

**SANMORA:
SUSTAINABLE FOREST MANAGEMENT**

FINAL REPORT

OF A STUDY

BY

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SECOND NATIONAL FADAMA BDEVELOPMENT PROJECT
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Table of Contents

List of Tables	ii
List of Figures	ii
List of Acronyms	iii
Executive Summary	iv
Chapter 1: Introduction	1
1.1 Background Information.....	1
1.2 Objectives of the GEF Intervention.....	1
1.3 Study Justification	2
1.4 Objective of the Study	2
1.5 Scope of Work.....	2
1.6 Structure of the Report	3
Chapter 2: Project Environment.....	4
2.1 General Description of the Study Area.....	4
2.2 Climate and Meteorology	4
2.3 Geomorphology and Soils	6
2.4 Vegetation	7
Chapter 3: Study Design	8
3.1 Consultations and Preliminary Survey	8
3.2 Field Survey.....	8
3.3 Biodiversity Studies.....	8
3.4 Inventory of Flora and Fauna	9
3.5 Reconnaissance Survey For Site Mapping	9
3.6 Participatory Rural Appraisal Survey.....	12
Chapter 4: Results and Discussions	13
4.1 Demography and Livelihoods	13
4.2 Social Network	16
4.3 Critical Environmental Problems in the Community	17
4.4 Traditional Approaches to Forest Conservation	17
4.5 Livelihoods Activities and the Forest Reserve	19
4.6 Awareness of the Proposed Community Forest.....	21
4.7 Community Forest Management	22
4.8 Inventory of Flora and Fauna	23
4.9 Production of an up to date map of the proposed Sanmora Community Forest	33
4.10 Analysis of Inventory	33
Chapter 5: Operational Management Plan for the Forest Reserve	35
5.1 Five Year Operational Management Plan.....	35
5.2 Division of the proposed forest reserve into management units	35
5.3 Status of the Growing Stocks	35
5.4 Action Plan 2009 -2013.....	37
5.5 Duties and Functions of the Community Forest Management Committee.....	45
5.6 Forest Management Programmes	48
5.7 Criteria for Species selection.....	48
5.8 Challenges to Successful Implementation and Solutions	49
5.9 Capacity Development and Implementation Arrangement.....	49
Chapter 6: Conclusion and Recommendations	50
6.1 Conclusion.....	50
6.2 Recommendations	50
Annex 1: Plan Production	51
Annex 2: References	52
Annex 3: Key Personnel	53

List of Tables

Table 2.1: Mean Annual Climatological Data over the Study Area.....	4
Table 2.2: Result of In-situ check on Controls.....	11
Table 4.1: Distribution of species among families in Sanmora Community Forest.....	25
Table 4.2: Percentage distribution among species in Sanmora Community Forest.....	27
Table 4.3: Principal Non-Timber Forest Species	29
Table 4.4: Short listed Non-timber Forest Products in Sanmora Community	29
Table 4.5: Animal Species Inhabiting Samora Forest (Birds).....	31
Table 4.6: Animal Species Inhabiting Samora Forest (Mammals and Reptiles)	33
Table 4.7: Coordinates of Sanmora Forest Boundary Beacons.....	33
Table 4.8: Analysis of Result	34
Table 5.1: Criteria for Selection.....	49

List of Figures

Figure 2.1: Map of Irepodun Local Government Area Showing the Study Area	5
Figure 2.2: Fadama Farm with a Mixture of Corn and Okra at Sanmora.....	7
Figure 3.3.1: Diagram Showing Principle of Total Station Observation	11
Figure 4.1: Gender Distribution of Respondents in Sanmora	13
Figure 4.2: Age Class Distribution of Respondents in Years.....	13
Figure 4.3: Marital Status of the Respondents	14
Figure 4.4: Educational Status of Respondents.....	14
Figure 4.5: Monthly Income Class Distribution of Respondents	15
Figure 4.6: Sources of Income	15
Figure 4.7: Duration of Residence of Respondents in the Community in Years	16
Figure 4.8: Membership of Social Organisation	16
Figure 4.9: Critical Environmental Problems	17
Figure 4.10: Planting of Trees by Individuals.....	17
Figure 4.11: Reasons Why Individuals Plant Trees	18
Figure 4.12: Types of Tree Planted or Retained by Individuals.....	18
Figure 4.13: Benefits Obtained from the Forest Surrounding the Community	19
Figure 4.14: Potential Benefits of the Community Forest to Individuals.....	20
Figure 4.15: Potential Benefits of the Proposed Forest to the Community.....	20
Figure 4.16: Multiple Benefits obtained by the Respondents	21
Figure 4.17: Awareness of the Proposed Community Forest.....	21
Figure 4.18: Source of Information about the Proposed Community Forest	22
Figure 4.19: Management Approach for the Community Forest	22
Figure 4.20: Willingness to Participate in the Management of the Community Forest	23
Figure 4.21: Management Activities Community Members will like to Join	23
Figure 4.22: Life Form Distribution Among Flora Species Within the Study Area.	24
Figure 4.23: Growth Status of Tree Species within the Proposed Community Forest Area.	30
Figure 5.1: Map of Sanmora Community Forest Showing Management Subdivisions.....	36
Figure 5.2: Proposed Community Forest Management Committee for Sanmora Community Forest	

List of Acronyms

ADP	Agricultural Development Project
CBD	Convention on Biological Diversity
CEMP	Critical Ecosystem Management Project
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EMS	Environmental Management System
EPA	Environmental Protection Activity
FAO	Food & Agricultural Organisation
FCA	Fadama Community Association
FGDs	Focus Group Discussions
FGDO	Fadama GEF Desk Office/Officers
FMAWRRD	Federal Ministry of Agriculture, Water Resources and Rural Development
FMEHUD	Federal Ministry of Environment; Housing and Urban Development
FUA	Fadama Users Association
FRUG	Fadama Resource Users' Group
GEF	Global Environmental Facility
GIS	Geographic Information System
GPS	Global Positioning Systems
LDPs	Local Development Plans
LGA	Local Government Area
IDA	International Development Association
IPM	Integrated Pest Management
IT	Information Technology
LDFC	Local Fadama Development Committee
LDP	Local Development Plan
LFD	Local Fadama Desk
LFDC	Local Fadama Development Committee
LFDO	Local Fadama Development Office/Officer
M&E	Monitoring and Evaluation
MIS	Management Information System
NFDO	National Fadama Development Office
NFDP	National Fadama Development Project
NFTC	National Fadama Technical Committee
NGO	Non-Governmental Organization
NPC	National Project Coordinator
NRM	Natural Resource Management
NTFPs	Non-Timber Forest Products
PCU	Projects Coordinating Unit
PME	Participatory Monitoring and Evaluation
PR	Participatory Rural Appraisal
RBDAs	River Basin Development Authorities
SFDC	State Fadama Development committee
SFDC	State Fadama Development Committee
SFDO	State Fadama Development Office
SFEO	State Fadama Environmental Officer
SWS	State Watershed Sub-committee
TOR	Terms of Reference
UNFCCC	United Nations Framework Convention on Climate Change
UNCCD	United Nations Convention to Combat Desertification

Executive Summary

Sustainable forest management is one of the main activities in integrated ecosystem management at the watershed level. It is a location-specific activity aimed at providing sustained ecological services and improving the productivity of the *Ajasse Ipo* watersheds (Fadama areas). Sustainable management of *Sanmora* forest will, therefore, serve as a test sample for further expansion of the Osin River watershed protection, which is expected to positively impact Fadama resources and by extension, the livelihoods of Fadama communities.

The objective of this study/survey is to provide data for the preparation of a management plan that will serve as a guide for the sustainable management of the *Sanmora* Forest by the community, using a community based forest management approach. It also involves identifying capacity building and empowerment needs of the community to manage the forest.

Sanmora community is located in Irepodun Local Government Area of Kwara State, which lies within Latitudes $8^{\circ} 12' 59''$ to $8^{\circ} 21' 45''$ N and Longitudes $4^{\circ} 41' 30''$ to $4^{\circ} 56' 25''$ E.

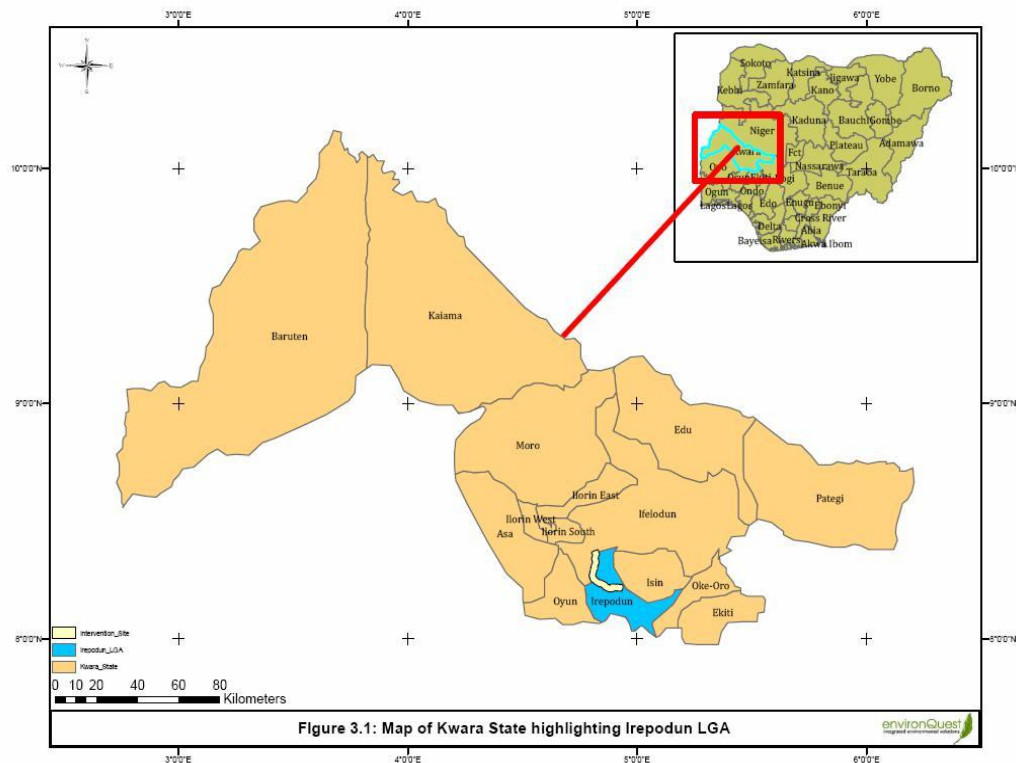


Figure ES 1: Map of Kwara State Highlighting Irepodun LGA

The community is small with an estimated population of 1,143 (NPC 1996). There is currently no designated community forest in Sanmora. However, the community is surrounded by 27ha (0.27km²) of private owned forest estate. This forest estate lies within the GEF intervention site, contiguous to Ajasse-Ipo community forest, within the Guinea Savanna vegetation zone.

