needed to be monitored over time. Teams from the different entities contributed to the draft structure of the baseline study and agreed on the indicators to be monitored going forward.

2.3.4 Field data collection automation

To monitor and ensure quality data collection, ICRAF deployed an automated process which used Android tablets and phones as main data input platforms. For each of the data types described in Section 1.3, appropriate data forms were developed and validated in close consultation with the PMU team in Banjul. The validated forms were then converted into an Excel spreadsheet that was then uploaded onto SurveyCTO™ software, which functions both online and offline. The choice of this software was to enable data collection, saving during the day, and relaying to the ICRAF server at night when the data collection team had returned to their base. Figure 13 describes the processes behind the data collection, aggregation and analysis tasks.

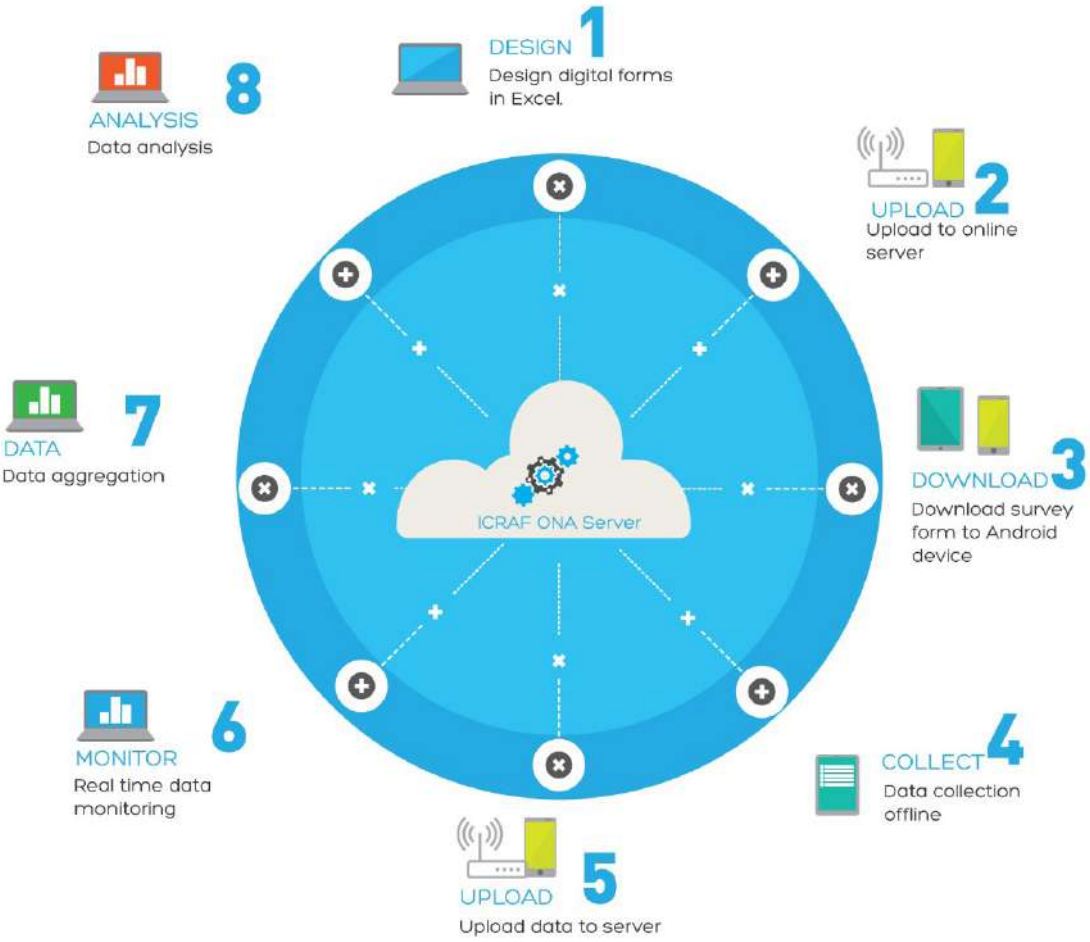


Figure 13: **The complete data collection process from design to analysis (Source: World Agroforestry)**

2.3.5 Secondary data compilation

Besides the field data, extensive information from various secondary sources was also used. Examples include official reports, publications, databases, etc. Spatial and non-spatial data, e.g., statistical databases from the various departments such as agriculture, forestry, community development, parks and wildlife (Table 7) were collected. For geospatial data,

the biggest hurdle was to locate metadata for the information.

Besides the above-mentioned sources, available global and regional databases with appropriate resolution were also used to develop the geospatial information dataset for the mapping and accuracy assessments.

Table 7: **Secondary data collected from key implementing departments of the EbA project**

Offices visited as part of the baseline study	Types of information gathered	Remarks
Department of Forestry	Data on CFs, both spatial and non-spatial information; Processes involved in creation of CFs; Current state of forest resources in the country	The available data needs to be better structured and compiled for ease of access For some details, accessing source of the metadata was difficult
Department of Community Development	Data on location and status of the Multipurpose Centres (MPCs) Procedures of creation of MPCs Prospects of MPCs in the EbA project activities	The available data needs to be better structured and compiled for ease of access
Department of Agriculture	Data on agricultural activities in the selected regions Data on state of degradation in agricultural lands Options for restoration and ongoing activities	The available data needs to be better structured and compiled for ease of access For some details, accessing source of the metadata was difficult
Department of Parks and Wildlife	Data on the state of parks, community protected areas and reserves in the country State of biodiversity conservation in the country	The available data needs to be better structured and compiled for ease of access For some details, accessing source of the metadata was difficult

2.3.6 Data analysis

Basic descriptive statistics were deployed. This included central tendency measures (mean, median, mode), standard deviation and standard error computation, wherever it applied. Univariate, bivariate and multivariate analysis was also deployed to capture the distribution, relations and prediction of the important variables of analysis linked to performance indicators of the project in different socio-cultural-environmental contexts.

CHAPTER 3 FINDINGS

3.1 THE GAMBIA'S EXPOSURE TO CLIMATE CHANGE EFFECTS: A BRIEF ANALYSIS

Gambia's economy is highly vulnerable to the impacts of climate change. Agriculture, which contributes close to 40% of the national export and 26% of the national GDP, and employs close to 68% of the active labour force, faces serious challenges and an uncertain future in the coming years and decades due to the impacts of climate change. More than half of the country's agricultural production comprises cereals which are highly dependent on rainfall. Cash crops (mostly groundnut and sesame) occupy about 48% of the agricultural land in the country. Groundnut, in fact, is the most commonly grown agricultural crop covering over 44% of the agricultural area, followed by millet (32%) (Jaiteh and Baboucarr 2011).

Almost all the croplands of The Gambia are entirely dependent on rainfall, hence highly susceptible to drought despite ongoing efforts to introduce fast-maturing varieties of crops and efficient water management. The country has been experiencing declining rainfall and erratic rainfall patterns which are a threat to its agricultural sector (Jaiteh and Baboucarr 2011). At household level changing climatic conditions, for example, influence decisions on whether to consume or sell the harvest. The biodiversity of the country is also threatened.

Sea level rise is another major threat posed by the changing climatic conditions. For example, Jaiteh and Baboucarr (2011) indicated that a 100 cm rise in sea level could lead to submerging of about 8% of the country's land area which includes 61% of the current mangroves, 33% swamps and over 20% of the lowland rice growing regions. According to this study, it could lead to submerging over 50% of the capital city of Banjul (rendering it virtually uninhabitable) and the towns of Barra, Jangjabureh and Kuntaur, together with the Port of Banjul, all ferry terminals, and harbour landings along the River Gambia. The sea level rise could also exacerbate the problem of salinization of coastal areas, water aquifers and other sources of drinking water for the population. This rise would have grave consequences on the coastal tourism which is among the key sources of revenue for the country. The sea level rise would inundate 6500 ha of woodland and 40,900 ha of mangrove area

within the North Bank, West Coast and Central River regions (Jaiteh and Baboucarr 2011).

Changes in ecosystems that provide goods and services which enhances the adaptation potential are also posing their own challenges. For instance, the woodland ecosystem which supports the majority of pastoral communities and generates wood and non-wood products for most of the community has shrunk significantly – from 80% of the land area in the 1940s to about 42% in 2001. The degradation trend has kept on rising and the ongoing changes are affecting the land cover that used to provide goods and services that contributed to the adaptation potential. The ongoing deforestation leads to changing local microclimatic conditions. Such changes increase the level of vulnerability of the community to the impacts of climate change.

3.1.1 Climate change and variability analysis using historical data

Despite the common belief of changes in climate variables, explicit information on the level of exposure and vulnerability of the country to climate change and variability effects are not available. We used historical data from Climate Change Knowledge Portal https://climateknowledgeportal.worldbank.org/) to estimate the extent of climate change. We focused on rainfall and temperature for this assessment.

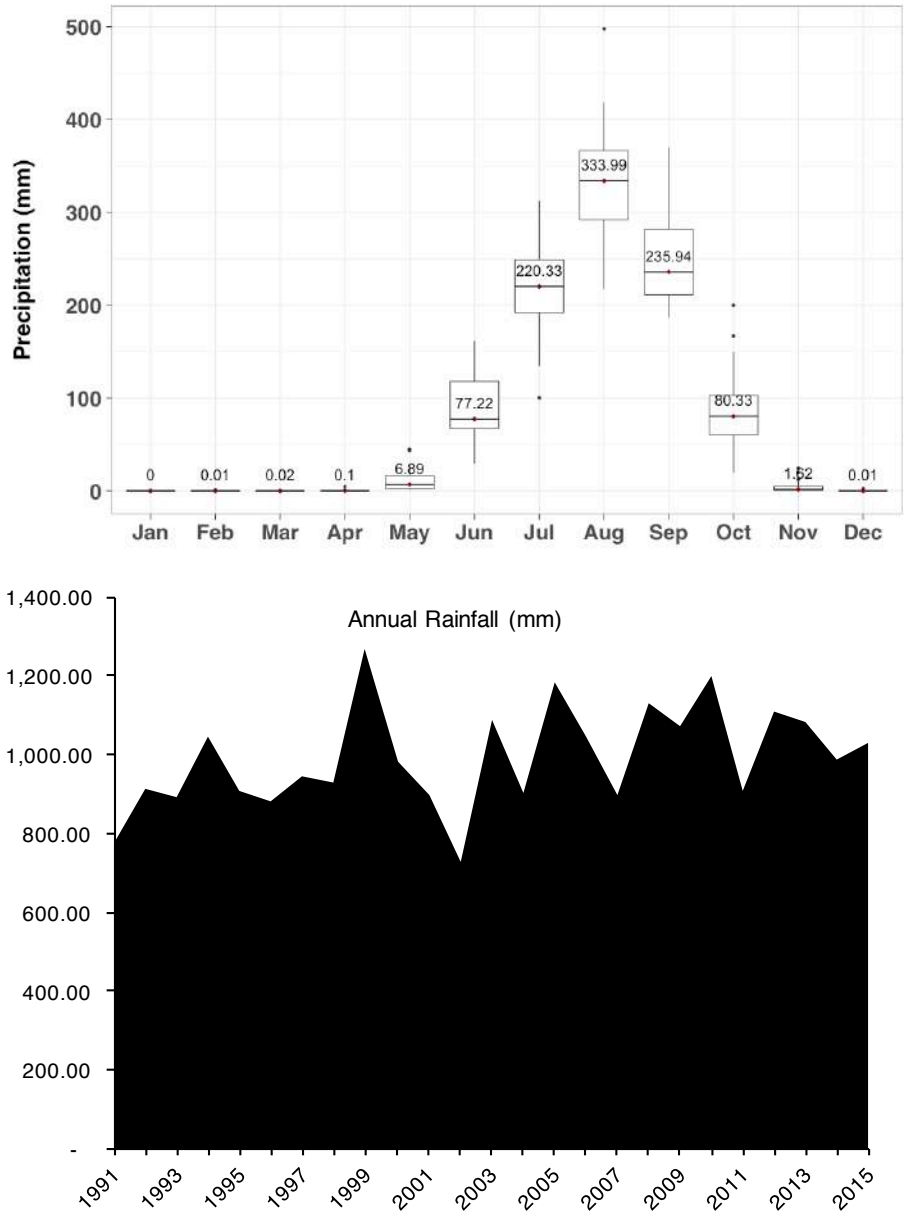
We observed considerable changes in mean monthly temperature. Nine out of the 12 months of the year experienced over 0.33°C increase in temperature over the period 1991-2015. Significant changes were from 0.44°C (for April and May) to 0.72°C for November (See Table 8).

Table 8: **Changes in mean monthly temperature over time**

Months	Average mean monthly temperature (°C) (1991-2015)	Change analysis		
		5-years average (1991-1996)	5-years average (2011-2015)	Change (°C)
Jan	25.03	24.51	25.14	0.63
Feb	27.22	27.04	26.81	-0.23
Mar	28.95	28.52	28.85	0.33
Apr	30.03	29.68	30.12	0.44
May	30.62	30.21	30.65	0.44
Jun	29.87	29.81	30.15	0.34
Jul	28.27	28.08	28.65	0.57
Aug	27.43	27.32	27.35	0.02
Sep	27.53	27.35	27.80	0.45
Oct	28.61	28.24	28.93	0.69
Nov	27.64	27.24	27.96	0.72
Dec	25.49	25.26	25.06	-0.20
Mean Annual Temperature °C)	28.06	27.77	28.12	0.35

Source: Authors' computation using historical data from World Bank Climate Change Knowledge Portal

The Gambia receives more than 90% of its annual rainfall from May to October in a unimodal rainfall pattern. Our brief assessment revealed that since the year 2000, there has been a highly variable rainfall pattern as shown in Figure 14a-b below. The mean annual rainfall has also been decreasing, especially after 2000. The NAPA clearly states that the area with average rainfall of less than 800 mm has increased from 36% to 93% since 1965. In addition, the wet season (July-September) rainfall has shrunk by over 200 mm. All this has grave consequences on the agricultural production potential of the country.



Source: Authors' computation using historical data from World Bank Climate Change Knowledge Portal.

Figure 14a-b: **Mean monthly rainfall (RF) and changes in annual RF (mm) across years (1991-2015).**

3.1.2 Climate change analysis: the projections

Bioclimatic variables are typically used by species distribution models to characterize the environmental niche of a species and predict habitat distribution in future climatic conditions (for example, Booth et al. 2014, De Sousa et al. 2017, Gaisberger et al. 2017, Kindt 2018). Besides their application in species suitability modelling (see also their use in vegetation modelling as in Dallmeyer et al. 2018 or Hengl et al. 2018), bioclimatic variables also summarize trends and variation in monthly datasets of precipitation, potential evapotranspiration and minimum and maximum temperatures. Therefore, a climate change analysis for The Gambia focused on these bioclimatic variables.

With the objective to infer future habitat suitability maps for a selection of priority tree species, the recommended source of bioclimatic layers is AFRICLIM (Platts et al. 2015) as these future geospatial data are also inferred from regional climate models, whereas other datasets such as WorldClim or Climond do not use regional models. AFRICLIM further provides a wider set of bioclimatic variables than available from WorldClim, although the ***envirem*** package (Title and Bemmels 2018) can also generate a wider set of bioclimatic variables from WorldClim. Analysis was done using a gridded dataset that completely covered The Gambia at a resolution of 2.5 arc-minutes (Figure 15), which is a realistic resolution given the relatively low density of weather stations in Africa.

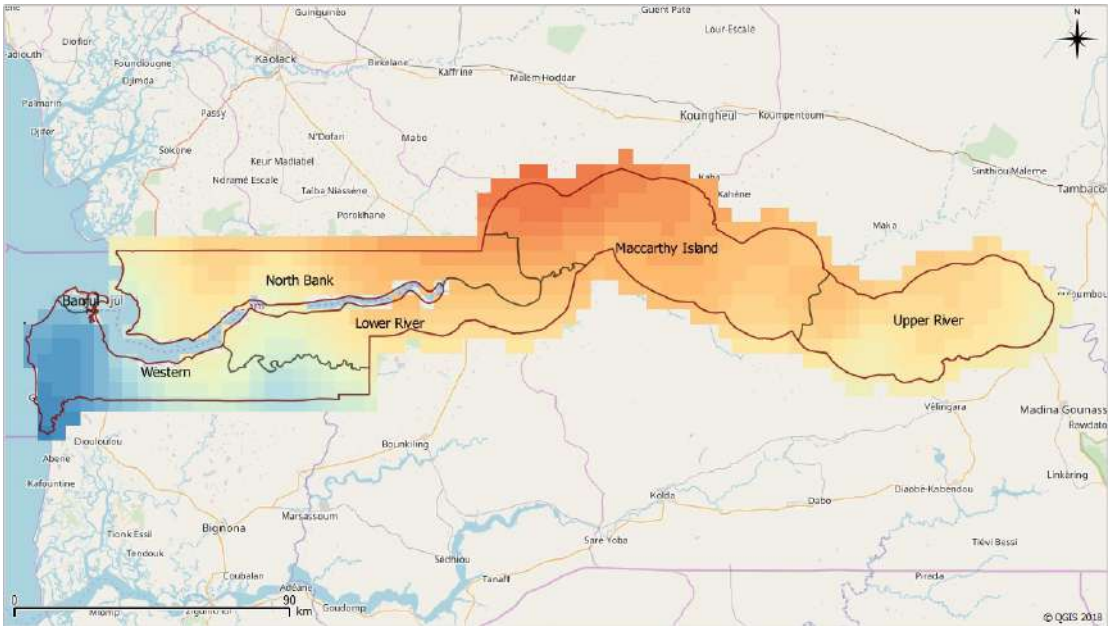


Figure 15: **Gradient of moisture index (0.3 [orange] – 0.6 [blue]) over Gambia. Map created in QGIS with OpenStreet Map baseline and administrative boundaries from GADM version 3.6 2018.**

To deal with uncertainties in projecting future climatic changes, analyses focused on consensus among General Circulation Models (it is generally recommended to treat the different GCM projections as equally likely[7] and to adopt ensemble [consensus] approaches).

[7] For example, in the *Atlas of Global and Regional Climate Projections* the different CMIP5 models are all considered to give equally likely projections in the sense of 'one model, one vote' (IPCC 2013).

All mid-21st century projections available from AFRICLIM for Representative Concentration Pathways RCP4.5 (a medium emissions scenario) and RCP8.5 (a high emissions scenario) were included. In checking for consensus among models, the likelihood scale recommended for the fifth assessment report of the IPCC (Mastrandea et al. 2011) was adopted. As such, results were reported as **likely** in cases where at least 66% of models showed the same trend and as **unlikely** where at most 33% of models showed the same trend.

Results showed that it is likely that future values of many bioclimatic variables related to **temperatures will increase** (BIO1, BIO5, BIO6, BIO10, BIO11 in Figure 17). However, for several bioclimatic variables related to precipitation, future values are likely to decrease, especially in the western parts of the country (BIO12, BIO13, BIO15, BIO16 in Figure 16 and 17).

As a result of the combined changes in temperatures and precipitation, the potential evapotranspiration (PET) is projected to increase, while the moisture index (MI) is projected to decrease (Figures 18 and 19).

Given that future bioclimatic changes include novel conditions for The Gambia (e.g., mean annual temperatures above 28˚C [Figure 17] or moisture indices below 31 percent [Figure 19]), the recommended approach for species distribution modelling will be to calibrate species distribution models for a larger area in western Africa, including baseline conditions that are better analogues for future conditions. Pursuing the recommended approach, a presence point location dataset is currently being collated for the selected set of priority tree species; data is being gathered from open-source repositories such as the Global Biodiversity Information Facility and the RAINBIO mega-database (Dauby et al. 2016).

RCP4.5 (medium emissions)

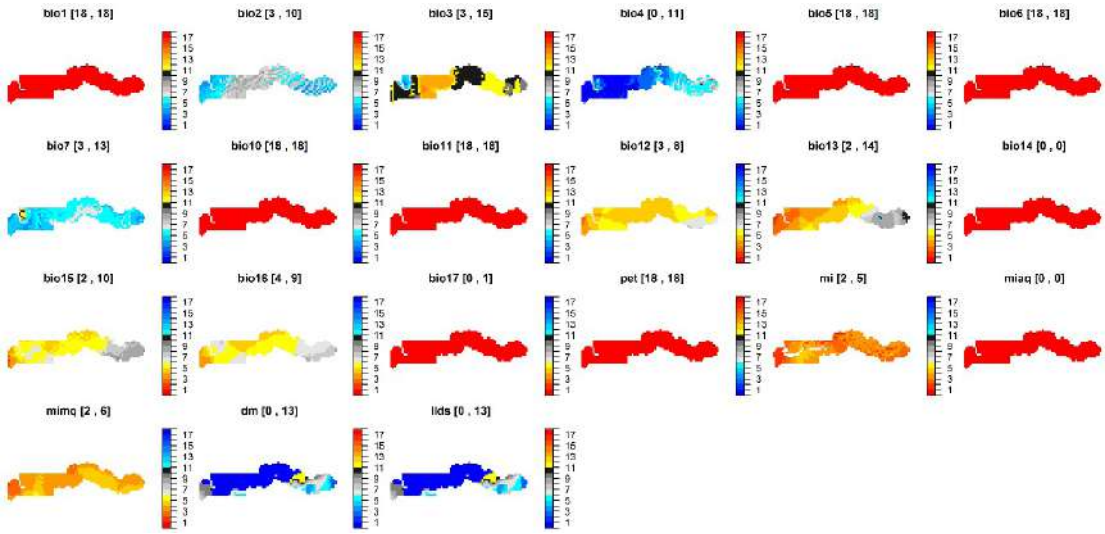


Figure 16: **Counts of General Circulation Models that project monthly increases in bioclimatic variables by the 2050s for RCP4.5 and RCP8.5 compared to the baseline centred on 1975 under medium emission scenario**

RCP8.5 (high emissions)

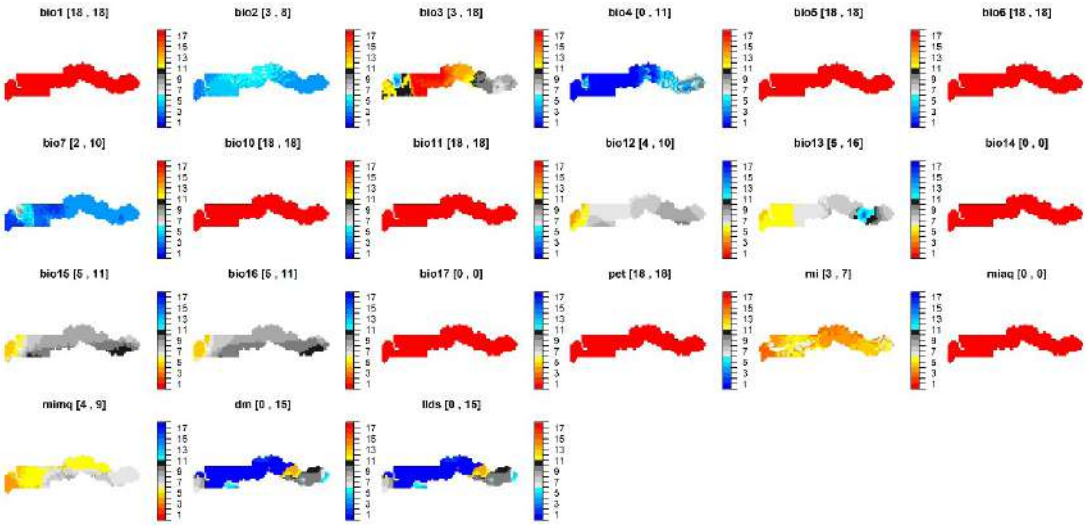


Figure 17: **Counts of General Circulation Models that project monthly increases in bioclimatic variables by the 2050s for RCP4.5 and RCP8.5 compared to the baseline centred on 1975 under high emission scenario**

Major changes in the colour schemes correspond to the likelihood scale recommended for the fifth assessment report of the IPCC (Mastrandea et al. 2011; see text). Note: Bio1: mean annual temperature; Bio2: mean diurnal range; Bio3: isothermality; Bio4: temperature seasonality (standard deviation of monthly values); Bio5: maximum temperature of the warmest month; Bio6: minimum temperature of the coldest month; Bio7: annual temperature range; Bio10: mean temperature of the warmest quarter; Bio11: mean temperature of the coolest quarter; Bio12: mean annual rainfall; Bio13: rainfall of the wettest month; Bio14: rainfall of the driest month; Bio15: rainfall seasonality (standard deviation of monthly values); Bio16: rainfall of the wettest quarter; Bio17: rainfall of the driest quarter; pet: potential evapotranspiration; mi: moisture index; miaq: moisture index of the most arid quarter; mimq: moisture index of the most moist quarter; dm: number of dry months; llds: length (months) of the longest dry season.

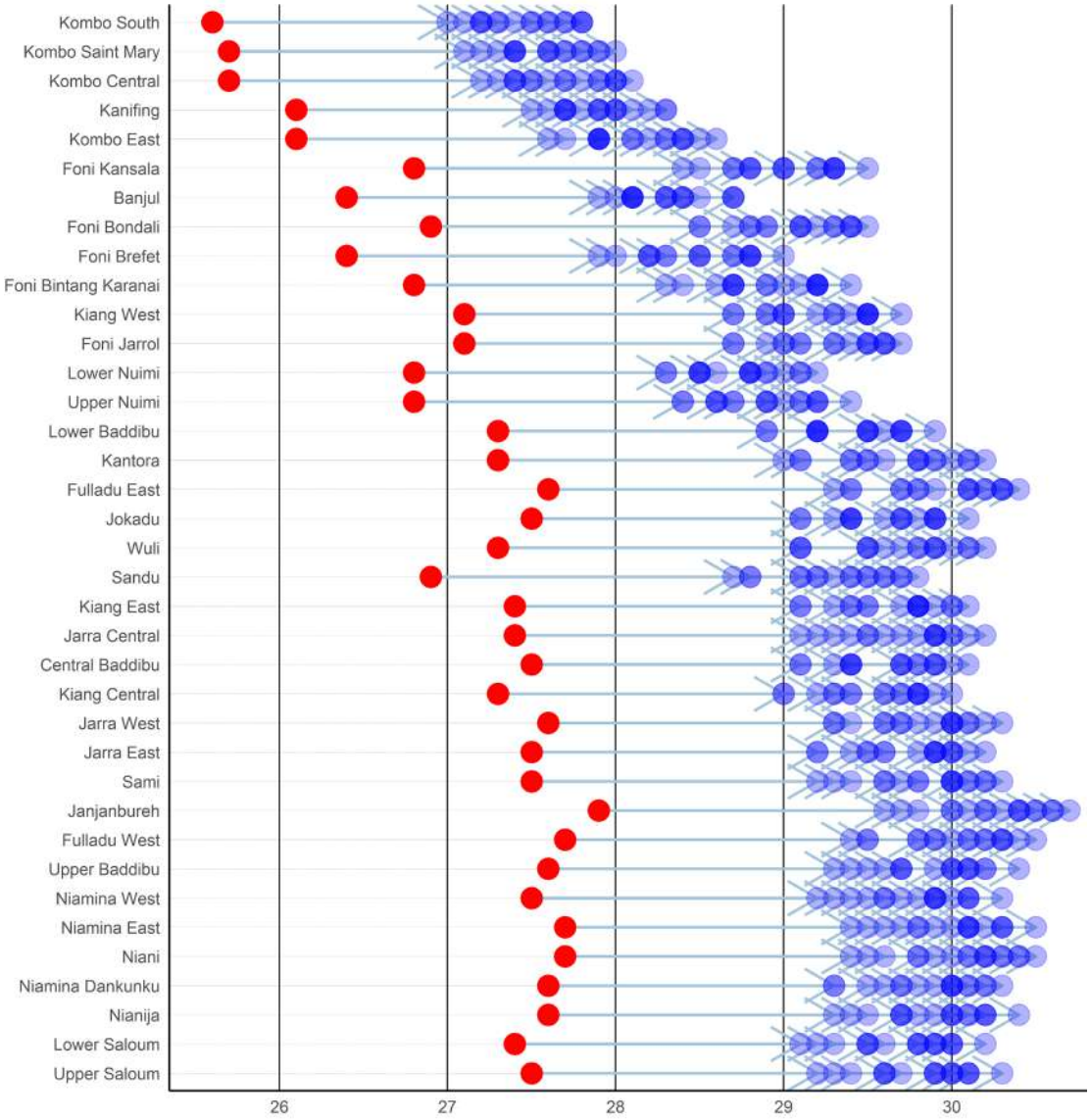


Figure 18: **Projected changes for the mean annual temperature for locations at the centroid location of administrative divisions, where these locations are sorted by baseline moisture indices. Red circles correspond to baseline values and blue circles to values projected for the 2050s**

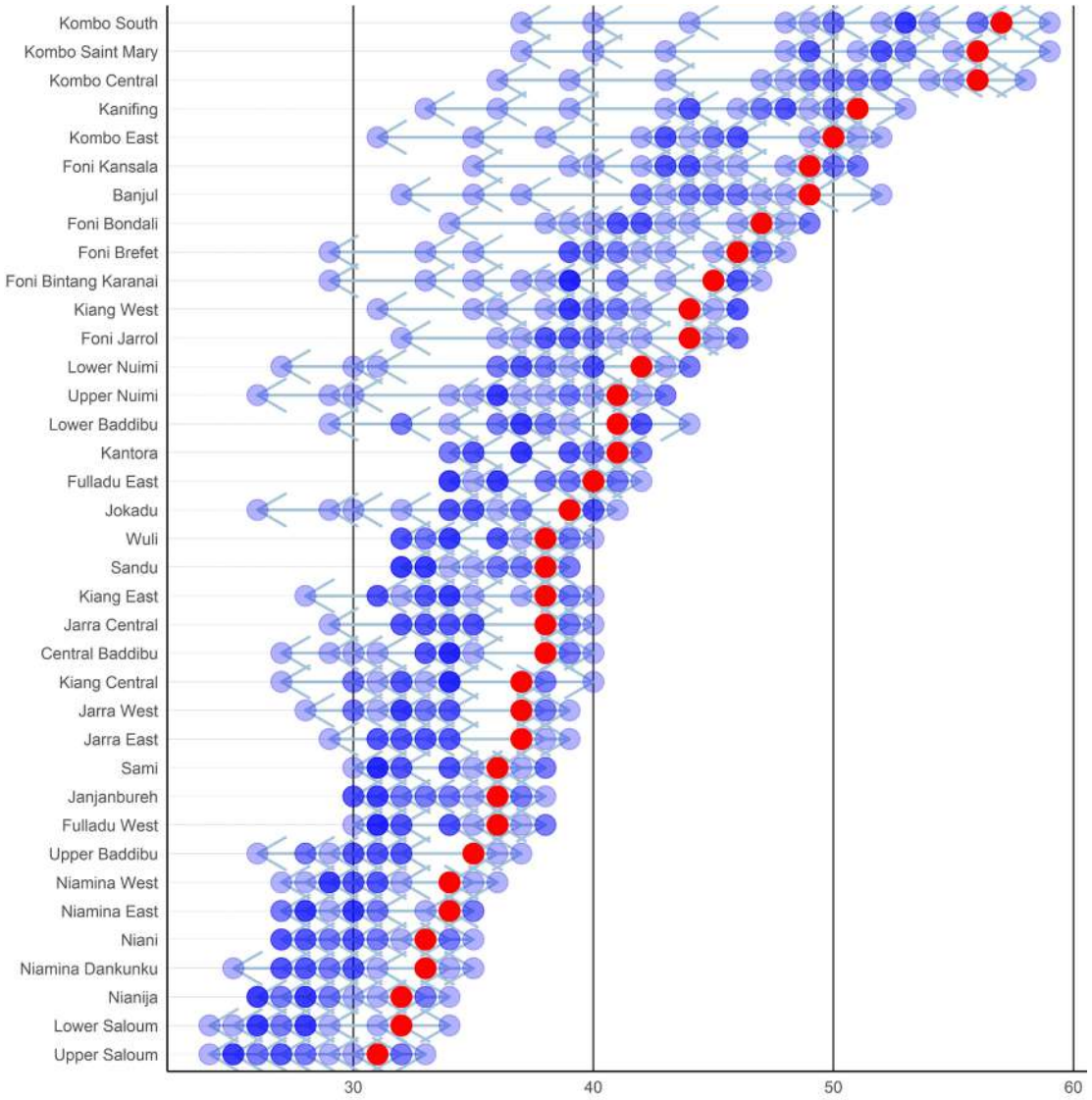


Figure 19: **Projected changes for the moisture index for locations at the centroid location of administrative divisions. Red circles correspond to baseline values and blue circles to values projected for the 2050s.**

3.1.3 Understanding the extent of vulnerability

UNDP and GoTG (2012)[8] reported that The Gambia is the 10th most vulnerable country to the impacts of sea level rise globally. Flash floods of 2002-2004 and the 2010 flood that affected almost all parts of the country remind us that there is a very strong exposure to such climate change-related effects. Drought was amongst the most common climate-induced disasters that the country has been experiencing. Other threats including disease outbreaks and pest invasions, are rather becoming serious concerns in some regions of the country (Table 9).

In a study that covered all regions of the country, NDMA and UNDP (2014)[9] observed that natural

[8] http://www.undp.org/content/dam/gambia/docs/GMB_UNDP_RIO%20+20%20Report%20The%20Gambia%20(2).pdf
[9] https://www.preventionweb.net/files/40203_40203strengtheninglocalriskgovernan.pdf

disasters play a key role in the functioning of the economy. For instance, among the highly prioritized risks and hazards the community is facing, the top four risks and hazards in the CRR, LRR and URR are directly linked to climate change.

ICCCAD (2016)[10] emphasized the need to launch a national debate on the Loss and Damage issues so that DRM can be taken seriously at national and local levels. UNDP and GoTG (2012) also stressed the significant level of exposure of the country to climate change effects and other related disasters, and highlighted the need to strengthen the local capacities to address the same.

Table 9: **Risk profile of The Gambia by administrative regions**

Region	Priority 1	Priority 2	Priority 3	Priority 4	Climate change -related risks
URR	Flood	Fire	Windstorm	Drought	All
LRR	Bush fire	Deforestation	Flood	Disease outbreak	All
CRR	Drought	Hippo and pest invasion	Bush fire	Flood	All
WR NBR	Poor waste management Deforestation	Flood Poor waste management	Accidents (Traffic) Misuse of pesticides & antibiotics	Fire Bush fire	Two of the top four are directly linked to climate change. Only one is directly linked to climate change.

Note: URR - Soil erosion, youth migration and disease outbreak were among the top 10. LRR - Salt intrusion and windstorm were identified among the top 10 priority risks. CRR – Deforestation, salt intrusion and soil erosion were among the top 10 risks the community identified. WR- Windstorm was identified as among the risks. NBR - Salt intrusion was identified as among the risks. Drought and flood were identified also as among the priority risks.

Source: NDMA and UNDP (2014).

Our assessment in the four administrative regions of the project revealed that 82.4% of the households interviewed had experienced at least one climate crisis in the last five years. When the climate crisis struck, only 18.7% reported receiving any assistance. Common sources of assistance reported were relative, friends and neighbors (11.6%), government entities (7.5%), NGOs (7.5%), local community groups (3%), and religious groups (1.3%).

3.2 COMMUNITY CHARACTERIZATION

3.2.1 Household characteristics

The mean number of household members in the study communities was 18.77. Male to female proportion of the households was almost equal (1.02:1). The URR had the biggest household size of 23.08 people, followed by CRR-N, CRR-S and LRR each with 18.03, 16.67 and 17.30 respectively.

The educational profile of the respondents indicates the following: 50.1% (no formal education), 14.4% (primary education), 23.9%

[10] http://www.icccad.net/wp-content/uploads/2016/04/Gambia-LD-Policy-Brief-1st-draft.pdf

(secondary education) and 11.6% (post-secondary education). The illiteracy rate is therefore at 50%. The national illiteracy level for the population above 10 years is about 52.1%, with females having a lower number of 40% compared to males, 64%[11]. The CRR-N and CRR-S regions had the highest share of people with no formal education of 84.2 and 60.7%, respectively. The highest share of educated respondents was from LRR (with 78.3% of respondents having secondary and above levels of education) followed by URR (with 45% of respondents falling in the same education category as in LRR). This implies that the level of capacity development that might be required in the four administrative regions may vary due to the differences described above.

The proportion of female-headed households was relatively low (CRR-N – 5%; CRR-S – 19%; LRR – 15%; URR – 8%). This confirms the wide dominance of male-headed households.

3.2.2 Key household income sources

Households have different sources of income throughout the year (Figure 20). The most notable sources of income mentioned were remittances (both domestic and foreign), informal employment as casual labourers, investments, salaries, etc. Figure 20 highlights the income sources in all the administrative regions, by frequency of mention; the most common one is remittances.

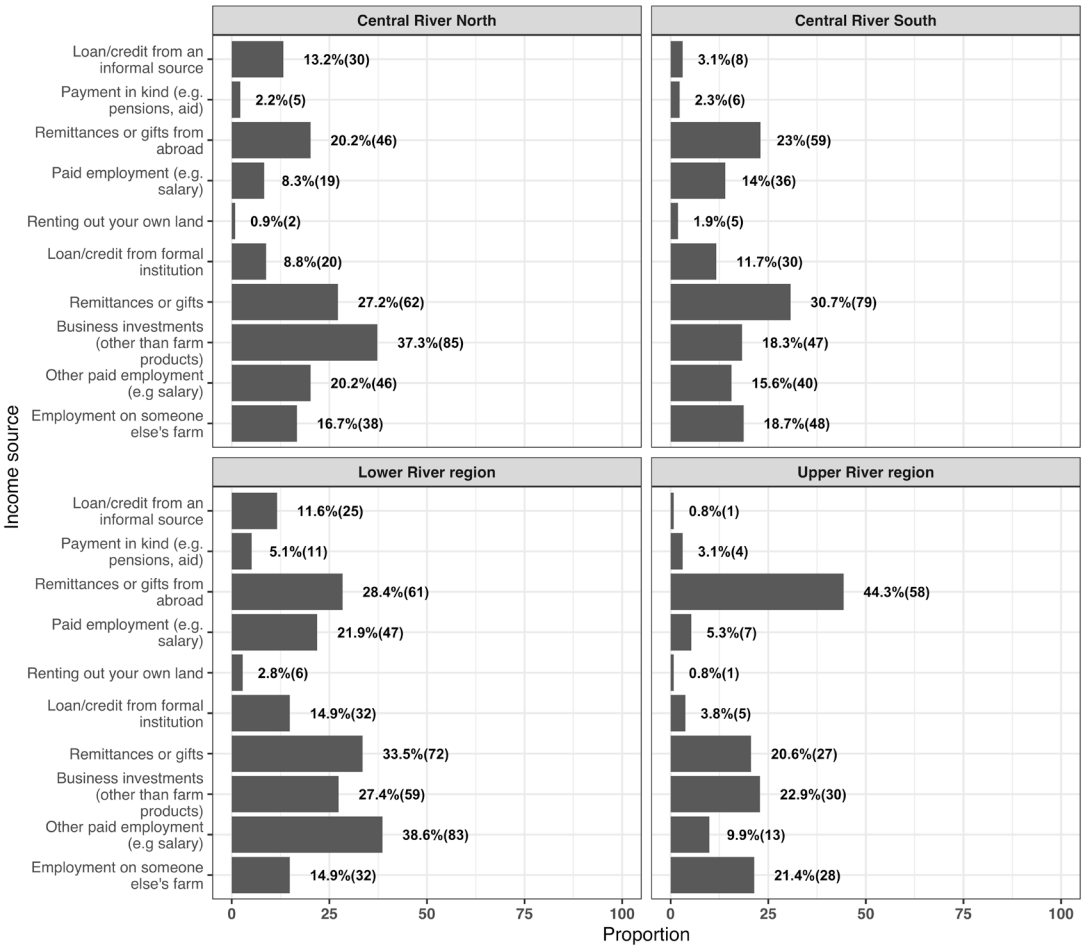


Figure 20: **Sources of income for households in the different administrative regions**

[11] http://uil.unesco.org/fileadmin/multimedia/uil/confintea/pdf/National_Reports/Africa/Africa/Gambia.pdf

Table 10: **Annual income in the last 12 months per household (in Dalasi [GMD])**

Income lines	Mean annual income (GMD)		
	CRR-N	CRR-S	LRR
Casual labour	1,348.68	963.80	1,256.52
Other paid employment (e.g. salary)	3,564.02	2,950.00	2,266.65
Loan/credit from formal institutions	5,251.00	2,749.03	3,046.88
Renting out own land	3,075.00	762.50	3,606.00
Paid employment (e.g. salary)	2,843.16	2,790.62	2,512.55
Payment in kind (e.g. pensions, aid)	2,960.00	2,083.33	2,211.11
Loan/credit from an informal source	1,513.33	2,088.00	947.92
Remittances or gifts (domestic)*	2,723.39	1,510.93	3,147.89
Remittances or gifts (abroad)*	69,973.91	2,588.76	4,310.66
Business investments (other than farm products)*	3,182.94	2,291.30	2,702.12

Note: Values marked with * still need validation since the figures are very high. Results for URR are not presented since the values are extremely inflated and are undergoing further validation.