The forest consists primarily of clusters of teak (*Tectona grandis*) stands at various stages of degradation. Other indigenous species include *Danielia olivera*, *Percopsis alaata*, *Terminalia spp.*, *Hymenocardia acida*, *Parkia biglobosa* and *Vitellaria paradoxa*. Common herb species include *Ageratum conyzoides*, *Pennisetum spp.*, *Tridax procumbens*, *Phyllanthus amarus*, *Aspilia Africana* and *Scoparia dulcis*. The forest currently has no management plan and there are no records of deliberate management interventions.

A biodiversity study was adopted to: provide data on the floristic and fauna composition and structure; determine the population density of the key economic plant species within the area; evaluate the level of degradation of vegetation; and suggest measures to conserve or restore the ecosystem. A total of 28 sample plots, measuring 11,200m² were enumerated, representing approximately 4% of the total land area. The enumeration was carried out twice; immediately after the annual bush burning and after the sprouting of the burnt vegetation (December, 2008 and February, 2009). This influenced the type of vegetation observed at each period.

A total of 76 floristic species were recorded from the sample plots among 32 families. Six groups of family abundance were recorded with Euphorbiaceae being the most abundant family (25%) followed by Asteraceae, Caesalpinoideae, Mimosoideae and Verbenaceae (18.75%); Combretaceae, Fabaceae/Papilionoideae and Rubiaceae (15.63%); Moraceae and Morphospecies constitute 9.38% each, while Anacardiaceae, Bignoniaceae, Meliaceae, Sterculiaceae and Tiliaceae were 6.25% each. Other families such as Amaranthaceae, Annonaceae, Arecaceae, Athyriaceae, Caricaceae, Chrysobalanaceae, Convolvulaceae, Cochlospermaceae, Guttiferae, Hymenocardiaceae, Loganiaceae, Malvaceae, Ochnaceae, Poaceae, Rahmnaceae, Sapindaceae and Sapontaceae were 3.12% each. Trees constituted the majority (79.94%) form of vegetation, shrubs constituted 15.7%, while herbs were 4.1%, grasses 0.34% and climber 0.1%. The average number of stems per hectare was 2,075. The high stem distribution is attributed to trees regeneration following cutting for farming or grazing by cattle. Average volume per hectare is 6.16m³; the minimum and maximum values being 1.9m³ and 17m³. Allowable cut per hectare per year is 0.82 m³. Thus commercial logging is presently not feasible due to poor stocking, young and deformed trees.

Despite human interference, the area is inhabited by many species of wild animals including birds, mammals and reptiles. 60 species of birds from 32 families, 8 species of mammals belonging to 6 families and 3 species of reptiles belonging to 3 families were recorded. The forest provides cover to abundant populations of birds (some of which are endangered species), green monkeys, hare, warthog and grasscutter. The forest holds great potentials for development into a wildlife sanctuary (conservation area) if necessary protective and funding measures are put in place.

An operational management plan from 2009-2013 was developed in consultation with members of the communities adjoining the forest reserve; Sanmora, Agbeola, Iludun Eju and Ajase Ipo. For ease of management and referencing the forest area was divided into four compartments (A,B,C,D) each of about seven hectares. The division was based on uniformity of vegetation cover, species composition and topography. Further subdivision into sub compartments was not feasible due to limited size of the forest. The management plan outlines activities for restocking and conserving resources within the forest. To implement the management plan, a Community Forest Management Committee should be established. The committee should comprise major interest group including:

- Community-Based Associations/Institutions
- Forestry and Fadama field staff on ground at Sanmora
- Academic and research Institutions
- Zonal forestry and Fadama officers at Ajasse - Ipo.
- Representatives of Sanmora Fadama Users Group.
- Kwara State Fadama Unit and Department of Forestry
- High Chiefs of Sanmora Land
- His Royal Highness the Oniju of Eju Land, Sanmora

This committee will be expected to give the overall direction for the proper management of the forest, including conflict management/resolution. To harmonise concurrent management activities and ensure that objectives of the management plan are met, a yearly management plan was developed.

Six species including one exotic and five indigenous ones are selected for restocking/enrichment planting in the community forest. They are:

- *Tectona grandis* (teak)
- *Khaya spp* (Mahogany)
- *Parika biglobosa* (locust bean)
- *Afzelia spp* (Apa)
- *Vitellaria paradoxa* (shea butter)
- *Vitex doniana*

Criteria for their selection include multiple uses, adaptability to ecosystem, valuable native species, livelihood support, unattractiveness to loggers, and community acceptability.

Hurdles to successful implementation of the management plan include farm encroachment, illegal logging, cattle grazing, and bush burning. Suggested mitigation measures include prohibition of such activities, arrest and prosecution of offenders, intensive patrol of the forest reserve, relocation of farmers currently within the reserve, and, fire tracing and boundary fencing amongst others.

Capacity challenges to the successful implementation of the management plan include knowledge gaps in species identification, record keeping, forest protection, and community forest management. Recommended capacity development plans include training in record keeping, forest protection techniques, study trips of other community forest management programs amongst others.

The following recommendations are also made:

- The CFMC should be carefully selected to reflect a balanced representation of all interest groups.
- Inauguration of CFMC should be done early enough to allow a smooth take-off of the project activities.
- The promulgation of community forest byelaws should be immediate, thorough and broad based.
- Timber exploitation in the forest area is not feasible for now. Therefore it should be outlawed for at least ten years if the protective functions goal is to be achieved
- Grazing, farming and bush burning should be totally prohibited within and around the forest area.
- Sand mining and charcoal burning should be stopped within the forest area.
- Benefit sharing arrangement/formula should be thoroughly debated and mutually agreed by all stakeholders.
- A dedicated community development account should be created into which the proceeds of forest output will be deposited. Such account is to be administered by trusted and respected members of the community. Approval to draw from the account should be as agreed at CFMC meetings attended by majority of the members.
- Stock taking should be done in each compartment at least twice within the life span of this plan.
- Project performance appraisal and evaluation should be conducted every two years.

Chapter 1: Introduction

1.1 Background Information

The Federal Government of Nigeria (FGN) has secured an International Development Association (IDA) facility to implement the Second National Fadama Development Project (Fadama II), which is aimed at improving the income of 2.3 million rural households, whose livelihoods depend directly or indirectly on Fadama activities. The proposed Global Environment Facility (GEF) co-financed component of the Fadama II project will assist government in its effort to improve Fadama productivity by ensuring the continual provision of ecological services. This project will provide the incremental costs for six of the 18 states in the Fadama II project. The target beneficiaries include both members of the Fadama Community Associations and other communities located around the intervention sites.

Fadama is the Hausa name for irrigable lands or flood plains and low-lying areas underlined by shallow aquifers. They are found along Nigeria's major rivers (e.g. Niger and Benue) and wetlands (e.g. Hadejia-Nguru). Fadamas play an important role in the recharge of shallow groundwater systems through infiltration. Prior to their conversion to cultivation, Fadama lands supported highly productive natural vegetation consisting of dense acacia scrubland, open grassland, and seasonally or permanently flooded open bodies of water supporting dense emergent vegetation, including rushes, sedges and reeds. Furthermore, Fadama lands provided water and forage for pastoral livestock during dry seasons. Fadama lands also supported large and diverse resident or transient wildlife, including herbivores, carnivores, reptiles and migratory birds.

The objective of Fadama II is to sustainably increase the incomes of Fadama users - those who depend directly or indirectly on Fadama resources (farmers, pastoralists, fishers, hunters, gatherers, and service providers) - through empowering communities to take charge of their own development agenda, and reducing conflict between Fadama users. The project will take a demand-driven approach whereby all users of Fadama resources will be encouraged to develop participatory and social-inclusive Local Development Plans (LDPs). The LDPs will provide the basis for support under the project.

To complement Fadama II and ensure long term sustainable management of Fadama lands, the FGN requested a grant support from the Global Environment Facility. The GEF intervention would target four hundred and sixty thousand (460,000) beneficiaries; thus ensuring the productivity of Fadama lands and the livelihood systems they support through sustainable land-use management. This objective will be achieved through sustainable watershed management, river basin and forest/woodland management, capacity enhancement at the national, state and local government levels, and support to Fadama communities for sustainable land management. By the end of the project it is expected that sustainable land use management practices would have been adopted by beneficiaries in the target areas.

1.2 Objectives of the GEF Intervention

The broad objective of the GEF Component of *Fadama II - Critical Ecosystem Management Project (CEMP)* is to maintain the productive and ecological health of the Fadama resources base, in order to enhance the productivity of the *Fadama* areas and the livelihood systems they support, through sustainable land-use and water management.

The GEF component will address sustainable land management practices by restoring watershed functions, stabilizing soil loss, encouraging riverbank protection, reducing resource use conflicts and protecting biological diversity in *Fadama* ecosystem. GEF intervention will also assist the FGN in her effort to improve capacity to manage and improve the productivity of Fadama resources by ensuring that the integrity of the ecosystem and securing the ecological services they provide from threats stemming from competing land use for agriculture, grazing etc.

The project, in addition, supports Nigeria's commitment to global environmental conventions including the Convention on Biological Diversity (CBD), the United Nations Framework

Convention on Climate Change (UNFCCC) and the United Nations Convention to Combat Desertification (UNCCD).

The stated objective of CEMP is being achieved through:

- Capacity development for sustainable Fadama natural resources management at National, State, LGA and Community levels, including strengthening institutional capacity for integrated watershed management, and strengthening community capacity for development planning.
- Integrated Ecosystem Management in selected watersheds through management of key forest areas, buffer zones and wetlands and improved water management; and
- Community sustainable land use management through support for alternative land and/or water use activities and adoption of indigenous sustainable land management practices.
- Project Management, Monitoring and Evaluation.

Specifically, the CEMP will:

- provide the ecological framework for addressing the root causes of reduced *Fadama* agricultural productivity and the negative impact of un-sustainable land-use practice;
- ensure ecosystem stability, functions and services;
- reduce land degradation;
- improve institutional capacity to manage Fadama resources; and
- Improve productivity by ensuring that ecological balance in the Fadama are maintained and protected from threats from land use for agriculture and water management in the watershed.