3.2.3 Livestock assets of households and cross-border livestock movement

CRR-N and URR had the highest number of livestock in TLU compared to all other administrative regions in this study.

Table 11: **Livestock possession per household in the communities surveyed during the baseline study**

Animal	Mean number of heads of animals owned			
	CRR-N	CRR-S	LRR	URR
Cattle	18.72	9.80	16.19	22.54
Donkeys	1.99	1.92	2.14	3.26
Goats	9.53	6.12	5.93	12.84
Sheep	8.31	5.09	5.13	10.52
Horses	1.82	1.33	1.88	2.12
Chicken	11.72	12.54	8.04	13.61
Pigeon	10.75	6.88	28.23	20.96
Others	6.33	5.45	4.57	4.63
TLU equivalent	17.63	10.26	15.42	21.84

Note: For converting 'Others' to TLU we used equivalent of 0.01 since the animals included in this category are small in size. Conversions were done using http://www.fao.org/Wairdocs/ILRI/x5443E/x5443e04.htm

Livestock movement along The Gambia-Senegal border is an essential element of the dominant transhumance pastoral system. The principal motivation is the need to access pasture and markets. Climatic extremes, including drought and floods, influence the mobility of herders. Instances of diseases as well as inter clan or community conflict contribute to mobility of pastoralists.

In West Africa transhumance is a major livestock production system involving 70-90% cattle and 30-40% small ruminants (Bouslikhane 2015) and is therefore an important ecological factor as well as a livestock productivity element. There is consensus that transhumance is essential for maintenance of ecological health and contributing to livestock productivity (Ayantunde et al. 2010). This system involves seasonal short and long-distance cross-border movement, and is mainly a north-to-south movement, from the arid north to the humid south. In addition, there is a characteristic ecologically sound management of pastoral resources. It has therefore enabled pastoral communities to survive climate extremes.

Transhumance is a form of adaptation to the harsh Sahelian zone and a way of utilizing the complementarities between the Sahel and Sudan regions. This pastoral system has merits, both among the pastoralist and host communities. For example, for pastoralists; herd productivity, reduction in mortality and building of social relations with the hosts. The host community will benefit from manuring of crops and milk availability (Ayantunde, et al. 2010). Therefore, a mutual relationship between the pastoralist and host communities has social and ecological benefits.

Transhumance, however, presents problems to both herders and the host community. The principal problem is herder-farmer conflict (Ayantunde et al. 2010). The main causes of this conflict include damage to crops and competition over pasture and water. In some instances, herders do not comply with the local laws and regulation; they claim that illegal/unofficial levies are imposed on them. Conflicts will however, depend on the nature of ties between these parties with minimal conflict occurring where there is a strong social relationship (Ayantunde et al. 2010).

A second drawback associated with transhumance is environmental degradation. Increase in livestock can contribute to overstocking and uncontrolled grazing in protected areas, including community forests. Smaller ruminants, such as sheep, exhibit a more aggressive feeding that could harm forest regrowth. Expansion of farmlands in agro-pastoral areas where protected areas are encroached upon leads to herders making detours that often result in moving livestock through protected areas. Herders will often regard these protected areas as open access feeding grounds or restricted areas with minimal fines and prone to minimal conflict. Other instances include grazing at night when there is minimal patrol. The resulting effect of grazing in protected areas is loss of diversity as animals may be selective. In some cases, herders will, in a wanton fashion, prune shrub to supply fodder to their livestock.

Figure 21: **Herding of small ruminants in an already open community forest in The Gambia**

Transboundary livestock movement is key for food security and to ensure supply of essential items in pastoral areas. West African governments recognize the ecological and economic importance of livestock mobility and have signed regional and bilateral agreements. These agreements allow pastoralists to move across borders with their animals. Senegal, for example, has been involved in international conventions to facilitate livestock mobility and peaceful cohabitation among populations in border countries. There exists regional and national transhumance legislation to tackle the wide range of challenges surrounding cross-border livestock movement. Key examples include the Economic Community of West African States (ECOWAS) which provides a framework for cross-border transhumance between member states (ECOWAS, 2016). This includes obtaining the International Transhumance Certificate (ITC) whenever there is transboundary movement. This certificate indicates information on the herd in terms of number and health, planned itinerary and border post to use. Herders are required to follow the legislation in the host country as pertains to forests, water, pasture and wildlife. The ECOWAS framework further details the dispute resolution mechanisms comprising a conciliation commission made up of farmers, herders, the local government and other concerned persons. The framework indicates that all pastoralists from the 15-member states can cross borders (ECOWAS 2016). Harmonization of the regional frameworks on cross-border transhumance through localized legislation remains undeveloped. Where local norms and regulations exist, there has been minimal enforcement.

The Gambia falls in the trade route for live animals coming from Chad, Sudan, Burkina Faso and Mali, among other countries. This is the western route in West Africa and involves movement of live animals from the Sahel to coastal countries. Since The Gambia is a departure, transit and recipient country, it is affected by transhumance. The PROGEBE[12] project demonstrated the typical livestock movements in selected regions of The Gambia identified using the Participatory Rural Appraisal

[12] Regional Project for the Sustainable Management of Endemic Ruminant Livestock in West Africa

technique (PRA) (Ayantunde et al. 2010). Two broad movement routes were identified: the first one is the general short distance (<30 km) from the south bank of River Gambia. Herders in this region engage in wet season short distance transhumance into Cassamance region, Senegal. This is a strategy to prevent crop damage by livestock. The second one is from the north west to south east, to and from Senegal, across the far eastern Gambia borders. Routes may change depending on prevailing factors.

In The Gambia, movement of herders into the country is minimal when compared to other countries, therefore there is less risk such as genetic pollution of cattle, e.g., Zebu.

3.2.4 Key considerations for project implementation

Since there is risk of biodiversity loss from herding and farming activities, the EbA project could consider restoration efforts in protected areas. In particular, areas along the borders could be prioritized so as to effectively establish buffer zones. Community forests, in particular those classified as protected, equally require restoration efforts in already encroached areas.

In addition, localized legislation is not effectively actualized in the context of use of community forests which are largely governed by respective communities. Community bylaws, while recognized and adhered to, to some extent by respective village(s), remain limited in jurisdiction among herders from neighbouring countries. A potential avenue is to support a forum that engages all affected stakeholders to ensure the legitimacy of these frameworks. This forum should generate outputs that are then accessible to all actors.

3.3 AGRICULTURE AND AGROFORESTRY

3.3.1 Farm attributes

Farms owned by rural households are relatively large compared to other African countries with high population densities. URR is the region with the largest median land area per household of 5.27 ha, followed by CRR-N with 4.86 ha. The values in CRR-S and LRR are relatively lower – 3.65 and 2.45 ha respectively (Figure 22). The total land area owned by the households surveyed is as follows: CRR-N 228 HHs with area of 1754 ha, CRR-S 257 HHs with area of 1245 ha, LRR 215 HHs with 1523 ha and URR 131 HHs with 1039 ha.

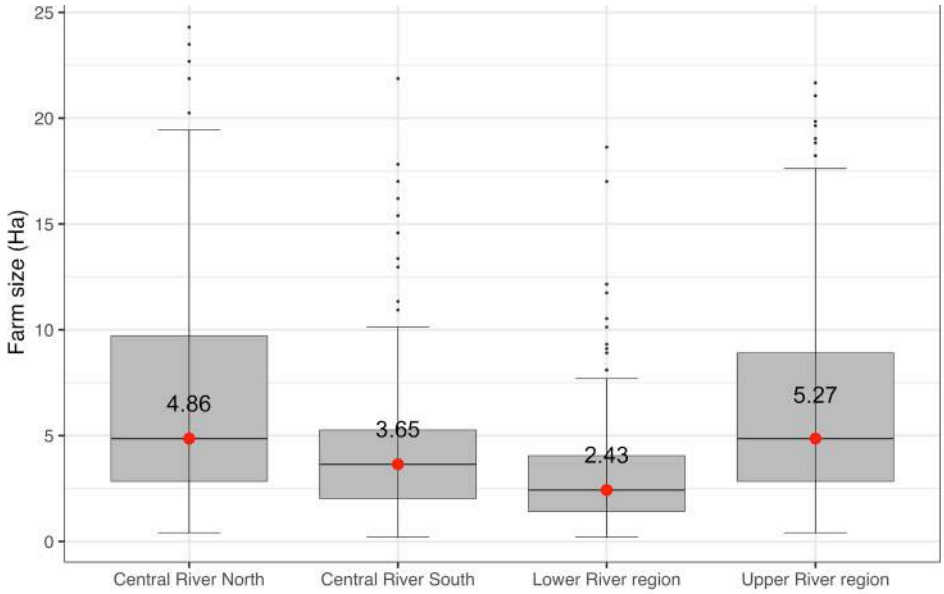


Figure 22: **Median land holding (ha) in the rural areas of The Gambia**

The most common use of the land is for annual crops followed by some perennial and annual crops mix (agroforestry). CRR-N has the highest share of land used for growing perennial crops and a mix of perennial and annual crops. See Figure 23 for details.

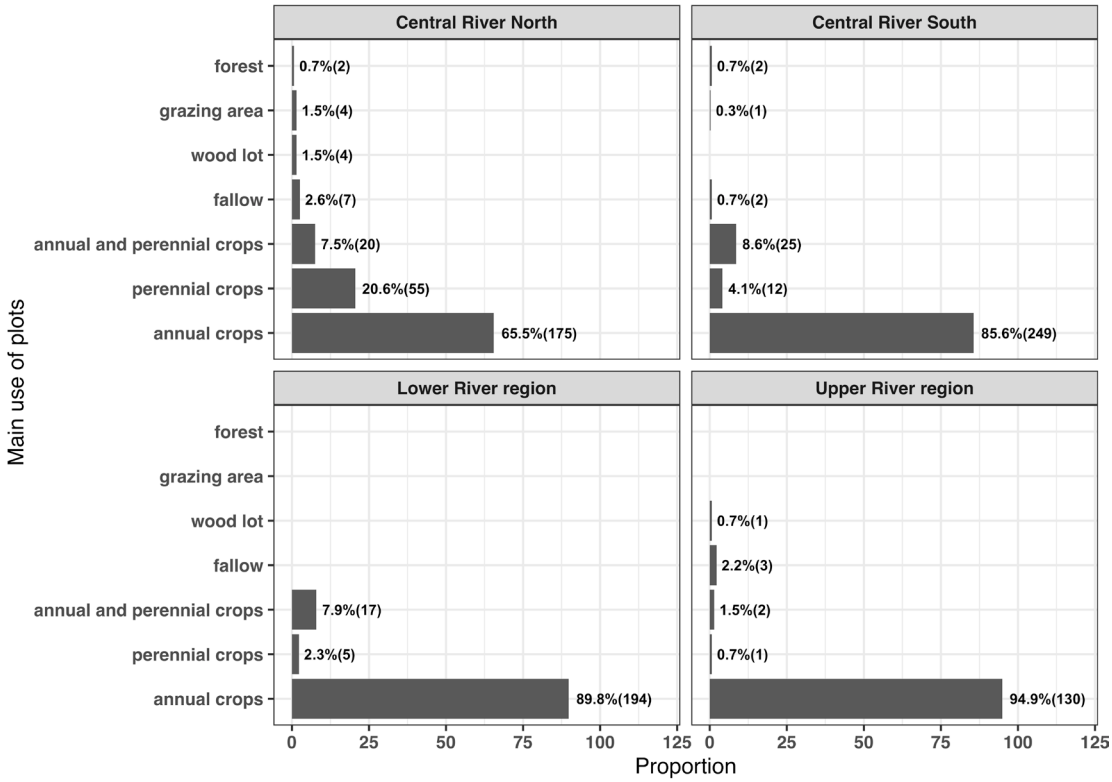


Figure 23: **Main uses of the land owned**

Most of the land owned by the households was acquired through inheritance (Figure 24). Traditional knowledge from ancestors helps farmers make authoritative decisions on how they should use the land under their ownership. Most of the currently owned farms were also farmlands in the past. When the land users acquired it, 81.2% of the farms were also farmlands, 14% forest and 4.2% open grazing areas. Today, the share of forest and grazing areas account for less than 1% of the land use.

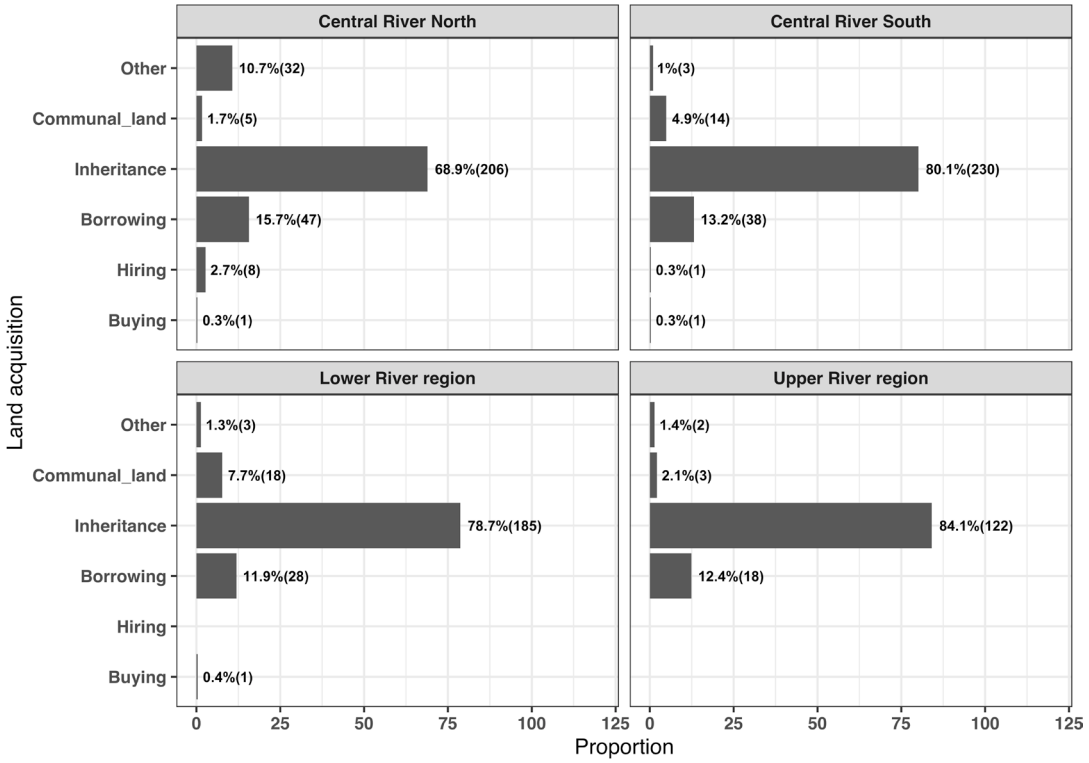


Figure 24: **Means of land acquisition in the different administrative regions**

3.3.2 State of farmlands owned by households

81.1% of the households reported being actively engaged in agricultural activities in the last 10 years or more. Most of the farms owned showed signs of degradation, i.e., very poor plant stature, signs of erosion, exposed soil parent materials, etc. Even the households themselves know that their land is quickly being degraded. Our assessment shows 72.3% of the surveyed households confirmed their land is degrading. Field observations on the farm areas also revealed that 61.84% of farms in CRR-N, 46.64% CRR-S, 70.89% LRR and 74.81% URR farms have clear signs of degradation. Erosion was among the most common signs of degradation recorded – 47.7% CRR-N, 42.1% CRR-S, 60.3% LRR, and 50.5% URR.

The main causes of degradation of the farms are as follows: CRR-N – intensive use of land (94.3%), erosion and flooding (67.54%), salt intrusion (4.8%); CRR-S – intensive use (15.18%), salt intrusion (3%); LRR- intensive use of land (55.8%), erosion and flooding (7.9%), salt intrusion (4.2%); URR – erosion and flooding (74.8%) and tree cover loss (13.74%).

3.3.3 Access to agricultural inputs

To improve the adaptive capacity of rural households' access to inputs and farming supplements is crucial. Our analysis revealed that the communities' access to such inputs is quite minimal (Figure 25).

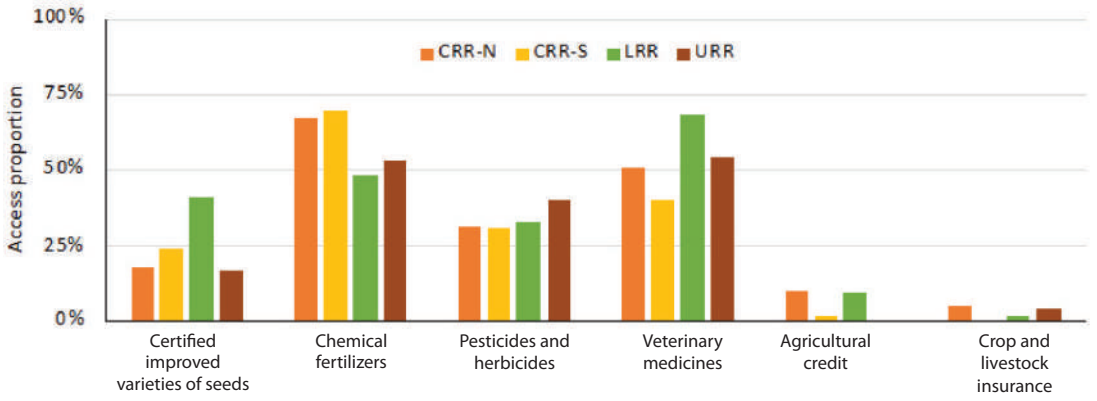


Figure 25: **Access to selected agriculture-related inputs**

3.3.4 Woody plants cultivation and management in agricultural areas

The farm inventory revealed that most of the farms have few trees and shrubs. Table 12 provides the details of the trees and shrub-related attributes.

Table 12: **Selected attributes of farms surveyed**

Farm attributes	Central River North	Central River South	Lower River region	Upper River region
No. of farms surveyed	228.00	253.00	213.00	131.00
No. of shrubs per ha	26.03	15.94	64.87	17.16
No. of stumps per ha	3.37	5.46	10.27	5.66
Share of plots with trees (%)	65.00	62.30	70.40	65.50
Mean number of trees per ha	8.19	27.04	48.77	3.89
Share of plots with self-planted trees (%)	32.89	38.74	64.32	50.38

The project regions indicate extensive engagement in agroforestry initiatives though most of the activities were not implemented deliberately as agroforestry practices. For instance, in all the regions, more than two-thirds of the households have integrated various types of trees into their farms. Details on the tree planting needs are described in the following sections.

3.3.4.1 Tree planting

In the past year, only a third of the surveyed households planted tree species on their farms, mostly fruit trees (see Table 13 as the species list preferred and planted is not different). About 23% of the households had planted at least 10 trees or more. About 16.5% of them planted up to 10 seedlings. When disaggregated by administrative region, LRR communities had planted the most trees in the project sites. Here, 52% of households had planted at least 10 trees in the last year. CRR-N, on the other hand, was

the least engaged in tree planting initiatives with only 5% of the surveyed households planting 10 or more trees in their farms.

Most of the planted tree seedlings were from own production (28.5%) and purchased (16.7%). Approximately 3% confirmed that they had obtained the seedlings from government institutions; only 1.6% mentioned NGOs as their source. Accessing and replanting wildlings was also reported by 1.8% of the population. This is an important asset for promoting natural regeneration, especially assisted natural regeneration.

With regard to deliberately keeping naturally grown trees, in URR and LRR, 23.7% and 20.5% of the farmers reported keeping at least 10 naturally grown trees on their farm, respectively. This is also evident from the results of the farm inventory presented in Table 12. The proportion of households which do not keep any trees in their farms is lowest in URR (7%) while in CRR-N and LRR the figure is as high as half of the surveyed households. In CRR-S, almost a third of the households do not deliberately keep naturally grown trees on their plots.

A large proportion of the surveyed households were interested in planting trees (about 90%). The most widely preferred tree species include Cashew, Mango, Orange, Gmelina and Eucalyptus. The most common trees that the farmers want to plant are fruit trees, both for domestic consumption and sale. Regionally, the highest tree planting ambition was recorded in the CRR regions, particularly CRR-S which represented more than half of the seedling demanded. LRR had the lowest demand for planting materials. On a per household basis, still CRR-S had the highest level of seedling needs per household (Table 13).

Table 13: **Tree species preference for planting and the number of seedlings needed**

Species	CRR-N	CRR-S	LRR	URR	Total	Main uses of species[13]
Anacardium occidentalis	23,311	46,371	6,963	16,362	93,007	Fruit, Firewood, Construction
Mangifera indica	12,955	18,649	5,014	6,623	43,241	Fruit, Firewood, Construction
Citrus spp	1,834	13,880	2,730	410	18,854	Fruit, Firewood, Construction
Gmelina arborea	1,615	8,875	5,010	2,045	17,545	Timber, Construction, Firewood
Eucalyptus spp	3,015	8,785	200	3,406	15,406	Timber, Construction, Firewood
Banana	420	5,405			5,825	Fruit
Psidium guajava	265	5,095	10	25	5,395	Fruit, Fencing
Khaya senegalensis	981	2,603	648	1,155	5,387	Cooking oil (seeds have oil content of 67%), Timber, Construction
Pterocarpus erinaceus	630	700	25	435	1,790	Leaves (cooked and eaten as a vegetable), Seeds, Live fencing, Medicinal
Persea americana		1,500			1,500	Fruit, Firewood
Moringa oleifera		1,170	100		1,270	Food (leaf, seedpod, seed, flower, oil from seed), Firewood, Medicinal

[13] http://tropical.theferns.infor/

Species	CRR-N	CRR-S	LRR	URR	Total	Main uses of species
Parkia biglobosa	225	200	255	498	1,178	Highly edible fruits (pulps) and seeds, referred to as meat or cheese substitute due to high protein levels
Cordyla pinnata	265	600		160	1,025	Fruit pulp is eaten raw, Medicinal, Firewood, Furniture
Acacia albida	50	50		500	600	N-fixing; firewood, feed; Construction
Rhun palm	380				380	Handcrafts; fire belt; edible seeds, leaves, buds
Seedling needs	46,778	114,243	20,955	31,729	213,705	
Seedlings needs per household	104	291	244	154	188	

Most of the households preferred non-native tree species such as cashew, mango, citrus and gmelina. In fact, cashew and mango were mentioned by almost two-thirds of the households (Table 14). Each of the rest of the tree species were listed as most preferred by less than 10% of the households. This could be due to two main reasons: either communities are not very aware of the species or they think that most of the native species in the area do not need to be planted. Another observation from the responses was that trees that provide edible parts (e.g. seeds, fruits, leaves, etc.) dominated the preferences by communities in almost all administrative regions. Market forces could have played a role in the preferences since markets for the products of the native species are low except for timber.

Table 14: **Number of households mentioning tree species for planting**

Number of households	Central River North	Central River South	Lower River region	Upper River region	Grand Total
Anacardium occidentalis	155	130	25	83	393
Mangifera indica	154	96	23	70	343
Citrus spp	30	49	7	4	90
Gmelina arborea	16	35	13	11	75
Eucalyptus spp	25	16	1	11	53
Khaya senegalensis	20	13	11	7	51
Guava	5	19	1	1	26
Banana	8	13			21
Pterocarpus erinaceus	7	8	1	5	21
Parkia biglobosa	2	1	3	7	13
Moringa oleifera		6	1		7
Cordyla africana	3	1		2	6

Number of households	Central River North	Central River South	Lower River region	Upper River region	Grand Total
Acacia albida	1	1		3	5
Rhun palm	4				4
Total number of households expressing interest to plant tree species	451	392	86	206	1135

Note: The total in the last row is greater that the sample size of households of 831 since some households expressed interest in multiple species each preference was counted.

On where preferred tree species could be planted, dominant niches were degraded woodlands and in separate plots as woodlots. About 58% of the preferred planting niche was degraded woodland; 34% of the planting was to happen in woodlot models. The practice of cashew and mango in woodlots is common in The Gambia. Woodlots were found to be the dominant preferred niches in the CRR-N region (Figure 26) while in the rest, woodlands were the most preferred planting areas.

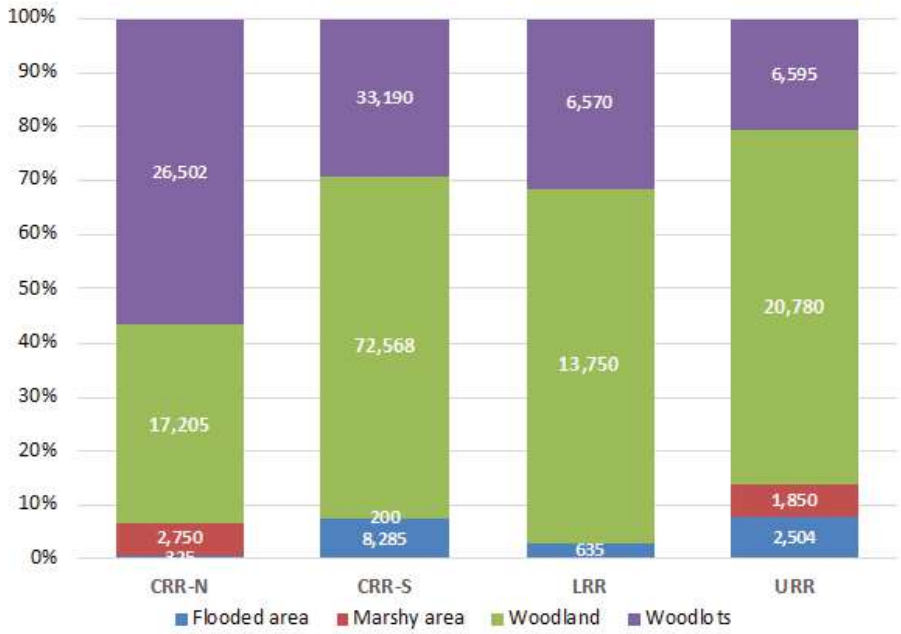


Figure 26: **Preferred planting niches for the species mentioned to be planted. Note: Numbers on the bars show the number of seedlings preferred in different niches in each of the project regions.**

The expressed need for growing nitrogen-fixing tree species, which could be useful to boost the production potential of farms, was low. This, in fact, is one of the key areas where agricultural extension workers could sensitize and educate communities on the role of nitrogen-fixing tree species that provide multiple benefits – wood, feed, firewood and even construction wood. Such

initiatives will have to be embedded in the other activities that were identified in Figure 25. The mean number of trees to be planted per unit area of land possessed is indicated in Table 15.

Table 15: **Average number of tree for planting per unit area in different regions of The Gambia**

Species for planting	Number of seedlings to be planted per ha as expressed by the communities			
	Central River North	Central River South	Lower River region	Upper River region
Anacardium occidentalis	29.55	86.05	117.58	43.54
Mangifera indica	20.15	77.00	38.49	32.36
Citrus spp	9.10	45.29	43.76	22.55
Gmelina arborea	15.29	55.51	148.82	36.58
Eucalyptus spp	13.14	56.20	109.74	33.54
Khaya senegalensis	5.74	81.28	24.11	53.09
Guava	10.05	45.56	12.35	2.37
Banana	4.92	62.89	-	-
Pterocarpus erinaceus	19.36	31.91	20.58	13.39
Parkia biglobosa	8.50	61.73	63.86	12.36
Moringa oleifera	-	47.88	33.82	-
Cordyla pinnata	11.15	296.30	-	185.44
Acacia albida	7.72	13.72	-	5.11
Rhun palm	35.48	-	-	-

Seven of the top 10 species are becoming rare and have been declared protected species according to the Forest Act 1998 (Table 16). Hence, the perception of the communities is in line with the policies. See Annex 3 for the phenological behavior of the preferred species.

Table 16: **Species that were perceived as rare in the regions**

CRR-N (n=228 HHs)	CRR-S (n=257 HHs)	LRR (n=215 HHs)	URR (n=131 HHs)
Khaya senegalensis (39%)	*Pterocarpus erinaceus (66%)*	*Khaya senegalensis (70%)*	*Pterocarpus erinaceus (84%)*
Pterocarpus erinaceus (32%)	*Khaya senegalensis (65%)*	*Pterocarpus erinaceus (60%)*	*Cordyla pinnata (60%)*
Parkia biglobosa (25%)	*Cordyla pinnata (28%)*	*Cordyla pinnata (41%)*	*Khaya senegalensis 50%)*
Ceiba pentandra (21%)	*Bombax costatum (18%)*	*Parkia biglobosa (26%)*	*Parkia biglobosa (40%)*
Ficus capensis (21%)	*Borassus aethiopum (14%)*	*Saba senegalensis (21%)*	*Bombax costatum (34%)*

CRR-N (n=228 HHs)	CRR-S (n=257 HHs)	LRR (n=215 HHs)	URR (n=131 HHs)
Borassus aethiopum (18%)	*Parkia biglobosa (13%)*	*Annona senegalensis (17%)*	*Terminalia macroptera (13%)*
Cordyla pinnata (18%)	*Cola cordifolia (8%)*	*Bombax costatum (16%)*	*Adansonia digitata (6%)*
Bombax costatum (11%)	*Ficus capensis (7%)*	*Adansonia digitata (15%)*	*Borassus aethiopum (2%)*
Adansonia digitata (10%)	*Ceiba pentandra (7%)*	*Cola cordifolia (13%)*	*Daniellia oliveri (2%)*
Daniellia oliveri (6%)	*Saba senegalensis (6%)*	*Ceiba pentandra (9%)*	*Ficus capensis (2%)*
Cola cordifolia (6%)		*Terminalia macroptera 9%)*	
		Daniellia oliveri (8%)	

Note: Species marked * denote the species currently in the list of protected species. Number in the bracket denote the percentage of households stating that the species are rare in the respective regions.

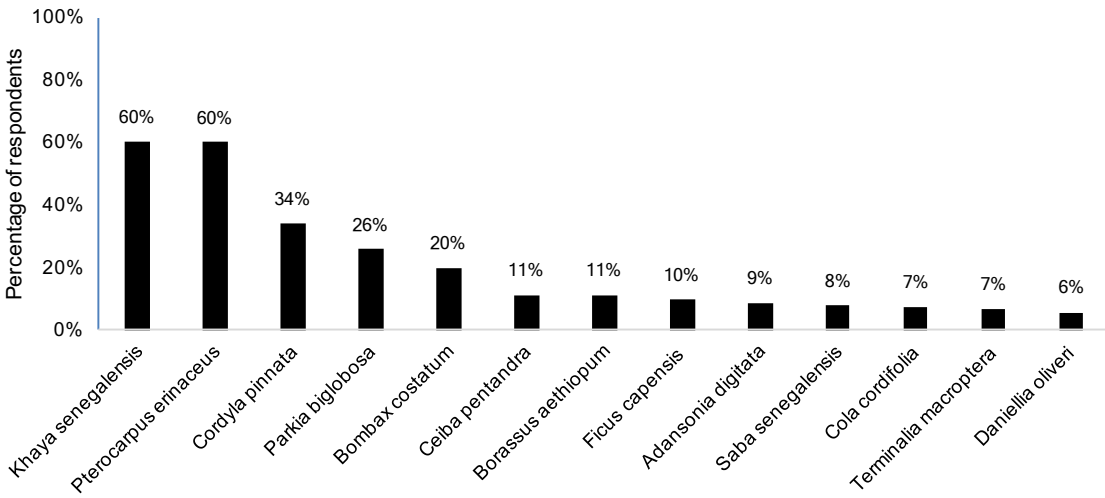


Figure 27: **Aggregate analysis of species becoming rare in the project regions based on community perceptions. Note: the percentages are out of 831 households.**

To promote the tree-growing initiative, communities put emphasis on the need for training. Key areas proposed: raising tree seedlings (mentioned by 92.3%), proper planting techniques (mentioned by 91.7%), management of planted seedlings (mentioned by 91.9%) and correct spacing (mentioned by 87.5%).

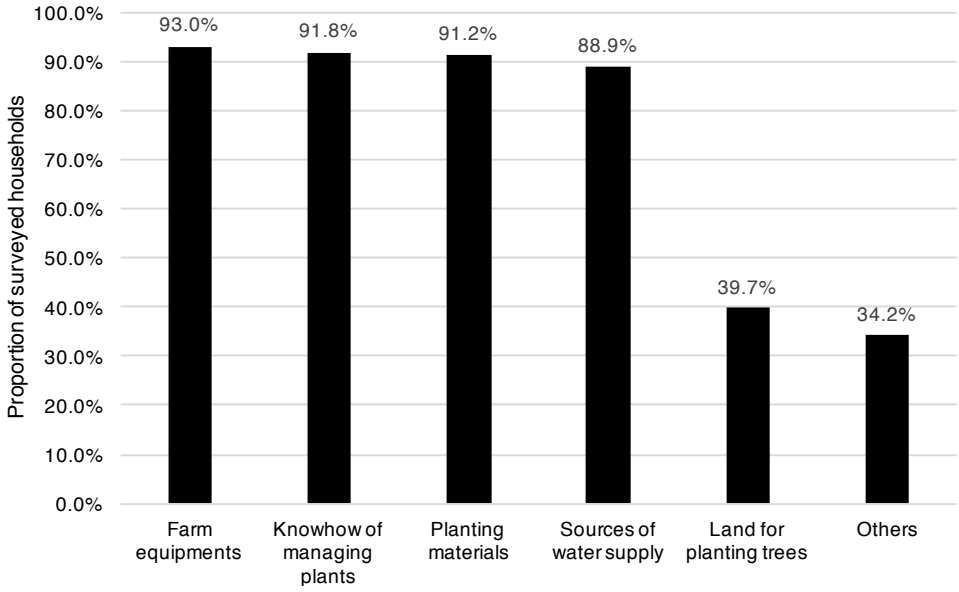


Figure 28: **Key types of support required for promoting tree growing**

3.3.4.2 Uses of trees

The uses are presented in Table 17. The most common are firewood, edible plants, medicinal uses and timber for construction.

Table 17: **Main uses of trees identified in the farms**

	Firewood	Food	Medicinal purpose	Timber	Fence post	Fodder	Furniture and craft
CRR-N	15	22	11	8	14	20	0
CRR-S	72	38	53	5	5	3	7
LRR	4	23	12	15	2	1	9
URR	21	0	0	16	8	0	3
Grand Total	112	83	76	44	29	24	19

Note: Values stand for number of uses mentioned by respondents for the various species encountered in the farms.

The trees that were recorded in the farms are located in different places within the farms (Table 18). Most of them are inside the farms, along farm and village boundaries and scattered in the field.

Table 18: **The niche where trees are usually grown**

	Boundary of the farm and village	Scattered in the field	Inside farmland	In the forest	Outside the village	Riverside
CRR-N	20	17	55	0	0	0
CRR-S	33	5	58	8	59	2
LRR	21	18	32	0	0	0
URR	1	23	24	0	0	1
Grand Total	75	63	169	8	59	3

Note: Values stand for niches where the various species grown by the households are usually located.

3.3.5 Adaptation strategies associated with agricultural and tree products

Communities have been experimenting with various adaptation strategies. In the agricultural sector, 29.5% introduced new varieties of crops that they were not growing before, 15.4% tested new crop varieties, 23% stopped growing crops altogether, 16.8% stopped growing some crops seasonally, 15% introduced tree species, 9.1% tested new tree species and 3.7% stopped growing some tree species. These were the most common changes identified by the communities to reduce losses or to improve their gains from agricultural activities. For instance, in LRR, 50.7% of the households stated introducing a new crop variety and about 44.2% also stated that they stopped growing some crop varieties totally. Still in the same region, 35.8% of the households mentioned introducing tree species in their farms.

The changes in crop varieties focused mainly on introducing: short-cycle crops (49.1%), high quality varieties that are adaptable to climate change (38.7%), drought-tolerant species (26.8%) and pretreated or improved seeds (21.1%). Introduction of fruit trees (17.9%) and timber trees (14.4%) were among other adaptation strategies mentioned by the communities.

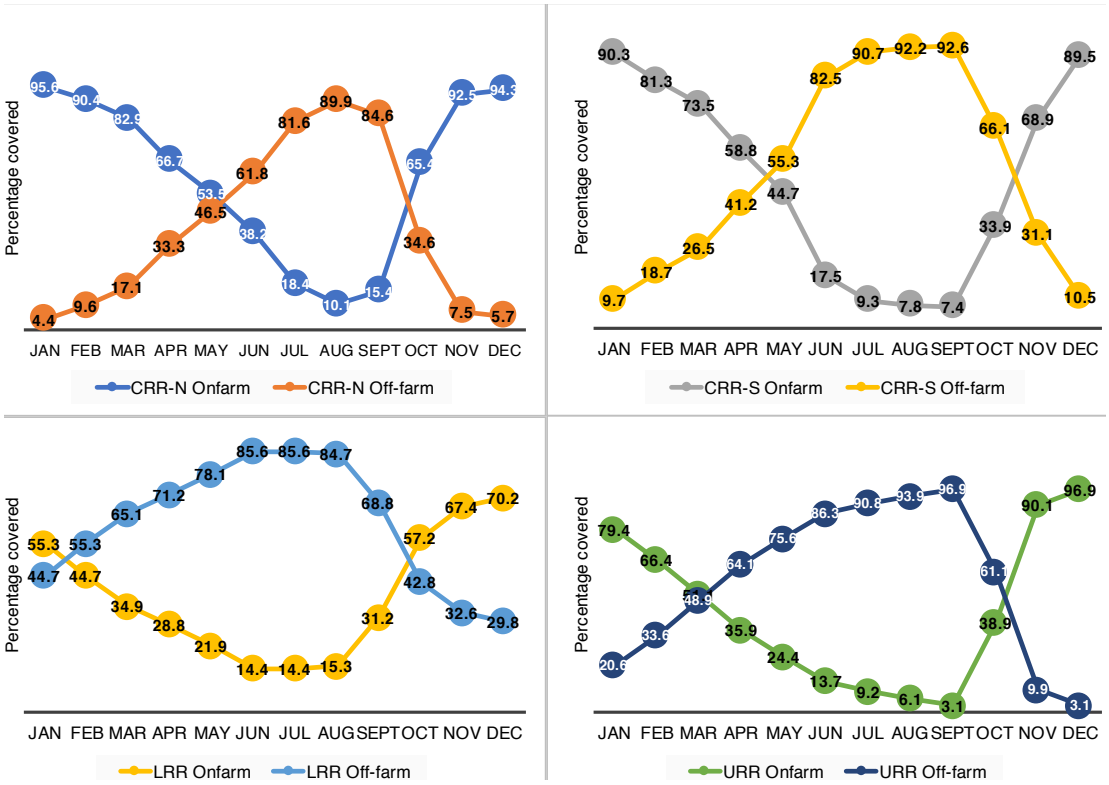


Figure 29: The state of food security in the project regions.