1.3 Study Justification

Sustainable forest management is one of the main activities in the integrated ecosystem management at the watershed level. It is a location-specific activity aimed at providing sustained ecological services and improving the productivity of the *Ajasse Ipo* watersheds (*Fadama* areas). Thus, the sustainable management of *Sanmora* forest located with *Ajasse Ipo* watershed will serve as a test sample for further expansion of the Osin River watershed protection, which is expected to positively impact *Fadama* resources and by extension the livelihood of *Fadama* communities.

1.4 Objective of the Study

The objective of the study/survey is to provide data/information for the preparation of a management plan that will serve as a guide for the sustainable management of the *Sanmora* Forest by the community, using a community based forest management approach. The activity will provide basis for support in the application of the provisions of the forest policy in the management of *Sanmora* community Forest. It will also identify capacity building and empowerment needs of the community to manage the forest.

1.5 Scope of Work

The study/survey among other concerns, addresses the following:

- (i) Survey/resurvey the boundary of the *Sanmora* forest reserve to establish/re-establish the extent, and produce an up to date map of the forest reserve.
- (ii) Determine the level of dependence of the fringe communities on the forest for livelihood and the impact of their activities on the health and integrity of the forest ecosystem.
- (iii) Delineate the reserve into management units (sub-compartments) of sizes between ten to twenty hectares inclusively.
- (iv) Carry out an assessment (inventory) of the forest reserve to determine tree species composition, distribution, quality and quantity.
- (v) Assess the occurrence of fauna species in the reserve.
- (vi) Identify and qualify the occurrence of NTFPs in the reserve and quantify the availability of the five most valuable NTFPs, to the community.

- (vii) Carry out analysis of the assessment/inventory data and develop/determine the following:
 - o Available growing stock
 - o Allowable annual cut
 - o Stock and stand table
 - o Diameter class distribution
 - o Yield projections.
- (ix) Based on the result of the assessment and other available data/information about the forest:
 - o Develop a five-year operational management plan for the forest reserve with 2007 as base year.
 - o Develop an implementation arrangement, including capacity development that will empower the community to manage the forest as an FCA sub-project.
 - o Develop forest management programmes and activities that will be implemented within the plan period and ways to ensure effectiveness in implementation.
 - o Make other recommendations and proffer ways that they could be best implemented.
- (x) Organize a stakeholders' workshop for the review of the draft final report. The workshop, which will mainly feature state and community level stakeholders, will be attended by about fifty (50) participants.

1.6 Structure of the Report

This report is structured as follows:

Chapter One presents project background.

Chapter Two presents an overview of the study environment. It discusses the location, climate, geomorphology, soil, and vegetation of the area.

Chapter Three provides a brief description of the study approach and the methodology detailing the survey techniques used.

Chapter Four presents results of the study. Issues discussed include demography of the study area, traditional approaches to forest conservation, level of dependence of community livelihoods on the proposed community forest potential benefit of the proposed project, inventory of flora and fauna as well as analysis of inventory.

Chapter Five presents the operational management plan for the forest reserve

Chapter Six wraps up with a conclusion and recommendations for the study

Chapter 2: Project Environment

2.1 General Description of the Study Area

Sanmora community is located in Irepodun Local Government Area of Kwara State. It lies within Latitudes 8° 12'59" to 8° 21'45"N and Longitudes 4° 41' 30" to 4° 56' 25"E (Fig. 2.1). The community is small but has well defined boundaries and an estimated population of 1,143 (NPC 1996 projection). Settlements are disperse along three major tarred roads within the community.

Literacy rate within Sanmora community is generally high. Past studies put the literacy rate of individuals below 50years at 70%. Although the community is predominantly agrarian, other means of livelihood include carpentry, panel beating, electrical repairs, welding and battery charging. Women in the community engage in farming, sale of farm produce, and physical labour including work on construction projects.

Public institutions present in the community include one primary and a secondary school (Ansil Islam Commercial School), a community market, and a health centre. Both schools are equipped with basic furniture; however, the primary school lacks electricity and sanitary facilities. The community market is no longer functional, while the health centre lacks public patronage and adequate staffing.

In a strict sense, there is currently no designated community forest in the study area. What exists however is a 27ha (0.27km²) forest estate which surrounds the community. This forest estate owned by several groups of families of Sanmora community, is located in the Guinea Savanna vegetation zone, within the GEF intervention site. The forest consists of clusters of teak (*Tectona grandis*) stands at various stages of degradation. Other indigenous species such as *Danielia olivera*, *Percopsis alaat*, *Terminalia spp.*, *Hymenocardia acida*, *Parkia biglobosa* and *Vitellaria paradoxa* etc also abound in the forest. Common herb species found include *Ageratum conyzoides*, *Pennisetum sp.*, *Tridax procumbens*, *Phyllantus amarus*, *Aspilia Africana* and *Scoparia dulcis*.

This forest, located within Sanmora clan is contiguous to Ajasse-Ipo Community Forest. Both forests protect river Osin and the watersheds. The forest has no management plan and there are no records of deliberate management interventions.

2.2 Climate and Meteorology

The study area falls within the hot equatorial climatic zone, experiencing a tropical hinterland or wet tropical climate (Kwara State Meteorological Station 2009). The site is influenced by two seasonal periods (wet and dry season). Wet season starts in April and ends in October with a break in July-August and a peak in September. Annual rainfall range is between 1000 and 1500mm. high evaporation rates combined with lack of rainfall during the dry season results in a complete drying up of seasonal streams during this period. Mean annual wind speed recorded over a 10 year period ranged between 130–142 m/s (Table 2.1). Temperature is high throughout the year with mean minimum and maximum temperature values of 23°C and 33.7°C respectively. Mean relative humidity ranges between 71.8% - 89.2%.

Table 2.1: Mean Annual Climatological Data over the Study Area

Year	Temp (°C)	Rainfall (mm)	Wind Speed (m/s)	Rel. Humidity (%)
2000	32.7	825.0	130	71.8
2001	33.7	580.1	142	73.3
2002	32.6	820.4	138	71.9
2003	32.8	1290	136	74.8
2004	32.4	1180	134	75.7
2005	32.6	1200	136	89.2
2006	33.1	890.4	138	75.6

Source: NIMET 2007

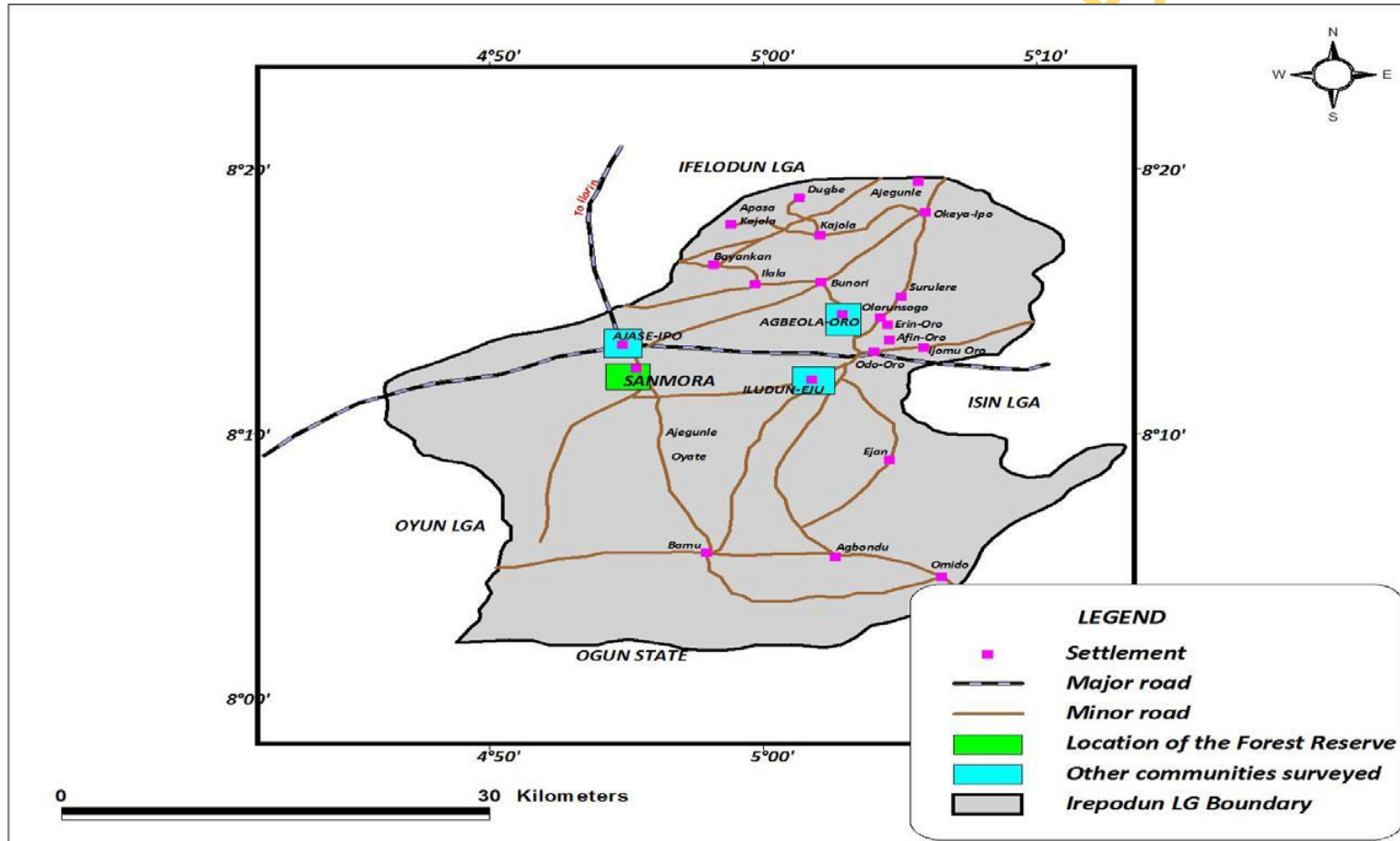


Figure 2.1: Map of Irepodun Local Government Area Showing the Study Area

2.3 Geomorphology and Soils

- *Geology*

The study area is a component of the general geology of south-western Nigeria; characterized by the occurrence of a combined Precambrian basement complex and sedimentary basins. The surface geology is primarily basement complex rocks that are deeply weathered having a lot of fractures and voids. The area is dominated by sandstone and shale with recent alluvium deposits. The formation is well drained and aerated. Depth of groundwater could not be ascertained but it is believed to be considerably greater than 10 meters.

- *Soil*

The soil within the project area is described as ferruginous tropical soil on acid crystalline rock (d'Hoore, 1964). It is characterized by brown or reddish-brown gravels and mottled clay containing ironstone, manganese concretions, flakes of mica and fragments of quartz.

The Fadama soil is relatively poor in organic matter, cation exchange capacities and essential macronutrients such as nitrogen, phosphates and potassium, despite the fact that it receives annual silt deposits from floodwaters. The soils here are however more fertile than the sandy upland soil in the study area.

- *Topography and Land use pattern*

The topography of the area is lowland with undulating terrains. The floodplain (*Fadama*) section of the watershed covers about 10.7km² and is generally gently sloping and comparatively wider on the eastern flank of River Oshin, while the western flank is moderately to strongly undulating and narrower.

The low-lying area adjoining River Oshin is used for the cultivation of commercial crops. These include *Amaranthus celosia*, Garden egg, corn, pepper and okra (Figure 2.2). The upland area adjoining the Fadama farms are sometimes planted with arable crops such as guinea corn, yam, cassava and guava. Spatially dispersed populations of wild oil palm (*Elaeis guineensis*) abound within the area. Some of these are tapped for palmwine. Most of the farms are in Sanmora, Iludun- Oro and Ajase. New Fadama farms are springing up in *Ilala*.

Across the project site, various land uses are distinguishable, including: crop production, livestock grazing, fisheries, forestry, wildlife sanctuaries, conservation management areas, and housing and cottage industry (blocks and burnt-brick production). Land use in the project site is principally agricultural with about 70% of the entire land area cultivated. Agriculture in the area is dominated by shift cultivation, crop rotation and mixed farming. Although fallow periods vary from site to site, the length of the fallow period generally increases with distance from the settlement. Thus, areas close to the homesteads are intensely farmed while Fadama lands are intensively used. The size of farmlands is about 20km². Crops identified include plantain/banana, maize, okra, and varieties of leaf and fruit vegetables (tomato, garden egg, *amaranthus*, *celosia*, *cocorus*, sugar cane, plantain/banana, and maize (Figure 2.2).

Livestock grazing is extensive within the study area. It is a major source of conflict between indigenous farmers and itinerant cattle farmers usually from the northern part of the country. A couple of charcoal kilns were also noticed at various locations within the area.



Figure 2.2: Fadama Farm with a Mixture of Corn and Okra at Sanmora

2.4 Vegetation

The natural ecosystem of the project area supports varying degrees of native vegetation ranging from treeless grasslands/shrub thicket of thorny Acacia on recent levees, to mixed tree-shrub-grass varieties of relatively large trees, woody browse and forage grasses. The native vegetation of the project site is open savanna woodland typical of the southern guinea savanna. Where landuse pressure is minimal and along river courses, stocking is still relatively dense at about 2-3 stems per m².

Fuel wood currently constitutes the major source of domestic energy. Inefficient exploitation and growing dependence on fuel wood places extreme pressure on diminishing woodlands, thus reducing their recovery capacity. This has resulted in deforestation and denuded land. The use of the Fadama for crop production is accompanied by uncontrolled clearing of natural vegetation and extreme reduction in biodiversity, resulting in increased erosion and flooding downstream.

Plant specie composition within the study area is diverse and consists of trees, shrubs and herbs. The woodland savanna area is dominated by fire resistant plants belonging to different species. Mean canopy height of the vegetation is 12m. The canopy is open with scattered trees having wide spreading crowns. Three main strata are discernible: trees, shrubs and herbaceous layers. The commonest trees include *Parkia biglobosa*, *Prosopis africana*, *Vitellaria paradoxa*, *Daniellia oliveri*, *Combretum glaucescens* and *Vitex doniana*, *Entada abyssinica*, *Hymenocardia acida*, *Terminalia glaucescens*, and *Terminalia avicinnioides* amongst others. These trees have thick barks which may be fissured like *Vitellaria paradoxa* or flaky like *Daniellia olivera*. The herbaceous layer is dominated by grasses such as *Pennisetum purpureum*, *Andropogon* spp and *Hyparrhenia* spp. Other shrubs species include *Detarium microcarpum*, *Piliostigma reticulatum* and *Gardenia ternifolia*.

Communal practice amongst hunters, cattle rearers and farmers involves burning most of the savanna woodland late in the rainy season or middle of the dry season. This devastates the landscape leaving trees looking twisted. In some cases, the fire enters the plantations of *Gmelina arborea*. Many of the fire resistant plants regenerate after the fire event. This however depends on the intensity of fire, stage of growth of the plant and local environmental conditions. The exposed landscape is easily eroded during the rainy season with resultant sedimentation of Oshin River.

Sedimentation affects aquatic life by decreasing light penetration, reducing dissolved oxygen and introducing toxins into the water body. This in turn reduces the food base, impairs fish feeding due to reduced catch per unit effort and reduces reproductive success (by covering spawning grounds and eggs, preventing the emergence of newly hatched fry, limiting the availability of oxygen to incubating eggs, and reducing water flow and removal of wastes).

Chapter 3: Study Design and Methodology

3.1 Consultations and Preliminary Survey

Prior to the field study, the project team held consultation meetings with opinion leaders in Sanmora community and the State Fadama Programme Coordinating Office in Ilorin. A reconnaissance survey of the supposed Sanmora community forest was also undertaken. The consultation revealed that:

1. there is no designated sanmora forest reserve on which to carry out the required activities of the TOR and;
2. there is also no legal document to show an agreement between the NFDO and the community on the establishment of community forest.

Based on these, the NFDO was recommended to finalize arrangements in terms of legal documentation for the establishment of Sanmora Community Reserve viz: the choice of site and the extent of the land area that will be used for the Sanmora Community Forest.

3.2 Field Survey

Data was collected from both primary and secondary sources, including local and state governments. Primary data was obtained through surveys and focus group discussions. Specific information was obtained from the 4 communities within the catchment area on issues including environmental awareness, livelihood, land-use practices, water resource management and existing community based organisations, utilization of forest and forest products and community social structure. Key groups sampled were women, men, youth and community leaders. A total of 8 focus group discussions were conducted with the community leaders and youth organisations to obtain information on community participation in forest management. Participants were carefully selected to reflect a gender balance. Checklists were also used to capture status of and importance of non timber forest products.

3.3 Biodiversity Studies

Biodiversity studies were conducted to provide data on the floristic and *fauna* composition and structure in and around the proposed community forest, determine the population density of the key economic plant species within the area, evaluate the level of vegetative degradation; and suggest measures to conserve or restore the ecosystems.

Quadrats were established to study the vegetation, within identified homogenous plant communities. These include fallow farm lands, fringe forest, Fadama farm, and woodland savanna. Plant species, composition and structure were obtained using 100m², 25m², and 1m² quadrats for trees, shrubs and herbs respectively. Within each plot, all plants were identified to species level and their heights measured with a Haga altimeter. The number of strata in the vegetation was noted and the dominant species recorded. Where counting of individuals was not possible such as creeping plants, cover was measured using the Braun-Blanquet scale (Sutherland, 1997). The population density of the trees was determined using 100m² quadrats placed within each relatively homogenous vegetation type (Kershaw, 1981). Rare, exotic and endangered species were listed. Samples of plants not identified on the field were collected and carried to the herbarium for identification. Visual observations on the field were complimented with adequate still photographs and the coordinates of important features were captured with hand-held GPS.

For wildlife survey, a total line transects of 15km was surveyed. These surveys were carried out in the morning (between 600hrs and 1130hrs) and afternoon (between 1230hrs and 1730hrs). Observations on wildlife populations were made by searching for footprints, droppings, burrows and feeding activities of animals. All wild animals sighted as well as those whose calls were heard were recorded. Direct observations were also made of animals and birds with the use of binoculars while distance was determined through the use of GPS.

3.4 Inventory of Flora and Fauna

From the survey map baseline of 408m in the East–West direction, three (3) transects (gradsects) were taken at 50m away from both ends (East and West) and another transect taken at the middle (i.e. 204m) from either end of the baseline. From each transect, a 20m distance was measured inward into the area from the baseline, to remove edge effects on the plots. A 20 x 20m sample unit/plot at 50m interval was selected for inventory of the vegetation (trees, shrubs, herbs, climbers, grasses, etc.) A complete enumeration was carried out in each sample plot, measurement carried out on trees with diameter at breast height (DBH) equal or above 5cm as well as the non-timber species including shrubs, herbs, climbers and grasses.

A total of 28 sample plots, measuring 11,200m² were enumerated, representing approximately 4% of the total land area. The enumeration was carried out twice; immediately after the annual bush burning and after the sprouting of the burnt vegetation (December, 2008 and February, 2009). This influenced the type of vegetation observed at each period.

3.5 Reconnaissance Survey For Site Mapping

3.5.1 Preliminary aspects

The survey made was for the purpose of carving out a portion of land and subsequently demarcating the boundary and determine the area of the land as required by the client. Hence, this activity was a perimeter traverse of a designated land for Sanmora Community Forest Management Plan.

Reconnaissance visit was made to the site in order to have a view of the site as well as to aid the choice of instrument among other things. This is usually referred to as the field *recce*. During the field *recce*, local guides were engaged to take the survey team round the designated land, thereby giving a good idea of the extent, nature and existing features on the land. Station (Traverse) points that would form the boundary of the designated land were marked with wooden bush pegs and the connecting lines of sight were properly cleared of vegetations to allow for inter- station visibility. Subsequently, concrete beacons of dimension 18cm x 18cm with 2.5inc nail marking the centre were buried at each of the station points. Due to the hard nature of the ground, each of the beacons was cast in-situ to a depth of 60cm and the top protruding 10cm above the ground.

In the course of doing the *recce*, three property beacons belonging to the Anglican Church at Sanmora community were located through the assistance of the Resident Reverend of the Church. The Surveyor who has the data for the beacon was later contacted to collect the coordinates of the beacons. The beacon numbers and their coordinates are:

- SC/KWAR12219- 18779.961mE, 13247.447mN
- SC/KWAR12229- 18703.031mE, 13279.709mN
- SC/KWAR12230- 18732.120mE, 13242.003mN

These beacons were adopted as the controls used for the survey

At the end of the field *recce*, a sketch diagram depicting the entire area was prepared to guide us in the field data capture during traversing.

Period of Execution

The project was executed between 29th November and 22nd December 2008.

Scope of Work

The scope of work for the project included the survey activities listed below

- Perimeter survey
- Detailing
- Data Processing
- Production of Digital plan.

Equipment

- 1 Set-610E Sokkia Total station with accessories.
- 1 Hand Held GPS (Garmin eTrex Venture Cx)
- 1 Lap-Top computer (P4)
- 1 Desk Top computer
- 2 Tracking Rods with Trot stands
- 1 Tripods
- 2 Reflectors and Holders
- 4 Cutlasses
- 600m Fibre tape
- 3.5m Measuring Tape
- Personnel Protective Equipment (PPE)
- 1 Shovel & Hand Trowel
- 1 Calculator (CASIO FX 4500P)
- Draughting materials and equipment

Instrument Test

In order to ensure that equipment used for this project was in good working condition, the Set 610E Total station was tested and certified ok. The Total station was set up and checked before the field observation commenced.