Besides off-farm sourcing options, communities also described how they collect wild fruits and edible plant parts as means of coping. Approximately 49% of the households reported that they collect wild fruits and edible plants to cope with the food shortage during various months of the year.

The collection of wild edibles mostly happens between the months of April and August (Figure 3). The proportion (%) in Figure 30 indicates the number of households reported to have engaged in wild fruit collection in any given month. The red line depicts the proportion of households who reported food shortage in any given month, while the blue presents the percentage of households reporting collecting wild edible plants from the forests in every month of the year.

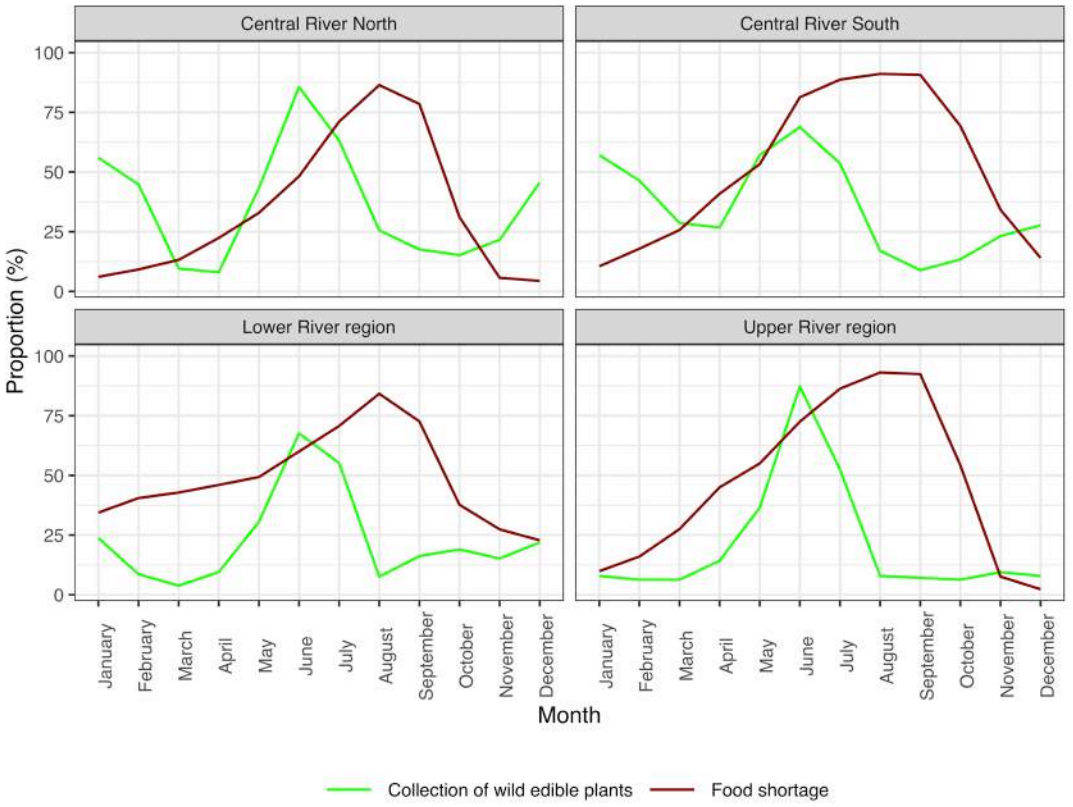


Figure 30: **The contribution of collecting edible wild plants in coping with food insecurity. Note: The Y-axis stands for proportion of all the HHs in the specific region assessed.**

3.3.6 Key considerations for project implementation

1. Enhancing tree cover does not only solve the wood crisis, it also provides protection against erosion. Increasing the proportion of nitrogen-fixing trees also helps to restore the land that is already degraded by replenishing nitrogen and other nutrients. Hence, trees growing in agricultural landscapes should be prioritized. The choice of species should be carefully done to ensure that they adapt to the projected climate changes in the districts. On the social aspects, it is important to take into consideration community perspectives on what they want to grow. ICRAF's approach of the right tree, at the right place and for the right purpose will be the guiding principle.

2. Our results reveal that wild, edible plants play a key role in mitigating the effects of food shortage (Figure 30). Hence, any tree-growing scheme in the CFs, CPAs and agricultural areas should put emphasis on ensuring that this natural source of food does not become extinct due to overexploitation. Regional authorities should invest in replenishing forests through enrichment planting, degraded area plantings and even in ANR activities. In the agricultural areas, such wild plants could even be domesticated to increase the benefits the community enjoys from such species.

3.4 COMMUNITY FORESTS

3.4.1 Developing CFs in The Gambia

In the 1990s, in a bid to stop the ongoing deforestation and forest degradation issues, the Department of Forestry in The Gambia commenced a push to decentralize management of the forest resources so that local communities would have a clear mandate and ownership in the resources located in their proximity. Decentralization of the forest resource management was critical to engage the local communities who were previously engaged in clearing forests and converting forest lands to other economic uses (Camara and Dampha 2007). This measure was critical to abate the impacts of bush fires, clearing forests for agriculture and expansion of *Gmelina arborea* plantations.

The initial process of decentralization began with the coining of the concept ***participatory forest management*** in The Gambia. This included community forestry at its core. A CF is a forest area identified by a community for collective management. It is often located within the customary lands. For a CF to be officially recognized by the Department of Forestry, it has to undergo four key processes. The Forest Act (1998) defines CFs as "***forests designated as such in accordance with Section 68 and which are owned and managed by the designated communities for the purpose of timber, firewood and non-wood forest produce production, forest grazing, protection and conservation."***

Startup phase: This is the phase when discussions commence between the community and the area DoF. It involves three key tasks:

- Community sensitization on CF establishment procedures by DoF and other entities
- Identification of the forest area that is going to be the future CF
- Establishment of the CF committee responsible for management of the forest

Preliminary phase: In this phase most of the details about the CF are substantiated. The following are the key tasks:

- Demarcation of the CF
- Development of the CF management agreement with support from the DoF, CF management committee and other entities
- Proof of ability of the community to manage the forest and protect it from fire and illegal extraction for 1.5-3 years with support from local DoF staff and NGOs.

Consolidation phase: This is the stage of evaluation during the preliminary phase. If the community has managed the forest well, they will be granted final ownership which allows them to exploit the forest sustainably based on the annual village planning with an Market Analysis and Development (MA&D) process which lets them identify feasible enterprises to support the communities.

Once communities obtain the ownership status, they develop a five-year management plan which specifically focuses on fire protection, enrichment planting and sustainable forest product utilization. The management plan specifies the activities to be carried out, the species and quantities to be used, harvesting procedures and other related details which are based on forest assessment and traditional knowledge of the resources (Tomaselli and Kozack 2005).

Table 19 shows the state of CFs in different stages of development as of 2017 in the whole country. The total area currently under CF schemes is about 36,699 ha; this is very low in relation to the government's target of managing close to 200,000 ha of forest with the communities. See Annex 1 for the full list of CFs selected for the baseline study.

Table 19: **State of CFs in The Gambia**

Adminstrative Regions	Start up		PCF A		CFMA		Total (2017)	
	No.	Area (ha)	No.	Area (ha)	No.	Area (ha)	No.	Area (ha)
West Coast	10	75.00	15	3022.90	46	5040.95	71	8138.85
North Bank	11	398.50	54	3309.37	7	357.50	72	4065.37
LRR	22	1366.60	17	2072.09	17	4021.03	56	7459.72
URR	40	500.00	3	345.00	27	3267.13	70	4112.13
CRR-S	40	1177.45	17	1238.50	58	4678.12	115	7094.07
CRR-N	24	410.00	19	1510.20	65	3908.99	108	5829.19
Total	**142**	**3,897.55**	**125**	**11,498.06**	**220**	**21, 273.72**	**492**	**36,699.33**

Source: Authors' compilation from DoF documents

3.4.2 State of vegetation in the CFs

This baseline study covered most of the CFs in the country to generate reliable evidence that forms the basis for the monitoring process during project implementation.

Table 20: **Some selected attributes of CFs represented in the baseline study**

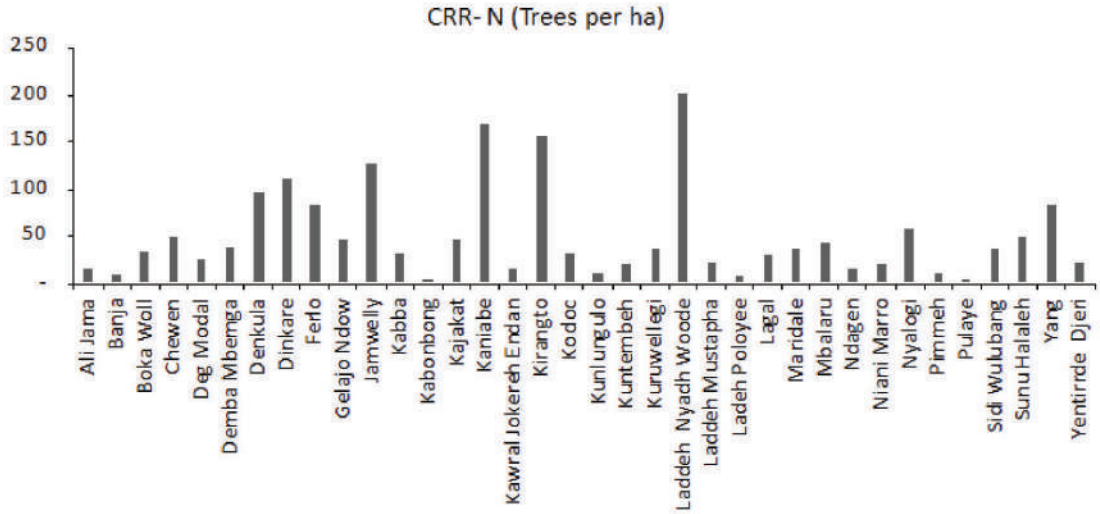
	CRR-N	CRR- S	LRR	URR
Number of CFs covered in the baseline	36	31	22	21
Percentage of total area of CFs with CFMA represented	79.62	90.00	84.17	58.07
Total area of CFs covered	3112.67	4,210.96	3384.69	1,897.20
Percentage of number of CFs with CFMA covered in the baseline study	85.77	89.97	68.37	58.07
Mean area per CF (ha)	86.46	135.84	153.85	90.34
Minimum area per CF (ha)	8.10	6.20	18.20	34.40
Maximum area per CF (ha)	786.50	1,073.90	575.60	422.00

Table 21 presents the diversity of the vegetation types in CFs. The results presented represent 110 of the CFs at CFMA stage i.e. the selected CFs do have clear ownership title. This represented 50% of the CFs with CFMAs as at 2017.

Table 21: **Some summary attributes of forest status in the CFs**

	CRR-N	CRR-S	LRR	URR
Mean number of trees per ha	50.39	111.52	267.1	124.43
Mean diameter at breast height (cm) of trees	11.20	13.15	11.14	19.13
Mean height of trees (m)	7.65	10.52	7.90	6.60
Mean number of shrubs per ha	74.79	54.71	315.02	30.37
Mean height of shrubs (m)	2.60	3.63	1.44	1.94
Mean number of saplings per ha	110.41	105.93	93.89	106.16
Mean number of dead trees per ha (non-anthropogenic mortality)	65.56	15.87	4.81	7.75

Our baseline assessment revealed that CFs in the LRR have the highest density of trees while those in the CRR region have the lowest tree density. Most of the CFs in the CRR-N have less than 50 trees per ha (Figure 31).



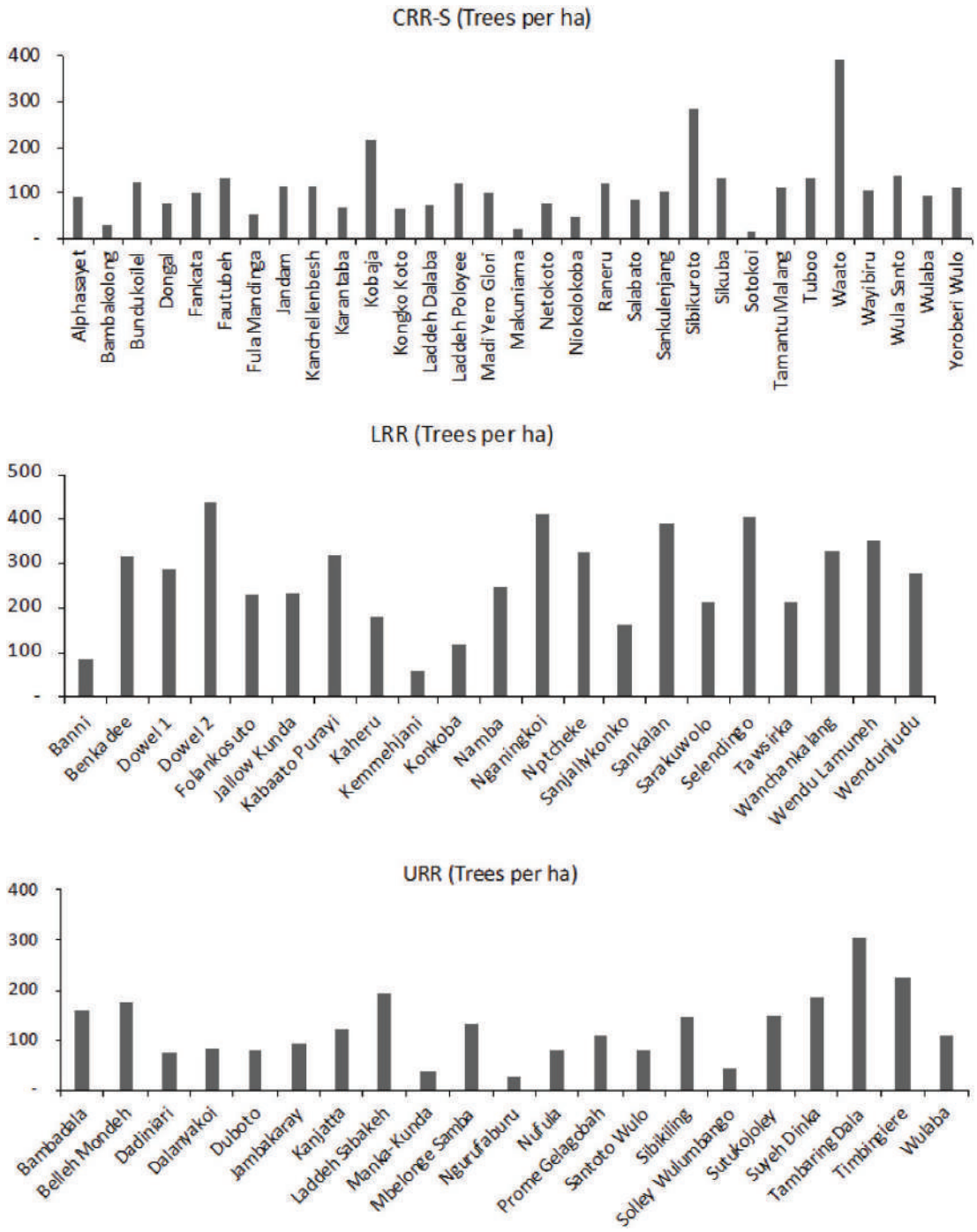


Figure 31: **Mean number of trees per ha in different CFs**

The most dominant species in the regions considered in this baseline is *Combretum* followed by *Lannia, Mitragyna* and *Terminalia* spp (Figure 32). Six of the top 10 most abundant species in the CFs (*Acacia, Bombax, Borussus, Pterocarpus, Mitragyna* and *Prosopis*) are protected by law in The Gambia according to the Forest Act 1998. This implies that the community could have limited options for exploiting the protected species other than for non-timber wood products. See Annex 2 for details of the dominant species.

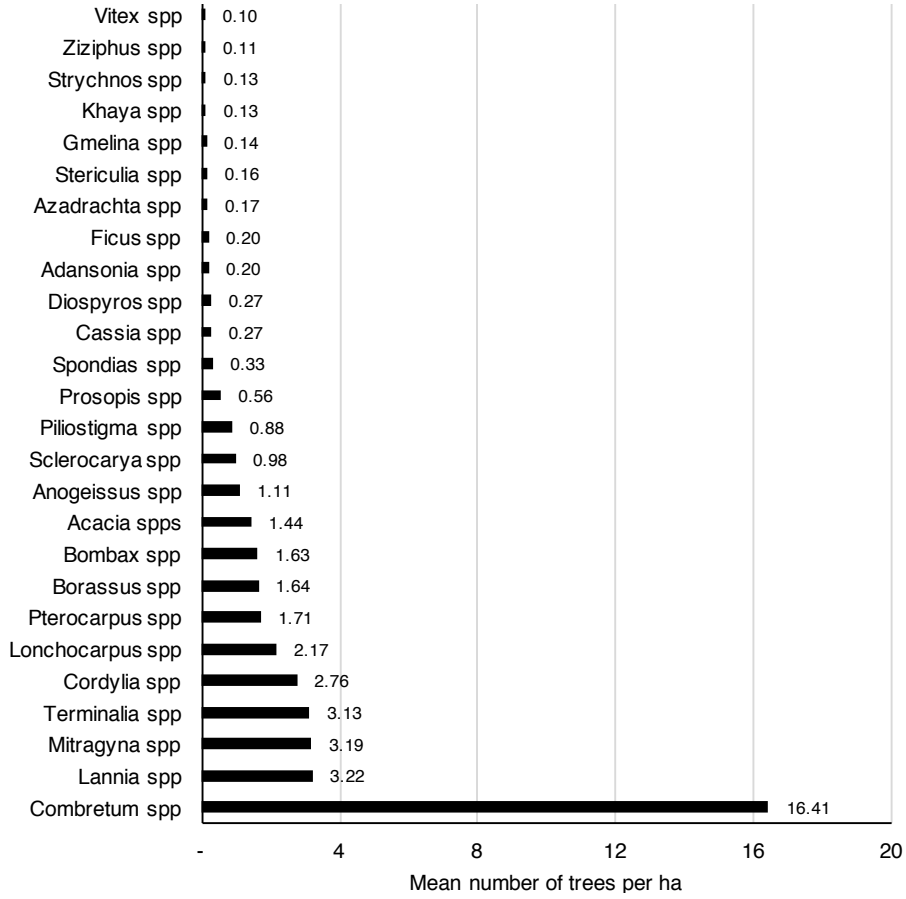


Figure 32: **Species dominance in the administrative regions considered for the study**

3.4.3 Understanding the ongoing changes in and around CFs

Using spatial analysis, it was found that most of the losses in tree cover are happening outside community forest areas. However, the losses are still attributed to villages that are either close to or are managing CFs. In and around CFs, detected losses dating from around early 2000 are presented in Figures 33-35. Most of the recent losses occurred in the mangrove and riverine forest areas. This might be associated with a number of factors – first, with the erratic rainfall, farmers may have resorted to growing more crops around areas close to the river, hence clearing mangroves and riverine forests. Second, land degradation which has been taking place for decades has forced some communities to cultivate pristine soils which are fertilized by tidal water from the river's system. Third, the fact that rice is a significantly expanding crop in the lowland areas may also have led to clearing

of some of the wetland, mangrove and riverine forests. Below is a sample analysis that was done around five CFs in the CRR region (Figures 33-35). The top one shows losses in forest cover from 2000 to 2017, while the lower picture presents the same details, but also highlights when the changes happened. The maps include OpenStreepMap and Google Hybrid as base layers and "Year of gross forest cover loss" as overlay from Global Forest Watch (https://www.globalforestwatch.org) using methods developed by Hansen et al (2013).

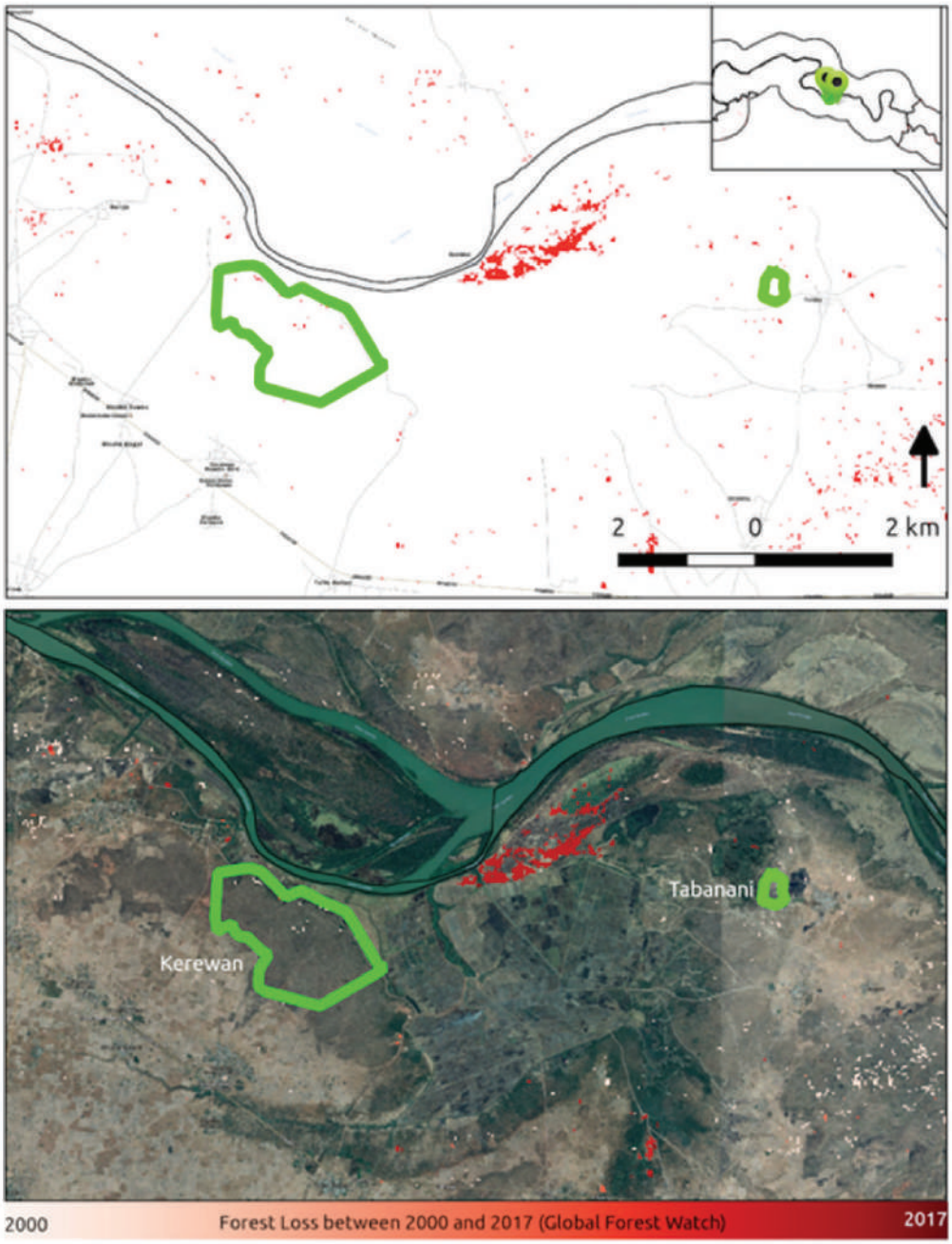


Figure 33: **Ongoing forest cover loss between Tabanani and Kerewan CFs. The bright green polygons are CFs labelled on the maps. The red points indicate loss of vegetation cover between 2000-2017.**

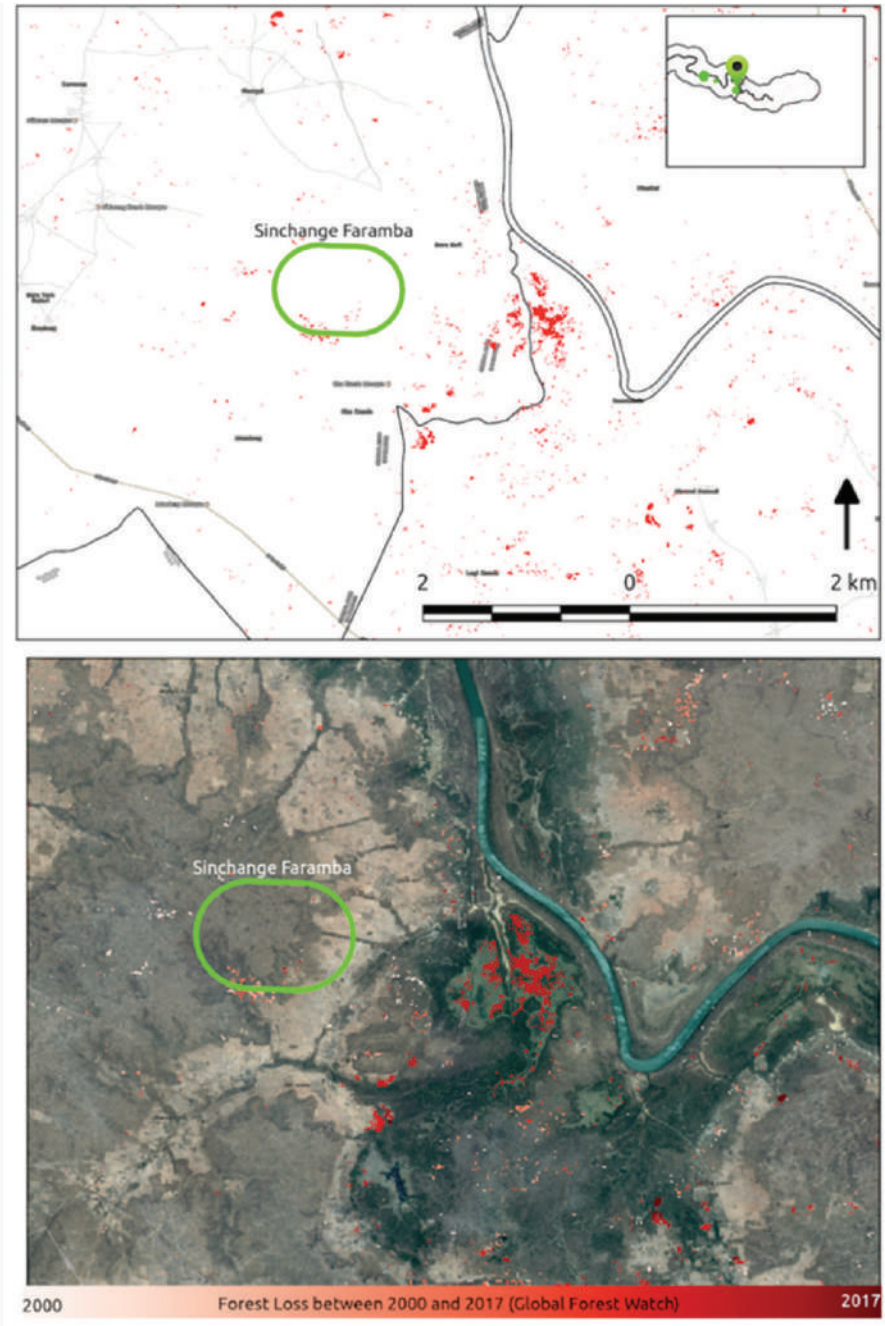


Figure 34: **Forest losses around Sinchange Faramba CF**

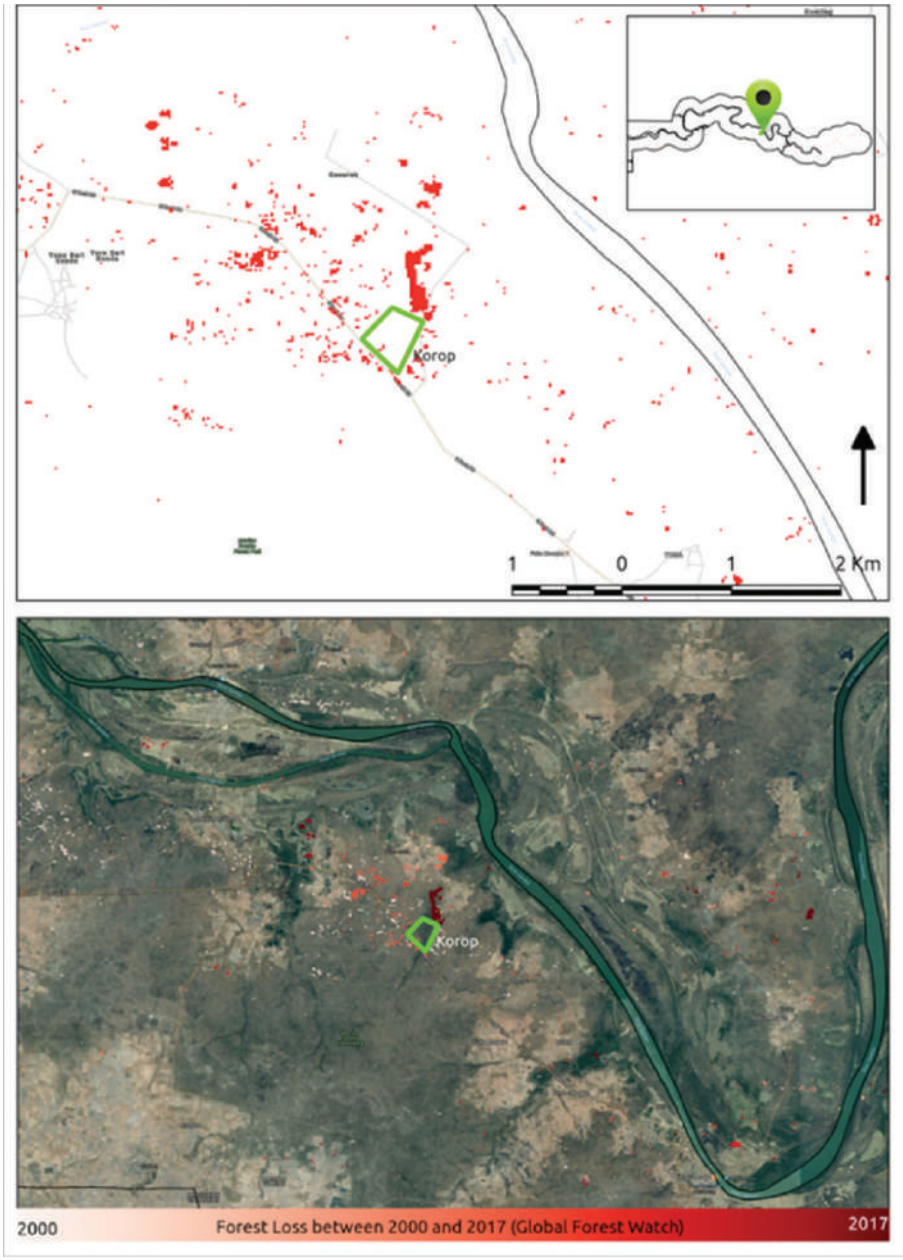


Figure 35: **Forest cover loss around Korop CF**

3.4.4 EbA options in CFs

EbA options in the CF areas listed below only used the baseline study results. The confirmation of whether or not these interventions take place in the CFs will depend on the validation results that will be done together with each of the CF management committees. Hence the information below is only focusing on the potential rather than the actual activities that a community would implement.

Restoration through enrichment planting: Enrichment planting is a forest management technique where trees of similar species are planted in places which have been cut or dead

due to climate change, fire, water logging, etc. To determine the opportunities for enrichment planting, we computed the number of trees cut per ha and the number of dead standing trees per ha from the vegetation inventory data. This EbA intervention works well in forest and savannah areas that have been degraded. **Current rates of enrichment planting in the surveyed CFs and CPAs is almost zero.**

Restoration through replanting of degraded lands (RDL): This EbA intervention applies to areas where the community wants to replant completely; areas that are devoid of vegetation due to clearing and conversion to agricultural lands. Often, farmers create farms by clearing parcels of forest which they abandon once these cease to be productive. Such areas are considered most suitable for planting indigenous and high value trees. We collected data on areas for full scale planting based on the management plans of the forests. **Current rate of replanting degraded areas is zero in the CFs that were assessed during the baseline study.**

Restoration through assisted natural regeneration (ANR): ANR is a form of regeneration where degraded areas are left to regenerate by reducing access and utilization. It can be complemented by planting additional useful tree species. ANR is a growing means of regenerating degraded areas in the savannah areas of Africa. Experiences and learnings can be sought from Niger which is among the pioneers in transforming landscapes through trees. **There was no record of ANR in any of the CFs during the baseline study.** Table 22 describes the relative assessment of various attributes of the EbA options to be implemented in the CF areas.

Table 22: **A comparative qualitative assessment of the EbA options to be considered in the CFs**

Assessment attributes	Enrichment planting	Degraded lands planting	Assisted natural regeneration
Application	Best in degraded parts of forest	Best fit in areas where complete clearance took place	Best in degraded parts not frequently accessed by people
Investment	Requires substantive investment in raising the tree species to replace the cut or dead ones	Requires significant investment to raise seedlings to be planted	Relatively affordable since regeneration drives the process when compared to intensive human and resource inputs
Level of knowledge and skills required	Knowledge of which trees fit the existing vegetation structure is crucial. Otherwise the trees may out-compete one another	Requires skills on tree growing and choices of species that fit into the future climatic scenarios	Key skill required is to know when to intervene or not and when to access for use or not
Time till first use by the community	The community may keep on extracting products at a regulated rate from the standing trees	This may take time till the plantings grow and begin to generate benefits	Benefit generation depends on how fast the system recovers
Benefit generation – wood and non-wood products	High to medium – existing trees and shrubs still keep on generating benefits but with gradual increment as the new plantings grow	Low to nil since this is like establishing new vegetation	Medium

Assessment attributes	Enrichment planting	Degraded lands planting	Assisted natural regeneration
Benefit generation – biodiversity	High to medium from the beginning	Low until the trees reach certain level to provide habitat values	High to medium, e.g., birds, insects and smaller mammals enjoy such areas
Ability to adapt to future agroecological and climatic changes	Medium to high since this scheme is about improving the state of vegetation in the area	Medium to low since this is new vegetation	Very high since it is largely a natural process
Ecosystem services delivery	High	Medium to low	Medium

Establishing fire belts: With the growing frequency of dry periods and increasing temperatures in the region due to climate change, it is expected that fire outbreaks will increase. With the long dry periods and temperature increases, combustibility of fuel on the vegetation floor is very high. Thus, fire management mechanisms are critical if CFs are to safeguard their investments. Possible increase of fire incidents needs to be monitored and strategies put in place to reduce its impact. Fire belt establishment is the most practical method of reducing the possible impacts of fire on vegetation, communities and investments.

From the community level assessments, it was found that 75.1% (out of 831 respondents) had witnessed at least one uncontrolled fire incident in the last 12 months. Incidences of uncontrolled fire were lowest in CRR-S where only 59.1% of the communities had witnessed at least one fire incident in the last year. CRR-N follows with 75.4%. LRR and URR had the highest number of fire incidences of 89.8% and 81.7%, respectively. **Hence, fire belt establishment should be prioritized in these two administrative regions.** Using the NDMA and UNDP (2014) assessment, we verified that bushfires are the most common hazards in all administrative regions of The Gambia. They are mainly used for clearing farms, clearing weeds and bushes, and hunting. NFA 2008-2010 found that fire affects about 68,000 ha of forest in URR, 46,000 ha in LRR and 26,000 ha in CRR. **The estimated uncontrolled fire incidence rate is 50%.** This does not mean that the remaining forest areas do not experience fire, but the frequency is relatively low at least every two years. Hence, priority should be given to areas which are getting burnt more than once every year.

Depending on the location of the CF, CPA and MPC, it is important that fire belts are established around the perimeter, so that if fire starts outside the perimeter it is contained outside the CF, CPA and MPC areas. Similarly, if a fire is started within the perimeter it will be contained within the boundaries without causing any further damage to the vegetation and households outside the incident area. In drier ecosystems, it is always advisable to establish a wide fire belt since combustibility of fuel on the ground is higher when compared to wet regions where combustibility is low. Despite the negative effects, fire in such savannah-dominated ecosystems is also a management tool and has to be utilized with utmost care in the form of controlled fires. For instance, fire is very effective in controlling invasive plant species; it burns down their seedlings. Fire also controls invasive insects, for example, locusts and worms by reducing their populations. Fire also hastens the development of new shoots of grasses for livestock in such savannah ecosystems; hence it has multiple benefits, but has to be utilized wisely. **The current baseline study assessment found no evidence of fire belts in any of the CFs. However, communities reported**

patrolling the forests to minimize damage from bush fires. They also rely on the DoF to control the fires.

3.4.5 Key considerations for project implementation

1. Though ANR is one of the most cost-effective restoration options, this was not explicitly defined as a priority EbA intervention in the project document. However, ANR's biggest advantage is that it is the most affordable restoration pathway besides being the most adaptable means of restoration, considering that the vegetation is left to evolve in its natural course of succession with minimal access by humans and animals. Field assessments revealed that it is possible to promote ANR with limited costs invested in fencing or limiting access so that vegetation develops on its own. In some cases, it is also possible to plant a few selected local trees and shrubs. **Currently, ANR is not common, hence the baseline status for the area it occupies is zero. If it is to be implemented, the community should be sensitized and trained. It is also important to note that application of ANR is most feasible in CFs with large areas. In CFs with small areas, limiting access to encourage regeneration may be counterproductive as communities want to use the forest.**
2. **The abundance of protected species (Forest Act 1998) in the CFs complicates exploitation and use by the community.** Hence there is a strong need to identify how the dominant species in the CFs can be utilized without disrupting the vegetation structure. This is particularly important for the extraction of non-wood products and even small timber processing. Opening the forest to such enterprises may increase the risk that the protected species could be over-exploited in the future. There is a clear need to ensure appropriate mechanisms are put in place to avoid deforesting well-established protected tree species in the country.
3. **Establishment of fire belts is strongly recommended in the Forest Act 1998.** However, implementation of the scheme requires proper training and awareness creation because fire belts may not be that useful if the width is not sufficient to slow down or limit fire intensity and speed. It is important that an appropriate width is determined for the fire belts.