For the Total Station:

1. Temporary adjustments were carried out.
2. The bubble was found to be in good adjustment.
3. Horizontal collimation and vertical index checks were done.

There was 05" second horizontal collimation error and a vertical index error of 08" second after the test was conducted. These errors were acceptable for this type of job, being a Cadastral (third order category of traverse) survey.

3.5.2 *In situ check*

Before the traverse commenced from the control pillars, in-situ checks were carried out on them to ensure their stability and reliability. This was done by setting the Total Station on pillar *SC/KW AR12230*, and all the temporary adjustment was carried out. With the instrument horizontal angle reading set to $0^{\circ} 00' 00''$, the back sight observation to the reflector target set on pillar *SC/KW AR12229* was taken. Then an angle was turned until the target on the forward station i.e. pillar *SC/KW AR12219*, was bisected. Linear and angular observations to these stations were taken with the instrument and the observed angles and distances were compared with the computed ones. The results obtained showed that the controls were okay.

3.5.3 *Perimeter Survey*

Having certified the good working condition of the Total station, the instrument was configured ready for the task ahead. All the initial parameters that would ensure the smooth functioning of the instrument were set from the appropriate menu display on the instrument.

Those parameters include:

- Unit of angle measurement = Degree at 1" accuracy
- Unit of distance measurement = Meters
- Vertical angle setting = Zenith
- Distance measurement mode = Fine
- Temperature = 30° C
- Pressure = 760mmHG
- Display XYZ

The Total Station uses the principle of Digital Tacheometry by angle and distance measurement to determine the coordinate of a point, given that an initial or back bearing

(BB°) and a distance (BC) are known and already pre-set/entered into the instrument. The illustration of the principle is given in the figure 3.3 below.

Table 3.1: Result of In-situ check on Controls

STATION	CHECKS	OBSERVED	COMPUTED	DIFFERENCE	ALLOWABLE DIFFERENCE	REMARKS
SC/KW AR12230	Angular SC/KW AR 12219 - SC/KW AR 12219	121° 09' 36"	121° 09' 26"	-0° 0' 10"	0° 0' 30"	Accepted
	Linear SC/KW AR12229	47.635m	47.623m	0.012m		Accepted
	Linear SC/KW AR 12219	48.165m	48.150m	0.015m		Accepted

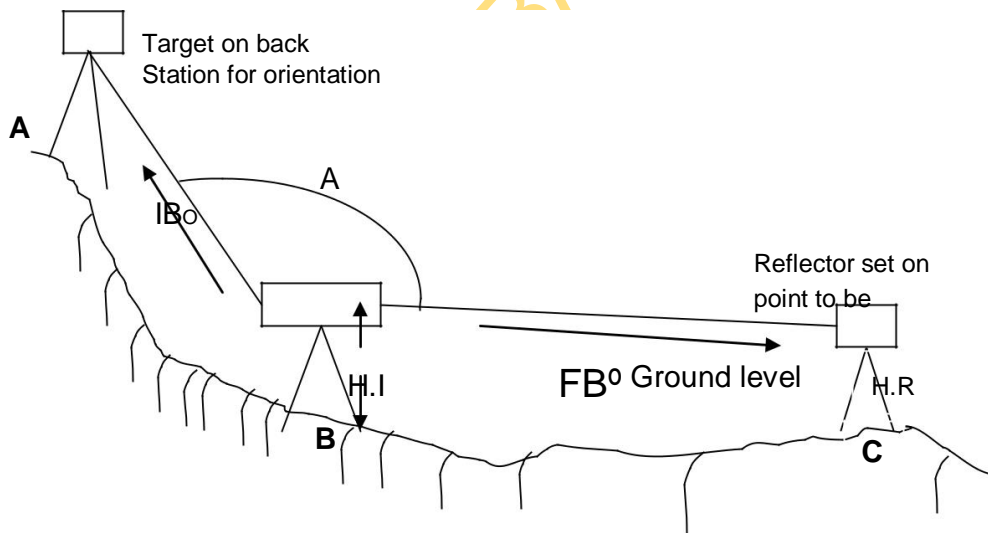


Figure 3.3.1: Diagram Showing Principle of Total Station Observation

The instrument calculates as follows:

$$\begin{aligned} FB^\circ &= IB^\circ + A^\circ \\ DN &= BC \cdot \cos(FB^\circ) \\ DE &= BC \cdot \sin(FB^\circ) \\ DH &= H.I. - H.R \end{aligned}$$

Therefore the coordinate of "C" is given as:

$$\begin{aligned} N_B + DN &= N_C \\ E_B + DE &= E_C \\ H_B + DH &= H_C \end{aligned}$$

At the commencement of the traverse, the instrument was set up on station SC/KW AR 12230 which served as the take off point and the temporary adjustments were made. The coordinates of the control stations were then entered into the internal memory of the instrument to complete the station set up. Next the orientation was carried out by sighting the reflector target that was set up on the back station; SC/KW AR12219. The coordinate of the target station was recalled from the instrument's internal memory in response to the menu prompts to complete the orientation. Thereafter, the target on the forward station; PEG1 was bisected and the XYZ coordinates of the point was measured and recorded in the internal memory of the instrument. The instrument was then moved to the next forward station (PEG1) and the same procedure was repeated to perform the station set up and orientation, referencing station (SC/KW AR12230). This sequence of observational procedure was carried out on all the Pegs to connect the boundary pillars and continue until it closes back on SC/KW AR12230 where the traverse commenced.

As the traverse progressed, some noticeable details such as roads, rivers, burrow pits and others features found along the traverse lines were properly detailed and depicted as indicated on the *recee* diagram.

During the traverse observation, adequate care was taken to ensure that all the temporary adjustments were done on each station before any observation commenced. Data recall and input into the instrument was also done in a careful manner to minimize error that could have occurred due to use of wrong coordinate values at each station set up.

3.6 Participatory Rural Appraisal Survey

This involved on-the-spot assessment of the socio-economic characteristics of each forest edge community in order to dialogue on the community perception and need for the resources of the forest. In each community, the various stakeholders/user groups were identified and invited for a village square meeting during which participants including government forestry staff, consultants, village heads, hunters/fisher groups, beekeepers group, farmer groups and women groups were encouraged to freely express their opinions on the resources available in each forest, their level of availability, the societal demand for them, local traditional taboos governing resource utilization and management, sustainable resource utilization, services peculiar to each community as well as marketable and marketed products in the communities.

Checklist-guided interviews were conducted with the representatives of stakeholders/users groups. During which specific information on forest resources (timber and non-timber) occurrence, prevalence, distribution and abundance levels were obtained. In addition information on traditional rules, laws and taboos guiding resource administration were obtained. Community members were encouraged to speak freely on their aspirations for the proposed forest reserve. They also made suggestions on the composition of the management committee. Target group interviews and discussions were held at Ajase Ipo, Iludun Eju Sanmora and Agbeola Oro communities. Knowledgeable members of the community were involved in boundary delimitation and species identification and prioritization.

Chapter 4: Results and Discussions

4.1 Demography and Livelihoods

4.1.1 Gender and Age of the Respondents

69% of the respondents involved in the study are male while 31% are female (Figure 4.1). The modal age group is 60-69 years which accounts for 22.1% of the respondents, followed by the age group 70-79 years which also accounts for 19.1% of the respondents (Figure 4.2). 10.3% and 13.3% of the respondents fall between the ages of 20-29 years and 30-39 years respectively. This low distribution is attributed to migration of young people from rural area in search of better prospects elsewhere. Such migration is often as a result of unemployment and or underemployment in rural areas. This underscores the importance of the project, since the proposed community forest project has a great potential to provide various jobs for the community members.

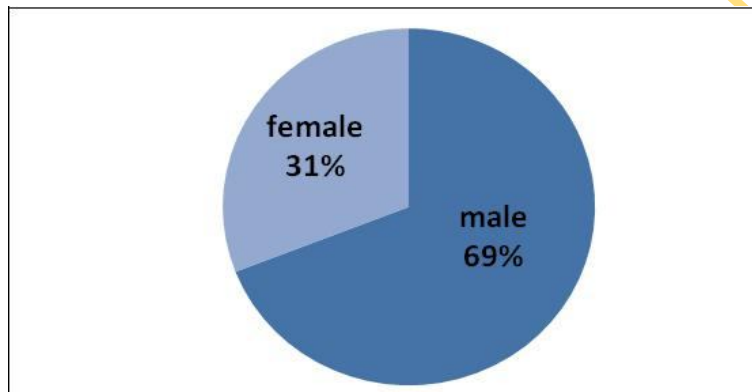


Figure 4.1: Gender Distribution of Respondents in Sanmora

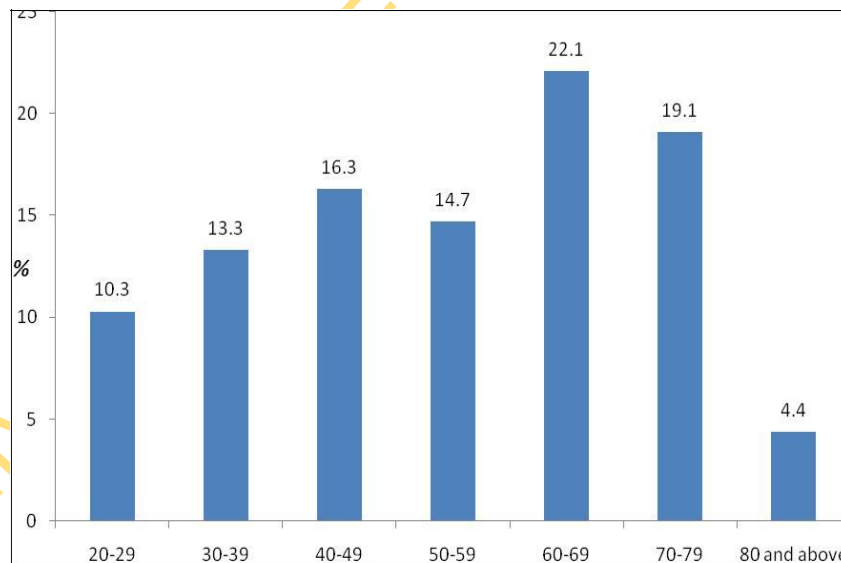


Figure 4.2: Age Class Distribution of Respondents in Years

4.1.2 Marital Status of Respondents

87% of the selected community members are married, 10% are single while 3% are divorced (Figure 4.3). Marriage is perceived as a symbol of responsibility, and married individuals are expected to be responsible and committed to their families and by extension their community. Thus, the high percentage of the community members who are married is expected to have a positive influence on the management of the proposed community forest.

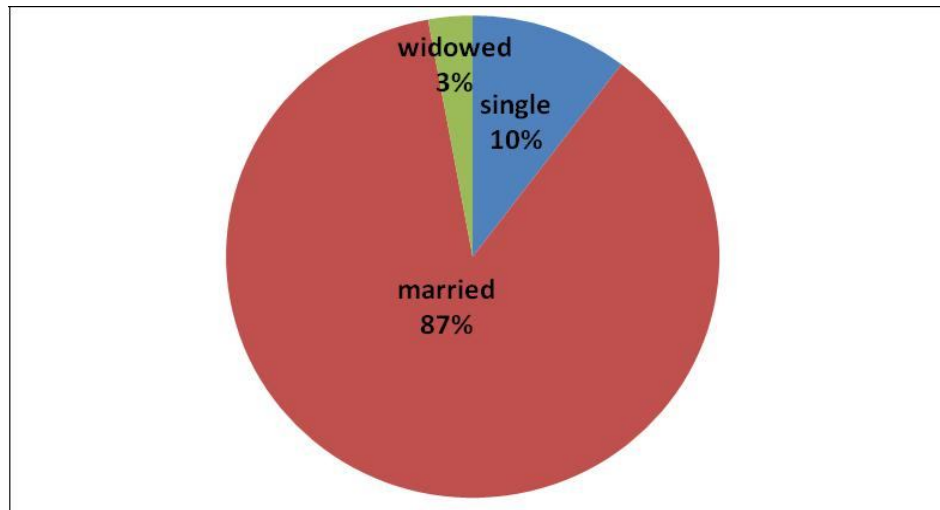


Figure 4.3: Marital Status of the Respondents

4.1.3 Educational Status of the Respondents

The bulk of the respondents (36.8%) consists of individuals without formal education. This is followed by those with primary education, secondary education and tertiary education which constitute 26.5%, 17.6% and 11.8% respectively (Figure 4.4). Establishing the level of education of community members is very essential in the planning of community based projects. It enables project planners to know how to notify and educate community members on the project when the needs arise to mobilize for support for the project.

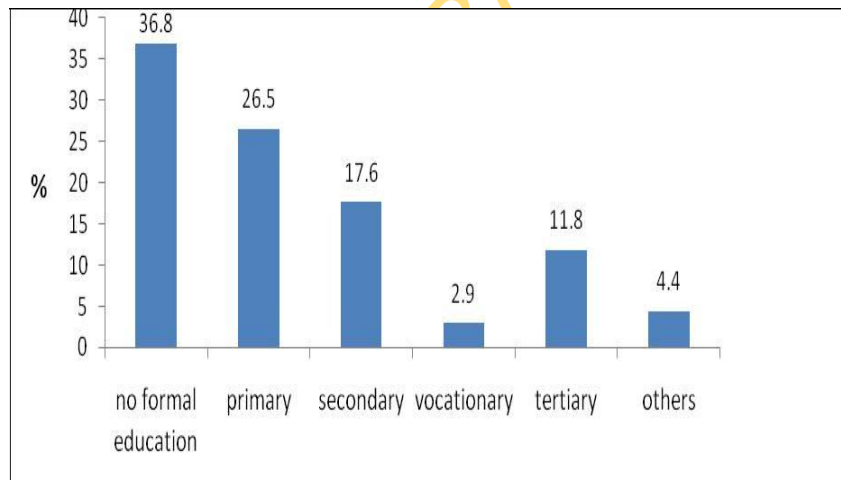


Figure 4.4 Educational Status of Respondents

4.1.4 Income

Most of the respondents are low income earners. Respondents who earn less than ₦10000 account for 43.7%, while those that earn between ₦10000 and ₦15000 account for 26.8% of the respondents (Figure 4.5). These two income groups cumulatively account for 70.5% of the respondents. An environment with such income pattern no doubt will benefit immensely from development projects such as the proposed community forest which will provide supplementary income for the people.

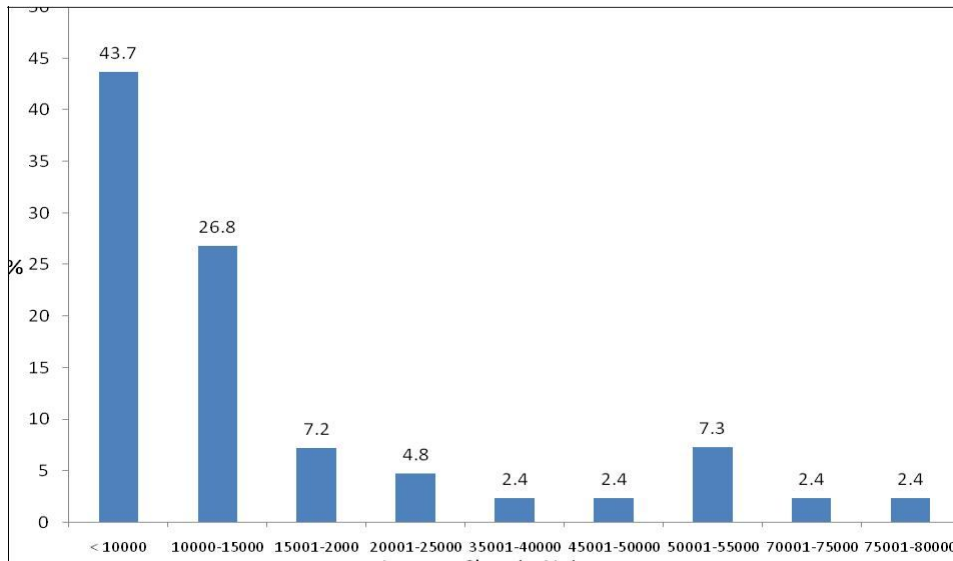


Figure 4.5: Monthly Income Class Distribution of Respondents

4.1.5 Sources of Income

Figure 4.6 reveals that crop farming is the major occupation of the paper in the area, being the major source of income for 51.3% of the respondents. This is followed by petty trading and teaching, which are the major sources of income for 16.3% and 8.8% of the respondents respectively.

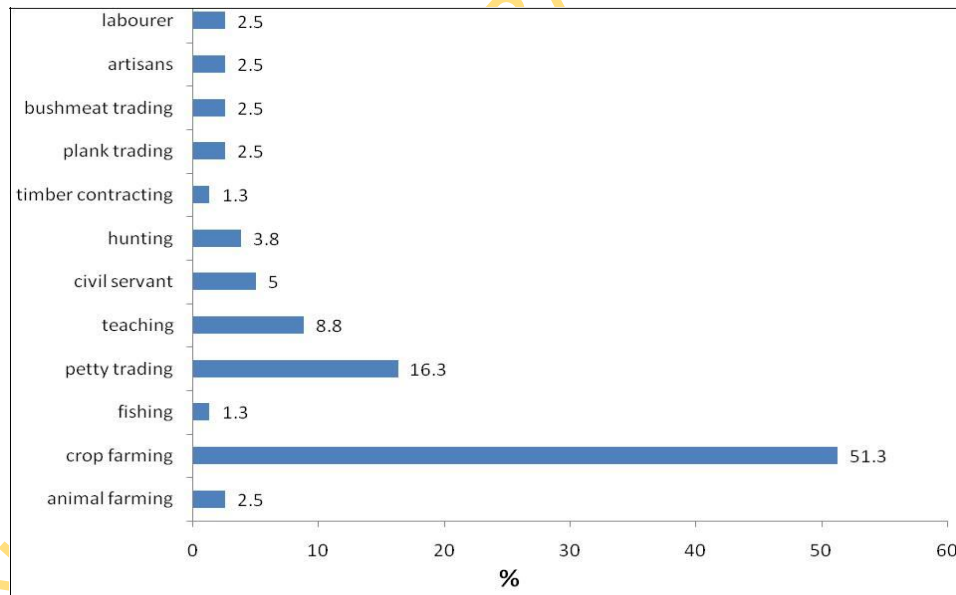


Figure 4.6: Sources of Income

The high percentage of people that are crop farmers is expected to have a positive influence on the participatory management of the proposed community forest, since they are already familiar with crop farming techniques. Thus, involving them in some aspects of forest management such as nursery development, silviculture, monitoring of forest growth etc. will expectedly be of benefit for the project. Furthermore, teachers in the community could be instrumental in creating awareness and educating the community members of the importance of the community forest and the need to participate fully in its development.

Hunters, bush-meat traders, plank marketers and timber contactors constitute a cumulative 15% of the sampled respondents. These are important stakeholders in participatory forest

management and they may be easily mobilized for such specialized activities as forest protection and suggestions on work scheduling and forest monitoring. An agreement has to be reached with livestock farmers (2.5%) to ensure that they restrict the movement of their animals, ensuring that they do not stray into the designated forest area.

4.2 Social Network

4.2.1 Residence Duration of Respondents in the Community

It is generally believed that those that have stayed for a relatively longer period of time in a place will have a sense of commitment to the development of such a place. With this supposition in mind, the study discovered as can be observed from Figure 3.7 that about 85% of the respondents have stayed over six years in the community. It is therefore believed that this long period of stay in this community will make them to have positive disposition to the development and also participate in the management of the community forest.

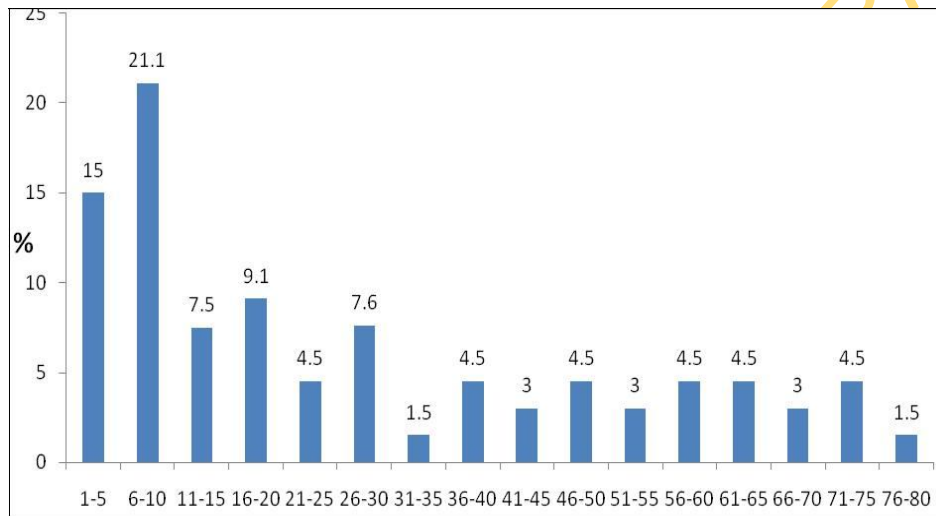


Figure 4.7: Duration of Residence of Respondents in the Community in Years

4.2.2 Membership of Social Organisations

Seven social organisations were identified comprising Fadama user group, hunters' association, traders' association (15.7%), women's group, youth association, farmers association (25.5%) and community development association (Figure 4.8).