3.4.6 Assessment of challenges faced by CF groups

A number of challenges were highlighted by members of the community. Key challenges in CFs include illegal logging, lack of investment or finances for CFs, human-wildlife conflict and uncontrolled fires.

Table 23: **Exploring the challenges currently experienced by CF groups**

Challenges	Proportion of respondents highlighting the challenge at different levels			
	0 (Not a challenge)	1 (Not a frequent challenge)	2 (Serious challenge)	3 (Key challenge requiring immediate action)
Illegal logging	20.7%	17.4%	16.7%	45.2%
Poor leadership	52.3%	17.6%	13.5%	16.6%
Boundary conflict	63.2%	14.6%	9%	13.2%
Financial mismanagement	45.2%	18.2%	14.9%	21.7%

Challenges	Proportion of respondents highlighting the challenge at different levels			
	0 (Not a challenge)	1 (Not a frequent challenge)	2 (Serious challenge)	3 (Key challenge requiring immediate action)
Human-wildlife conflict	26.1%	21.1%	14.2%	38.0%
Poor patrolling	43.4%	22.9%	15.8%	17.9%
Uncontrolled fires	22.5%	25.4%	14.9%	37.2%

Leadership issues, boundary conflicts and poor patrolling were among the challenges mentioned. However, these are not widespread enough to warrant attention for now. Efforts to improve the performance of CFs require that appropriate management responses are put in place.

Most of the challenges were assigned higher scores by respondents in the CRR-N and URR regions. For example, illegal logging was given a score of 3 by close to 77% of the respondents, making this a priority challenge that needs to be addressed in the short-term. In CRR-N, the same challenge was rated 3 by almost half of the respondents, also making it one of the urgent issues that need to be addressed.

3.5 COMMUNITY PROTECTED AREAS AND PARKS

3.5.1 Developing CPAs and parks in The Gambia

The Gambia is a signatory to several regional and international agreements that target sustainable use of biodiversity. These include the Convention on Biological Diversity (CBD) which focuses on sustainable use of biological diversity and fair sharing of benefits resulting from the use of associated genetic resources. Being a signatory to this pact has guided the development of the National Biodiversity Strategic and Action Plan (NBSAP), 1999, which aims at increasing the protected area coverage from 6% to 10% (NEA, 2010). The plan is the principal document that forms a basis for biodiversity conservation and implementation of the CBD at national level. Other agreements of importance that the country has signed include; the Convention on International Trade of Endangered Species of Wild Flora and Fauna (CITES) Convention on Wetlands of International Importance (The Ramsar Convention), Convention on Migratory Species (CMS) and the Africa Eurasian Waterfowl Agreement (AEWA).

Being a signatory to these global agreements implies that The Gambia is working towards global efforts to conserve and sustainably use biodiversity. Further, it implies that the country is well informed on the best practices in the field of biodiversity use and conservation. It is, nonetheless, not feasible to determine in this report whether the country adheres to the ratified obligations to the letter. Some progress can however, be mentioned; the country is well equipped with policy documents and strategic plans to inform the use of various ecological assets related to parks and community conservation areas. An example is The Gambia Environmental Act and Action Plan (GEAP), the National Climate Change Adaptation Plan of Action (NAPA 2007) and the Wildlife Policy 2003 (Wicander et al. 2016, NEA 2018). The GEAP is meant to serve as the national umbrella environmental framework while NAPA recognizes the need to preserve coastal and terrestrial biodiversity. The Wildlife Policy aims at increasing the proportion of protected areas to 10% of national land territory since biodiversity resources in these entities contribute significantly to the living standards of the population.

The range of international, regional and national instruments has triggered action aimed at creation of protected areas. In The Gambia, 22 protected areas[14] including national parks, reserves and community protected areas or community conservation areas exist (GoTG 2012). These are spread out in the various regions and are created to protect unusual species and ecosystems of national priority. Two of the parks and one reserve, in the wetland ecosystem, are Ramsar sites implying they are of global importance as pertains to in-situ conservation under the Ramsar Convention. Six protected areas are recognized as important bird nesting grounds. In The Gambia, the protected areas are integrated and include principal habitats; mangroves, forests, tidal zones, gallery forests and savannah woodlands.

In the EbA project, eight areas have been selected and these will benefit from a range of restoration activities (See Table 24).

3.5.2 Characterizing land uses in the CPAs

The country's population is largely dependent on its natural environment and ecosystems to meet its economic needs. Majority of the Gambians therefore directly depend on biological diversity and natural resources for their social, economic, ecological and spiritual pursuits.

CPAs help protect biodiversity against external pressures resulting from high consumption rates. Protected areas generally face immense pressure from communities in the buffer zones. These groups mainly engage in rain-fed crop farming, employing methods such as shifting and/or slash and burn cultivation (GEF, UNDP and GoTG 2015). For example, around Kiang West National Park (KWNP), rice, maize, sorghum and groundnut farming are practiced in freshwater areas in the east where soils are often alluvial. Agricultural activities have contributed to changes such as reduced percentage of closed and open woodlands. On land that has been converted to agricultural use, tree cover varies; areas initially including tree cover exhibit an increased coverage and areas with no tree cover tend to increase implying some efforts to engage in afforestation (GEF, UNDP and GoTG 2015). Horticultural activities, mainly vegetable gardens, are practiced during the dry season around settlements by women. These crop farming activities are rudimentary and employ tools such as animal traction and hoes (including traditional short and long handle).

Livestock keeping is practiced alongside crop farming, with rearing of cattle and small ruminants such as sheep and goats. This practice also happens in and at the periphery of the protected areas and affects the ecosystem. During the dry season there is always scarcity of forage which leads to convergence and concentration of livestock in selected pockets following bush fires. Small ruminants tend to aggressively feed on emerging vegetation and contribute to loosening of the soil and erosion. The result is degradation of the natural resource base and loss of biodiversity. A third land use is fish farming which is practiced in areas adjacent to the River Gambia. Catches are sold in village markets or consumed at the household level. The fishing is largely artisanal, and volume and number of catches is limited.

3.5.3 The impact of climate change on CPAs and parks

In The Gambia, CPAs experience a wide range of environmental threats. Foremost, the changing climate presents several risks due to the inherent difficulty in prediction. Climate change is not only a risk to vulnerable households but also to the adjacent biodiversity in the various protected areas. For example, climate change has been linked to the loss of amphibian populations (USAID, GoTG and WWF 2009) in protected areas adjacent to coastal belts. This impact is caused by the declining volume of water bodies

[14] In this section of the report the term Protected Areas implies either of the entities, i.e., parks and/or CPAs

resulting from persistent dry weather conditions and lower annual rainfall. In addition, higher temperatures due to the larger number of dry days have resulted in a higher evaporation of water bodies.

During the wet season, rainfall intensity in The Gambia is high and frequently contributes to widespread flooding. Instances of flooding during the wet season are a common occurrence in many areas since the country is largely characterized by a flat topography, with the highest point at 53m above mean sea level (FAO 2011). Flooding hampers access to CPAs, threatens small mammals, and leads to asset loss among households. Some protected areas include wetland ecosystems, which are of great ecological importance, in particular for provision of water and food for human and animal consumption. These ecosystems are highly sensitive to changes in climate conditions. Extreme weather conditions tend to affect the health of these areas, leading to eventual loss of multiple benefits.

Changes in climatic conditions frequently result in the emergence and aggressive colonization of ecosystems by invasive species, as the spread and range of such species is amplified. Protected areas are therefore at risk since these invasive species could be introduced by livestock. The occurrence of such species can contribute to ecological instability by hampering regeneration of natural vegetation.

The growing population (one of the highest rates in Africa) has led to exacerbation of climate-induced impacts through unsustainable exploitation of natural resources. For example, there has been intensification of agricultural activities in riparian land, coupled with overexploitation of goods and services. Such land conversion continues to be a threat to CPAs and parks and involves practices such as shifting cultivation which contributes to fragmentation of wildlife habitats. KWNP, for example, is unpopulated, but there are villages located along its borders. The park does experience minimal pressure from the local population which has led to fewer disturbances on the ecological integrity. This implies that the park is one of the few areas with remaining habitats of flora and fauna in the country. Nevertheless, it still faces a range of natural resource management problems including environmental degradation resulting from deforestation, soil erosion and improper disposal of solid waste (WWF and GoTG, 2012).

In addition, forest fires, closely associated with slash and burn agriculture, have contributed to loss of vegetative cover and general loss of fauna in areas surrounding CPAs. In many instances, these fires are started by farmers intending to expand their farmland. Unfortunately, these fire usually turn out to be uncontrollable. The lack of capacity and policies to manage such fires is evidenced by unavailable equipment, insufficient modern response mechanisms and human resources in the Forestry and Wildlife Departments.

The growing population of The Gambia has also led to a burgeoning demand for timber, firewood and non-timber products such as wild fruits and medicine. The country has a long tradition of wood use for various purposes including timber, charcoal and handicrafts (Hajjar and Timko 2014). The rise in demand has led to a decrease of 7% forest cover in the last decade. Mangrove ecosystems in some CPAs have also been affected. Tree cutting by communities and illegal lumbering is selective; ***Rhun Palm*** is often felled for timber. Urban demand for charcoal and fuel wood in cities such as Banjul has also led to more pressure on available resources and destruction of certain preferred species. Infrastructure development such as road construction, to some extent, has disrupted the functioning of protected areas and adjacent ecosystems. Such activities affect migration corridors and movement of species such as birds and mammals. The availability of technology such as chain saws has advanced destruction of indigenous species, e.g., ***Cordyla pinnata*** and ***Terminalia macroptera*** within and adjacent to the protected areas.

During the dry season, the demand for pasture tends to increase. With the high stock density in the country, the remaining rangelands face enormous pressure. Illegal hunting activities in rural areas also pose a threat to fauna in protected areas, (Oates 2002). In many instances, hunting aims at supplementing the local diet with bush meat. Modern hunting practices which involve the use of guns destroy wildlife diversity.

The net result of these pressures is the evident decline in biological diversity in several of the protected areas which translates to loss of goods and services (Wicander et al. 2016).

3.5.4 CPA management

The management of CPAs largely falls within the Department of Parks and Wildlife under the Ministry of Environment, Climate Change, Water Resources and Wildlife (Wicander et al. 2016). Communities living on the periphery are engaged in the parks' management, and in several occasions are involved in restoration efforts. Their inputs are key since they play a prime role in protection of the parks against forces such as illegal extraction. This follows the concerted efforts by the government to institute efforts of decentralizing land and forest tenure to communities through participatory governance (FAO 2005).

There is heavy involvement of local communities in the designation and management of protected areas. Their participation is an avenue to sustainable development. Communities, led by ***Keifs*** (village elders), are actively involved in the development of management plans as well as identification of boundaries. The creation of protected areas involves an elaborate process and includes relevant legal and administrative government agencies. With their ownership and involvement, legalized communities can run their respective areas through an appointed Warden, who is a resident of the community. Ultimately, the communities are actively involved in the governance and play a key role in reducing conflict and mobilization of resources.

Funding for protected areas are mainly provided by the national government. Available workplans for KWNP indicate that resources are allocated to support recurrent activities. These records do not include funding from donor agencies. By the time of compiling this report, the CWR did not have any accessible records from the national government on resource allocation.

An assessment of the threat levels of CPAs revealed that KWNP, Kiang Bamako, Demba Kunda and Genji Wolof are facing numerous threats, hence should be prioritized. Threat intensity (expressed as a percentage) was computed using the number of threats the CPA is facing in proportion to all potential threats listed in Annex 4.

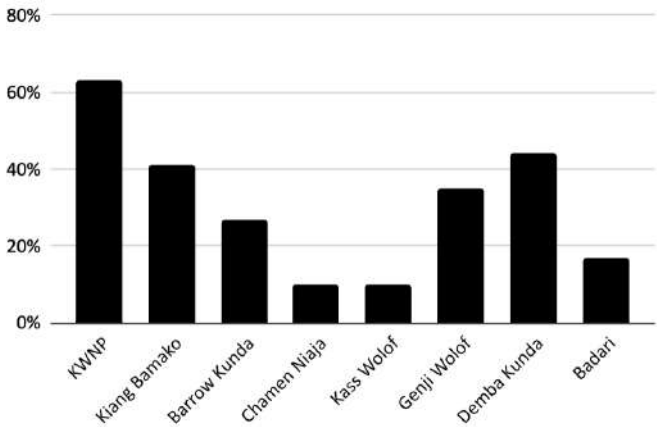


Figure 36: **Threat intensity of the CPAs considered in the baseline**

3.5.5 Analysis of EbA options in CPAs

CPAs are very important in The Gambia as an array of ecosystem goods and services of importance, at both the national and local levels, are accrued from these lands. Protected areas can contribute to poverty reduction, and when well managed are efficient and sustainable contributors to economic empowerment of local residents (de Boissie et al. 2007). CPAs also play a major role in conservation of biological life. However, they have not been effectively exploited to generate multiple benefits. CPAs also present a great resource that could protect biodiversity and provide incentives to the local community. In light of these opportunities, the benefits need to be carefully managed and explored.

Ecosystem based adaptation (EbA) presents a highly beneficial approach to conserving the biological life in CPAs, manage risks such as climate change and concurrently generate multiple economic and social benefits (IUCN 2018). In The Gambia, the EbA project has identified eight protected areas (Table 24) which will benefit from selected interventions. This section identifies potential EbA approaches that could be instituted in the respective CPAs. Further, Table 24 describes the rationale for the EbA interventions selected. As detailed in the project document, the EbA approaches should be participatory and should prioritize non-invasive species with multiple benefits including the reduction of vulnerability while offering benefits to the natural environment.

Table 24: **EbA options in the CPAs**

CPA	Area (ha)	Suggested EbA prototype[15] and approaches	Rationale
KWNP-LRR	19,051	**Prototype A** -Restoration through reforestation or natural regeneration -Enrichment planting	Major parts of the park are dry woodland and guinea savannah. In addition, there are extensive mangrove creeks and tidal flats. The ecosystem in the western part of the park, Sitaba Forest, is mainly closed canopy woodlands.
Kiang Bamako CWR-LRR	1032	**Prototype A** -Restoration through reforestation or natural regeneration -Enrichment planting -Effective management of natural areas to reduce the frequency of forest fires	The protected area is characterized by a largely evergreen and semi-deciduous forest similar to adjacent areas.
Barrow Kunda CWR- LRR	359	**Prototype A** -Restoration through reforestation or natural regeneration -Enrichment planting -Effective management of natural areas to reduce the frequency of forest fires	The protected area is characterized by a largely evergreen and semi-deciduous forest. Mangrove and other plant species have been recorded in the area e.g. Paspallum spp, Rhizophora spp, Phoenix spp, Typhae spp, among others.

[15] A detailed description of the prototypes is available in the GCF funding proposal (Appendix H)

CPA	Area (ha)	Suggested EbA prototype and approaches	Rationale
Chamen Nianija CWR- CRRN	32	**Prototype C** -Restoration through reforestation or natural regeneration -Enrichment planting -Effective management of natural areas to reduce the frequency of forest fires	Majority of the CRR-N is characterized by semi-deciduous forest, savanna woodland and mangroves. In Chamen CWR, there are signs of degradation likely due to deforestation for agriculture.
Kass Wolof CWR-CRRN	7		
Genji Wolof CWR-CRRN	10		
Demba Kunda CWR- URR	7	**Prototype D** -Restoration through reforestation or natural regeneration -Enrichment planting -Effective management of natural areas to reduce the frequency of forest fires	The URR is dry and is mainly characterized by low biomass and sparse savanna woodland. Grazing and wild fires present key risks to natural vegetation.
Badari CWR-URR	2		

3.5.6 Recommendations for project implementation

The local community, particularly those on the CPA periphery, should be sensitized on the importance of conserving biodiversity. With knowledge, the local community will realize the importance of protected areas and play a key role in ensuring minimal loss of biological life. It is equally important to educate the local community on the economic value of biodiversity. This should be accompanied with assistance to start and manage sustainable enterprises such as beekeeping and nature trails. The ultimate objective is to promote the mind shift to view nature as highly beneficial and important. The project could provide support, including logistics and gear for controlling wild fires. With this support the CPA management would be enabled to supervise and quickly respond to instances of conflict, as well as illegal activities.

The existing management capacity of these protected areas remains inadequate as staff are already overwhelmed by the numerous responsibilities. For example, at KWNP there is an insufficient number of wardens to protect the park from intrusion. In CWRs, the situation is grave as wardens are engaged on a voluntary basis. Conservation of biodiversity is frequently left out in budget allocations at national level due to immediate demands for resources from sectors such as health, education, infrastructure, etc. The solution is to build awareness on the importance of protected areas to ensure that sufficient funds are allocated.

In the same vein, there is need to enhance fundraising efforts by partnering with donor organizations and philanthropists. At the same time protected areas should be modelled to engage in sustainable income generating activities such as ecotourism and beekeeping to supplement allocations from the central government. Although the EbA project does not include recruitment of more manpower in the responsible department, there are recommendations to provide essential office equipment which would motivate the responsible department to recruit more staff. Provision of equipment should also be accompanied by infrastructure improvement. The EbA could also support the existing capacity of auxiliary staff from the local communities. These should be incentivized for motivation.

Protected areas remain prone to multiple risks due to extreme events associated with drier and wetter conditions. Many of the CPAs have limited resources and capacity to respond to

these elements of climate variability and change even when warning systems are in place. This calls for the development of CPA-specific climate change adaptation plans that clearly spell out feasible response mechanisms. The plans could clearly indicate potential risks with reference to past events and roles, responsibilities and resource provisions to respond to these risks. Reference to lessons and mechanisms that have worked in similar ecological conditions are highly beneficial. It is recommended that community participation be maximized and well-structured, e.g., setting up of a committee or using existing ones, to tap and manage resources and ensure that adaptation efforts are inculcated in the community. Participation of the local population should not be limited or ambiguous. It should be modelled such that the know-how of the indigenous community is taken into account. At the same time, adaptation plans should involve experts from the local or national government or organizations with experience in similar activities. Involvement of local expertise in an integrated climate adaptation plan that effectively ensures participation of multiple stakeholders that will provide different levels of input.

Conservation efforts are costly and require substantial investments that are not available in The Gambia since the country has one of the lowest human development indexes globally. Exploring transboundary protected area options is a highly beneficial option that facilitates sharing of costs between countries, reinforcing of synergies as well as exchange of expertise. Establishing partnerships with non-profit organizations (e.g., IUCN, WWF and Conservation International), development cooperation agencies and international institutions can add impetus to this effort. This option is applicable to The Gambia where protected areas could benefit from relevant alliances. In addition, review of available literature demonstrates that there are minimal activities to set up ecotourism in the project areas. Such enterprises could range from nature trails, camp sites, handicrafts, bird watching to tourist Centres targeting local (including students), regional and international clients. These nature-based enterprises can be concurrently run to facilitate availability of income with minimal negative impact during low seasons. The range of options is not limited to these examples. Youth and women groups would be an optimal resource to promote these ventures where they can be capacitated to generate their own income, build their environmental knowledge and protect their natural ecosystems. In addition, it is important to build the financial management capacity within the communities to facilitate prudent accounting of income and expenditure. This is an avenue the EbA project can explore as the model has produced positive results in several countries.

A commitment should be sought through advocacy among the political class. In many instances, the political elite will play a significant role in developing policies and plans that directly touch on climate change and environmental conservation issues. To achieve policy goals, it would be useful to organize a reasonable number of events towards this objective as part of the capacity building activities.

In the same vein, it is necessary to work towards development of an education curriculum that builds the next generation of informed stewards sensitive to protected areas. Most CPAs remain poorly researched as available secondary data are scanty and unverified. Involvement of graduate students to study the ecological profile and climate change vulnerabilities in these areas of high importance would be highly beneficial over time.

3.6 MULTI-PURPOSE CENTRES

The Department of Community Development (DOCD) is mandated to enhance and promote the empowerment of communities in charting their destiny through participatory development processes. It constitutes centralized structures/ offices throughout the administrative regions in The Gambia. The offices are headed by Regional Community Development Officers (RCDOs)

and assisted by Community Development Assistants (CDAs), who work directly with the community-based organizations (CBOs) at the district or ward levels. There are basically five (5) units operating under the DOCD, namely the Appropriate Technology Unit (ATEP), Research and Planning, Monitoring and Evaluation Unit (RPMEU), Rural Development Training Unit known as the Rural Development Institute (RDI), Rural Mechanical Workshop and the Women's Programme Unit. Two key programmes being implemented by the DOCD are the Community Driven Development Project (CDDP) and the Rural Water Supply and Sanitation Initiative (RWSSI). The department works in partnership with agencies and NGOs such as the Social Development Fund (SDF), Regional Project on Sustainable Management of Endemic Ruminant (PROGEBE), The Gambia Technical Training Institute (GTTI), Participatory Integrated Watershed Management Project (PIWAMP) and The Gambia Commercial Agriculture and Value Chain Management Project (GCAV).

Objectives of the Department of Community Development include the following:

1. Ensuring that development is people-focused with effective use of the available human resources through self-help.
2. Building human and institutional capacity at local and community levels, fostering the creative participation of beneficiaries in development activities from identification of their needs to the implementation and maintenance of projects.
3. Enhancing the productive capacity of rural communities by promoting appropriate technology and income-generating activities.
4. Improving access to and performance of social services.
5. Promoting participatory development actions.

3.6.1 Developing MPCs in The Gambia

The DOCD through funding from the African Development Bank (ADB) and the Government of The Gambia (GoTG) coordinated and implemented the Community Skills Improvement Project (CSIP) over a nine-year period (2001-2010). The project targeted women and out-of-school youth groups across 250 communities, covering four key components (Institutional Strengthening and Capacity Building; Functional Literacy, Skill Training and Income Generation; Skills Fund; and Project Management). Through this project, a total of 21 MPCs were constructed in 21 Wards across North Bank Region (NBR), Central River Region North and South (CRR-N/S), Upper River Region (URR), Lower River Region (LRR), West Coast Region (WCR), and Kanifing Municipal Council (KMC), from 2005 to 2006.

The MPC was meant to serve as a primary vehicle for social development by offering a wide range of services that communities can explore for their own empowerment. The concept of the MPCs was anchored on the need to promote skills acquisition and development among women and out of school youths, as a means of promoting self-employment and income generation with the overall objective of reducing poverty and unemployment amongst the affected groups.

Some key strategic elements linked to the operations of the MPCs are:

- Research and development in appropriate technology
- Skill training in agroforestry processing, appropriate technology and -environmental sanitation
- Literacy training
- Development communication, information and education support strategies
- Rural engineering and agro-industrial production

- Group organizational and capacity building trainings
- Advocacy and networking

The EbA intervention areas presently consist of sixteen (16) MPCs and workshops across four regions – LRR, CRR North, CRR South and URR (Table 25).

The following are the main activities carried out in the MPCs/workshops:

- Supporting community-driven development activities (solar lighting systems in villages, solar powered village water systems).
- Training of local blacksmiths in production of farm implements and labour-saving devices (simple farming tools to complex machines like combine threshers and winnowers of grains).
- Capacity building in organizational development and natural resource management and utilization.
- Livelihood training in diversified skills and sectors across the economy such as tie and dye, pottery, food processing, etc.
- Low cost, affordable building materials (press bricks, roof tiles, pavement tiles) with various sizes and decorative patterns.
- Training in energy-saving cooking devices such as charcoal-efficient stoves (Furno Jambarr), firewood-efficient stoves (Furno Jambarr), etc.
- Food processing and preservation: with the use of milling machines, grains are processed into flour for use in cooking local delicacies. Groundnut pastry machines are used to produce peanut butter.

Table 25: **General conditions of MPCs/Works in EbA intervention regions**

Region	MPC/Workshop	General condition/Remarks
Lower River Region	Karantaba MPC	The structure is in poor condition and needs major maintenance especially the solar system
	Koliorr MPC	The structure is in poor condition and need major maintenance especially the solar system
	Kaif Workshop	The facility is too small for most skills activities. Only soap-making and batik are currently carried out
	Manduarr Work Shop	The facility is too small for most skills activities. Only soap making, and batik activities are currently carried out.
Central River Region South	Jarreng MPC	The structure is in fairly good condition and needs minor maintenance especially the solar system. The facility has a guest house.
	Chakunda MPC	The structure is in poor condition and needs major maintenance, especially the solar system
	Bati Njol Workshop	The facility is too small for most skills activities. Only soap making, and batik are currently carried out.

Region	MPC/Workshop	General condition/Remarks
Central River Region North	Wassu PMC	The structure is in fairly good condition and needs minor maintenance especially the solar system. The facility has a guest house
	Kaur MPC	The structure is in poor condition and needs major maintenance, especially the solar system
	Njau Sey Kunda	Facility too small for most skills activities. Only soap making and batik are currently carried out
	Chamen Nanija Workshop	Small facility
Upper River Region	Hella Kunda MPC	The structure is in fairly good condition and needs minor maintenance especially the solar system. The facility has a guest house.
	Jah Kunda MPC	The structure is in poor condition and needs major maintenance especially the solar system.
	Kulkuleh MPC	The structure is in fairly good condition and needs minor maintenance especially the solar system. The facility has a guest house.
	Gendeh MPC	The structure is in fairly good condition and needs minor maintenance especially the solar system. The facility has a guest house.
	Nyakoi Workshop	Well-functioning centre with a strong management committee.

3.6.2 Characterizing land uses in the MPCs

The MPCs are strategically located within the villages and are ideal for mixed-use purposes that caters for residential (guest house), commercial (business activities), cultural and entertainment uses to generate revenue for the participating communities. Each MPC site has a solid single building, bathroom facilities and a well for drawing water. Some communities have added more business enterprises such as local bakeries, guest houses, etc.

The main activities in the MPCs include:

- Weaving
- Tie and dye
- Selling ice blocks
- Video clubs
- Milling
- Selling fertilizer
- Soap making
- Guest house
- Hall rental
- Pottery
- Photocopy services
- Tailoring

Presently, the MPCs are not utilizing the available land spaces within the premises for any agroforestry activity. A new approach is needed to provide a well-balanced variety of revenue generating activities and opportunities for each MPC. The MPCs are appropriately located with reference to topography and proximity within the village. Since the committees have expressed a renewed interest in agroforestry and food production and processing activities; facilities needed to explore these ventures should be provided.

3.6.3 The impact of climate change on MPCs

The MPCs have functional wells fitted with hand pumps. Though not so serious, the impacts of climate change on the MPCs could be linked to a possible change in the water table, which could potentially affect nursery production as observed in some tree nursery stations across EbA intervention areas. EbA is mandated to support local efforts to manage and adapt to the effects of climate change in the farmlands, forests and tree nursery sites.

3.6.4 MPC management

Operations of the MPCs are based on the CBO concept where neighboring communities partner with the host village in their activities, thereby providing them with the opportunity to diversify their income and livelihood systems. To enhance effective operations, the MPCs were equipped with adult teaching materials such as literacy aids, and life and livelihood skills training equipment. Additionally, cluster management committees were instituted with the mandate of ensuring effective and efficient operation, utilization and management of MPCs for the benefit of participating groups. Representatives of the Cluster Management Committees were drawn from both the host communities and other satellite villages, with the majority comprising women.

A recent evaluation exercise (June-July 2018) conducted by DoCD revealed that the Cluster Management Committees were partially active, representing 33.3% of the 21 MPCs assessed. In general, most of the satellite villages were not active mainly due to constraints such long distance travel, inadequate understanding of the concept of cluster management and lack of a clear benefit sharing policy. Lack of transport facilities, especially in some of the rural areas is extremely challenging for women; they are unable to regularly attend committee meetings and activities. The MPCs that have active management committees were found to organize regular meetings and coordinate skills and other income generating activities at the centres.

The number of members in the village management committees ranged from 6 to 28. In general, over 90% of the committees have management structures and executive positions such as President, Vice President, Treasurer, Assistant Treasurer, Secretary, Assistant Secretary, Auditor, Organizers, and Advisers. Presently, two MPCs lack proper constituted management structures and are facing management crises.

Over 75% of the 21 MPC committees are legally registered with the Attorney General's Chambers, each having a written constitution with defined goals, objectives, governance principles and management committees. Practically, the members' knowledge of their constitutions is grossly inadequate, implying that the provisions of the constitutions are not adequately applied in the administration of the MPCs. All the 21 MPCs operate savings accounts with various commercial banks, credit unions and VISACAs.

Participatory Planning Monitoring and Evaluation (PPME) have become relevant in enhancing popular participation. It is apparent that the MPC committees are not engaged in PPME. Strengthening PPME at local level enhances participation, collective decision-making, and the quality of activity planning, implementation and management. Therefore, lack of knowledge and practice of PPME by the management committees limit diffusion and information sharing, and accountability and transparency, especially in the financial dealings of the MPCs. Therefore, for committees to be effectively and efficiently functional there is need to strengthen PPME in their activities. This will include training the MPC Management Committees and members on the concept, including providing them with continuous coaching and mentoring in all aspects of the operations of the MPCs: planning, monitoring and evaluation of activity schedules, financial, and material resource management, etc.

3.6.5 Analysis of EbA interventions options in MPCs

Although the MPC committees are mainly involved in skills building and income generating activities such as soap making, tie and dye, weaving, mobile charging, sale of cold water and juice, milling, tailoring and pottery, most management committees have expressed interest in venturing into tree nursery management, food processing, animal rearing, beekeeping and poultry production, which are in line with EbA's intervention domains. These potential agroforestry niche markets need to be explored.

3.6.6 Recommendations for project implementation

MPCs have potential to contribute to the socio-economic improvement of local communities. Specifically, they serve as a means for self-employment, thus boosting income levels and access to locally-made products for participating communities. To achieve greater success, their current management challenges must be addressed through effective capacity building for efficient activity planning and monitoring. It is quite evident that the capacities of the management committee are generally weak as reflected in their performance records. To address these challenges, there is need to augment the capacities of management committees in the areas of leadership and management training, record keeping, business plan development, participatory planning, monitoring and evaluation, resource mobilization and sustainability planning. A more intensive leadership training programme and constant coaching is a precondition for sharpening the skills and the knowledge base of the management committees.

The MPCs have boreholes for the dry season and also have sufficient space for nursery activities, hence the project could provide training to the MPC members so that they could be engaged in producing the tree seedlings. This could leverage the existing gaps in the supply potentials for the seedlings that are preferred for planting. Such avenues can boost the income generation potential of the MPCs and even bolster the implementation of the EbA activities within the regions through the supply of the demanded seedlings. To safeguard the MPCs against any potential damage, it is advisable for the project to have some contractual agreement with those MPCs who want to engage in production of seedlings for the project.

3.6.7 Challenges faced by MPCs

- Inadequate government development budgetary allocation to facilitate good governance and promotion of participatory community planning and development interventions to provide much needed support
- Weak capacity of local decentralized structures such as MPC management committees to plan and implement their own local development initiatives.
- Limited understanding across the board on the role of decentralized structures in promoting good governance.
- Inadequate support to both DOCD and local and community institutions for research and development initiatives.
- Inadequate food technology processing equipment and techniques.

3.6.8 Recommendations on infrastructural renovation and governance of MPCs

- Develop a policy document that recognizes the current state of these centres and outline strategic plans for revival, in particular financial resources for rebuilding structures. With an elaborate strategy, the DOCD can convince external funding agencies to participate in rebuilding the centres and

re-installing key utilities such as solar panels. This should be followed by a maintenance framework which should stipulate the use and conditions of the installations.

- It would be necessary to conduct a thorough assessment that identifies the factors leading to the failure of most of these centres to achieve their objectives. Several questions can be asked; for example, whether the community was adequately consulted prior to establishment. In addition, whether cultural elements or lack of access to markets contributed to the failure. This will inform action and planning prior to reconstruction. A few centres are thriving by offering a wide range of services and engaging in entrepreneurial activities. These could be used for learning and local replication of success stories. Continuous research should be conducted in the MPCs to identify community needs, prioritization of service needs, social dynamics of the committees, operations, quality of service rendered, etc.
- The capacities and structures of the MPC management committee are weak. Generally, there is need to conduct a comprehensive training that will better prepare MPC management committees to become functional. To fill the existing capacity gaps, there is a need to train them on the following aspects: leadership and management; record keeping; business plan development; participatory planning monitoring and evaluation; resource mobilization; and sustainability planning. Building the capacities of participating communities and committees will help to improve their performance, as they have a crucial role to play in maintaining existing infrastructures, and expanding skills and income generating activities. In addition, there is limited capacity in financial management and bookkeeping. The centre should be required to have a leader or assistant who demonstrates necessary skills in financial aspects as well as integrity. The DOCD should further facilitate restructuring of the management committees to promote greater participation, transparency, revenue generation and organization for sustainable development.
- It appears that there is lack of knowledge and practice of Participatory Planning Monitoring and Evaluation (PPME) by the management committees, and this limits information sharing, accountability and transparency, especially in financial dealings of the MPCs. For the centres to be functional there is need to strengthen PPME in their activities which can be achieved through continuous coaching and mentoring on the concept. Popular participation of members in all aspects of the operations of the MPCs, including planning, monitoring and evaluation of activity schedules, financial, and material resources should be encouraged.
- There are no clear mechanisms or plans for the continuous maintenance of the MPCs' facilities. For example, the solar systems, which are the main sources of energy supply are in deplorable conditions and are mostly not working due to damaged inverter, faulty charge controller, faulty batteries or inadequate panel number. MPC facilities, including buildings, should be upgraded and refurbished.
- Support should be provided to the MPCs' management committees to identify and diversify their revenue generation activities such as food processing and packaging, nursery production, gardening, beekeeping, etc. MPCs should also be linked to Community Forest Management Committees to facilitate access to forest fruits for processing and value addition.
- MPCs should work closely with the early warning project to ensure their investments will not be damaged by possible climate-related risks.

- There is need to provide MPCs' management committees with the required monitoring, mentoring and coaching extension support to improve and sustain their organizational capacity.
- Participating committees in each MPC should be given the opportunity to embark on study tours within the sub-region to have firsthand experience of skills development enterprises including from active MPC
- Increase in resource allocation for specialized training of women and youth.
- Establish and facilitate suitable microcredit schemes in rural areas for agricultural and agribusiness activities
- Facilitate establishment of vibrant local institutions, interest groups, market structures, information and support systems.

CHAPTER 4

NATURAL RESOURCE-BASED BUSINESSES

4.1 THE NATIONAL FOREST FUND AND COMMUNITY FOREST ENTERPRISES

The National Forest Fund is a fund created by law (Forest Act 1998). It aims to promote the protection, development and sustainable use of forest resources, and to promote community forestry. It covers the following:

1. Proceeds from the sale of timber and forest produce extracted from forest parks
2. Proceeds from the contribution of community forestry committees
3. Fifty percent of all fees and royalties received
4. Monies earned by any project financed from the fund
5. Subvention from the government
6. Grants, donations and endowments that may be received from sources within and outside The Gambia.

According to the Forest Act (1998) the fund should be administered by a committee comprising a representative from the Ministry of Finance, Forest, Local Government, representatives of local authorities, a representative from the forest committees, NGOs and any other member that the team would wish to include.

For every CF that owns an approved Community Forest Management Agreement (CFMA), a local fund is established. This fund is composed of 85% of proceeds from the sale of forest produce extracted from the CF; 50% of all fines collected; any money generated from investments by the fund, and any other voluntary contributions. The purpose of the local fund is to promote the protection and development of community forests and the sustainable use of forest resources as well as general community development. Not more than 60% of the amount deposited into the local fund can be used for community development activities; the rest goes to forest management activities. Fifteen per cent (15%) of all proceeds from the sale of forest produce extracted from the CF goes to the National Forest Fund (NFF) and serves as a contribution for the technical services rendered by the DoF.

Four key items contribute to the NFF (Tables 26 and 27) – royalty, permit, license and fines. Royalty is a payment made to the Forestry

Department based on a rate per unit of forest produce removed. The permit applies to a document issued by the Forestry Department to exploit, on a unit basis, any forest products for commercial purposes as permitted by a license or for domestic use. License applies to a document issued on an annual basis, effective from the start of the current financial year by the Forestry Department to exploit or process any forest product for any commercial purpose. Lastly, fines apply to any illegal acts that contravene the implementation of sustainable management and use of forest resources. The first three pieces have a clear structure as per the Forest Act 1998, though fines are applied on a case-by-case basis and cannot be generalized as such.

Table 26: **Timber permit fees in The Gambia**

	Trade or Vernacular	Timber permit fees (Dalasi)	Unit of payment
Cordyla africana	Dutto	210.00	Per tree
Erythrophleum guineense	Talimbaro	525.00	Per tree
Borassus aethiopium	Sibo	210.00	Per tree
Elaeis guineensis	Tengo	157.50	Per tree
Prosopis africana	Kembo	105.00	Per tree
Pterocarpus erinaceus	Keno	210.00	Per tree
Bombax costatum	Bunkungo	315.00	Per tree
Daniellia oliveri	Santango	210.00	Per tree
Khaya senegalensis	Jallo	840.00	Per tree
Ceiba pentandra	Bantango	525.00	Per tree
Rhizophora Spp. (Masts)	Manko	125.00	Per tree
Roofing poles		1.25	Per pole
All other trees		105.00	Per tree
Fence posts (dead wood only)		1.60	Per post
Gmelina fence post		1.90	Per post
Gmelina poles		1.10	Per pole
Gmelina logs		157.50	Per m^3
Gmelina boat mast		10.50	Per count

Table 27: **Royalty and license fees in the forestry sector in The Gambia**

Royalty fees	Charges (Dalasi)	Remarks
Firewood (per m^3)	10.50	
Mats (per count)	15.00	
Kirintings (per count)	10.50	
Palm beds (per count)	50.00	
Fruits and nuts (per bag or container)	10.50	
License fee		
Firewood (dead wood only)	525.00	Per annum
Vendor	525.00	Per annum
Assistant for fuelwood collection	262.50	Per annum
Tapping palm wine	420.00	Per annum
Palm kernel nuts	105.00	Per annum
Wood carvers (dead wood only)	157.50	Per annum
Fruits and nuts (other than palm fruits and baobab)	210.00	Per annum
Mats	300.00	Per annum
Fans and basket	210.00	Per annum
Baobab	105.00	Per annum
Kirintings	210.00	Per annum
Rhun palms	1,050.00	Per annum
(Raphia) palm beds	300.00	Per annum
Shrubs and grasses	105.00	Per annum
Pit sawyers	1,050.00	Per annum
Honey collection	Free	Per annum
Licenses for re-saw machines	1,575.00	Per annum
License sawmills	10,500.00	Per annum

4.2 FIREWOOD AS AN ENTERPRISE IN CF

4.2.1 Introduction

The population of The Gambia heavily relies on firewood for energy generation. Estimates indicate that close to 97% of the household energy demand is fulfilled by firewood. Access to electricity is still below half (only 48% of the population) and in rural areas access is very low, at about 16% only.

Most of the firewood demand is fulfilled by the remaining open forests, savannah woodlands and trees on farms.

The Gambia's fuelwood consumption per capita varies annually and was valued at 0.45 m^3 in 2004 (Thoma & Camara 2005) on average. With the current population of the country standing at 2,100,568 (World Bank 2017 estimate), the annual demand for firewood is about 0.95 million cubic metres. Sustainable wood supply that takes into account fuelwood that is annually consumed by bush fires and used for other domestic and commercial purposes is critical (Thoma & Camara 2005). With the heavy reliance on firewood for energy in the country, if the firewood enterprise is properly and sustainably managed, CFs can create profitable enterprises that could help them generate income and create employment for their members.

4.2.2 Estimating the supply potential

All the CFs that have CFMA and are located in the project areas have the capacity to produce 134,374- 484,348 m^3 (Table 28).

Table 28: **Estimating the fuelwood supply potential per annum of CFs in project regions**

	LRR	URR	CRR-S	CRR-N	Total
No. of CFs	17	27	58	65	167
CF area (ha)	4021.03	3267.13	4678.12	3908.99	15,875.27
Minimum fuelwood density (m^3 per ha)*	8	5	10	10	NA
Maximum fuelwood density (m^3 per ha)*	14	18	43	43	NA
Average fuelwood density (m^3 per ha)*	16	10	13	13	NA
Minimum total fuel production potential (m^3)	32,168.24	16,335.65	46,781.20	39,089.90	134,374.99
Maximum total fuel production potential (m^3)	56,294.42	58,808.34	201,159.16	168,086.57	484,348.49
Average total fuelwood production potential (m^3)	64,336.48	32,671.30	60,815.56	50,816.87	208,640.21

* NFA 2008-2010 estimates. Maximum fuelwood density assumes that the whole CF area is a forest, while minimum fuelwood density assumes that the CF area is covered with other wooded land such as shrubs and degraded savannah.

4.2.3 Estimating the return on investments

The highest net profit was obtained in the Western region probably due to the high demand by the population in and around the capital, Banjul. In the CRR areas, net revenue is quite low compared to that in the Western region probably due to low purchasing power of the community. The transaction cost of operating the firewood enterprise could be very low in the LRR region because of the large volume of firewood produced by very few entities as compared to the CRR and URR regions. Besides, even the net profit per unit volume is relatively higher in LRR because of its proximity to areas such as Banjul with higher purchasing power.

Table 29: **Investment and returns on investments on firewood in different regions of The Gambia**

Region	CF name	Costs and revenues (GMD) of firewood enterprise per unit truckload as of 2005			
		Gross income	Production & Marketing costs	Taxes, NFF & Royalty fees	Net Profit
Lower River Region	Nganingkoi	17,600.00	6,765.63	2,812.00	8,022.38
	Wanchankalang	21,000.00	10,248.13	3,150.00	7,601.88
Central River Region	Sibikuroto	22,500.00	13,500.00	3,600.00	5,400.00
	Kapeesaba	12,000.00	7,650.00	1,904.00	2,446.00
	Sutujang	12,500.00	4,150.00	2,035.00	6,315.00
	Kanaibu	2,000.00	250.00	300.00	1,450.00
	Fankanta	1,200.00	90.00	180.00	930.00
	CRR Average	**10,040.00**	**5,128.00**	**1,603.80**	**3,308.20**
Western Region	Tunku	28,000.00	8,308.00	4,200.00	15,492.00
	Brinkinai	16,500.00	4,380.17	2,634.00	9,485.83
	Kussabel	16,500.00	4,416.00	2,634.00	9,450.00
	Kasila	28,000.00	9,110.00	4,408.00	14,482.00
	Jassana	16,500.00	3,900.00	384.00	9,966.00
	Kumbato	28,000.00	9,085.00	4,408.00	14,507.00
	Sibac	16,500.00	5,055.00	2,634.00	8,811.00
	WR Mean	**21,428.57**	**6,322.02**	**3,043.14**	**11,741.98**
	Overall Mean	*17,057.14*	*6,207.71*	*2,520.21*	*8,168.51*
	Stdev	*8,460.11*	*3,755.68*	*1,447.02*	*4,660.93*

Source of data: Thoma and Camara 2005.
Note: One truckload consists of some 10m^3 of branch wood.

Using the modest investment cost and net profit of the CRR region which are D 5,128 and D 3,308.20 per truckload, respectively, the total investment required in terms of production and marketing cost is about D 0.107 billion (US$ 2.378 million)16[16] and D 690 million (US$ 1.534 million) if all the CFs with CFMA are engaged in firewood enterprises. Assuming the envisaged area of CFs of 7000 ha in the project, the fuelwood production is around 92,000 m^3. The investment cost required would be approximately D 47.2 million (US$ 1.05 million) and the net profit is going to be D 30.4 million (US$ 676,323). Assuming 50 beneficiaries from 75 CFs (as per the project document), the net profit per beneficiary is about D 8,116 (US$ 180.35) over the investment period. The royalty, NFF and other fees for the same amount are going to be around D 14.8 million (US$ 327,888). It is important to note that the EbA project document proposed about US$ 0.75 million for the 75 firewood enterprises, hence US$ 10,000 per CF. However,

[16] 1 US$ = GMD 45

our computation, even on the lower end, was estimated at US$ 14,000 (D 630,000) excluding the royalty, NFF contribution and taxes. Thus, the investment requirement for the firewood enterprises will need to be adjusted.

4.2.4 Elements on fuelwood as an energy source in the project context

Over 80% of the energy used in The Gambia comes from wood-related biomass. From the latest GBOS figures, charcoal use in The Gambia stands at 35.1% and 1% in urban and rural areas, respectively. Firewood usage figures are equally high at 94.5% and 48.1% in rural and urban areas, respectively. Charcoal is primarily produced in the rural areas, especially LRR where even women have begun to cut down trees to engage in charcoal production due to lack of alternative income sources. Perhaps one of the drivers is the high demand in key adjacent urban markets in Soma and Banjul. While charcoal use is banned in The Gambia, in these urban centres, particularly Soma in LRR, the fuel source is widely available in open markets. If no clear measures are taken, there is a strong possibility that the population of standing trees might shrink quickly due to harvesting for charcoal production to fulfill the rising urban demand. Such actions jeopardize restoration efforts in the project regions. The booming demand is due to lack of access to electricity and other alternative improved technologies of energy generation in both rural and urban settlements.

4.2.5 Implications for ecosystem services delivery

Firewood enterprises could play both positive and negative roles on the environment at large. They can generate positive benefits in various ways. First, the collection of firewood reduces the fuel load in the forest hence lowering the occurrence and intensity of bush fires. Collecting firewood could also be detrimental to the environment. If the collection intensity is not regulated, the forest floor could be left bare and hence no organic matter returns to the soil. The collection of firewood also reduces the habitat values of the ecosystem for smaller creatures that use fallen sticks and branches as their nesting area or egg-laying spots especially for insects.

The EbA project needs to implement activities aimed at reducing pressure on the forest and savannah ecosystems by establishing woodlots where possible, since demand for biomass energy will continue to grow due to lack of alternative energy sources. We propose two alternative measures that could be implemented depending on availability of project resources. First, the establishment of woodlots for supplying firewood and even wood for charcoal production. Second, it is also possible to consider the potential use of groundnuts shells as an alternative energy source. In The Gambia, groundnuts are widely cultivated and are a principal contributor to agricultural GDP.

Regarding implementation of the two measures, a thorough analysis is required to determine the resources required (e.g., land, capital, equipment, etc.). The woodlot idea is more or less straightforward depending on availability of land, both for the establishment of private and communal woodlots. For groundnut shell briquettes, there is already a huge unexploited potential. The Gambia produced an average of 110,588 metric tons (MT) of groundnuts with shells in the last two decades (1994 to 2014). Other than offering several products after processing, groundnut shells are a potential energy source. These shells are widely available in large quantities in The Gambia due to the country's dominant groundnut industry and are frequently regarded as agricultural waste. Discarded groundnut shells are a byproduct of groundnut farming that can be used to make fuel briquettes for use in households and restaurants. This could even be a cheaper option compared to expenses incurred in fuelwood purchase. Groundnut shell briquettes is an alternative to charcoal and firewood and could further contribute to reducing forest loss due to

charcoal burning. Some private entities in The Gambia area are trying to pilot the briquettes. Just like improved cook stoves which contribute to cutting emissions from charcoal production and use, the option should be initially assessed for effectiveness, feasibility and mechanical requirements prior to adoption. Production of groundnut shell briquettes is an income-generating activity that could also be explored by MPCs.

4.2.6 Multi-dimensional assessment of the pros and cons of the enterprise

Firewood enterprises have both positive and negative sides when undertaken in the context of The Gambia. Table 30 presents the pros and cons of engaging CFs in firewood enterprises. The implication from the assessment is that there is need for a proper management plan for the enterprise, and to ensure that establishment of the enterprise does not lead to other environmental externalities that may contravene sustainable management of CFs.

Table 30: **A brief overview of the pros and cons of firewood enterprises from the CF perspective**

Pros	Cons
Fuelwood is easily marketable	Access to market constraints depending on the economies of scale
Generates income without necessarily causing forest cover loss	Can contribute to degradation of the forest floor, resulting in poor regeneration
Leads to creation of employment opportunities	Unregulated harvesting and collection of firewood leads to forest degradation, hence increasing greenhouse gas emissions
Promotes gender inclusivity and minority inclusion	
Generates income, providing a diversified source of livelihood	
Low damage to biodiversity loss in sustainably managed forests	

4.3 BEEKEEPING ENTERPRISES

4.3.1 Current state

There is a long history of beekeeping in The Gambia. Communities that have not benefited from beekeeping and other development projects often use traditional production methods and are unaware of advanced beekeeping techniques. In fact, honey hunting is generally practiced all over The Gambia, and mostly by men. Cognizant of the negative consequences of traditional beekeeping and hunting techniques on the environment, The Government of The Gambia, through the Forestry Department and non-governmental organizations (NGOs), is offering better opportunities to rural populations through modern technologies and appropriate beekeeping methods.

Interventions by the Forestry Department in the sector include awareness creation, information and technical support to individuals involved in beekeeping nationwide. Government efforts to boost beekeeping in the country is supplemented by the activities of several NGOs and community-based organizations (CBOs) who provide similar extension services in the country. Some of these include Action Aid, The Christian Children Fund, The Gambia Co-operative Beekeepers' Association, The Gambia Agricultural Rural

Development Agency, US Peace Corps and Catholic Relief Services, among others (http://www.fao.org/docrep/003/x6691e/x6691e03.htm).

Using the MA&D approach, enterprise development on beekeeping has been promoted in villages in the Western, Lower River and Central River regions. Interventions usually involve individuals or groups. Group membership, for example, the Bulanjor group, averages about 24 individuals, 40% of whom are females. The general impression is that there are individual beekeepers who have the skills and seem to manage their hives effectively. However, those in this category are very few (Joseph and Graham-Matheson 2011). Beekeepers in The Gambia have been described as "untrue" beekeepers because a majority own hives (obtained through projects) which they rarely visit or harvest. This notwithstanding, the sector provides opportunities for social entrepreneurship. Revenue from the sale of honey often complements other income sources and beekeepers spend comparatively little time on the activity (Tomaseli et al. 2014), which means that investing in the business will not prevent the beekeepers from carrying out other activities.

Most beekeeping projects in The Gambia promote Kenyan Top-Bar (KTB) hives. The cost of such hives ranges from D 500 to 800 (Kent 2012). Other beekeepers use log hives and other hybrids, or adapted hives constructed from a variety of materials such as cement and discarded wooden boxes and grass. Hybrid hives could cost about D 118 (Blaschke et al. 2005). The KTBs and hybrids can produce 5-10 litres per harvest if properly managed. Some authors argue that yields from KTBs are lower than those of log hives, and that there is no evidence that KTBs produce more honey than fixed comb hives.

4.3.2 Enterprise performance

4.3.2.1 Economic viability

Annual harvest of honey in Gambia rose from 40 tons in 1996 to 60 tons in 1998 (http://www.fao.org/3/a-x6691e.pdf). With intervention from projects and the Forestry Department, production has been rising gradually.

Case studies in The Gambia reveal that a community running a small honey enterprise may need about D 13,045 as start-up capital. About 66% (D 8,595) of the required start-up was donated by a project supporting the initiative. Funds mobilized by the community constituted only 34% of the total start-up. This confirms earlier information that investment in honey production may be too expensive for poor beekeepers to potentially invest. The table of cost and returns indicates that from almost the same number of hives, production and revenue increased 7-fold due to improved production methods acquired through training. The enterprise increases its income by almost 4% by diversifying into wax production (Table 31).

Table 31: **Investments and returns on honey enterprises**

Item	2004	2005	2006
Number of hives colonized	39	45	45
Honey (In litres)	121	840	840
Sales (Dalasi)	8,850	67,000	67,000
Resource investment (Dalasi)	4450	-	-
Depreciation (Dalasi)	-	2,222.50	2,222.50

Item	2004	2005	2006
Processing & marketing (Dalasi)	120	675	675
Tax (15%) (Dalasi)	-	10,050	10,050
Net income (Dalasi)	4,280	54,052	54,052
Body cream (Jars)	18	105	105
Sales (Dalasi)	270	2,160	2,160
Processing & marketing (Dalasi)	166.50	939.50	939.50
Net income (Dalasi)	103.50	1,220.50	1,220.50
Total combined income for the village	**4,383.50**	**55,272.50**	**55,272.50**

Source: Computed from Thoma and Camara 2005

Statistics on honey production in Gambia are scarce. However, production quantities and income from 18 beekeeping enterprises in the country in 2005 were estimated at 5,830 litres from which they generated net profits of about D 248,143. The net profits constitute about 73% of the gross income, suggesting a very profitable business.

Table 32: **Returns from honey enterprises in different regions of The Gambia**

	WR	LRR	CRR	Average	Total
Quantity (litre)	3,210	1,440	1,180	1,943	5,830
Gross Income (Dalasis)	185,500	90,900	61,800	112,733	338,200
Production and marketing costs (Dalasis)	15,708	15,935	7,757	13,133	39,400
Taxes, NFF and royalties (Dalasis)	27,825	13635	9,196	16,885	50,656
Net profit (Dalasis)	141, 966	61,330	44,847	82,714	248,143

Source: Computed from Thoma and Camara 2005

4.3.2.2 Market and enterprise development

Gambians are yet to respond to the potential of honey production in the country. While efforts have been made to modernize the sector and produce quality honey, hunters still move around harvesting wild honey from trees using fire. The honey is often contaminated with smoke and ash and sold by retailers who deceive their buyers by adding water, sugar and syrup to color the honey. It is therefore important to convert honey hunters into beekeepers.

Gambian honey is usually available in the market from May to July. After this period much of the honey sold in the country is imported from Senegal and Ghana, even though they are often sold as honey from The Gambia. The wholesale price of imported honey is D 60 per litre, while honey produced in The Gambia sells at D 75 per litre (Joseph and Graham-Matheson 2011). There is currently no grading of honey at the retail end and no demand for specific Gambian honey. Good quality honey sells at about D 100 a litre (Kent 2012). It is thus important to think about

producing a honey brand that could be unique to The Gambia.

Earlier opportunities to promote beekeeping in the country had failed because the project did not embrace a marketing approach. Incorporating elements of marketing allowed about 18 enterprises to produce and sell approximately 5,830 litres of honey in 2005, twice as much of what was projected prior to being introduced to the marketing approach. This volume accounted for close to 20% of the total production of honey in the entire country. Market opportunities are an important element of success. Study reports indicate that communities that were closer to markets have the opportunity to make more profits than those that are far away.

4.3.3 Beeswax production

Wax production continues to be a secondary activity for most beekeepers even though a number of organizations are gradually picking up the activity. In the late 1990s, a survey involving 50 beekeepers revealed that 36 of them (70%) produced 5-10 kg of wax, 8 of them (6%) produced 10-20 kg of wax, 5 (10%) produced 20-25 kg, while only 2 (4%) produced more than 25 kg. The marketing of beeswax is localized and often uncoordinated. According to the National Beekeeping Association (NBA), 80% of the wax produced in the country is sold locally at the production site, 15% is sold in weekly markets across the country, while the remaining 5% is either sold by the NBA or is unaccounted for. The cost of a kg is between D 15 and D 45 depending on the location (NBAG 1999). In recent times, several community-based organizations have been involved in processing beeswax to produce body cream. It may require D 469 to process 1kg of wax into 105 containers of body lotion, each selling at D 8.95. The market for such products is local. There is thus a need to refine the technology and target other markets within the country.

4.3.4 Institutions and institutional arrangements

Honey enterprises in The Gambia involve several NGOs and a very strong national beekeeping association. The Forestry Department has placed the beekeeping sector under its technical unit, and in collaboration with NGOs, is providing technical assistance to local communities. NGOs and the Forestry Department train beekeepers on various activities including hive preparation, honey harvesting, processing and quality control. Some of the training sessions are offered via the National Beekeepers' Association of Gambia (NBAG) who in turn train its affiliates. These associations play an important role in increasing the efficiency of the enterprise by providing training and other technical advice. Collaborating with the NBAG led one community enterprise to multiply its projected supply within two years from 121 to 840 litres. When the enterprise was set up in 2004, they only had 39 colonized hives. Poor production was attributed to lack of knowledge on hive maintenance, which was sorted out once they underwent training.

4.3.5 Ecosystem services delivery

The use of fire by honey hunters is among the main causes of bush fires in The Gambia. The traditional beekeeping and hunting methods lead to negative environmental externalities including killing of bees, bush fires and deforestation. The 1998 Forest Act prohibits fires in forests. Forming interest groups around beekeeping can help to reduce the impact of bush fires because community members would know that indiscriminate burning may damage their hives. In the Lower River Region for example, bush fires were common around 2004 and led to the burning of about 70% of the CF and 95% of forest parks in the region. In the Western Region, with a limited number of fire incidents compared to the LR, about 9 cases of fires covering 588 hectares of forest (10.8%) of total forest area were burnt in 2004. It is thus important to address bush fires without which beekeeping may be impossible

(Blaschke et al. 2005). General trends in 2005 suggest fewer incidences of fires compared to 10 years ago. This is especially true for community forests (Thoma and Camara, 2005).

In general, beekeeping provides the following services:

- The natural environment benefits through increased pollination
- Through beekeeping, bush fires can be easily prevented, and if carried out within the context of a community forest, illegal felling of wood may be controlled
- Higher occurrence of bees will improve crop production through increased pollination.

4.3.6 Recommendations for implementation

- The country boasts a National Beekeepers' Association of Gambia (NBAG). It is important to promote collaboration between newly formed community groups and NBAG. This can be achieved through a model where small enterprises serve as suppliers of raw materials to NBAG. The association can then run a factory to ensure quality control. A cooperative-type model is also an option.
- The EbA project can improve business capacity and basic accounting through training and capacity building, especially in cases where user groups are created. This will promote good governance and avoid conflicts.
- It is important to compare the costs and benefits of using different types of hives. KTBs are highly promoted by most development projects, but it would be advisable to develop hybrid forms that can produce the same results and give poor households the opportunity to engage in beekeeping at a low cost.
- The EbA project can invest in value addition to increase both production and quality. Through this, enterprises that produce quality honey under standardized norms could be developed. By-products of bees have not yet been developed to their full potential. Opportunities for new products and markets should be encouraged. Processing, packaging, marketing, distribution and sales should be included in training programs. This should engage existing and future beekeepers, as well as their beneficiaries. Public-private partnerships and strategic linkages between producers and the private sector provide a huge opportunity to take this forward.
- Put in place a gender approach with focus on youth and women. It is important to encourage youth to invest in honey production as the activity is currently dominated by older men, and thus could easily die out.
- Promote Gambian honey as a quality brand label. Geographic indication is a form of certification which is yet to be developed in West and Central Africa. Geographic indications can be given for a product based on the unique area where it is produced. For example, the Oku honey from Cameroon is produced from a highland forest. It could also be linked to quality attributes specific to the area where it is produced. These special qualities can be recognized in both national and international markets thereby attracting a higher price. It is important to set such standards to promote Gambian honey.
- Access to finance: though profitable, the sector does not seem to have access to private finance, hence most support comes from NGOs. More private sector linkages are important to serve as potential sources of finance. In this case, it is important to develop model bankable projects that can be presented to different financial institutions for funding.
- Despite the presence of numerous NGOs in the country, some reports suggest that most training on management skills that

have been delivered seem to have been lost or not absorbed initially. Some people leave their hives in the bush and seldom go back to check on them (Kent 2012). This shortcoming requires that the MA&D method be used in order to select motivated potential entrepreneurs rather than involving individuals who may not necessarily have the internal drive to invest in the activity.

- Break cultural beliefs: some cultural beliefs (e.g., that bees need to be harvested only at night and fear of the aggressiveness of bees) may limit production. Proper sensitization is important to break such myths.

4.4 SIMPLE TIMBER COLLECTION AND PROCESSING

4.4.1 Introduction

A report by UNDP estimates that the forest sector accounts for around 0.8% of the GDP of The Gambia (UNDP 2012). The contribution of the sector to GDP may be higher because data on the formal trade of forest products are difficult to access (e.g., import of fuel wood and timber). The country depends heavily on importation of commercial wood and processed boards both from the sub-region and Europe. Local production satisfies more than 70% of wood requirements for furniture and household use (UNDP 2012). However, the rapidly growing population has led to an increase in the demand for timber. In general, forest cover in the country is not sufficient for commercial timber exploitation. Only a few timber species are millable (the most important amongst which are ***Khaya senegalensis*** and ***Pterocarpus erinaceus***). Growth in the building industry around the country has led to an increase in demand for construction timber. Consequently, most construction timber used in the country is imported from Côte d'Ivoire, Liberia, Benin and Europe (Thoma and Camara 2005).

4.4.2 Enterprise performance

4.4.2.1 Economic viability

An assessment in 2007 revealed that about 42 sawmills were operating in the country. In the past, trees were felled using an axe or pit saw, and transformation into timber was done with the pit saw. More recently, felling of trees and processing into timber is done with the aid of chainsaws and machines (UNDP 2012). By 2005, two mobile sawmills had been introduced in the country and operated in community and state forests in the CRR and the URR. In 2005, it was estimated that about 16 interest groups (IGs) with 107 members who had used the Market Analysis and Development approach were attracted by the log/timber enterprises. Five of these enterprises calculated the profitability for processing trunks into high quality timber and found that profits could increase four to tenfold if they used a mobile sawmill compared to hand felling. Table 33 shows that if the enterprise bears the daily costs of operating the machine, maintenance costs and the operator's salary, it would still make profits.

Profits may be increased further if the members are sufficiently trained on sawmill operations, meaning they will no longer pay miller fees (Thoma and Camara 2005). The highest cost elements were found to be the cost of renting the tractor (Dalasis 2000). Calculations from the table below show that they could produce about $3m^3$ of wood a day. However, if the enterprise has enough wood to saw they may produce more because the Lucas mill has the capacity to produce between 6-$13m^3$ of wood per day, depending on whether the timber is dispersed or from a single location.

Table 33: **Income expenditure statement for one-day timber processing**

Enterprise attributes	Expenses (Dalasis)	Income (Dalasis)
Saw miller fees	1,000	
Fuel	450	
Tractor Rental	2,000	
Preparations including felling and chain saw rental	1,500	
Contributions to maintenance of the mobile saw	500	
Income from timber sales (3500 Dalasis per m3)		10,000
NFF taxes (15% of the profit) or rate of purchasing dead trees from state forest	700 -1000	
Total	5650 -5950	10,000
Net income		3550-3850

Source: Extracted from Thoma and Camara 2005

Estimates of the total timber production capacity in the country were not available. Available data estimating production and sales of some selected timber enterprises from three regions that were introduced to the MA&D approach revealed that they could produce 225m^3 of timber in 2005. This was expected to generate a total net profit of D 833,973. The net profit accounts for about 73% of the total income of the enterprises, suggesting a very profitable business. It is worth noting that the rental cost of the Lucas mill is not factored into the analysis below because the mill was offered free of charge. Factoring the rental cost would reduce the net profit margin.

Table 34: **Production and sales projection for selected enterprises in 2005**

Region	WRR	LRR	CRR	Total
Quantity (truckload)	17	6	30	53
Gross income (Dalasis)	20,5000	44,000	888,110	1,137,110
Production and marketing cost (Dalasis)	34,000	9,000	89,570	132,570
Taxes, NFF and royalties (Dalasis)	30,750	6,600	133,216	170,566
Net profit (Dalasis)	140,250	284,00	665,323	833,973
Net profit per truckload (Dalasis)	8,250.00	4,733.33	22,177.47	

4.4.2.2 Market-related issues

As already mentioned, the market potential for timber in The Gambia is enormous. However, several challenges may prevent enterprises from benefiting from the existing potential. Prominent amongst them are poor road infrastructure connecting the supply villages and urban markets. This means that some communities may be forced to limit their sales to local markets, thereby preventing them from reaching lucrative urban markets.

4.4.3 Ecosystem services

Commercial timber species are now scarce in The Gambia and are being replaced by fuel wood species. This scarcity is related to frequent and intense bush fires and heavy and uncontrolled timber exploitation in the country. It therefore calls for better protection of timber species and increased plantings in order to meet the policy objectives of sustainable supply of timber. The growing use of chain saws has contributed to depletion of the forest, particularly the high-value tree species.

In general, rural communities' knowledge about environmental protection, forest management as well as government policies is very high. These observations were more positive in community than in state forests (Thoma and Camara 2005). Bush fires continue to be a major threat to forests in The Gambia, but the trend seems to be less today when compared to about a decade ago. Several CFs have developed strategies to prevent bush fires. Villages that have applied MA&D are increasingly requested to extend their CFs.

Timber producer groups are also engaging in environmental management activities. For instance, a total of about US$ 4,000 has been spent on tree planting by the timber and forest users' associations. This improves the long-term ecosystem service delivery of the CFs.

4.4.4 Recommendations for implementation

It is more profitable to use a Lucas mill than a hand saw. Taking into consideration the purchasing price of a Lucas mill, poor communities may not generate enough resources to purchase one. This means that some support is needed to start timber enterprises in terms of investment capital to purchase the mobile and hand saws. One could also rent the Lucas mill, considering that the production capacity of the timber enterprises may not exploit a Lucas mill to its full potential. This calls for some kind of joint management agreement and system where a few enterprises come together to own or manage a Lucas mill for such a venture to work, and for the equipment to be maintained and replaced when it depreciates. This implies that initiatives like those in the Western region where JATIFI was created should be encouraged. Such joint initiatives will not only be useful in managing the Lucas mills, but will also serve as a medium to jointly manage resources and market their products.

Since enterprises will be created around timber markets, it is important that effective strategies are developed to ensure that all trees harvested are replanted. In this regard, all business plans must have a duly costed reforestation component. Incentives may be provided in such cases by availing quality tree planting materials, especially of those timber species in high demand. Other incentives may include provision of water points to water plants in the nurseries.

Data on production, contribution to labor and the viability of enterprises are generally not available. It is important that a good monitoring system be put in place to collect and analyse data that may be used to monitor the health of enterprises.

In addition, the following management strategies are proposed; use of only dead and old timber in simple timber processing; community by-laws must be reviewed to provide sanctions and backed by national legislature to include this and other aspects on sustainable timber processing; destructive wood-related businesses should be discouraged, and the Department of Forestry must closely monitor and work towards that end.

4.5 ECOTOURISM

Tourism has a long history in The Gambia and has been a promising means of earning foreign exchange, especially when market prices for agricultural products such as groundnuts fluctuate or become unstable. Political instability, in particular the 1994 coup, contributed to instability and stunted growth of the industry

(Sharpley 2009). Some additional factors currently affect the scope and scale of tourism in The Gambia, in particular the dependence on seasonal and highly variable tourist arrivals by numbers and origin. Despite these uncertainties the country has nevertheless made tremendous steps towards supporting the growth of the sector and remaining competitive. For example, the country has set a 15km strip along the coast as a tourism development area.

However, these efforts continue to encounter challenges such as inefficient administration and inadequate funding for promotion of tourist activities. Nevertheless, tourism (including tours and travel) continues to contribute tremendously to The Gambia's economy with the total contribution at 5.8%, the latest projected figures from the WTTC (WTTC 2017). This contribution, which is further broken down for the last decade, has been on an upward trajectory as revealed in Figure 37 which details the contribution to GDP by industries involving tourists, such as hotels and travel agents. The overall positive trend in the last decade demonstrates the growing potential of the industry. In addition, investments by the private sector demonstrate a similar growth pattern with a steady increase over the years.

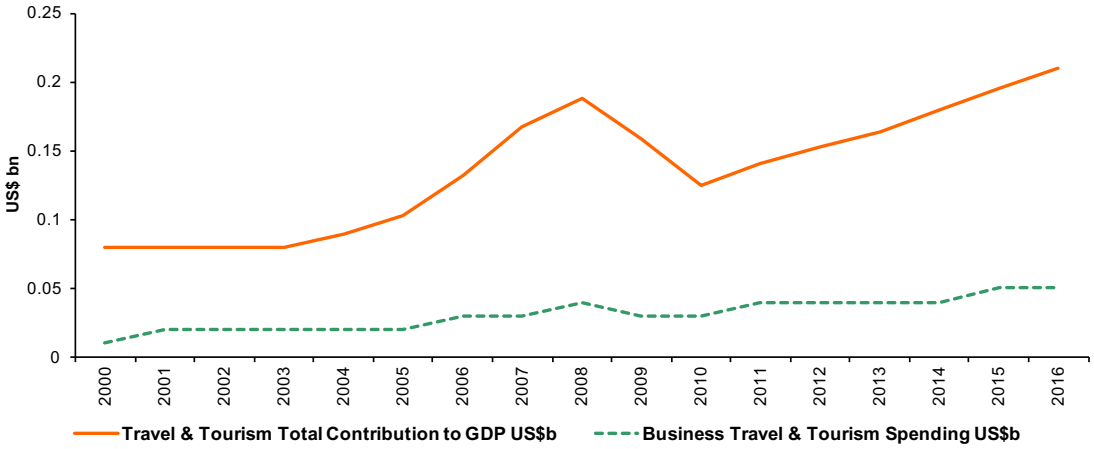


Figure 37: **Measures and trends of contribution of the tour and travel industry to the economy of The Gambia.**

Tourism has a long history of being a potential key employer in The Gambia with many individuals working in the industry, in particular hotel and catering businesses (Farver 1984). Figures from the WTTC (GBoS 2018) reveal that the private sector shows a near uniform growth with the contributions of tourism and travel to employment in The Gambia (Figure 38). The employment figures in thousands show a continuous positive trend which peaks in the 2005 to 2009 period with numbers from 2010 to date continuously rising.

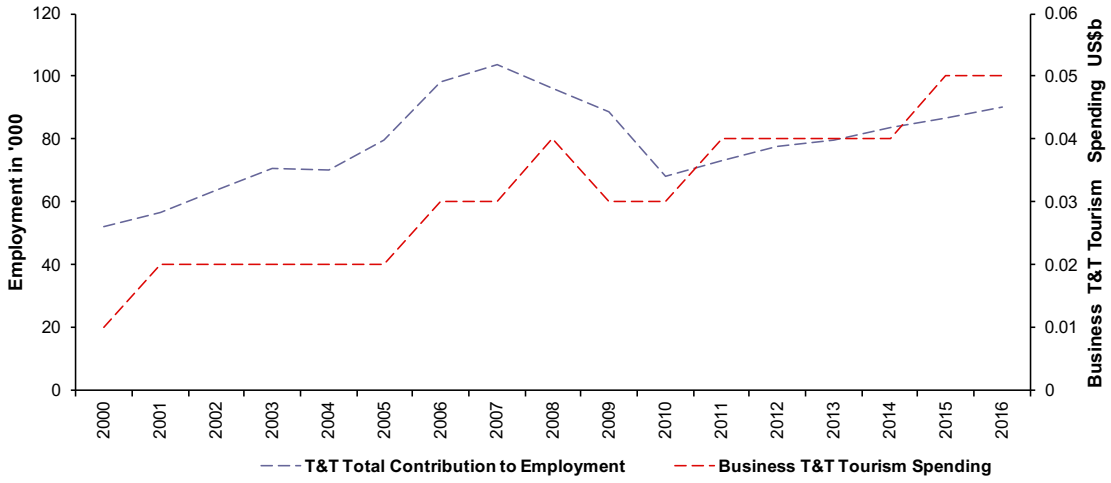


Figure 38: **Contribution of tourism and travel to employment in The Gambia.**

With the described growing potential of tourism, uncertainties including the seasonality of tourist arrivals still exist (Sharpley 2009). Other risks include threats to the integrity of ecosystems by the influx of tourists. This damage can further affect local residents who are exposed to new cultures and wealth, thus encouraging over-dependence on tourism. Changes in climate could also add to this risk, especially when key tourist spots are compromised. Consequently, The Gambia should venture into alternative tourism-based enterprises to attract more tourists, in particular those from the greater Banjul area, to maximize on the benefits of the industry.

These challenges imply there is need to engage intuitive enterprises that have multiple benefits. Ecotourism is a venture that can be focused upon since it has extraordinary positive impacts on the community and natural environment when instated appropriately. The IUCN (Cellabos Lascurain, 1996) defines ecotourism as "*Environmentally responsible travel to natural areas, in order to enjoy and appreciate nature (and accompanying cultural features, both past and present) that promote conservation, have a low visitor impact and provide for beneficially active socio-economic involvement of local peoples*." In the definition, key points of importance stand out including environmental conservation, culture, societal involvement and local people. In addition, ecotourism includes aspects of education, local community engagement in decision-making, support for conservation, and appreciation of local biodiversity and culture (Fennel 2001). With such elements, ecotourism presents an avenue for not only natural conservation, but also emancipation of local livelihoods. It provides local communities with alternative sources of income amid unforeseeable risks.

The principal aim of most ecotourism centres in The Gambia is to offer lodging services and provide recreational facilities around the River Gambia. Currently, there are ecotourism activities associated with community forests. These have been documented by Tomaselli and Kozak (2014). In their study they noted that among the villages sampled, ecotourism ranked lowest when compared to enterprises such as beekeeping and handicrafts. An interesting finding demonstrates the financial potential of ecotourism as an enterprise: one of the ecotourism centres had the highest revenues with annual profits exceeding US$ 5,000, while handicrafts had the lowest annual profits of US$ 90. Other examples of ecotourism centres found in literature include Abuko Nature Reserve, Tendaba, Tumani tenda

and Berefet tourist camps. This demonstrates that there are still tremendous opportunities for exploring other income-generating activities related to ecotourism.

The economic potential of ecotourism is indeed recognized by the Government of The Gambia as a sustainable forest management approach. The approach is viewed as an opportunity to conserve forests and manage biodiversity, and presents an avenue for financial investment for both the public and private sectors. In the assessment by UNDP & GoTG (2012) ecotourism is identified as a priority in the 2012-2030 window in relation to financial flows emanating from forestry. This perhaps not only recognizes the role of wildlife protected areas, but also notes the potential of community-managed forests. As such ecotourism holds limitless options for implementation.

4.5.1 The impact of climate change

Ecotourism is intimately linked to nature, with any climatic changes influencing the integrity of natural ecosystems posing a great risk. Impacts such as floods, which are a common occurrence in The Gambia, will contribute to destruction of assets such as camps. In many cases ecotourism centres such as camps will tend to use locally available materials to set up simple structures that are highly vulnerable to flash floods. In several cases flooding will create a healthy ground for multiplication of mosquitoes. During the rainy season the number of these malaria vectors will tend to increase, and this scenario will worsen during above-average rainfall. The associated risk and discomfort will likely be an impediment to arrival of visitors.

Access to ecotourism facilities will be greatly hampered by flooding. This will translate to fewer visits to these centres and will eventually contribute to reduced income. This may affect operations and could lead to abandonment of the facilities as they become unviable.

Climate change also adds to challenges associated with management of ecotourism enterprises to achieve environmental, social and cultural sustainability (Dangi and Jamal 2016). As such in many cases these entities will face governance challenges that can be exacerbated by the changing climate. Therefore, it is imperative to consider these threats in development of plans for ecotourism centres.

4.5.2 Analysis of EbA intervention options

In the EbA project framework ecotourism is identified as one of the means to increase resilience through ecosystem goods and services. Further, the project hopes to establish or expand ecotourism facilities under the Department of Parks and Wildlife in the four implementation regions. This targets community conservation areas under the Department of Parks and Wildlife. Restoration efforts will increase the ecotourism potential as a result of improved biodiversity. In this section, specific ecotourism enterprises are mentioned for the CPAs.

Ecotourism centres can offer a range of benefits that contribute to protecting the natural environment and improving livelihoods of local communities. Since the principal economic activity in rural Gambia is rain-fed farming, venturing into alternatives is of great importance. Ecotourism presents a highly rewarding income-generating activity that can also offer nature-based benefits, since it is strongly hinged on emancipation of local communities and promotion of conservation and cultures. Several settlements occupy ecologies that offer an opportunity to set up ecotourism facilities. Most of The Gambia is filled with teaming biological life that presents a conducive locality to set up tourism camps. The adjacency of River Gambia for some settlements and community forests further offers perfect spots for establishment of recreational facilities as riparian areas thrive with biological life. Other ecotourism options include

wildlife viewing, safari hunting, river rafting, sport fishing, bird watching, cultural heritage, corporate retreats and boating. Stone Circles such as those in ***Wassu,*** still hold tremendous potential to draw tourists as cultural heritage sites.

These could involve setting up of other nature-based enterprises adjacent or alongside including handicrafts and guides to provide necessary information to visitors.

4.5.3 Baseline situation

Currently there are some ecotourism activities associated with entities such as community forests and protected areas. Studies such as Tomaselli and Kozak (2014) identify the potential of ecotourism activities managed by communities. The current baseline study focused on community protected areas, community forests and multipurpose centres. While reviewing their activities, CPAs demonstrated some ongoing activity related to ecotourism. Annex 4 presents data extracted from the CPAs including ecotourism. Data shows that Kiang Bamako CWR has been set up to act as an ecotourism centre. The success or benefits of activities in the CWR were not captured by the study and therefore are not reported here. The CWR can however act as the leading entry point since it is legally recognized by existing legislation.

The remaining protected areas management objectives imply the institution of such entities fits well. In addition, the absence of these facilities acts as justification for setting up of ecotourism centres as natural resource-based enterprises. Majority of these protected areas indicated experiencing constraints related to financial resources. As such, any alternative source of income designed to offer other benefits such as conservation of biodiversity will come in handy.

The evident active involvement of communities in the ownership and more so the management of these areas suggests it would be an advantage when instituting the aspect of community involvement. This is key as these communities are the custodians of these resources and understand the dynamics of such resources.

The traditional acceptance of ecotourism and The Gambia (Blaschke et al. 2005) and ease of marrying this enterprise to other products and services, such as beekeeping, tree nursery and forest walks further highlights the potential of investing in this service. In their documentation of the MA&D experience in The Gambia, they show that several communities had a strong desire to adopt ecotourism and a reasonable number of interest groups had adopted the activity.

4.5.4 Recommendations for project implementation

Ecotourism offers a venture that can immensely benefit communities residing adjacent to community forests. In addition, community conservation and protected areas can tap into these highly sustainable enterprises. Examples of specific benefits that ecotourism can contribute to include; provision of revenues for conservation activities in parks and reserves, income to local communities and improvement in levels of education among visitors and locals in the field of conservation. Ecotourism centres could also be beneficial to the community in several ways; creation of employment opportunities, provision of social services such as schools, and ensuring availability of forest products such as herbal medicine and fuelwood.