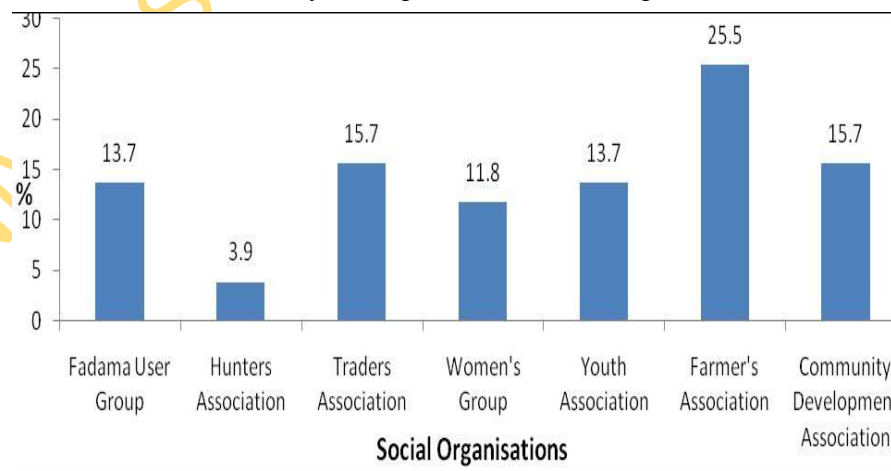


Figure 4.8: Membership of Social Organisation

4.3 Critical Environmental Problems in the Community

Critical environmental problems in the community include deforestation, soil erosion, bush burning, sand mining, water pollution, low soil fertility, bad roads and overgrazing. Respondents identified bush burning as the most prominent and critical problem (41.9%), followed by water pollution (12.3%), and deforestation (10.5%) and low soil fertility (10.5%). Most of the identified environmental problems can be mitigated by reforestation via participatory community forest development.

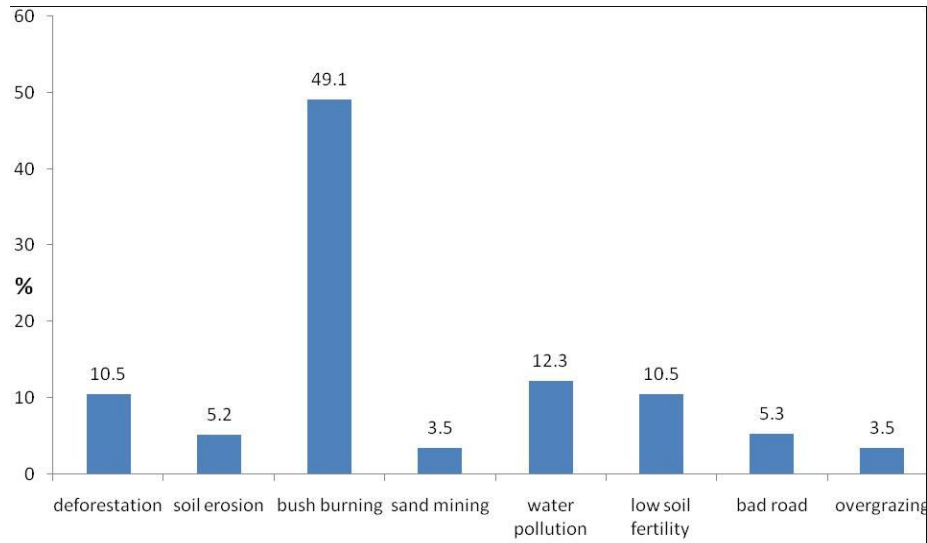


Figure 4.9: Critical Environmental Problems

4.4 Traditional Approaches to Forest Conservation

4.4.1 Tree Planting by Individuals

The study revealed that only 25% of the respondents planted trees in their land (Figure 4.10). Further investigations on the relative abundance of Teak trees in the community revealed that few trees were planted by their grand fathers, and that the abundance of the trees currently witnessed is as a result of seed dispersal. Reasons attributed by respondents for planting trees comprise: production of timber, poles, fuelwood and fruits, watershed protection, erosion control, windbreak and boundary delineation.

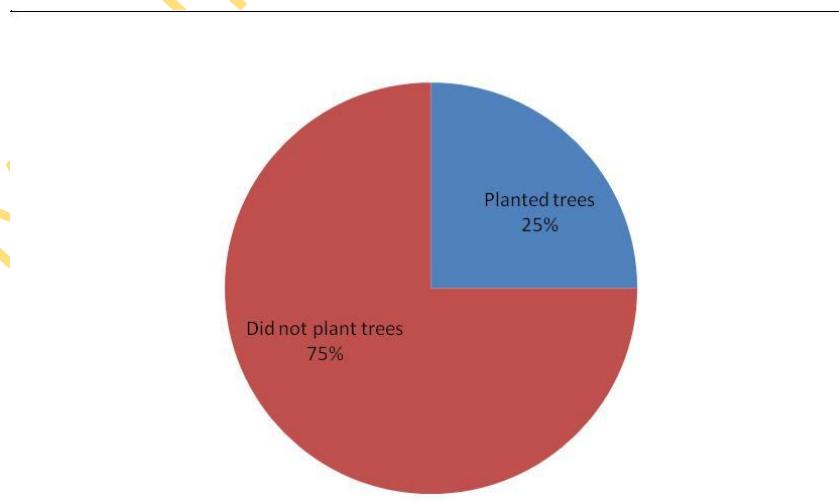


Figure 4.10: Planting of Trees by Individuals

Results presented in Figure 4.11 show that production of poles, timber and watershed protection are the most prominent reasons for planting of trees by individuals in the community, having been mentioned by 37.5%, 18.75% and 12.5% of the respondents. Teak (*Tectona grandis*) is the most prominent tree species planted or retained by individuals in the community, as revealed in Figure 4.12 by 31.8% of the respondents as tree species planted or retained in their lands. Other trees planted include fruit trees such as Orange and Mango (18.2%), and Cashew (13.2%). Few forest trees such as Cassia species, *Gmelina arborea*, *Ceiba pentandra* and Mahogany species were mentioned by 4.5% of the respondents respectively.

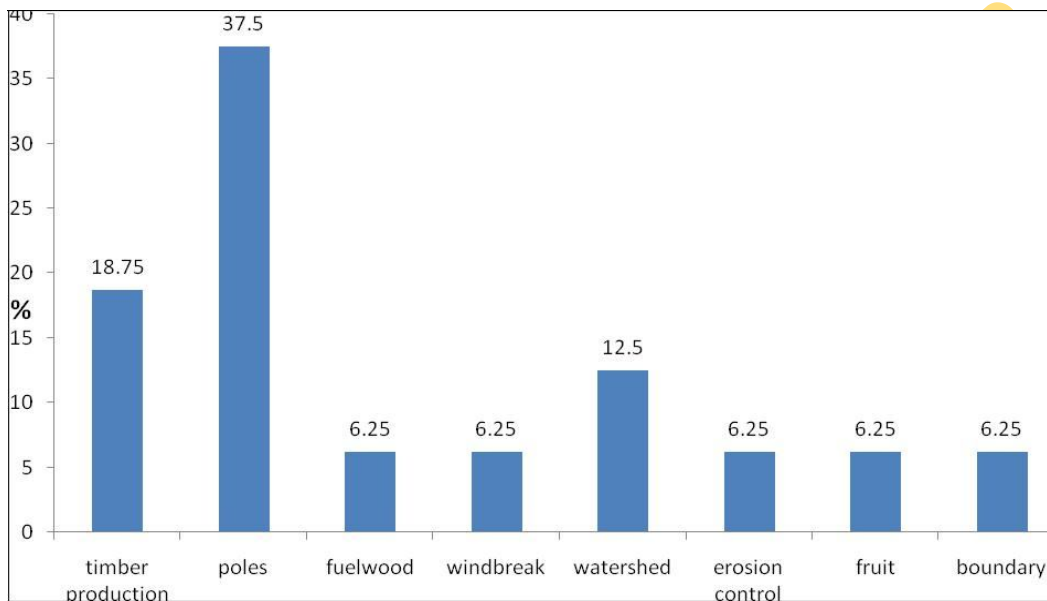


Figure 4.11: Reasons Why Individuals Plant Trees

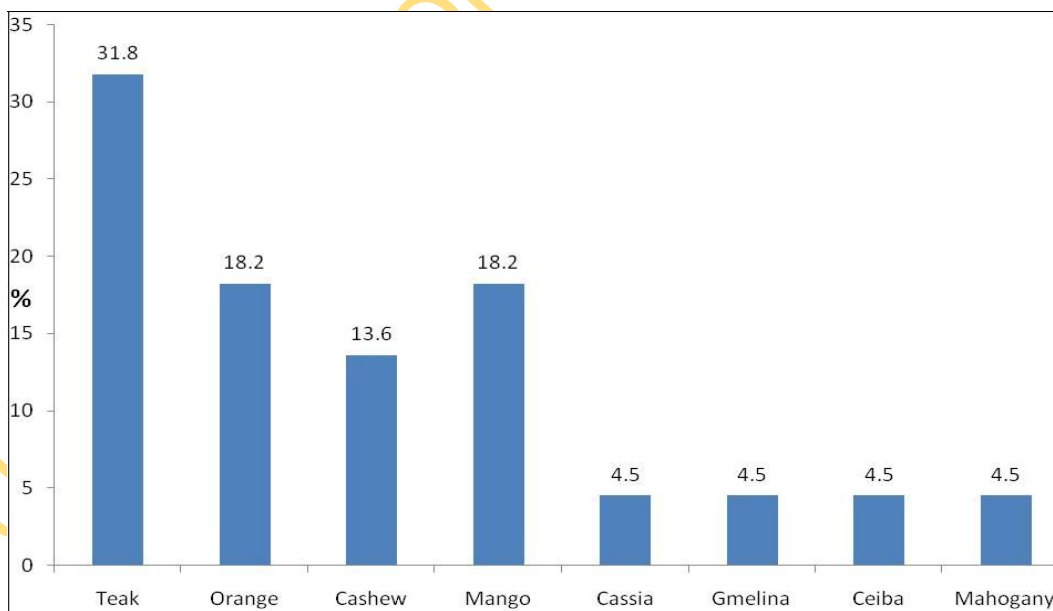


Figure 4.12: Types of Tree Planted or Retained by Individuals

4.5 Livelihoods Activities and the Forest Reserve

4.5.1 Benefits from the Forests Surrounding the Community

Figure 4.13 presents the benefits respondents obtained from the surrounding forests. Firewood tops the list of benefits enjoyed by respondents having been mentioned by 32.3% of them, followed by fruits (21.5%), medicinal plants (13.8%), water (12.3%), bush-meat (10%), charcoal (8.5%), and, grazing (1.5%). The community forest will boost availability of medicinal plants, bush-meat, fodder and charcoal. Further analysis show that only 10% of the respondents sell the goods obtained from the forest, 27% consume and sell the goods, while 63% only consume the goods. The community forest can also increase the level of production of these benefits to a sustainable commercial level, such that more community members will have benefits for consumption and trading.