In the set-up of ecotourism centres, it is important to follow up and ensure adherence to certain principles. Nature Conservancy (2018) identifies some of the principles that typical ecotourism centres should employ; educational components for locals and visitors, local participation in decision-making, support for conservation efforts and sensitivity to cultures and biodiversity. These aspects are important and ensure that ecotourism centres achieve sustainability which is a core principal of this project. In addition, other possible good practices that can be

adopted to ensure smooth running of ecotourism enterprises include; legal backing to ensure long-term tenure security of land and forging of partnerships with like-minded organizations.

In the Department of Parks and Wildlife, there is documentation which reveal efforts to promote ecotourism in protected areas (GEF, UNDP & GoTG 2015). This is however, not accompanied by resources, both manpower and financial. The result is several reports of work plans and objectives but no implementation. The evident absence of such resources will continue to hamper the establishment and uptake of this high-potential option. The EbA project can now support these protected areas by initially emphasizing on these two critical aspects.

Responses from review of the evaluation of the protected areas outline the deterioration of traditional knowledge and cultural values in conservation practices. The importance of these elements cannot be underestimated, and further neglect will lead to their loss in future generations. Ecotourism is of great use in restoring and documenting these methods which could range from the community's knowledge of biological life, its approach to protecting of such diversity and the range of adaptation mechanisms in the face of emerging risks, in particular the changing climate.

4.6 RHUN PALM HANDICRAFTS

4.6.1 Introduction

Rhun palms are important in the socio-economic lives of local communities in The Gambia. The tree has several uses – the fruit is edible, as are the tender roots produced by the young plant; fibres can be obtained from the leaves; and the wood, which is reputed to be termite-proof can be used in construction. The Rhun palm is used mainly to provide sticks and leaves as roofing or fencing materials. Normally, a frame is made from the sticks, and the huge leaves are laid over it to create the waterproof canopy as a thatched roof. Deforestation activities have made it quite difficult to find rhun palm in certain ecologies in The Gambia. Among the EbA intervention sites, CRR North, particularly in the Nianijas and Saloums, the growth of rhun palm appears to be very favorable in those ecologies. The farmlands in some of these communities are inundated with rhun palm seedlings which are usually cleared by farmers to enhance animal traction during crop production. The multi-purpose centres in all the EbA intervention areas are not engaged in rhun palm handicraft.

4.6.2 Enterprise performance

4.6.2.1 **Economic viability**

The Rhun palm, once among the most dominant species of The Gambian forests, is used for various purposes. It's extremely durable and termite resistant stem is cut into splits and used for roofing, fencing and other construction purposes (Thoma and Camara 2005). The dry leaves are used for thatching, fencing and wickerwork, and nuts and palm hearts are a welcome diet for rural families. However, the palm tree has been overexploited in the past years because of its valuable trunk with the result that today only a few relicts of the formerly dense palm forests are left. Although mature trees have widely disappeared, Rhun palm regeneration is still abundant in many parts of the country, providing a continuous supply of leaves. The leaf fronds and stems are sold locally at generally low prices for household construction purposes.

The market opportunity in the sale of handicraft works from locally manufactured rhun palm products from fronds and stems is generally low. The communities need more skill training to process these raw materials into value-added products. The MPCs should set up a handicraft enterprise effectively using the skills learned to produce a large quantity of handicrafts that can be sold at local markets, eco-tourist lodges in the provinces as well as to hotels in the coastal tourist areas.

4.6.2.2 Ecosystem services delivery

Human activity is exerting enormous pressure on ecosystems, thus leading to damage that can be economically, socially and environmentally costly. The perpetual loss of ecosystem service (ES) delivery can also have a negative impact on human well-being. Economic valuation of the changes to ES delivery could help decision makers take into consideration the public and private consequences of a restoration project.

Rhun palms are vital to rural people whose daily subsistence depends heavily on natural resources. Their multiple uses include thatching, construction, basket weaving, food and even medicine. Palms play a vital ecological role in Gambia's ecosystems. The loss of several species will undoubtedly have a negative impact on both fauna and flora in the country. Their fruits are eaten by many animals; their leaves and crown are often used as nests for birds, insects, reptiles or amphibians. Therefore, the destruction of rhun palm trees could threaten the existence of animals who depend on it for food, shelter or as a breeding habitat.

Bushfires and tree felling are frequent and still one of the major causes of forest destruction. Threats to forested areas across the country may plague communities with loss of important tree species such as the rhun palm. This is evident in most farmlands where the population of rhun palm trees is very minimal, as farmers are in the habit of clearing emerging seedlings to facilitate their agricultural activities.

4.6.3 Baseline situation

The Gambia is rapidly losing its rhun palm trees due to climate change impacts and over-exploitation for use as roofing materials. It is apparent that most communities have not explored the market potential of handicrafts made from rhun palm leaves, because they did not have the practical skills or market knowledge. There is limited use of commercial rhun palm handicraft products in EbA intervention areas as well as the MPCs.

4.6.4 Recommendations for implementation

The use of rhun palm products in handicrafts has a significant potential to improve the livelihoods of rural people in The Gambia. However, the realization of this potential is affected by a number of factors such as lack of conducive institutional frameworks, weak capacity and inadequate financial support to start and maintain a viable handicraft business. Although The Gambia has played a significant role in establishing community forestry since the early 1990s, there has been rapid loss of its natural forest trees during the past decades. Rhun palms are typical examples. There is need to embark on a massive restoration exercise of rhun palms in both farmlands and community forests. The baseline exercise shows that the local communities have recognized the value of trees and forests, and are willing to develop a vested interest in their production and protection as permanent sources of income and livelihoods. The communities should be empowered to better manage their forest trees for productive activities and sustainable socio-economic development. Capacity development and skills building programs that are key to organizational and technical success should be adopted. To maintain a viable business sector, attention should be paid to the provision of communities with further technical training in nursery establishment and management techniques. Market channels/linkages should be identified and established to give forest users greater market access.

4.7 FOOD PROCESSING

4.7.1 Introduction

Food processing is undoubtedly an important link between agriculture and industry. In recent years, a considerable number of small- and medium-scale food processing industries have emerged in The Gambia, producing an array of food and non-food products such as fruit juice, jam, bread, soap, etc.

The Gambia Horticultural Enterprise (GHE) is a key player in the food processing industry. Almost all the MPCs in the EbA intervention areas are not involved in food processing ventures except in Njaw in the Upper Saloum District, where activities such as cooking demonstrations for lactating mothers and food processing activities are undertaken. Njaw can be a model centre where other MPCs can benefit from in terms of food processing, marketing, organization and capacity development experiences.

Lack of food processing facilities, poor investment support and skills training, coupled with a fragmented supply chain are the major impediments to the growth of food processing industry in The Gambia. Therefore, concentration at the level of production, processing and retailing can provide the much-needed impetus for the sector. To address these challenges, a number of initiatives should be put in place to help promote primary as well as secondary processing ventures in the MPCs. This is because agricultural and forestry-based products can potentially play a vital role in the food processing sector which can provide opportunities for sustainable and profitable business ventures in the future.

4.7.2 Enterprise performance

4.7.2.1 Economic viability

Involvement of MPCs in food processing is minimal despite its huge economic viability potential. To enhance productivity and efficiency of their activities, it is important to develop tailor-made interventions to address the technical and business needs of MPCs, and to source appropriate expertise from partner companies. The technical assistance can include new product development, quality improvement, equipment upgrading and compliance with standards, with emphasis on food safety and quality. There is need to provide the centres with vital technical assistance on the business side, including business and marketing plans, branding, recordkeeping, financial system improvement and linkages to investment and financing.

4.7.2.2 Ecosystem services delivery

Ecosystem services are the direct and indirect contributions of ecosystems to human well-being. They support the survival and quality of people's lives. Food processing in relation to ecosystem service delivery at the community level hinges on the sustainable use of natural resources to ensure the availability, access, and utilization of food, including the processing component. At the level of food processing, we have provision of critical ecosystem services that facilitate food production, create income-generating opportunities, and provide means of sustenance. In the future if the MPCs are to embark on food processing activities, the issue of sustainable utilization of resource materials should be given a critical thought. This is to ensure that the resources are used judiciously without jeopardizing the quality of the environment. As already observed during the baseline survey, water availability is a challenge in the centres, particularly during the dry season when the water table drops significantly. The concept of zero waste should be promoted to ensure that the waste that might be generated from food processing activities are utilized in the production enterprise as organic manure. To increase the adaptive capacity of poor households, it is essential to incorporate climate change adaptations within the local planning process.

4.7.3 Baseline situation

The Gambia's agro-food processing sector is underdeveloped, utilizing a limited range of skills and technology. There are opportunities that exist in the areas of food and drink processing, and packaging from the food processing sector. The baseline survey shows that most of the MPCs lack capacity, skills and financial support to venture into food processing activities. Despite the fact that the Gambian market is small, there is substantial potential in the food processing

industry. The EbA project can significantly fill this gap if the MPCs upgraded and the capacities of the people are improved.

4.7.4 Recommendations for implementation

Food processing in The Gambia is predominantly in the hands of small-scale operators. Due to limited exposure to technical and business knowledge, these processors are characterized by sub-optimal productivity levels, low efficiency rates and poor-quality products, which limit their ability to access growing domestic and export markets.

Food processing businesses are key to improving Gambia's economic growth, with the potential to increase the incomes of local communities, create formal jobs, and increase the availability of affordable, safe, and nutritious food for the country's consumers. Gambia's food processing industry has huge potential for growth. The MPCs, once equipped with the technical and business skills in food processing best practices, such as manufacturing, food safety, packaging, marketing, budgeting and planning, as well as increased access to inputs, new markets and finance, can play a significant role in improving the lives and livelihoods of local communities in The Gambia. Opportunities include processing of ***Parkia biglobosa*** (this was a huge source of food and business and still is).

4.7.5 Current state of engagement in different EbA-related enterprise activities in a community group model

People come together in different settings to undertake different activities that generate income and improve livelihoods. Our survey of around 831 people revealed that the level of engagement in EbA-related enterprise activities is very low. The highest engagement was recorded for vegetable production with 30.8% of the respondents reporting being members of a community group that is engaged in this enterprise. Vegetable production is followed by saving and credit groups (14.2%), agricultural marketing (11.6%), forest and forest production and sale (11.2%), and seed production (10.3%). However, the level of engagement varies by region. For instance, URR, CRR-S and LRR had relatively better engagement in the various EbA-related activities compared to CRR-N (Figure 39).

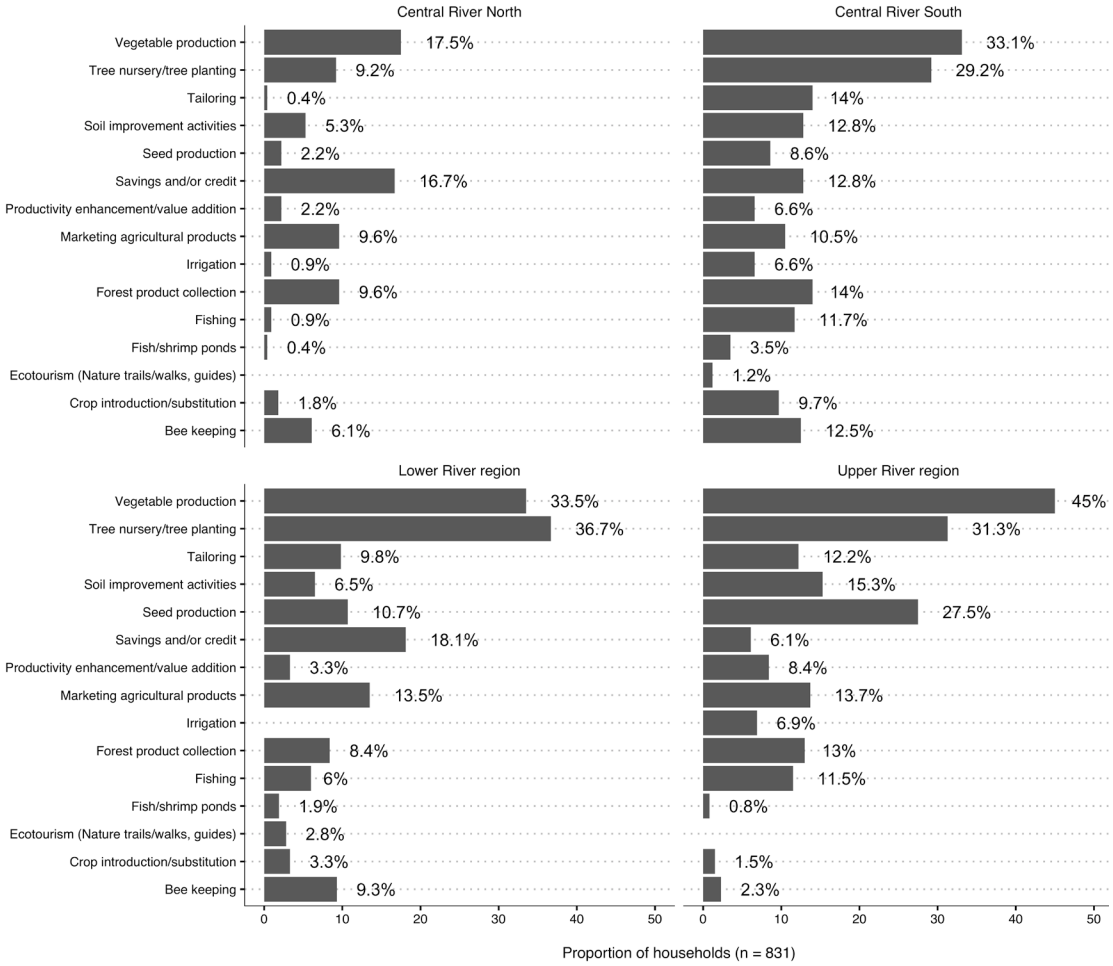


Figure 39: **Household level engagements in EbA-related enterprise activities.**

The implications of these assessment values are that the community is already aware of some of the activities that are being integrated into the EbA scheme through the CFs, CPAs and MPCs.

CHAPTER 5

POLICY PROCESSES AND IMPLICATIONS FOR EbA PROJECT IMPLEMENTATION

5.1 OVERVIEW OF POLICIES, STRATEGIES AND PLANS

The concept of EbA first emerged in international policy in 2008 and has subsequently seen a rapid uptake in practice. As a policy and practice focus area, EbA offers significant opportunities to ensure that interventions respond to the imperatives of climate change, biodiversity management and conservation, while aligning opportunities to socio-economic development objectives. To address the challenges related to interventions above, the Government of The Gambia developed policies and established projects to protect the country's environment and increase the effectiveness of natural resource management. Policies such as the Agriculture and Natural Resources (ANR) policy (2009-2015) identifies several priorities related to management of natural resources and wildlife, as well as the development of: value chains for natural resource-based products; opportunities for micro finance; and REDD+ projects. Similarly, the Forest Policy (2010-2019) was formulated with the objective of establishing an institutional framework for the Department of Forestry (DoF) and non-governmental stakeholders to manage and implement natural resource programs within the country's forests, woodlands and savannas.

EbA is defined and strongly promoted in the country's National Adaptation Programs of Action (NAPA), National Adaptation Plan and Gambia's Intended Nationally Determined Contributions (INDC). These strategies have recognized EbA for its ability to offer co-benefits in helping The Gambia adapt to the impacts of climate change and its potential to support vulnerable communities who are more directly dependent on natural resources and ecosystem services in adapting to climate change. Additionally, The Gambia's existing ANR and Forest policies promote decentralization of natural resource management (including inter alia community forests, forest reserves and conservation areas) to community-based committees. The policies also consider the importance of the potential contributions that could be made by community-based management committees towards the country's objectives of sustainable management of the environment and natural resources.

5.2 OVERVIEW OF INSTITUTIONAL CONTEXTS FOR EBA IMPLEMENTATION

The Gambia has several institutions that govern the country's environment and natural resource

management. These include: Ministry of Forestry and the Environment (MoFEN), Department of Forestry (DoF), Department of Fisheries, Department of Planning, Department of Lands and Surveys, Department of Parks and Wildlife Management, National Environment Agency (NEA), National Agricultural Research Institute (NARI), Department of Agricultural Services, Department of Livestock Services, National Beekeepers Association of The Gambia, Ministry of Energy and Local Government Authorities. Despite the large number, both government and the private sector institutions have insufficient technical capacity to implement EbA interventions as well as implement the existing policies promoting community-based management of natural resources. This is largely attributed to insufficient evidence of the benefits of EbA to assess the commercial viability of natural resource-based businesses that could emerge from investments in EbA and the absence of security of land tenure and rights to access the natural resources and natural resource-based businesses (Nget et al. 2011).

5.3 INCENTIVES AND MOTIVATING PROVISIONS FOR CFS, CPAS AND MPCS

- At policy level, there exist strategic frameworks which promote community participation in sustainable management and utilization of forest resources. The Gambian Forest Management Concept (GFMC), 2000, and the National Forestry Action Plan (NFAP), which are the blueprints for Participatory Forest Management (PFM), and community-based forest enterprise development using the Market Analysis and Development (MA&D) approach provided sufficient incentives for CFs, CPAs and utilization of MPCs for local capacity building.
- Other concepts including the Joint Forest Park Management Concept (JFPM), Community Controlled State Forest (CCSF) Management and guidelines for Community Forestry Implementation of 2002 played a significant role in motivating community involvement in forest resource management. Similarly, an in-depth review of community forest programs for sustainability found that CFs and CPAs were the most cost-effective approach in restoring natural capital, which according to focus groups were encouraging participation in forest resource management. An analysis of the commercial viability of the two programs and likely rates of return on their investments (in terms of time, labour and other local resources) indicates positive returns which generates maximum motivation.
- At regional consultations, stakeholders expressed the significant growth in non-timber forest product (NTFP) markets in the country; growing interest in products such as herbal medicines, wild fruits, handcrafted utensils, and decorative items; and therefore, entrepreneurs focused on production and trade of NTFPs. These NTFPs are vital for the livelihoods of the poor, and with some value addition, there is potential to create large and reliable markets for the products. During the discussions, it was noted that the roles of civil society and private sector players were relevant in the management of forest products, reflecting the public's desire to secure a range of ecosystem services from forests. Consequently, multi-stakeholder processes are becoming significant in sustainable forest management. They can become important agents of change in forestry.
- Appreciating the efforts of DoF at an FGD, the CF committee of ***Kaiyai*** stated that the introduction of community forestry and sustainable forest management (SFM) models are presenting them new opportunities. "Forestry has become more people-centred, and people's perceptions of forests have undergone significant

changes with increasing emphasis on the environmental, social and cultural values of forests."

- The focus group also noted that the interactions between other sectors such as construction and the forest sector are increasingly understood to be the source of both problems and opportunities. There is growing recognition of the links between forestry and agriculture, energy and water among the communities. In addition, the FGD illustrated the special initiatives that exist in CFs and CPAs providing wood and non-wood forest products, in a sustainable manner, to meet people's requirements; and that community members are making multiple use of forests and forest resources/ products for food and nutrition security, incomes, employment and investment.
- DoF extension staff trained CF committees on the MA&D process, which resulted in the development of community business plans. This was cited as a progressive incentive in CF and CPA programming. The outcome of the MA&D process in participating villages included identification of priority natural resource-based businesses for local vendors, and the required capital investments for the business, including procurement of equipment and infrastructure.
- Multi-Purpose Centres managed under the purview of the Department of Community Development (DoCD) were cited as opportunities (training facilities) for training vendors of NTFP in business development including business management, financial management and record-keeping as well as training on operation of equipment procured for each business type.

5.4 REVIEW OF EXISTING POLICY INSTRUMENTS AND THEIR IMPLICATIONS FOR EbA IMPLEMENTATION

About 28 policies, plans and strategies that touch on EbA implementation were reviewed. The assessment revealed that just a few of these capture the wider spectrum of EbA-related elements. The Agriculture and Natural Resources (ANR) Policy (2009-2015), National Action Program to Combat Desertification, Gambia National Environmental Action Plan 1992-2001, National Adaptation Programs of Action (NAPA), The National Biodiversity Strategy and Action Plan (NBSAP), National Adaptation Plan and Gambia INDC were found to have a relatively strong EbA integration score. Among the EbA-related thematic areas – agriculture, forests, disaster risk management, livelihoods, water security and resilience were among those that were relatively strongly emphasized. See Table 35 for details.

Policy awareness is key to understanding what legal provisions and mechanisms are in place in the process of developing EbA. Our enquiry with local communities revealed that only 26.7% of the communities are aware of at least one policy related to climate change and natural resource management for better resilience. This is very low generally and needs to be a priority in the extension and training schemes so that people are aware of the policy level processes on EbA-related matters.

Table 35: **Summary of The Gambia's policies, strategies and national plans and extent of EbA-related areas**

Policies, startegies and Thematic areas strongly linked to EbA															
	Adaptation/ vulnerabilty	Restoration	Agriculture	Forest	Disaster risk management	Livelihoods	Desertification	Food security	Water security	Employment	Enterprises	Conservation	Resilience	EbA integration score	EbA integration score on a scale of 10
Agriculture and Natural Resources (ANR) policy 2009-2015	1.00	1.00	3.00	2.00	3.00	2.00	1.00	3.00	2.00	3.00	3.00	3.00	3.00	27.00	6.92
Forest Policy of the Gambia for 1995 to 2005	0.00	0.00	0.00	3.00	0.00	1.00	2.00	0.00	0.00	1.00	0.00	1.00	2.00	10.00	2.56
Forest Act (1998)	0.00	0.00	1.00	3.00	0.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	2.00	11.00	2.82
Forest Policy 2010-2019	0.00	1.00	1.00	3.00	1.00	1.00	2.00	0.00	0.00	0.00	1.00	0.00	2.00	12.00	3.08
Forest Bill 2010	0.00	0.00	1.00	3.00	0.00	1.00	2.00	0.00	1.00	0.00	1.00	1.00	2.00	12.00	3.03
National Action Programme to Combat Desertification	1.00	2.00	1.00	2.00	1.00	1.00	3.00	1.00	1.00	1.00	1.00	0.00	2.00	17.00	4.36
The National Environmental Management Act 1994	0.00	2.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00	1.00	3.00	11.00	2.82
Gambia National Environmental Action Plan 1992-2001	1.00	1.00	2.00	3.00	1.00	1.00	1.00	2.00	3.00	2.00	0.00	2.00	0.00	19.00	4.87
National Adaptation Programmes of Action (NAPA)	3.00	2.00	1.00	1.00	1.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	2.00	18.00	4.62
Vision 2020	1.00	0.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	2.00	1.00	0.00	1.00	14.00	3.59
The Wildlife Policy and Biodiversity Bill 2003.	0.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00	1.00	0.00	3.00	9.00	2.31
The Local Government Act 2002	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	2.00	0.51
Poverty Reduction Strategy Paper	1.00	0.00	1.00	0.00	1.00	2.00	1.00	1.00	2.00	3.00	2.00	0.00	1.00	15.00	3.85
The Gambia National Gender Policy 2010-2020	1.00	1.00	2.00	1.00	1.00	1.00	0.00	1.00	1.00	2.00	1.00	1.00	1.00	14.00	3.59

	Adaptation/ vulnerabilty	Restoration	Agriculture	Forest	Disaster risk management	Livelihoods	Desertification	Food security	Water security	Employment	Enterprises	Conservation	Resilience	EbA integration score	EbA integration score on a scale of 10
National Nutrition Policy	2.00	0.00	2.00	0.00	2.00	1.00	0.00	3.00	1.00	1.00	1.00	0.00	0.00	13.00	3.33
National Population Policy 2007-2011	1.00	0.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	2.00	1.00	0.00	1.00	14.00	3.59
The National Biodiversity Strategy and Action Plan (NBSAP)	1.00	3.00	2.00	3.00	1.00	3.00	2.00	2.00	3.00	2.00	0.00	3.00	0.00	25.00	6.41
The Gambia National Strategy for Contingency and Disaster Preparedness	2.00	0.00	1.00	1.00	3.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	14.00	3.59
National Disaster Management Bill 2008	2.00	1.00	0.00	0.00	3.00	1.00	0.00	1.00	1.00	0.00	1.00	0.00	0.00	10.00	2.56
National Disaster Management Policy	2.00	0.00	0.00	1.00	3.00	0.00	0.00	0.00	1.00	0.00	2.00	1.00	1.00	11.00	2.82
National Water Resources Policy 2006	1.00	0.00	2.00	1.00	1.00	1.00	0.00	1.00	3.00	1.00	1.00	0.00	2.00	14.00	3.59
Fisheries Act 2007	0.00	1.00	0.00	0.00	0.00	1.00	0.00	1.00	3.00	1.00	1.00	0.00	2.00	10.00	2.56
Fisheries Regulations 2008	0.00	0.00	1.00	0.00	0.00	0.00	0.00	1.00	3.00	0.00	1.00	0.00	2.00	8.00	2.05
Fisheries Strategy and Management Plan 2009	1.00	0.00	1.00	0.00	0.00	3.00	0.00	3.00	1.00	2.00	1.00	3.00	0.00	15.00	3.85
Gambia National Water Policy	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	3.00	0.00	0.00	2.00	0.00	6.00	1.54
Gambia National Energy Policy	1.00	0.00	1.00	3.00	0.00	0.00	0.00	0.00	1.00	1.00	0.00	1.00	0.00	8.00	2.05
National Adaptation Plan	3.00	2.00	3.00	3.00	3.00	3.00	2.00	3.00	3.00	2.00	1.00	3.00	0.00	31.00	7.95
Gambia INDC	3.00	1.00	3.00	3.00	3.00	2.00	0.00	2.00	3.00	1.00	0.00	0.00	0.00	21.00	5.38
Mean score for EbA -related thematic areas	1.00	0.68	1.25	1.43	1.14	1.21	0.79	1.07	1.50	1.04	0.93	0.89	1.04		

Note: 1) Score values are as follows: 3 - when the policy/strategy/plan is primarily emphasizing the EbA-related thematic areas, 2 - when the policy/strategy/plan is clearly linking with the EbA-related thematic areas, 1 - when the policy/strategy/plan mentions the thematic area but with no clear indication of implementation, 0 - when the policy/strategy/plan does not mention or place any emphasis on the EbA-related thematic areas selected. The mean score on a scale of 10 was computed by dividing the aggregate score by 39 and multiplying that by 10 to change to a 10-scale score. 2) Bold number on EbA integration scores show those with very strong emphasis on EbA-related thematic areas. 3) Bold number on mean score indicates those thematic areas that relatively receive wider recognition in the policy documents.

5.5 THE BASELINE STATE

The review of existing policies and strategies related to natural resources revealed limited policy alignment and poor harmonization of sector plans. There are overlaps of mandates and inconsistencies among sectors tend to curtail cross-sectoral cooperation and collaboration, especially on sector-wide issues. The need for comprehensive mainstreaming of climate change mitigation and adaptation measures, as well as significant institutional reforms, are glaring in all the policies reviewed. Consequently, there is now heightened importance and urgency to provide updated institutional arrangements to safeguard the nation's natural resource base. Existing policies and institutional frameworks for natural resource management are unable to keep pace with developments on the ground.

The ANR policy recommends an integrated approach in implementing its provisions, employing a multi-sectoral approach and ensuring coordination and synergy among projects related to natural resources. The policy is consistent with major environmental and rural development priorities of The Gambia, and represents a major step forward in the implementation of sub-sectoral policies and plans, and key national and international strategy plans and conventions, respectively. Enforcement of the policy will thus be crucial to national development and Gambia's contribution to the achievement of the Sustainable Development Goals (SDGs). Nonetheless, there exists the following gaps in this policy that will require some attention:

- Inadequate mainstreaming of climate change mitigation and adaptation strategies with concrete strategic actions
- Poor harmonization of sub-sectoral strategic plans resulting in incoherent and fragmented policies
- Weak linkages in the planning, coordination and implementation of natural resource-based programs.

Furthermore, many of the challenges facing the sector are poor value-addition on natural resource products and undeveloped market linkages, poor road infrastructure and financing issues. Inter-sectoral collaboration and the development of synergies is therefore essential.

The Forestry Policy (2010-2019) which promotes the involvement of local communities and the private sector in the management and development of forest resources is expiring in 2019. In terms of overall direction for the forestry sector, the policy is sound, but falls short of providing specific direction for on-the-ground issues and measures.

Although, climate change has been mainstreamed into the national development frameworks and some policies to promote sustainable development and low carbon pathways, relevant sectors must fast-track implementation of response mechanisms; and not all the priority actions identified in the Climate Change Priority Action Plan (PAP) 2012-2015 have been implemented.

With an average annual rainfall of only 850 mm, large parts of the country are poorly served with quality water and water scarcity is becoming a common phenomenon. Over-exploitation of groundwater resources with the indiscriminate sinking of boreholes is a major hydrogeological concern. Relying as it does on groundwater and River Gambia for much of its water requirement, The Gambia is particularly sensitive to acute water shortages. This Policy recognizes this reality. There are several institutional arrangements in the management of water resources in The Gambia. It has been observed in the National Water Policy that the water resource sector is thus, fragmented with several institutions having overlapping responsibilities for monitoring water quality and quantity. There is therefore, need for improved collaboration among the water sector-governing bodies. Hence, further analysis of this policy identifies the following universal problems in the sector:

- Lack of public coordination and effective regulations for water quality, health and environment issues.
- Difficulty in addressing the interdependencies among agencies, jurisdictions and sectors, thus hampering effective public investment programming and sector management.
- Inadequate institutional capacity building incentives for effective management and administration of the sector.

A review of the National Development Plan (2018-2021) revealed that key environmental considerations were not adequately mainstreamed in the macroeconomic framework of the country, particularly the policy and regulatory aspects. For example, the fiscal policies to control importation of environmentally un-friendly products elaborated in The Gambia Environmental Action Plan (GEAP) were not enforced as required. In addition, the need for greater engagement of civil society in the implementation process; and the need for incorporation of environmental considerations into policy and economic decision-making processes have been underestimated. Consequently, the strategic actions of the plan are very government-oriented, and they do not really provide for participation of other important stakeholders, including communities, in the process.

An intensive analysis of forestry policy and programmes further showed that, despite the massive support provided in strengthening local capacities for community forestry to date, there are both skills and technical gaps in sustainable forest resource management. DoF is providing extension services to farmers but has to scale-up and improve its methods towards more participatory approaches.

5.6 RECOMMENDATIONS FOR IMPLEMENTATION

The Gambia recognizes the severity and urgency of threats posed by climate change and has engaged actively in international initiatives related to addressing climate change. However, at present, there is need to revise and strengthen The Gambia's institutional and policy frameworks to include consideration of future climate change risks and to develop sector-specific adaptation plans which can be better integrated into broader adaptation and development strategies. EbA and its implementation will need to be aligned and integrated with existing initiatives, polices and strategies and national plans to maintain and increase the resilience and reduce the vulnerability of ecosystems and communities. While the EbA can be implemented in The Gambia to some degree through alignment of existing resources and enabled through improved coordination, additional resources would strengthen the practice of EbA by unlocking capacity needed for faster scale-up, communication, learning and research activities.

5.6.1 Policy recommendations

- Current policies and strategies should elaborate the critical linkages with Disaster Risk Reduction (DRR)/resilience building and how this can be integrated for effective program intervention. These sector strategies and policies need to reemphasize mainstreaming youth, gender and climate change interventions in practice and developing an accountability framework for their operatives at sector levels. For instance, it will be necessary to expand the job framework of staffers in all the core agencies, and integrate climate change responsibilities in their job briefs, dedicate funds for climate change activities, improve their capacity and indeed provide sanctions for lack of attention and neglect.

- Strengthen DoF institutional and policy frameworks to adequately mainstream measures addressing climate change risks, and to develop sector-specific adaptation plans. In recognition of this, there is need to adequately mainstream climate change into the new forest policy and strategy (under development), and all other cross-sectoral planning activities.
- While natural resource management is the responsibility of the relevant ministries, its success heavily depends on the effectiveness of core agencies and their decentralized coordinating structures. Leading policy direction and legal frameworks is fundamental to ensure the protection of dwindling natural resources, but the establishment of professional and effective delivery mechanisms are crucial in natural resource management.
- To enhance understanding on natural resource-related Acts, policies and strategies there is need to employ the Communication, Education and Public Awareness (CEPA) approach to generate active and informed participation of stakeholders and communities in Act/policy dissemination and enforcement.

5.6.2 Improve intersectoral partnership and coordination

Natural resource programming in The Gambia calls for coordinated efforts of a wide range of government ministries and agencies, as well as cooperation of research and training institutions, the media, NGOs and the private sector.

- It has been acknowledged that natural resource-related services in The Gambia are provided and supported by a multitude of development programs and partners motivated by a range of mandates and resources. Support in the subsector is welcome, but national priorities in natural resource programming must be addressed in an integrated and harmonized manner to ensure positive impacts of the desired synergy for all Gambians.
- A joint public/private sector/civil society programming in natural resource development will surely boost the government's efforts. National intersectoral coordination mechanisms will be reinforced to ensure concerted implementation of a balance protection and conservation interventions in a resolute, efficient, effective and sustainable manner, guided by partnership principles. The relevant ministries must promote coordination of a multi-sectoral response to enable appropriate and timely attention to emerging climate change issues.
- The core agencies should provide a strategic framework for programming and policy work based on the larger country context by increasing understanding of micro- and macro-linkages; clarifying linkages and program overlaps and synergies between subsectors; and providing the framework for accountability in relation to strategy and overall institutional mandate.

5.6.3 Institutional capacity development of natural resource core agencies

This should be prioritized to enhance their professional and institutional abilities for effective and efficient programming.

- Strengthening the institutional capability and building staff capacity in the core agencies of the ANR sector as well as local institutional structures, e.g., CF Committees, Non-Timber Forest Products (NTFPs) development interest groups, etc., are essential for effective natural resource programming.
- Stimulate private sector investment and employment creation by encouraging private sector partnership with local associations of resource-users (e.g. local fishers'

associations in fisheries, CBOs in eco-tourism, etc.) in joint ventures that expand market outlets for their products.

- To overcome resource constraints (fiscal and human) of the core agencies, government should implement the following measures: a) increase allocation sectoral budgets such as augmenting the NFF for efficient programming; b) provide grants (for matching) to promote private partnerships as well as private sector entrepreneurs for EbA investments; c) concessional loans to entrepreneurs investing in EbA; and d) creating financial value for carbon sequestration based on models such as REDD+ financing.
- The ANR sector is continually evolving and dynamic, with changes in the availability of resources and steadily increasing demand, placing considerable pressure on service delivery. These challenges have serious implications for the institutions managing the country's natural resources. The core agencies must maintain an adequate number of quality and well "motivated" staff at professional and technical level, providing services that will promote positive public attitude towards utilization of natural resources, and ensure the willingness of the local population to be involved in the protection and management of natural resources.
- To sustain the NDA-finance ministry, there is need to link sector plans and budget allocation to integration of climate adaptation initiatives and assess these during budget bilateral events. Sectors must also integrate requirement in staff job profiles such that they are well equipped to facilitate these efforts.

5.6.4 Building competitive value chains and market linkages

This will be done by improving access to markets through increased investment in rural marketing infrastructure such as physical marketplaces and storage (for eco-tourism), and maximum utilization of MPCs for training and skills development. In addition, support labor-saving transitional devices and technologies to increase productivity and reduce drudgery; promote financial services and improve the skills and knowledge of value-chain actors in a bid to link them to domestic, regional and international markets.

- Build and commercialize the value chain initiatives using various approaches including cooperative schemes that link private sector and small-scale actors in an effort to increase productivity, food and household incomes. Specific areas of focus include a) strengthening cooperative organizations to access services, credit, improved storage and processing facilities and markets; b) developing a business culture along commodity chains to facilitate value addition and link producers and vendors to input and output markets; c) developing and improving knowledge of market information systems and quality control measures and standards; and d) developing appropriate institutional arrangements to extend credit to actors in the subsectors; create awareness among the value chain actors of appropriate financial sources; and establish credit guarantee schemes for producers and cooperative organizations.
- Promote the establishment of small-scale tree and forest-based product enterprises through its community-based enterprise development program. The aim of the program is to enhance the entrepreneurial capacities of local communities so they can access market opportunities and improve their cash income, while also gaining greater incentives to protect and sustainably manage their natural resource base.
- Develop the capacity of community-based tree and forest product enterprises through training on the MA&D approach, which

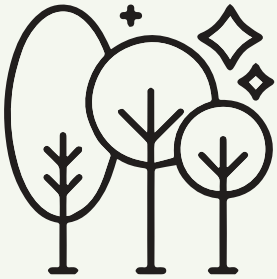
encourages planning and development of business strategies that contribute to community investment preparedness, making it easier for communities to access external capital and donor investment. Also, to assist forest communities to develop enterprises that generate and improve incomes, while also sustainably using and managing their forest resources.

5.6.5 Enhancing research and development

- Promote research for new discoveries, technology generation, dissemination and adoption to overcome the major development constraints in the ANR sector.
- Engage and collaborate with NARI and other relevant sub-regional research institutions on technology generation and transfer in order to restore extinct and endangered natural resource species.

Support research in acquiring baseline data through applied forestry research and studies on forest economics – to show forest produce including non-wood forest products consumption trends; wood utilisation and the cross-border trade; explore emerging markets for forest beverages (local tea) and 'green' products; explore economic use of medicinal plants and genetic materials; and engaging local companies in the production of medicinal plants and genetic materials for the pharmaceutical industry.

CHAPTER 6 CROSSCUTTING ISSUES



6.1 TRAINING

Training is a key capacity development mechanism at national, subnational or local level. We assessed if the local communities responsible for CFs, CPAs and MPCs had attended any training on nature-based adaptation, and found that only 14% of the respondents (out of 831) had received some form of training on policies, tools and/or methods for nature-based adaptation. The figure varies by region though. LRR had the highest proportion of 20%, followed by CRR-S (16.3%) and URR (13.7%). CRR-N had the lowest proportion of people who had attended such training with only 5.7%. Most have only attended 1-3 trainings. Overall the level of exposure to such important capacity building activities is very low in the project regions. There is a great interest to learn and apply knowledge by the community. 9.7% of those attending training said they apply their knowledge to a large extent.

However, the communities were being trained on a number of other aspects on socioeconomic development. For instance, 38.9% stated they received training on health care issues, 35.9% on sanitation, 15.8% on entrepreneurship and 13.6% on value addition. Out of all the regions, the lowest number of training sessions was among communities in URR.

6.2 INSTITUTIONAL CAPACITY DEVELOPMENT

6.2.1 Overview in relation to climate change and NRM

National institutions in forestry, agriculture and community development sectors have raised concerns over climate change impacts even from changes in weather patterns involving the rainy season experienced in The Gambia. Farmers and extension agents have observed that the single rainfall season is no longer predictable and intensity has disrupted agriculture production. Erratic rainfall has serious effects on the River Gambia ecology as salt water intrusion has been found to worsen with reduced rainfall episodes with risks of damaging agricultural soils due to salinity problems.

The capacity of national and rural advisory services to address these issues is weak and reliant on external donor support, which often lacked sustainability. Furthermore, rural institutions that could play a key role in helping mitigate the impacts of climate change are either

in the formative stages or non-existent in many situations.

6.2.2 Baseline situation

Dependence on forestry resources for food, energy and construction materials is increasingly at risk due to clearing of forests for more arable land for agriculture. At the same time, the increasing rural population demands forest and tree products and services to support their daily livelihoods. Trees provide the main source of energy and construction materials. On the other hand, agricultural productivity is performing poorly due to loss of soil fertility, reduction of moisture, use of poor inputs, reduced farm labour, low mechanization and lack of extension services. Government regulations on harvesting tree products have mixed effects on the state of trees and forest resources in the country. Strict regulations on tree felling in agricultural land serve as a disincentive to farmers' tree planting activities and discourages private forestry growth.

Local agricultural extension services do not carry tree farming messages while forestry extension is based on external forestry tendencies involving state-run monoculture plantation without regard to agroforestry practices. Local practitioners lack information on choice of species, access to planting materials involving seeds and good nursery management, techniques on vegetative propagation and marketing of especially indigenous tree seedlings and related products.

6.2.3 Capacity at national level

There was need to broadly understand where the capacity level currently is. The baseline team conducted a rapid capacity assessment using the UNDP Rapid capacity assessment tool with its own score card. The scoring was done on a scale of 0 to 5, where the scores were interpreted as follows: 1 – No evidence of capacity, 2 – Anecdotal evidence of capacity, 3 – Partially developed capacity, 4 – Widespread, but not comprehensive capacity, 5 – Fully developed capacity. Responses were collected from 23 respondents who represented the different institutions and departments currently active in climate change area. Overall, 70% of the respondents believe that the current capacity level is less than a score of 3, i.e., partially developed. Capacity for planning, implementation and monitoring and evaluation for climate change and Capacity for community engagement were among the attributes of climate change that scored 2 and below(by almost half of the respondents). There was consensus among the responses that the capacity in the country is low (Figure 40). There was clear expression from the respondents that it is crucial to build the capacity of the departments that are directly responsible for the implementation of the EbA project both at national and sub-national level. The anticipated level of capacity for all the attributes in the next five years was found to be, on average, at a score of 4 with few respondents even suggesting 5.

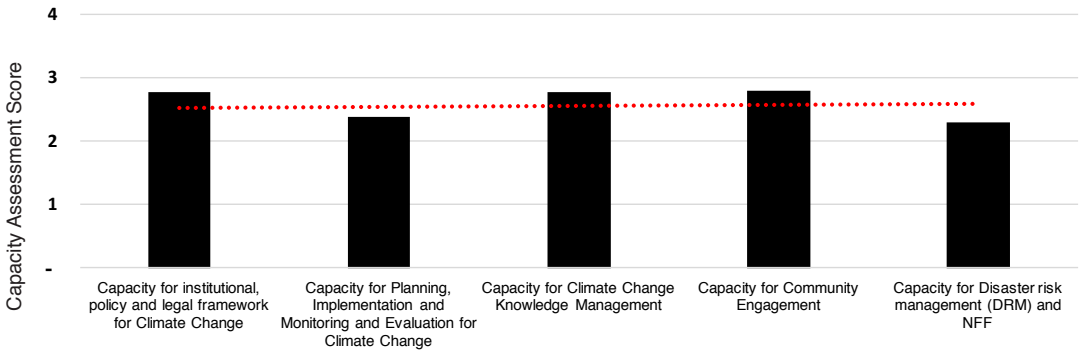


Figure 40: **Rapid assessment of capacity for implementation of ecosystem-based adaptation in The Gambia. The red broken line shows the minimum average level of capacity that is required.**

6.2.4 Planting material supply potential

One of the fundamental requirements for EbA project implementation is the capacity of the nursery to deliver appropriate seedlings. The current capacity is very low, and there is a need to invest in building the capacity of existing nurseries to deliver the right species of seedlings. Table 36 shows the existing capacities of the nurseries surveyed in the country. See section 6.2.5 for more details. Access to quality inputs for both agriculture and forestry is a challenge with no national institutions mandated to support these to any extent. For example, the country has no national tree seed centre to conserve its invaluable diversity of tree genetic resources. Furthermore, use of quality and diseases-free planting materials is not assured as national regulations on phytosanitary standards are either weak or missing altogether.

Project land restoration plans involve tree planting of about 10,000 ha covering community forests, parks, village settlements and farmlands with mainly indigenous trees. An annual target to plant 2,500 ha requires an assured supply of at least 1.5 million quality tree seedlings at a planting density of 625 trees per hectare. Assuming larger spacing, planting options such as 7m x 7m are implemented at least 500,000 planting materials are needed. A rapid assessment of 43 local nurseries for available seedling stocks across three project regions showed that 97,475 seedlings were available (correct age and size) to support year 2018 planting plans; this represents barely 10% of required seedlings. The calculation assumes all available nursery stocks would be availed to the EbA project and forego other projects' planting demands. This stock estimation includes mangroves wildlings transplanting and rhun palm regeneration by direct sowing. The total seedlings available were of 12 tree species with more than 2000 plants. Of these, indigenous species ***K. senegalensis*** (Jallo), ***P. biglobosa*** (Neto) and ***A. albida*** (barangsango) are available. Most of the other planting stock consists of exotics such as mango, cashew, gmelina, lime, eucalyptus, orange and moringa. Operators attributed this situation to the available market, unlike for the indigenous seedlings.

Lack of indigenous seedlings for transplanting was unexpected and therefore will have a negative impact on the project's planting plans. The current plan to develop only a single nursery per region is therefore not sufficient, considering the lack of capacity for indigenous seedlings supply. To close the current supply gap, at least three nurseries are required per region to help raise more planting materials and meet the annual planting target of 2,500 hectares. Location of nurseries close to planting sites have an additional advantage of reducing the cost of transportation and shock that affects field survival.

Table 36: **Nursery capacity in The Gambia at the time of the baseline study**

Common name	Scientific name	Number of seedlings	Age ranges of seedlings	Remarks
Mango	*Mangifera indica*	19,880	90-548 days	Sorting of overgrown seedlings required for materials aged of>365 days
Cashew	*Anacardium occidentale*	18,141	90-365 days	30% of current stock is immature not suitable for out-planting
Jalo	*Khaya senegalensis*	14,705	90- 480 days	>75% of stock good quality for out-planting

Common name	Scientific name	Number of seedlings	Age ranges of seedlings	Remarks
Palm tree	*Elaeis guineensis*	10,100	365 days	Ready stock for out- planting. Only healthy stock to be selected
Gmelina	*Gmelina arborea*	7,575	90-365 days	20% of available stock immature for out-planting
Netto	*Parkia biglobosa*	5,556	90-365 days	28% of stock below 120 days immature for out-planting
Lime	*Citrus limon*	5442	180-365 days	80% of disease free stock ready for out-planting.
Nebneb	Unidentified	4000	365 days	Ready material available
Eucalyptus	*Eucalyptus sp.*	3900	90-365 days	Not recommended for this planting programme
Barangsangoh	*Acacia albida*	2848	150-365 days	55% stock are immature seedlings
Orange	*Citrus sp.*	2728	150-480 days	Sorting required to use healthy, disease free stock
Moringa	*Moringa oleifera*	2600	180-365 days	All available stock usable for farmland planting

Other stakeholder concerns on recent tree planting activities have revealed negative feedback on seedlings out-planting survival. Field survival rates are low (below 30%) due to insufficient rains, bush fires and free grazing practices.

Figure 41: **The poor state of the German-Gambia Forestry Project nursery. Rows of nursery beds made with permanent structure.**

The assumptions of obtaining seedlings from the German-Gambia Forestry Project (https://www.dfs-online.de/references/gmb-01/) nurseries was impossible as the nurseries in this project were abandoned years ago. The baseline team visited the project site only to find an abandoned field.

6.2.5 Recommendations for project implementation

This project approach is to utilize local resources to improve natural resource management practices. They will partner with national and local implementing partners such as village development committees to restore community forests, farmlands and village settlements. Key improvement areas include:

- Improved tree establishment practices to help restore remaining forestry and agricultural areas by planting appropriate trees especially indigenous species to raise community appreciation of existing genetic resources.
- Revitalization and support of tree nursery development activities to provide right planting materials to the right place.
- Provision of guidelines and techniques on quality tree germplasm collection, storage, use and sourcing.
- Supporting knowledge on tree establishment, management and harvesting in farmlands and village settlement areas.
- Knowledge on species diversity, conservation, use and avoidance of invasive species.
- Best practices on sharing and handling plant genetic resources involving adherence to international phytosanitary standards.

Following challenges on indigenous seedling procurement and survival in the field after out planting, the following are recommended:

i) Increase the number of project-supported nurseries from one to three per region in LRR, CRR-S, CRR-N and NBR.

ii) Avail guidelines and techniques for indigenous tree germplasm collection, storage, use and sourcing.

iii) Support installation of boreholes for water supplies in the nurseries and strategic water points in the field to support planted trees and livestock with water supply.

6.3 INFORMATION AND DATA

6.3.1 Overview in relation to climate change and NRM

The Gambia, as stated in its National Adaptation Programme for Action (NAPA) on Climate Change, is undergoing a change in its natural resource base due in part to climate change and in part to intensive land management that has reduced its forest cover/vegetation resources[17]. Human population growth, coupled with the decline in annual average rainfall of 25-30%, high consumption rates and the nature of the land and forest management continue to drive environmental and natural resource degradation (National Climate Change Policy of The Gambia 2016).

The Intergovernmental Panel on Climate Change (IPCC), in its Assessment Report number 4, Chapter 22[18], notes that "…***areas where there are sufficient data include very likely decreases in annual precipitation over the past century over parts of the western and eastern Sahel region in northern Africa***…". Jaiteh and Sarr (2011) note that The Gambia is very vulnerable to climate change as extreme climate events like windstorms, rainstorms, drought and dust storms will be more frequent and severe in the short-term, while land use and land cover change, sea level rise, and coastal erosion will present significant long-term challenges. Rainfall patterns have changed, with a shortening of the rainy season.

[17] https://unfccc.int/resource/docs/napa/gmb01.pdf

[18] IPCC AR 5. Africa in Climate Change 2014: Impacts Adaptation and Vulnerability. Part B. Regional Aspects.

As their natural resource systems are under threat, leaders must make decisions that will protect their environment and ensure sustainable economic development in the years to come. The role of the EbA data and information system is to provide these decision makers with information on status and trends of climate change and natural resources in The Gambia, both with respect to the EbA project, and to the national and regional "big picture".

Within this overall context, the EbA project information and data component will:

1. Demonstrate the important role that project information and data plays in project management and reporting by collecting, processing, storing, and sharing project data information and high level, key performance indicators (KPIs). The KPIs include, for example, forest cover change based on the number of hectares that have been planted; impact to communities in economic (and social) benefits from the project activities; capacity building within and across government ministries at both national and district level, and within community structures that are targeted to enjoy project benefits. A list of KPIs to be presented on the project dashboard are provided in Annex 1.

2. Provide a geo-spatial platform (GIS) that serves as a basis for capturing, processing, storing and visualizing project data.

3. Provide a time series of changes in vegetation cover based on available satellite imagery (and aerial photography if also available). These results will contribute to establishing regional trends and demonstrate the value of the GCF project for combatting land degradation and climate change by re-establishing the natural resource base.

4. Support eventual EbA policy implementation by providing feedback from local communities about the impact of project activities on their social and economic development.

6.3.2 Baseline survey of EbA data and information in The Gambia

Collection of information for the baseline study was sourced by 1) visiting key **institutions** to assess how they manage and share data and information for EbA to climate change, 2) assessing **data and information quality**, relevance, accuracy, metadata, etc. needed for project management (understanding the conditions of access, quality, etc.), and 3) assessing **capacity** to host and manage data systems.

6.3.3 Institutions

The ICRAF EbA baseline assessment team visited various institutions to acquire key datasets required for project management and to assess capacity to develop and manage data and information (within the context of the above-mentioned goals).

Table 37: **Assessment of institutions visited during baseline study**

Institution visited	Purpose	Result	Comment
Forest Department	Overall: assess current state of forest resources in the country, obtain geo-spatial data sets, prepare contacts for further data collection and GIS map development. Learn processes involved in creation of Community Forests.	Procured digital maps on land use/ cover and data on Community Forests: both spatial and non-spatial information	Baseline assessment team did not see up-to-date computing facilities to manage these data. The available data needs to be better structured and compiled for ease of access. For some details getting source of the metadata was very difficult.
National Environment Agency	Meet lead environment agency; obtain geo-spatial data sets for project baseline and impact evaluation	Procured digital maps on land/use land cover were similar to the data procured from the Forest Department	NEA maintains the highest technical capacity of the institutions visited, with new equipment and trained staff who process geo- spatial data
Lands and Surveys Department	Meet staff and inquire about availability of base maps and topographic data	EbA team was not able to procure any new/additional information other than that cited above	Lands and Surveys has the mandate to produce and store key map data. The EbA team did not see evidence of up-to- date technical capacity to manage digital information
Department of Parks and Wildlife	As a significant portion of the project activities operate in community protected areas, the baseline assessment team requested data sets on the state of parks and reserves, including biodiversity conservation the country.	After a second visit, it was proposed that the spatial data would be availed through the PMU. It was agreed additional documentation of all CPAs planned for project implementation will be provided by the Department. The Department also advised to visit the Environment Ministry for a report on CPAs dated 2011 developed with the Justice Department.	As CPA data are critical for the data and information component, the PMU will endeavor to access these.
Department of Agriculture	Collect data on agricultural activities in the selected regions, including data on state of degradation in agricultural lands and options for restoration and ongoing activities	PMU is accessing key data sets from the Department of Agriculture.	
Early Warning System Project	Reviewed complementarity between EWS and EbA projects	Confirmed possibility of using EWP data to inform EbA project activities.	This complementarity should be pursued within the years one and two of the EbA project.

Institution visited	Purpose	Result	Comment
Department of Community Development	Data on location and status of the Multipurpose Centres (MPCs); Procedures of creation of MPCs; Prospects of MPCs in the EbA project activities	During a second follow-up visit the department indicated they recently conducted a review of all MPCs in the country and is finalizing a report which will be shared with the PMU. Data on location, income, expenses and activities of selected collected MPCs data are in the baseline report.	The available data needs to be better structured and compiled for ease of access. Data on income and expenses in particular needs to be recorded using simple and standard financial methods.

The team also reviewed availability and quality of data information available on-line:

- The Gambia Bureau of Statistics (GBoS) plays a key role in collecting and making national and district level statistics available online. A variety of social and economic data are available; however no links to forestry-related data were evident.
- The AccessGambia website (http://www.accessgambia.com/information/forestry.html) provides introductory information about the country, including high level statistics about the forestry sector.
- In general, as most datasets are not available online, it is necessary to apply to the specific ministry concerned in order to access digital geospatial data.

6.3.4 Data and information

Given its unique history and small size, The Gambia is reasonably well covered with core datasets required for ecosystem-based adaptation to climate change.

Data accessed: Most of the geographic databases received were produced from agreements between The Gambia's Ministry of Local Governments and Lands, and the Japan International Cooperation Agency (JICA). These 1:50,000 scale databases include:

- District level data such as administrative boundaries, socio-economic data and settlement names
- Transportation layers
- Buildings, small objects, and other structures
- Water resources
- Land cover and topographic features.

These features will be used to develop the village level, participatory maps. Population data of 2003 and 2013 were provided for different age groups and will be used to analyse the livelihood of people in the communities. The socio-economic data also includes the percentage of the ethnic groups in each region. The census gap of 10 years will be used to assess land degradation by remote sensing analysis. Settlement data from 1998 compared with 2018 in the project sites will help project the percentage growth of the area and therefore may suggest which degraded areas should be targeted for restoration.

Satellite imagery for the baseline report included one tile Landsat 8 satellite images dated 06 February 2018 from the USGS. Spectral bands used includes 2, 3, 4, 5, 6 and 7 with a spatial resolution of 30 m.

Metadata: the team experienced some difficulties in obtaining detailed metadata on the various datasets collected. Here, the reference to metadata (***sometimes called the identity card***) means information about the who, what, when, where, why and how of the dataset being

accessed. The importance of metadata is that they allow the user to determine if the datasets can be used and for which possible application.

Platforms and portals: at present, there are no EbA platforms that provide current information about the status of how ecosystems have adapted to climate change. Information available, and associated metadata, is dispersed and therefore requires a platform on which it can be assembled, integrated, displayed and shared. The EbA project will meet this goal. Figure 35 depicts how the EbA Data and Information platform is being developed and will operate.

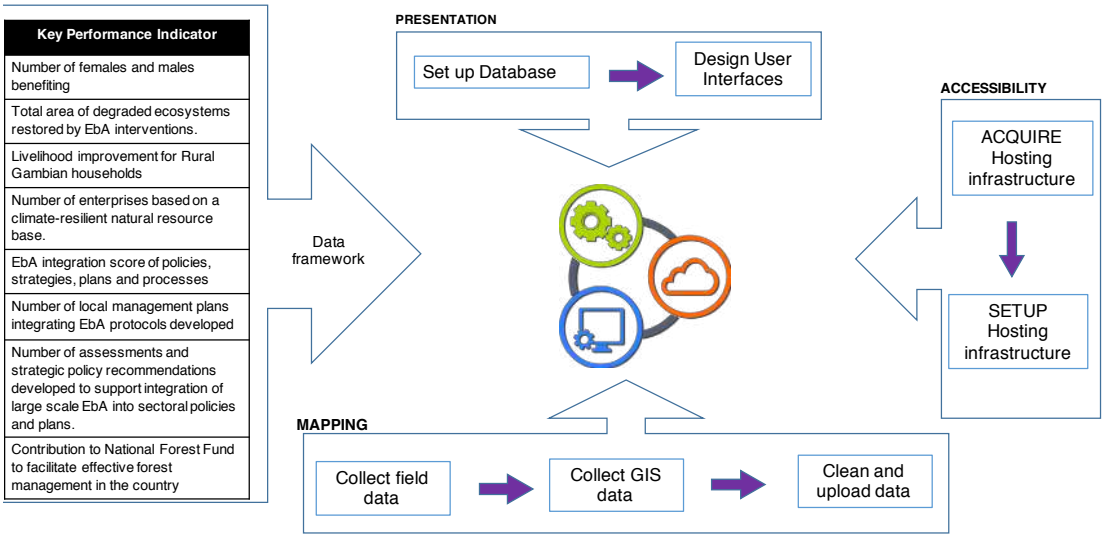


Figure 42: **Workflow for the EbA information management system**

It was proposed that data KPIs (see Table 1) be divided into two groups; the first four are to be measured at the management entities level, and the last four are national indicators. The EbA baseline team noted that some of the indicators are related, for example, Indicator 15 (No. of NR-related businesses) is linked to Indicator 16 (Investments in NR-based businesses), Indicator 19 (Revenue from NR-based businesses) and Indicator 27 (Amount of tax and license fees collected from NR-businesses). All indicators will be monitored annually.

Gaps: the lowest level administrative boundary available is the district level; the village level administrative boundaries are missing, and this will affect the EbA project baseline development and monitoring. Settlement data are also in point form, as are community-level data. *The implication of these data gaps is that the production of village level maps, as required by the EbA project document, will be derived from a combination of remote sensing data and district level, point data, and not from pre-existing polygon files*. Similarly, community forest data is given in point form; therefore it was not easy to define the CF boundaries for mapping.

Many other types of information are given including, brochure, concept note, conference summary, images, interview documents, audio recordings of interviews, and others for reference.

Currently, gaps include CPAs, salt intrusion, and village level data. A complete listing of the geospatial data that was received by ICRAF is available in the metadata link below.

https://docs.google.com/spreadsheets/d/133-gL9EiZFNiIFRwFigQtaS7eEz8eTsHfiVNpB3A uP8/edit#gid=0

6.3.5 Capacity building

The Gambia has suffered from a drain of human resources in the last decade as several youth have left the country to seek economic opportunities elsewhere. This loss has resulted in a stagnation and even diminution of intellectual capacity to manage data and information systems. Furthermore, senior staff in the government mentioned that many are approaching retirement age and there are doubts about how this capacity will be replaced.

The capacity gap also includes the need to update the hardware and software required to manage project data, both in the short and medium terms. The baseline assessment team also noted that the capacity to manage data was uneven across ministries (see Table 37).

The team's overall assessment is that capacity is low, therefore capacity development needs to be prioritized in subsequent years of project implementation.

6.3.6 Recommendations for project implementation

The following recommendations address the role of data and information platforms:

Short-term recommendations:

- Strengthen the capacity building component of the project, touching on both community and national levels. Develop a detailed training plan, including EbA modelling techniques, for the remainder of the project lifetime. The training plan should address: server management, database management systems, developing user interfaces, GIS modelling, etc. (and software programming language to run the above).
- Together with the management of the Early Warning Project currently being undertaken by MECCNAR, ensure that there will be a critical mass of skilled human resources to operate The Gambia Early Warning System and perform long-term climate adaptation planning that could work in synergy with the geo-spatial tasks.
- For the EbA component 3 on policy development, find and implement synergies between the agricultural and forestry sectors (see section 1.4.4). For example, concerning data and information, both sectors require data on soils, markets for agroforestry and forestry products, invasive species, social dimensions such as preference for tree species for various purposes, etc. A sharing of information across sectors could lead to cost savings in data collection as well as identification of new EbA opportunities.

Long-term recommendations:

- As the EbA project will improve vegetation/forest cover in The Gambia, evidence of impact will be provided even beyond the lifespan of the initiative. Keeping the "big picture" in focus also applies to any possible scientific exchange with the Centre de Suivi Ecologique in Senegal to establish an overall context of land cover change in SeneGambia over the past two decades. The EbA project contribution must be situated within the regional context.

6.4 HUMAN-WILDLIFE CONFLICT

The principal conflict in The Gambia affecting households involves hippos especially in rice cultivating areas along The River Gambia. This is perhaps a risk to households dependent on farming in these areas due to loss of life[19, 20, 21] disruption of farming activities and loss of cultivated rice. Hippos are commonly found in the River Gambia particularly in the Central

[19] bhttps://allafrica.com/stories/200101200053.html
[20] http://foroyaa.gm/hippo-attack-claims-life/
[21] http://thepoint.gm/africa/gambia/article/farmers-raises-concern-over-hippopotamus-in-crr-northsouth

River Region where the water is fresh. They can be very agile, unpredictable and aggressive, and can trek miles to nibble on tasty vegetation, including in the rice fields. The common hippopotamus (Hippopotamus amphibious) categorized as vulnerable on the IUCN Red List (Lewison and Oliver 2008), is a major source of human-wildlife conflict in Africa. It causes damage to crops and attacks people. Thus, their presence causes great panic among villagers, sometimes forcing women to abandon their fields.

Decline of the species has been attributed to killing of hippopotamuses by farmers, and the loss of grazing grounds as a result of agricultural development. Aquatic biodiversity change due to the impacts of climate change can affect the movement and behavior of hippos. For example, an increase in sea level over the long term could result in the conversion of freshwater ecosystem swamps to open water or salt marshes, thus displacing species that depend on them. As part of efforts to address hippo-human conflict, The Gambia needs to develop good land use planning to conserve hippo populations and preserve farmers' crops from hippo damage. An approach could be to identify hippo corridors that are designated as areas where cultivation is disallowed. This effort should be highly participatory; the Department of Parks and Wildlife and affected communities should be elaborately engaged. The community could assist in identifying the corridors while the Department of Parks provides technical input through capacity building and awareness creation.

6.5 WATER AS AN ELEMENT IN THE EBA PROJECT

Restoration activities in the various entities such as CFs, CPAs and agricultural areas will involve consumption of water from a range of sources, including community wells. Therefore, mechanisms will be in place to ensure that there are social and environmental safeguards in place. The principal aim is to ensure there is no negative impact on consumptive uses by the community as well as over-extraction. It is important to plant trees where there is a sustainable water supply. Considering the level of erraticism of rainfall being experienced it is important to have a reliable means of water supply. Boreholes may not be that sustainable in the long run since there is already a lot of water extraction going on throughout the country; this may deplete water availability in the future. Hence, the need for water harvesting structures to capture rainwater that will be used to grow the trees. This may also entail running water abstraction during the intense rainy season.

CHAPTER 7 LEVERAGING BASELINE INSIGHTS

7.1 IMPLICATIONS OF THE BASELINE STUDY RESULTS

This section draws on insights from the baseline findings. It reviews and reflects on the initial indicators, targets and assumptions of the project. We focus on a set of eight key indicators and the associated targets and assumptions (direct and implicit) from project documents. The key targets and indicators were covered in Section 1.3. Below is a list of the main indicators:

i) Number of females and males benefiting;

ii) Total area of degraded ecosystems restored through EbA interventions;

iii) Livelihood improvement for rural Gambian households;

iv) Number of enterprises based on a climate-resilient natural resource base;

v) EbA integration score of policies, strategies, plans and processes;

vi) Number of local management plans which integrate EbA protocols;

vii) Number of assessments and strategic policy recommendations developed to support integration of large-scale EbA into sectoral policies and plans; and

viii) Contribution to the National Forest Fund to facilitate effective forest management in the country.

For each of these indicators, its associated targets and assumptions, we highlight significant confirmations, variances, emerging issues and key recommendations for project implementation. Each section represents the project components. All these indicators are interdependent.

7.1.1 Component 1: Ecosystem-Based Adaptation

Table 38 summarizes the key performance indicators and relevant targets and assumptions for the EbA component of the project.

Table 38: **KPIs, sub-indicators and targets for component 1**

Key performance indicators	Sub-indicators	Targets/Assumptions
Number of females and males benefiting	Number of households benefiting from the project	Expected total number of direct and indirect beneficiaries (reduced vulnerability or increased resilience); number of beneficiaries relative to total population (adaptation only) - 11,550 direct beneficiary households (50% women) supporting ~46,200 dependent household members (indirect beneficiaries).
	Gender representation in the management committee	
Livelihood improvement for rural Gambian households	Income per household (USD); Number of direct jobs created through natural resource-based enterprises (FTE)	The cash benefit to the direct beneficiary household per year is USD 330 per beneficiary household per year, assuming 11,550 beneficiary households. This adds up to a cash return from the businesses of at least USD75M/20 years.
Total area of degraded ecosystems restored by EbA interventions	Area planted with trees (ha); Mortality rate of trees planted; Area of agricultural land area developed (ha); Area of forest restored (ha); Number of trees planted in different planting arrangements; Number of incidents of illegal extraction; Number of uncontrolled fire incidences in CF/CPA; Area of fire belt established (ha); Frequency of patrolling CFs/ CPAs per month; Number of awareness creation events supported; No. of technical staff trained (Including extension staff)	Total area of degraded ecosystems restored by the project's EbA interventions – 7,000 hectares of degraded forest, woodland, savanna and mangrove; 3,000 hectares of agricultural land. Four nurseries – 1 per project region
Number of local management plans integrating EbA protocols developed	Number of management plans updated to include EbA	Expected increase in generation and use of climate information in decision-making – identification and integration of climate change adaptation priorities into village/ community management plans for at least 125 CFs and CPAs. 125 Kafos established

Confirmations

The baseline confirmed huge climate change risks and vulnerability. Review of secondary materials also indicated that The Gambia faces numerous climate-related hazards and risks – droughts, floods, forest fires and windstorms. 82.4% of the households interviewed had experienced at least one climate-related crisis in the past five years. Analysis of historical climate data (1991-2015) revealed that 9 out of the 12 months of the year experienced over 0.33°C increase in temperature between 1991 and 2015. Significant increase in temperatures were recorded during the months of November (0.72°C), October (0.69°C), January (0.63°C) and July (0.57°C). Results from the projection analysis revealed that it is likely that future values of many bioclimatic variables related to the temperatures will increase (See section 3.1.2). For several bioclimatic variables related to precipitation, future values are likely to decrease especially in the west of the country. As a result of the combined changes in temperatures and

precipitation, the potential evapotranspiration (PET) is projected to increase whereas the moisture index (MI) is projected to decrease.

Degradation of community forests and community protected areas were confirmed to be in a state that is "restorable". Natural degradation in the CFs is currently around 14.07 trees per ha overall with region specific values of 25.4 trees/ha in CRR-N, 15.87 in CRR-S, 4.81 in LRR, 7.75 in URR. Livestock encroachment, agricultural expansion, plantation establishment, invasive alien species, drought, poaching, overharvesting (fish), fire incidences, vanishing of traditional (cultural) management practices and housing and settlement expansion were the top priority threats identified. CPAs are facing similar threats and hence the need for restoration is assumed by the project.

Divergence

- Assumptions on nurseries and planting materials: The target of establishing one nursery per region as part of the strategy for covering 10,000 ha was found to be grossly inadequate. This is because despite the goodwill and hard work of the regional forestry staff, the capacity to host a nursery expected to produce over a million plants per region per year is not adequate. This, coupled with an overall weak production capacity of just under 200,000 trees across all nurseries in an inventory during this baseline (see section 6.2.4), indicate that there is need to revise the nursery development plans of the project. Furthermore, the German-Gambia project cited as one source of seedlings has long ended and the nursery is no longer functional.
- Assumptions on priority tree species: In addition to the local and indigenous tree species named in the project proposal, as well as the timber species specified in the project, fruit trees and wild edible plants emerged as highly preferable among the local communities. This is due to their value in terms of food security and economics. See section 3.3.5 for details on fruit and wild edible plants.
- Most of the dominant trees species in the CFs are protected by law (Forest Act 1998). This complicates the exploitation of such species, particularly the timber enterprises. If such exploitation has to be allowed, species level management plans are mandatory to ascertain that the utilization does not threaten the species.

Emergence

- Wild fruits and edible plants emerge as a significant hunger and adaptation strategy for many households in rural areas and in the project area during the months of May to August when on-farm food supply is reduced. 48.7% of the households reported that they collect wild fruits and edible plants to cope with the food shortage during various months of the year.
- Bushfire and illegal logging, though mentioned and highlighted in the proposals, emerge as much stronger drivers of degradation of ecosystems and forests. In fact, they rank as the most significant threats by far, with more than 79% of forest area getting burnt at least once a year and fire incidence rates up almost 50% in recent years.
- Water management and provision emerge as necessary conditions for seedling development, as well tree planting and management given the rainfall and water availability in most of The Gambia. It would be important to include this as part of the process of nursery selection and/or investments in supporting EbA activities. This might have budget implications and/or might require concentration of EbA activities in clusters that enable efficiency. This would mean funding boreholes and/or rainwater harvesting activities alongside EbA activities.

- Assessment of the threat levels of the CPAs revealed that KWNP, Kiang Bamako, Demba Kunda and Genji Wolof are facing numerous threat factors compared to the rest. Hence, these four areas should be prioritized.

Recommendations

1. We propose diversification and a mix of trees species for planting in EbA that meets multiple needs, i.e., local indigenous species for ecological resilience, wild edible trees for food security adaptation purposes and fruit trees on agricultural land for economic and nutritional reasons. It is recommended to include the domestication of wild edible plants as a significant part of the tree planting and CF and CPA management strategies. This would include planning for them as priority trees in EbA activities (See section 3.4.6).

2. Given that future bioclimatic changes include novel conditions for Gambia (e.g., mean annual temperatures above 28˚C [See section 3.1.2] or moisture indices below 31%), the recommended approach for species distribution modelling will be to calibrate species distribution models for a larger area in western Africa, including baseline conditions that are better analogues for future conditions.

3. We recommend developing 3-5 nurseries per region, to involve both regional forestry offices, potential community and women's groups as well as some forestry stations with the space and experience on the same.

4. We recommend including water management aspects into the planning of EbA activities both as a criterion for selecting nursery and EbA activity sites. This will need to be budgeted for in the process as it is necessary for success.

5. With the prevailing concerns about nursery capacity, ANR should be given considerable priority and has to be framed as a key intervention going forward. The strong preference for ANR is that it relies on ecologically-resilient species and systems that are already thriving within the change dynamics, particularly from a climate perspective.

6. Illegal logging and bush fires were identified as major concerns. The EbA project has clear mechanisms to deal with the bush fire through fire belt establishment. However, there is no clear approach for dealing with the problem of illegal logging.

7.1.2 Component 2: Natural Resource-Based Businesses

Table 39 summarizes the key performance indicators and relevant targets and assumptions for the NR business component of the project.

Table 39: **KPIs, sub-indicators and targets for Component 2**

Key performance indicators	Sub-indicators	Targets/Assumptions
Number of enterprises based on a climate- resilient natural resource base.	Number of NR-based enterprises in CFs, CPAs and MPCs; Investments in NR-based businesses (USD); Investments in MPCs (USD); Investments in nursery developments (USD); Revenue from NR-based businesses (USD); Number of communities trained on NR-based enterprise	5 enterprises with a climate-resilient base including at least 3 enterprise types to be managed by village women committees 21 MPCs targeted with, 5000 people trained through more than 500 trainings.

Key performance indicators	Sub-indicators	Targets/Assumptions
Contribution to National Forest Fund to facilitate effective forest management in the country	Amount of tax and license fees collected from NR-based NR-based businesses (USD);	The cash benefit to the direct beneficiary household per year is USD 330 per beneficiary household businesses (USD) per year, assuming 11,550 beneficiary households. This adds up to a cash return from the businesses of at least US$75M /20 years. The business engagement should also generate about US$11.3 million/20 years to the National Forest Fund in taxes and licensing fees.

Confirmations

Our survey of around 831 representatives of households revealed that while many were aware of the enterprises the project intends to implement, actual engagement in EbA-related enterprise activities is very low. The highest engagement was recorded for vegetable production with 30.8% of the respondents reporting being members of a community group that is engaged in this enterprise. Vegetable production is followed by savings and credit groups (14.2%), agricultural marketing (11.6%), forest and forest production and sale (11.2%), and seed production (10.3%). However, the level of engagement varies by region. For instance, URR, CRR-S and LRR had relatively better engagement in the various EbA-related activities compared to CRR-N (Figure 39).

Divergence

1. While MPCs provide an avenue for training, management and group experience, the activities undertaken in MPCs are far from the enterprises being proposed as well as from EbA activities envisaged. Main activities around weaving, tie and dye, selling ice blocks, video clubs, fertilizer sales, soap-making, guest house services, hall rentals, pottery, photocopy services and tailoring are largely not directly related to EbA activities and NR enterprises.
   Furthermore, the MPC target of 21 in the project area cannot be met within the project regions as only 16 MPCs were identified. However, there are some workshops (lower level MPC-type institutions) (see Table 25).
2. The resources allocated in the project for the enterprise establishment is also low. We confirmed that for firewood enterprise. For instance, in the EbA project design the investment cost proposed for the 75 firewood enterprises was USD 0.75 million, hence USD 10,000 per CF. However, our computation even on the lower end estimation showed an investment cost need of about USD 14,000 (D630,000) per enterprise excluding the royalty, NFF contribution and taxes.
3. The net cash return per direct beneficiary household per year is not also as high as anticipated in the project document. For instance, if we take the firewood enterprises as a case, the net return per beneficiary household was found to be about USD 180, much lower than the anticipated USD 330. Unless households are engaged in multiple enterprises, the likelihood of achieving the USD 330 per annum cash return may seem impossible. This estimation even needs a very careful assessment of the actual costs and benefits associated with the enterprises since the above estimates were based on available data from few years back.

Recommendations

1. Value addition to increase both production and quality has to be also an important

avenue to create additional benefits to the community.

2. A strategy needs to be developed on how to integrate CF/CPA enterprises and EbA-related activities into MPCs, particularly with ideas of value addition.

3. A plan on how to engage households in multiple enterprises has to be laid out carefully. This will help to increase the cash return per beneficiary household. Such plans should take into consideration the complementarity between the different enterprises the households will be engaged in. For instance, firewood enterprises and beekeeping could work well together if the time and labor requirements are readily available.

4. There is need to revisit the budgetary allocations for enterprises, after cost and benefit actualization (i.e., after verifying the current costs and returns). As stated earlier, the allocation for firewood enterprises seem to be lower.

5. Food processing as proposed in the project design was not very common; there were some cashew nut-related engagements. However, vegetable production was very popular especially with MPCs. The EbA project needs to consider such activities as easy entry points (possibly low-hanging fruits).

6. Nursery activities were also found to be among the popular areas where people are already active. This could create an avenue to help communities launch enterprises, e.g., production of tree seedlings. Women, youth groups and the MPCs could be instrumental in realizing this potential. Such enterprises could easily be managed by women groups.

7.1.3 Component 3: Policy support, institutional strengthening and knowledge generation for EbA

Table 40 summarizes the key performance indicators, relevant targets and assumptions for the NR business component of the project.

Table 40: **KPIs, sub-indicators and targets for Component 3**

Key performance indicators	Sub-indicators	Targets/Assumptions
EbA integration score of policies, strategies, plans and processes	Number of policies, strategies and plans integrating EbA; Number of EbA protocols developed; Number of national and regional level policy dialogues held on EbA	Integration of EbA, including priority actions and strategic options, into at **least three national-level policies and strategies** included the updated ANR policy, Vision 2020 and proposed national Climate Change Strategy and Action Plan. Sectoral policies, plans and processes for decentralized management of natural resources and community development that are in process of being modified through the GCF project have an **EbA integration score of at least 6**[22]. Increased capacity of MoE staff, including regional-level DoF and DoPWM extension staff, to identify, priorities, design and implement an EbA project. The project will aim to increase the technical capacity of these stakeholders to design, implement and monitor large-scale EbA projects relative to a baseline score measured using capacity assessment questionnaires. This captures building capacity of at least 40 regional-level extension staff in DoF and DoPWM increased to **at least 8/12, relative to a baseline score of 4/12**, measured using Capacity Assessment scorecards
Number of assessments and strategic policy recommendations developed to support integration of large scale EbA into sectoral policies and plans.	Number of EbA-related policy recommendations developed; Number of assessments conducted on the different policies, strategies and plans related to EbA	

Confirmations

Overall, most of the 28 policy instruments reviewed indicated weak recognition and integration of EbA-related parameters. Agriculture and natural resource instruments revealed better integration of EbA elements. See section 5.4 and Table 35.

Divergence

The lowest level administrative boundary available is the district level, thus the village level administrative boundaries are missing. Settlement data are also in point form, as are community-level data. ***The implication of these data gaps is that the production of village level maps, as required by the EbA project document, will be derived from a combination of remote sensing data and district level, point data, and not from pre-existing polygon files.*** Similarly, community forest spatial data is given in point form, therefore it was not easy to define the CF boundaries for mapping and subsequent planning.

Emergence and recommendation

To ensure development of the village level development plans (VDPs) it is important to spatial boundary data of all the CFs and CPAs included in this project. The current information is not polygon data and that may help little as a planning tool.

[22] Sectoral policies, plans and processes were assessed based on 13 thematic areas strongly linked to EbA. These were adaptation/ vulnerability; restoration; agriculture; forests; disaster; risk; management; livelihoods; desertification; food security; water security; employment; enterprises; conservation and resilience. The attributes were scored on an aggerated mean score scale of 10. The higher the score, the stronger emphasis on EbA-related thematic area and the stronger indication of receiving relatively wider recognition in the policy documents. For further details refer to section 5.4 and Table 35

7.2 CONSIDERATIONS ON SAFEGUARDS

Numerous social and environmental safeguards need to be taken into consideration to ensure project sustainability. It is important that the implementation process takes appropriate measures to reduce the likely negative impacts of the interventions.

7.2.1 Environmental safeguards

The following are key environmental concerns that may arise due to project activities.

1. Biomass extraction pressure: a number of enterprises, e.g., fuelwood, timber and Rhun palm involve extractive activities. Biomass materials are transferred from within the ecosystem for human use. This process creates movement of biomass materials which in effect will translocate minerals from the ecosystem. This means that the ecosystem from which the biomass is extracted is going to be poorer unless an appropriate and optimum extraction limit is defined. Such practices could have a significant impact on soil organic matter which is the key component used to hold the limited soil moisture and provide growth nutrients for young seedlings and saplings. If most of the litter is extracted as (dead wood) timber and firewood, there will be no surface cover for the soil. It is also important to note that high-intensity rain which falls within a short period of time, removes soil cover and could have a devastating effect in that it exacerbates surface flow which leads to soil erosion.
   Recommendation: It is important to assess and define the optimum biomass harvest level per ha to reduce the negative effects of potential enterprises on the ecosystem. An extensive assessment has to be conducted to determine the amount of extraction that is sustainable; such in-depth assessments are lacking.
2. Water extraction pressure: The Gambia is among countries which lack adequate drinking water due to the dominance of highly alkaline sea water. Currently, many of the interventions mainly use newly constructed boreholes as sources of water for different purposes, e.g., tree nurseries, vegetable farming and watering of planted seedlings. This activity could reduce the ground water level significantly, thus affecting the water recharge balance. There is therefore need to balance extraction of water for various uses to ensure sustainable supply for other uses, particularly drinking water. Even for the nursery activities, use of ground water should be properly monitored and managed. The following section describes the water needs associated with nursery activities.

Standard EbA Tree Nursery Water Use Estimation: Water is a key component for tree seedlings production. Project nurseries require reliable water supply to execute successful seedling production plans. Clean water for nursery installation is often sourced from rivers, lakes, swamps, dams, boreholes, wells, rainwater harvesting and others. However, in The Gambia, surface water is rarely used as a source of potable water due to saline conditions in the lower parts of River Gambia and its tributaries. The demand for potable water in urban areas, tourism, industry, irrigation and livestock watering is supplied by groundwater sources (FAO 2005). Fortunately, groundwater is available in all parts of The Gambia as the country is in one of Africa's major sedimentary basins referred to as the Mauritania/Senegal Basin. It is characterized by two main aquifer systems with water table depths varying from 10 m to 450 m (FAO 2005). Best practices on managing available water supplies are therefore critical to support production of large quantities of planting materials. There also needs to be consideration for competing water use demands in most African households reduced to about 47 litres per person per day (UNFPA 2002).

This provides calculations on water use for tree seedling production purposes in The Gambia for the EbA project. The estimation recognizes that several factors will influence water utilization for the project planned nursery installation in all project area. These factors are:

i) Season of the year (dry or wet season)

ii) Time of water application during the day

iii) Number and type of seedlings under production

iv) Seedling production method (containerized or bare root)

v) Potting medium (water holding capacity)

vi) Use of shade

vii) Water application techniques and equipment

viii) Availability of storage facilities

Given the many factors varying by site and available expertise of local nursery personnel, practices on water use in tree nurseries tend to vary a lot and a single calculation may not precisely apply for all nurseries. Furthermore, there is an assumption that water requirement is not that huge given that planting material production takes a short time per production batch. The frequency of watering is also not as demanding as that of crops or highly commercial or horticulture nurseries.

Medium to large EbA project nurseries with an estimated capacity of about 50,000 seedlings of at least five major species types taking about 1-year production cycle would use about 2800 m^3/yr of water annually (Table 41). This calculation is based on the following assumptions:

i) Project nurseries produce all planting material in 6 feet x 9 feet pots

ii) Daily application of 200ml of water per pot is sufficient to sustain seedlings healthy growth in 7 dry months of the year (November 10th to June 15th)

iii) Three-time water (200 ml) application per week is sufficient to sustain seedling production for the 5 rainy months of the year (June 16th to November 9th)

iv) Potting medium used offers good water holding capacity (>80%)

v) Non-porous water potting material is used for seedling production

vi) Water storage is sufficient for a single season

Table 41: **Estimated annual water-use for medium to large tree nurseries in The Gambia (using 6 x 9 ft) pot size**

Dry months use: - includes increased demand due to drought and all-days application without fail, plus -non-working days (Ave. daily temp 30°C)					**Rainy/cool months use**: - 3 times application per week (compensated by rainfall events)- (Ave. daily temp 27°C)				
No. of potted seedlings	Water used per pot (mls)	No. of drought days	Total water use (m^3)	Daily Use (m^3)	No. of rainy days	Effective application Days	Total water use (m^3)	Daily Use (m^3)	Total Annual use (m^3)
50,000	200	217	2,170	10	148	63	630	4.26	2,800

Recommendation: Water management and use has to be done in an efficient manner to avoid depletion of ground water in the near future. Determining this requires an appropriate assessment of the groundwater level and also the extent of extraction and use demanded during the project activity implementations. It is also advisable to think of options such as water harvesting to reduce the loss of rainwater and use that efficiently for nurseries and vegetable farming and other tree growing schemes. The technical and financial feasibility of such recommendations need to be done to ascertain what is appropriate in the contexts within which the options have to be used. In addition, where boreholes are considered, an optimal access and use plan has to be developed such that the current domestic users are not inconvenienced while also ensuring there is no over extraction.

7.2.2 Social safeguards

First, if enterprises become profitable, more people could be engaged in the development of such enterprises. This may now create a social tension between those already operating and those who want to engage in the scheme as new. There is need to participatorily define which members among the community would be engaged in the enterprises development. This requires serious considerations of gender, social status (e.g. wealth, political affiliations, etc.) and other socially relevant criteria.

Second, it could be easy to create demand but difficult to sustain the supply scheme considering the slow growth of vegetation in the ecosystem under consideration. Considering The Gambia's population which is largely becoming urban (over 60%) the demand for wood products, in particular for construction, may rise gradually unless technologies replace the demands. However, as it stands now, balancing the demand and supply has to be a priority.

Behavior change by beneficiaries, during and after the project, is key in facilitating understanding and uptake of various elements ranging from enterprises to the concept of sustainability. This ideally implies recognizing the need to strike a balance in the use and accruing of benefits while also maintaining the integrity of ecosystems. Such behavior is key in promoting and inculcating or even growing the present perceptions. The threshold on how communities view their forests' environmental and economic importance is always a difficult balance to strike. This is because they also have to accrue benefits relating to food and income.

Recommendation: Number of enterprises should be guided by the management plans developed for the CFs/CPAs. There has to be a clear and transparent process of selecting groups that need to be doing business on behalf of the community.

Capacity building, which is a core activity within the project framework, should involve a theme focused on building existing knowledge systems (including indigenous) among beneficiaries such that there is a mind shift or solidification of existing know how. Such efforts should focus on areas facing more illegal extraction and intrusion. In many communities in Africa, accrued knowledge is shared in casual communications as well as formal and informal gatherings. As such there is a likelihood of knowledge reaching many individuals.

7.2.3 Policy safeguards

Illegal logging was listed as the major challenge the CFs and CPAs are facing currently. This, as mentioned, was due to poor law enforcement practices within the CFs and limited enforcement capacity in the Forestry department. The same is true on illegal encroachment for farming. Hence, appropriate policy instruments should be put in place to ensure activities damaging the ecosystem are punished and those promoting sustainability are rewarded. This may be strengthened if communities at CF and CPA level do have byelaws that could guide the implementations of such measures. This is important since most of the illegal encroachment

and illegal logging activities may happen through collusion with some people from within the community or with the knowledge of some member of the community.

Recommendation: CFs and CPAs should be encouraged to develop bylaws, including neighboring villages in the landscape, to reduce illegal activities in their forests and protected areas. Provisions should be made at national and regional policy levels to support the efforts of the CFs/ CPAs.

7.2.4 Economic safeguards

The project focuses on improving rural livelihoods of beneficiaries through nature-based enterprises such as bee keeping, ecotourism and tree nurseries. The proposed enterprises will be exposed to trends in consumer needs as well as market dynamics. Goods and services targeted for development, while highly beneficial, are exposed to these drivers. Therefore, the approach to markets should be highly flexible.

Recommendations: Enterprise development should clearly involve participatory market enterprise and development (such as the FAO approach) and as much as possible refer to lessons and experiences from The Gambia or other locations with similar scenarios. This will involve, for example, incorporating features and measures that target consumers. In addition, existing vibrant market channels could be adopted through target beneficiaries. A key example is including nature-based enterprises in MPCs and exploring whether present markets for their other products can adopt nature-based enterprises. Furthermore, target beneficiaries could engage in multiple nature-based enterprises to not only achieve the target income indicators but also diversify and cushion against shifts in sales of goods and services.

7.2.5 Next steps and way forward

This baseline has set the starting situation for EbA in The Gambia. Besides leveraging insights to enhance project implementation, the results will be used in monitoring and evaluation of the project. Figure 43 shows the proposed scheme with yearly measurement of progress including a Mid-Term Evaluation (MTE) and a Terminal Evaluation (TE). The same methodology used in this study could be applied in the monitoring process going forward, with any modifications as necessary.

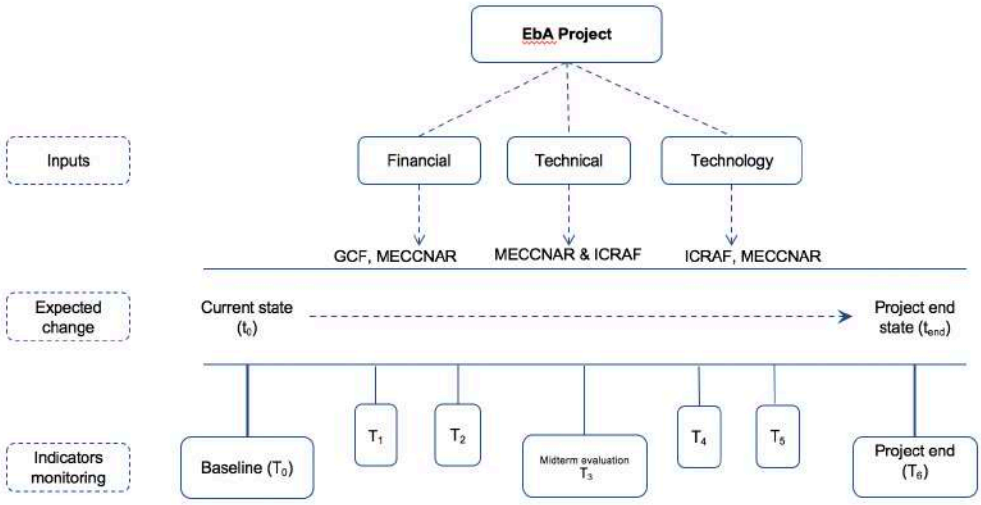


Figure 43: **Schematic for monitoring the progress of the EbA project**

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ANNEXES

ANNEX 1: LIST OF CFS SELECTED FOR THE EbA PROJECT

ASSOCIATED NEW CF	CF AREA (HA)	SETTLEMENT	DISTRICT
Upper River (Basse)			
Balleh Mondeh	86.00	Touba Woppa	Wuli West
Kanjata	47.10	Tambasansang	Tumana
Nafula	106.00	Kumbul	Kantora
Prome galajo bah	34.70	Sare Gubu Basiru	Sandu
Dandinari	119.62	Sare Mamudu	Sandu
	199.62	Sare Mbaye	Sandu
Suyeh Dinka	64.12	Koro Jula Kunda	Jimara
Ngurufaburu	51.77	Sandy Kunda	Jimara
Tambaring Dala	422.00	Limbambulu Yamadou	Wuli West
Bambadala	36.40	Daraman	Wuli West
Wulaba	99.50	Yerobawol	Wuli West
Duboto	50.00	Taibatou	Wuli West
Santoto Wulo	88.47	Touba Wuli	Wuli West

ASSOCIATED NEW CF	CF AREA (HA)	SETTLEMENT	DISTRICT
Upper River (Basse)			
Sibikiling	34.30	Limbambulu Bambo	Wuli West
Timbingiere	51.10	Mbye Kunda	Sandu
Mbelonge Samba	115.00	Changeli Chewdo	Sandu
Laddeh Sabakeh	41.00	Tobi Chindeh	Sandu
Manka-kunda	69.70	Banni	Sandu
Dalanyakoi	38.90	Kassikunda	Kantora
Sutukojoley	52.22	Ndinbu	Kantora
Solley Wulumbango	157.30	Sung Kunda	Kantora
Jambakaray	131.90	Njieley	Kantora
Jallow Kunda	18.20	Buiba Jallow Kunda	Jarra Central
		Buiba Musa Njadoh	Jarra Central

ASSOCIATED NEW CF	CF AREA (HA)	SETTLEMENT	DISTRICT
Lower River (Mansa-konko)			
Nptcheke	86.00	Bajana	Kiang West
Wendo Lamuneh	101.10	Sare Samba(Sarrba Ya)	Kiang East
Nganingkoi	496.90	Batelling	Kiang west
Namba	575.60	Kwinella-Sansankono	Kiang Central
		Tendaba	Kiang Central
WeduNjundu	147.80	Sibito	Kiang Central
WeduNjundu	147.80	Medina	Kiang Central
Sankalan	140.40	Sankandi	Kiang West
Kabaato Purayi	75.14	Nema	Kiang Central
		Bambako	Kiang Central
	57.20	Jabisa	Jarra West
SarakuWulo	56.00	Karantaba	Kiang West
KemmehJani	187.00	Jabisa	Jarra West
SanjallyKonko	71.10	Jomarr	Kiang East
Kunkujangbato	53.00	Si Kunda	Jarra West
FolankoSuto	96.90	Bureng	Kiang West
Banni	321.30	Sutukung	Jarra East
Dowel 1	89.81	Nyawurulung	Jarra East
Dowel 2	63.41	Bantanyima	Jarra East
Benkadee	38.80	Minna	Jarra Central
Tawsirka	98.50	Dasilami Be	Kiang West
Konkoba	210.00	Barokunda	
Wanchakalang	176.80	Manduar	Kiang West
Kankungbato	72.10	KuliKunda	Kiang West

ASSOCIATED NEW CF	CF AREA (HA)	SETTLEMENT	DISTRICT
Central River South (Janjan-bureh)			
Alphasayet	173.90	Daru	Upper Fuladu West
Bamba Kolong	13.80	Bamba Kolong	Niamina East
Bowal	24.50	Boweh Fulbeh	Niamina East
Bundukoilel	66.99	Chargel	Upper Fuladu West
Dongal	226.10	Sare Yoro Glory	Upper Fuladu West
Dongal	226.10	Sare Bakary	Niamini West
Fankata	30.50	Santanto Bubu	Upper Fuladu West
Fautubeh	106.60	Ndorna	Upper Fuladu West
Fula Mandinga	332.04	Kerewan Samba Sira	Lower Fuladu West
Jandam	6.20	Sare Yewtu (Kurkur Bukary Mballow)	Lower Fuladu West
Kaheru	233.01	Ndakaru Kebba Susso	Lower Fuladu West
Kanchellebesh	47.30	Boraba	Upper Fuladu West
Karantaba	13.30	Karantaba	Niamina East
Kobaja	28.00	Madina Dutawally	Niamina East
Kongko Koto	240.00	Sotokoi	Niamina East
Madi Yerro Glori	264.16	Sareh Madi Genteh	Upper Fuladu West
Makuniama	132.50	Kudang	Niamina East
Netokoto	44.70	Kesseri Kunda	Upper Fuladu West

ASSOCIATED NEW CF	CF AREA (HA)	SETTLEMENT	DISTRICT
Central River South (Janjan-bureh)			
Niokolokoba	86.00	Sare Ngai	Lower Fuladu West
Raneru	78.96	Santando Mawdo Bambe	Upper Fuladu West
Sankulenjang	32.60	Konko Fula	Lower Fuladu West
Sellabato	240.00	Sankuleh Kunda	Lower Fuladu West
Sibikrawto	26.30	Buruko	Upper Fuladu West
Sibikuroto	122.20	Tabanani	Niamina West
Sikuba	113.90	Kununku	Niamina East
Tamantu Malang	44.00	Sare Malang	Lower Fuladu West
Tuboo	33.00	Medina Ceesay Kunda	Lower Fuladu West
Waato	40.00	Tubanding	Upper Fuladu West
Wayibiru	206.00	Jahaly	Lower Fuladu West
Wula santo	49.30	Korop	Upper Fuladu West
Wulaba	56.00	Wuring Kunda	Lower Fuladu West
YoroBeri Wulo	113.60	Mbansara	Upper Fuladu West
Ali Jama	33.30	Tabanani	Sami
Banja	52.50	Darusalam	Upper Badibbu
Boka Holl	76.00	Gui Jahanka	Lower Saloum

ASSOCIATED NEW CF	CF AREA (HA)	SETTLEMENT	DISTRICT
Central River North (Kuntaur)			
Buba Wol	4.50	Batti Yungo	Upper Mandibu
Chewen	26.90	Batti Khai	Upper Mandibu
Deg Modal	24.60	Fass/Serm	Upper Mandibu
Demba Benga	43.30	Fitu Wollof	Sami
Denkula	14.00	Konko Duma	Sami
Dinkare	56.00	Timpa	Sami
Ferlo	35.30	Ngeden	Nianija
Gaindeh Njie	65.00	Kerr Ali Jalleh	Upper Badibbu
Gelajo Ndow	45.00	Mbayen Wollof	Niani
Kabba	86.00	Jala Koto	Sami
Kabonbong	20.00	Yona	Sami
Kajakat	786.50	Kayai	Niani
Kaniabe	204.90	Dobo	Sami
Kawral Jokereh Endam	12.60	Sinchu Tamsir	Nianija
Kirangto	51.10	Kayai	Niani
Kolonjulu	12.10	Mbayen Burama	Nianija
Kuntembeh	18.30	Sinchu Demba (Kerr Batch)	Nianija
Kuruwellegi	19.50	Buduck	Nianija
Laddeh Mustapha	8.10	Gingory Mustapha	Niani
Laddeh Nyada Woode	10.00	Nyalal Samba	Sami
Ladeh Poloyee	29.90	Nema	Lower Saloum
Lagal	34.80	Manjakharr	Lower Saloum

ASSOCIATED NEW CF	CF AREA (HA)	SETTLEMENT	DISTRICT
Central River North (Kuntaur)			
Locloc and Douguma	12.40	Nyanga Bantang	Niani
Maridale	50.90	Kujew	Sami
Mbalaru	51.50	Batti Ndar	Upper Mandibu
Ndagen	106.00	Geinge Wollof	Lower Saloum
Niani Marro	29.70	Sanguleh	Niani

ASSOCIATED NEW CF	CF AREA (HA)	SETTLEMENT	DISTRICT
Central River North (Kuntaur)			
Pimmeh	619.90	Simbara Khai	Lower Saloum
Pulaye	76.00	Gui Jahanka	Upper Badibbu
Sidi Wulumbang	114.20	Karantaba Duto Koto	Sami
Sunu Hallal	240.00	Changai Wollof	Sami
Yang	16.80	Kayai	Nianija
Yentirrde Djeri	38.47	Nawel	Niani

ANNEX 2: MOST DOMINANT SPECIES ENCOUNTERED DURING FIELD DATA COLLECTION

Species	Mean Circumference (cm)	Mean bole height (m)	Mean total height (m)	Mean canopy width (m)	Proportion of standing trees >10 cm circumference
Combretum glutinosum	36.26	2.39	7.47	3.87	36.67%
Mitragyna inermis	52.49	2.11	8.86	4.54	7.29%
Lannea acida	42.83	2.76	7.36	3.57	6.99%
Terminalia macroptera	40.77	2.71	9.08	4.97	6.66%
Cordyla pinnata	47.54	2.88	9.60	5.59	6.05%
Lonchocarpus laxiflorus	39.77	2.61	9.74	5.60	5.59%
Borassus aethiopum	46.76	10.11	12.17	4.11	3.73%
Pterocarpus erinaceus	42.91	2.99	9.14	4.30	3.73%
Bombax costatum	37.40	4.40	9.84	4.89	3.69%
Anogeissus leiocarpa	31.57	1.97	10.89	6.86	2.51%
Sclerocarya birrea	50.49	2.39	8.68	5.18	2.25%
Acacia macrostachya	28.72	1.97	5.76	3.83	1.66%
Piliostigma reticulatum	35.45	1.82	5.93	3.60	1.35%
Prosopis africana	56.69	2.70	10.51	5.97	1.22%
Acacia seyal	38.62	1.97	8.00	3.68	0.96%
Spondias mombin	54.47	3.36	10.74	4.93	0.76%

Species	Mean Circumference (cm)	Mean bole height (m)	Mean total height (m)	Mean canopy width (m)	Proportion of standing trees >10 cm circumference
Cassia sieberiana	41.96	1.74	5.82	4.08	0.72%
Lannea microcarpa	57.67	2.10	6.36	4.95	0.72%
Diospyros mespiliformis	49.44	3.21	11.45	6.16	0.63%
Piliostigma thonningii	39.25	2.33	5.56	3.15	0.52%
Ficus capensis	65.74	2.29	10.88	7.85	0.50%
Adansonia digitata	215.67	6.45	17.74	9.65	0.46%
Entada africana	69.86	2.31	8.81	4.10	0.46%
Acacia siberiana	26.79	1.69	5.82	2.93	0.44%
Azadirachta indica	49.93	2.62	7.72	3.79	0.39%
Stericulia stigera	57.65	2.34	7.38	5.12	0.37%
Elaeis guineensis	167.25	4.14	5.63	1.55	0.35%
Gmelina arborea	49.53	3.77	9.47	4.42	0.33%
Khaya senegalensis	70.19	2.87	11.86	6.56	0.31%
Ziziphus jujuba	26.53	2.20	6.33	3.25	0.26%
Vitex doniana	61.55	2.65	7.34	5.32	0.24%
Dichrostachys glomerata	26.34	2.68	7.60	3.45	0.22%

ANNEX 3: PHENOLOGICAL BEHAVIOR OF SPECIES

Species	Flowering	Means of propagation
Acacia albida (Barasango) +*	First flowering occurs in the seventh year and subsequent flowerings occur 1-2 months after the start of the dry season for up to 5 months. The fruits mature about 3 months after flowering. Ripe fruit falls towards the end of the dry season. The seeds are dispersed by animals, which eat the pods.	Potted plants and direct sowing and vegetative propagation methods include cuttings, grafting and multiplication by root fragments. However, direct seeding is not advisable due to the high failure rate. The seed must be removed from the pods immediately and after lengthy storage prior to sowing; seeds should either be boiled for 7-15 minutes and then cooled slowly or have boiling water poured on them followed by soaking for 24 hours. A solution of 66% sulphuric acid can also be poured on the seeds, left for 4-5 minutes and then rinsed off with water. These treatments give 40-60% germination in 6-30 days. Mechanical scarification is reported to yield 95% germination within 8 days of sowing.

Species	Flowering	Means of propagation
Adansonia digitata	In Africa, the tree flowers from October to December and fruits from April to May. It may take 16-23 years before a tree produces its first flower. The flowers are mostly pollinated by bats (*Ephormorphus wahlbergii* and *Rousettus aegyptiacus*).	Artificial propagation is by direct sowing of the seed. Pre-treatment is not necessary. However, germination is more successful if the seeds are nicked or boiling water is poured on them, after which they are left to soak for 24 hours. Soaking in water overnight softens the seed coat and makes water absorption for germination easy. When the seed coat is nicked it may take only 6 days to germinate. Germination is usually 90-100% and takes 1-3 months. It is preferable to sow the seed directly into the soil or straight into polythene tubes.
Anacardium occidentalis (Cashew)	The tree comes into flowering in 3-5 years. The tree fruits well if rains are not abundant during flowering and if nuts mature during the dry period; the latter ensures good keeping quality.	Seeds and vegetative materials propagate. The seeds should be of good shape and should not float on water. They are sown at stake (in-situ) 5-8 cm deep in planting holes 30 cm wide. Vegetative methods of propagation include layering (air-layering, ground layering), budding and grafting (veneer grafting, side grafting, whip grafting, cleft grafting, tip grafting).
Anogeissus leicarpus	Flowers appear all year round but are most abundant during the rainy season, at the end of the dry season, just after coming into leaf. Fruiting by adult trees is abundant around this period (March and June). While the tree may flower several periods within a year, only one flowering results in fruiting.	The tree is propagated by direct sowing and seedlings and has a low germination rate (5%). The poor germination results from the low fertility rate (5% on average). Seeds do not require treatment. Seeds lose their viability after 6 months but transplant well (only 10-15% of the seed prove to be viable). The seedlings can sprout below mature trees. The tree is fire-resistant but sensitive to fire. The plant is slow growing following establishment. This is the principal reason for minimal regeneration in the wild. Up to now harvesting is mainly from the wild with some commercial cultivation in Mali and Burkina Faso.
*Bombax costatum**	Flowers after leaf fall in November to February. Fructifies, according to site and conditions, from the sixth year on, but very irregularly. Fruit formation begins around August and September.	Direct seeding is a preferred propagation mode; however, wildlings may also be used. The seedlings are difficult to plant in spite of their vigorous rooting ability. Natural regeneration is easy and abundant when sufficiently protected against fire and livestock.
Borassus aethiopum (Rhun palm) +*	The palm starts flowering and fruiting 12-20 years after germination, usually in the dry season.	Rhun palm is propagated solely by seed. Large healthy seeds are sown 10 cm deep and spaced 3-6 m apart, preferably directly in the field because seedlings are difficult to transplant. They are usually planted in groups, in order to facilitate tapping.
*Ceiba pentandra**	The tree starts producing fruits when 4-5 years old. Leafing and flowering varies from drier (regular) to moist areas (irregular) and occurs during the leafless period. Fruits ripen 80-100 days after flowering. Flowers open in the evening and the trees may only bloom once every five years. The tree requires abundant rainfall during flowering and fruiting.	Generally, seed propagated, C. pentandra can also be easily raised by cuttings. Natural reproduction from seed is unknown and there is little scope of reproduction from self-sown seeds. Without pre-treatment seeds germinate slowly (less than 10% after one month on sowing). Germination may proceed for 3-4 months. Subsequent growth is relatively fast. Seed viability diminishes with storage. Seeds maintain viability for up to one year in normal conditions. Number of seeds per kilogram ranges from 10,000 to 45,000.

Species	Flowering	Means of propagation
Cola cordifolia	Fruiting occurs mainly between July and August in The Gambia. Growth can take 7-10 years before fruit and seed bearing.	Propagation is by seeds or cuttings.
Combretum glutinosum	In West Africa the flowers tend to appear between December and March, but this varies from area to area and flowers may appear as late as July. Generally, flowering and seed dispersal occurs during the dry season. Fire may be a trigger to flowering; the earlier the bush fires, the earlier the flowering. It bears fruits generally in January and fruiting lasts until November. Seeds are collected by shaking the branches of the tree.	Propagation is by seed which involves removing the covering structure by manually pulling the opposite wings. This improves the germination rate. Optimum germination temperature is 250°C to 300°C. Germination varies with temperatures, e.g., 70% rate 150°C to 350°C. In addition, the light regime tends to affect the germination with, for example, 12/12 regime at 260°C resulting in a 95% germination rate.
Cordyla pinnata (Duto) + *	Flowering varies depending on the year and tends to occur mid-dry season to rainy season, before or when leafing.	Tree is propagated by seeds. Seed survival tends to vary with temperature. Minimal survival among seeds beyond 90 days for storage at 300°C or 150°C and 60 days at 50°C. The weight of 1000 seeds is about 10.4 kg.
Daniellia oliveri	Flowers during the first half of the dry season from October to March, usually when trees are leafless or are developing new leaves, and fruits from January to June.	Natural regeneration often happens easily. Seeds may also be sown directly into the field, propagated by root suckers. Seeds should be soaked in water for 72 hours before sowing. The germination rate is 75-95% in 2-3 weeks. Growth in the nursery is slow and irregular. Transplanting of seedlings is usually not very successful; tap roots are formed rapidly, and frequent pruning of the roots is essential for successful planting.
Ficus capensis (Ficus sur)	Flowers are borne in hollow receptacles called figs or syconia. Fruiting (production of fruit-like structure – syconimum) is continuous throughout the year but tends to increase during the warm, wet season. There is a build-up of seeds and pollinators during this period. Initial flowering following planting of the syconimum (Phenophase) takes around 60 days.	Propagated by seed with dispersal facilitated by birds and mammals. The seed germinates best at 200°C. Sowing can be done in a fine medium and uncovered, and should be soon after collection. Germination is quick, and transplanting can be done 15 to 20 days once seedlings have grown to a metre. Once transplanted, e.g., in large containers, saplings' growth is rapid at about a metre or more in the second year. The tree can also be propagated by stem cuttings and wildings. Mature trees can be transplanted, although severe pruning may be necessary. The tree is moisture trapping and does not compete with agricultural crops. The rooting is, however, aggressive and can crack walls and raise flagstones. The tree grows to 10-12 m.

Species	Flowering	Means of propagation
Gmelina arborea (Gmelina)	Seed years recorded from various locations show that the tree seeds well every year. There are 2 peak periods for floral bud burst, which may vary from year to year, and with the local climatic conditions. The first flowers are borne 3-4 years after planting and, in nature. Mature fruits are produced one week after flowering peak and fruiting may be spread over a 2-month period. In India, the species flowers from February to March and fruits ripen from the end of April to June.	Normally, seed is collected from the ground, de-pulped and the stones are dried. Pre-treatment is not necessary. For quick germination, the seeds should be soaked for 48 hours. The seeds germinate within 20-50 days under ideal conditions; the average rate for a healthy seed lot is 60%. Trees can be raised easily by transplanting, which is carried out in the rainy season, or by direct sowing in lines; the latter has proved to be more successful in some instances. Large cuttings planted during the rainy season do well.
Khaya senegalensis (Jalo) +*	Flowering shortly before or early in the rainy season, the fruit apparently remaining on the tree throughout the dry season. When the fruit ripens, the color changes from grey to black. Begins to bear seed when the tree is 20-25 years old. Seed may be dispersed up to 100 m by prevailing winds.	Natural regeneration from seed is poor, although it grows from pre-treated seed and transplants well. Seed yield is usually heavy. Germination is epigeal, about 90% of fresh seed germinate within 18 days. Seedlings can survive light to moderate shade. Containerized stock is best; however, bare-root and stump plantings give satisfactory results. Reproduction may also occur from root suckers. Establishment of new seedlings can be encouraged by disturbances such as cultivation or prescribed fire just before seed fall. After seedlings have emerged, a partial cut applied to allow light to reach the forest floor improves seedling establishment before the final harvest of the existing stand.
Mangifera indica (Mango)	Individual trees often flower irregularly; some trees do not flower for periods of 10-20 years, sometimes even longer. Flowering starts at the beginning of the rainy season and fruits ripen at the end of the rainy season. The time of development after fertilization to maturity of fruit is 2-5 months, depending on the cultivar and temperature. Fruiting is often biennial; some cultivars, in addition to the main fruiting seasons, set a few fruits throughout the year.	Worldwide, most mangos are propagated from seed. Preferably, large and fully developed stones should be sown. Careful removal of the endocarp, releasing the seed, results in earlier and more uniform germination, producing seedlings with a straight stem and roots. However, this method is not feasible for commercial production of planting stock. Stones should be sown under shade, and seedlings also require a certain amount of shade. Those that are raised in nursery beds can be transplanted without much difficulty before the taproot has developed to any great extent. However, seedlings raised in baskets or containers are preferable. Selected varieties may also be propagated vegetatively by grafting the rootstock of the same or other Mangifera species and by budding.
Moringa oleifera (Nabedayo)	Young trees raised from seed start flowering after 2 years. In trees grown from cuttings the first fruits may be expected 6-12 months after planting. Flowering often precedes or coincides with the formation of new leaves.	Easily established by cuttings or by seeds. Seeds can be sown either directly or in containers. No seed pretreatment is required, and seeds sprout readily in 1-2 weeks. Plants raised from seed produce fruit of unpredictable quality.

Species	Flowering	Means of propagation
Parkia biglobosa (Netto)+ *	First fruit at 5-10 years; they vary in precocity; fruits start to ripen just before the first rains and continue over most of the season. It has 2 types of seeds: reddish-dark and dark (black); both occur in every pod, and the ratio of their number varies from 1:20 to 1:5; the reddish-dark seed have a thinner coat and germinates earlier than the dark seed if the seeds are not acid treated before sowing.	Can be established vegetatively in nursery beds by grafting or budding, or by rooting adult cuttings. The dark seeds have a hard seed coat and require various pre-treatments to ensure good germination rates; acid treatment is the best method; next is by chipping the seeds at one end. Germination can also be improved by scalding the seeds for about 7 minutes and then cooling or soaking them in hot water overnight; the germination rate is usually 75%.
Pterocarpus erinaceus (Keno) +*	The trees flower when leafless, usually in December- February, before developing new leaves, but sometimes inflorescences develop together with young leaves. The tree may produce so many fruits that when the fruits are green it looks as if the tree is covered with leaves. Young leaves normally develop after the fruits have ripened and have turned brown.	Propagated by natural regeneration, cuttings or direct sowing. Seedling with epigeal germination.
Saba senegalensis	This hermaphroditic liane flowers all year through.	Direct seeding and natural regeneration methods are employed in propagating the species.
Terminalia macroptera	Flowering of trees is often in the second half of the dry season, usually just after the development of new foliage. In Ghana, it flowers in February-March, in Nigeria in February-May, and fruits develop 2–5 months, later but persist for a long time on the tree.	Can be propagated by fruits or cuttings. It is recommended to pre-treat the fruits by clipping both ends before sowing.

+ Species that communities said are becoming scarce
** Species that are protected as per the Forest Act 1998*

ANNEX 4: THREATS TO CPAS AND PARKS OF THE GAMBIA

Threat category and sub-categories	KWNP	Kiang Bamako CWR	Barrow Kunda CWR	Chamen Nianija CWR	Kass Wolof CWR	Genji Wolof CWR	Demba Kunda CWR	Badari CWR
Residential and commercial development within a protected area								
Housing and settlement effects	Yes	No	Yes	No	No	No	Yes	Yes
Commercial and industrial areas effects	No	No	No	No	No	No	No	No
Tourism and recreation infrastructure effects	Yes	Yes	No	No	No	No	Yes	No
Agriculture and aquaculture within a protected area								
Annual and perennial non-timber crop cultivation	Yes	No	Yes	No	No	Yes	Yes	Yes
Drug cultivation	No	No	No	No	No	No	No	No
Wood and pulp plantations	Yes	No	Yes	No	No	Yes	No	Yes
Livestock farming and grazing	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Marine and freshwater aquaculture	No	No	Yes	No	No	No	No	No
Energy production and mining within a protected area								
Oil and gas drilling	No	No	No	No	No	No	No	No
Mining and quarrying	No	No	No	No	No	No	No	Yes
Energy generation	No	No	No	No	No	No	No	Yes
Transportation and service corridors within a protected area								
Roads and railroads (include road- killed animals)	Yes	No	No	No	No	No	Yes	No
Utility and service lines (e.g. electricity cables, telephone lines)	No	No	No	No	No	No	No	No
Shipping lanes	No	No	No	No	No	No	No	No
Biological resource use and harm within a protected area								
Hunting, killing and collecting terrestrial animals (including human/wildlife conflict)	Yes	Yes	No	No	No	Yes	Yes	Yes
Gathering terrestrial plants or plant products (non-timber)	Yes	No	Yes	No	No	Yes	Yes	No
Logging and wood harvesting	Yes	No	Yes	No	No	Yes	Yes	No
Fishing, killing and harvesting aquatic resources	Yes	Yes	Yes	No	No	Yes	Yes	No

Threat category and sub-categories	KWNP	Kiang Bamako CWR	Barrow Kunda CWR	Chamen Nianija CWR	Kass Wolof CWR	Genji Wolof CWR	Demba Kunda CWR	Badari CWR
Human intrusions and disturbance within a protected area								
Recreational activities and tourism	Yes	Yes	No	No	No	No	Yes	No
War, civil unrest and military exercises	No	No	No	No	No	No	No	No
Research, education and other work-related activities in protected areas	Yes	No	Yes	No	No	No	No	No
Activities of protected area managers (e.g., construction or vehicle use)	Yes	No	No	No	No	No	No	No
Deliberate vandalism, destructive activities or threats to protected area staff and visitors	Yes	Yes	No	No	No	No	No	No
Natural system modifications								
Fire and fire suppression (including arson)	Yes	No	No	Yes	No	Yes	Yes	Yes
Dams, hydrological modification and water management/use	No	No	No	No	No	No	No	No
Increased fragmentation within protected area	Yes	Yes	No	No	No	Yes	No	No
Isolation from other natural habitat (e.g., deforestation)	Yes	Yes	No	Yes	No	Yes	Yes	No
Natural system modifications								
Other 'edge effects' on park values	Yes	No	No	Yes	No	No	Yes	No
Loss of keystone species (e.g., top predators, pollinators, etc.)	Yes	Yes	No	No	No	Yes	Yes	No
Invasive and other problematic species and genes								
Invasive non-native/alien plants (weeds)	Yes	Yes	No	No	No	Yes	No	No
Invasive non-native/alien animals	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Pathogens (non-native or native but creating new/increased problems)	Yes	Yes	No	No	No	No	No	No
Introduced genetic material (e.g., genetically modified organisms)	Yes	Yes	No	No	No	No	No	No
Pollution entering or generated within protected area								
Household sewage and urban waste water	No	No	No	No	No	No	No	No
Sewage and waste water from protected area facilities (e.g., toilets, hotels, etc.)	No	No	No	No	No	No	No	No

Threat category and sub-categories	KWNP	Kiang Bamako CWR	Barrow Kunda CWR	Chamen Nianija CWR	Kass Wolof CWR	Genji Wolof CWR	Demba Kunda CWR	Badari CWR
Human intrusions and disturbance within a protected area								
Industrial, mining and military effluents	No	No	No	No	No	No	No	No
Agricultural and forestry effluents (e.g., excess fertilizers or pesticides)	Yes	Yes	Yes	No	No	No	Yes	No
Garbage and solid waste	No	No	No	No	No	No	No	No
Air-borne pollutants	No	No	No	No	No	No	No	No
Excess energy (e.g. heat pollution, lights etc.)	Yes	Yes	No	No	No	No	Yes	No
Geological events								
Volcanic activity	No	No	No	No	No	No	No	No
Earthquakes/tsunamis	No	No	No	No	No	No	No	No
Avalanches/landslides	No	No	No	No	No	No	No	No
Erosion and siltation/deposition (e.g. shoreline or riverbed changes)	Yes	Yes	Yes	No	No	No	Yes	No
Climate change and severe weather based threats								
Habitat shifting and alteration	Yes	No	No	No	No	No	Yes	No
Periods of drought	Yes	Yes	No	No	Yes	Yes	Yes	No
Temperature extremes	Yes	Yes	No	No	Yes	Yes	Yes	Yes
Storms and flooding events	Yes		No	No	No	No	Yes	No
Specific cultural and social threats								
Loss of cultural links, traditional knowledge and/or management practices	Yes	Yes	Yes	No	Yes	Yes	Yes	No
Natural deterioration of important cultural site values	Yes	Yes	Yes	No	No	Yes	Yes	No
Destruction of cultural heritage buildings, gardens, sites, etc.	Yes	Yes	No	No	No		No	No

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