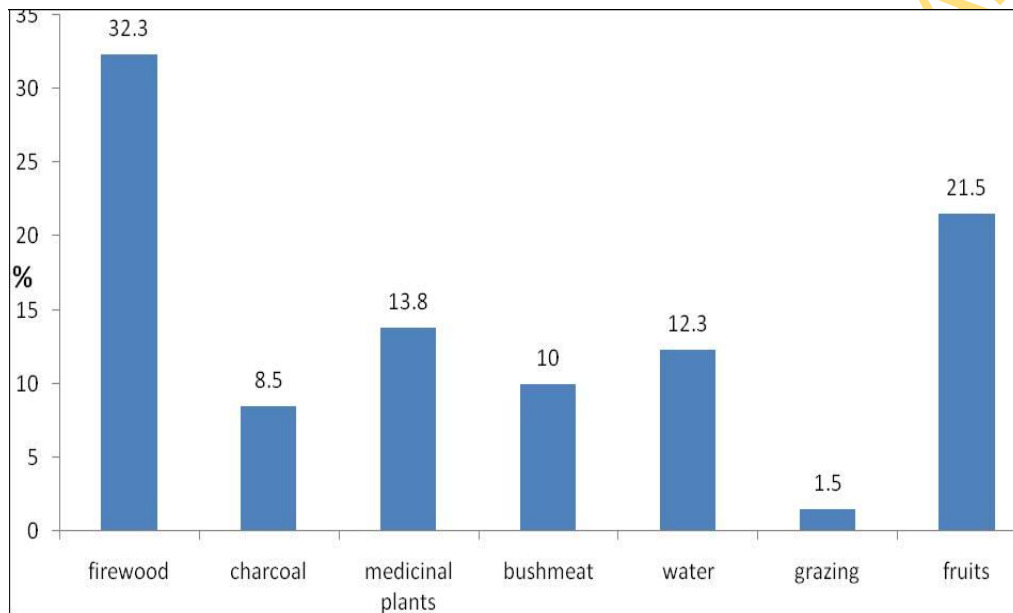


Figure 4.13: Benefits Obtained from the Forest Surrounding the Community

4.5.2 Potential Benefits of the Proposed Community Forest

The potential benefits of the community forest include employment, food, reduction of poverty, production of timber, improvement of standard of living, improvement of water supply, cooler climate, increased income, soil erosion control and provision of bush meat (Figure 4.14). Provision of employment was identified as the most important benefit by respondents (71.4%).

Potential benefits of the forest to the community (Figure 3.15) includes protection of buildings, environmental amelioration, unity, soil erosion control, increased population, reduction in deforestation, increased hunting activities, increased market, tourism, employment, timber availability, community development, increased revenue, improvement of living standard and helping the community in general to grow.

Employment (26.7%) was also identified as the most important benefit to the community, followed by increased revenue (17.8%) and improvement of living standard (15.6%). From the foregoing, it is apparent that the community is expecting the community forest project to reduce the employment rate in the community.

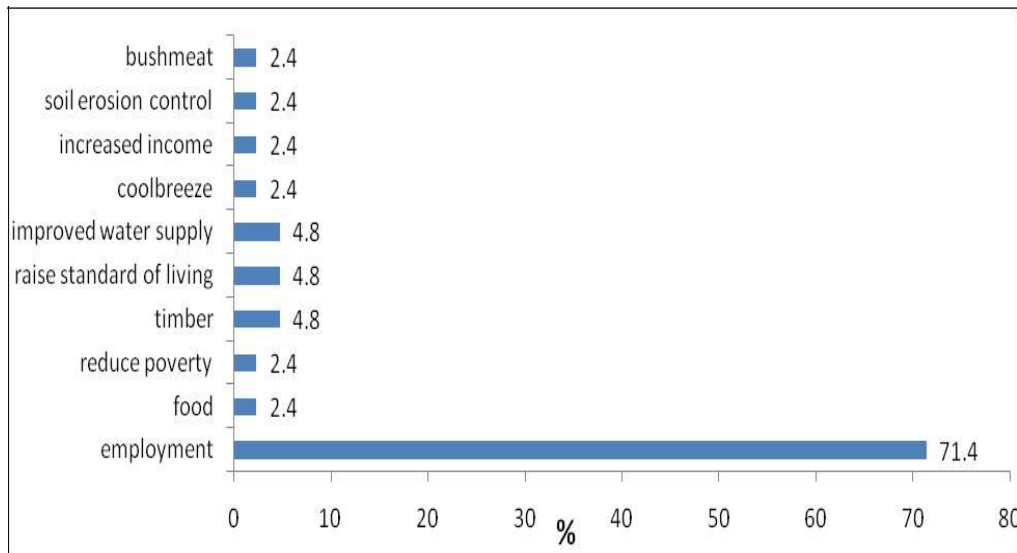


Figure 4.14: Potential Benefits of the Community Forest to Individuals



Figure 4.15: Potential Benefits of the Proposed Forest to the Community

4.5.3 Community Dependence on the Forest

Dependence of community members on the adjoining forest can be effectively evaluated by the number of benefits an individual member of the community derives from the forest. Figure 4.16 shows that 73.7% of the respondents derive more than one benefit from the forest. This underscores the importance of the forest in the lives of the community. The results further show that most of the respondents (36.8%) derive three benefits from the forest, followed by those that derive two benefits (29.8%). Respondents deriving four and five benefits constitute 3.5% each respectively. This implies that forest degradation would impact negatively on a greater percentage of the community.

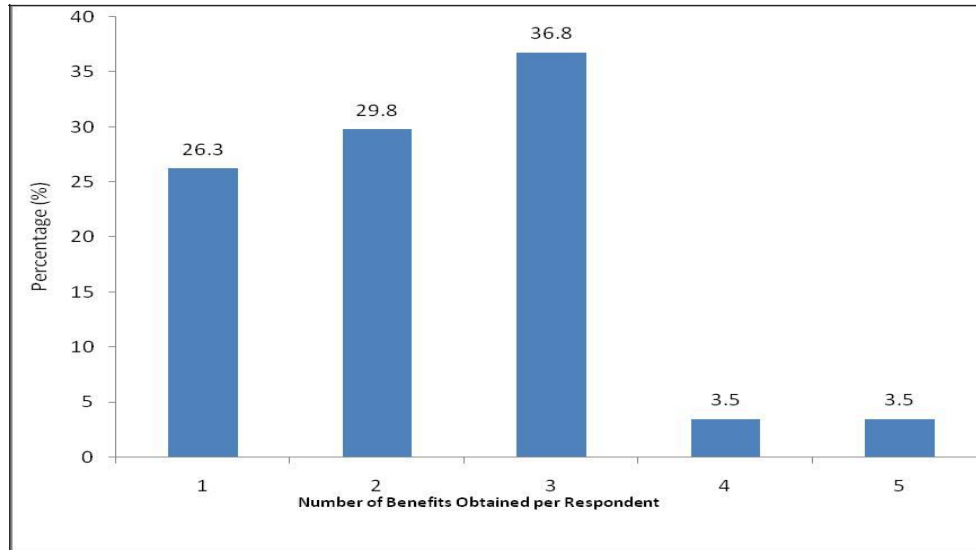


Figure 4.16: Multiple Benefits obtained by the Respondents

4.6 Awareness of the Proposed Community Forest

Figure 4.17 show that 61% of the respondents were aware of the proposed community forest project. 30.3% got to know of the project through the community political leaders and community members respectively, while 24.2% got to know through Fadama agents (Figure 4.18). Other sources that are not so prominent include extension agents (6.1%), king (6.1%) and research agents (3%). These results imply that the community political leaders such as the councillors, community secretary etc., community members and Fadama agents will be veritable instruments in mobilisation for community participation in the management of the proposed community forest.

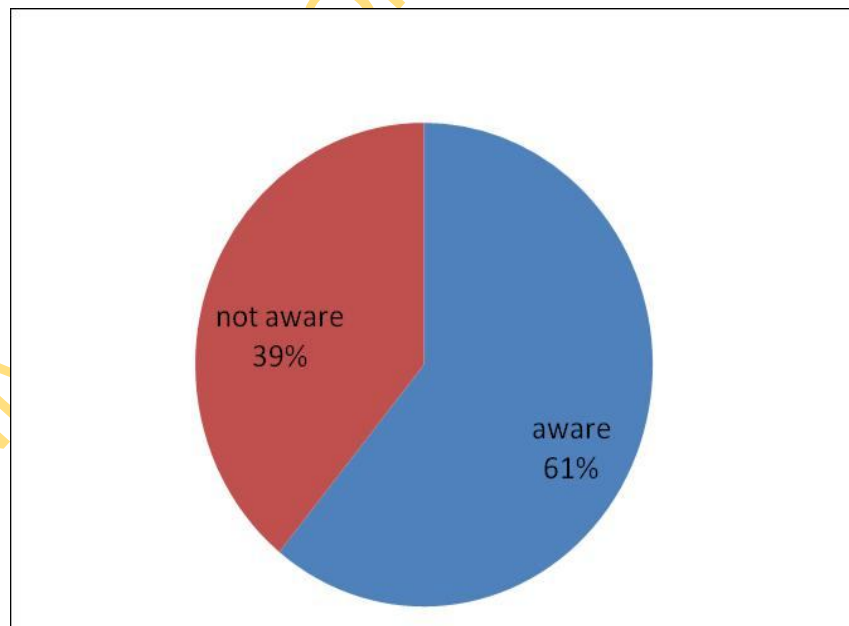


Figure 4.17: Awareness of the Proposed Community Forest

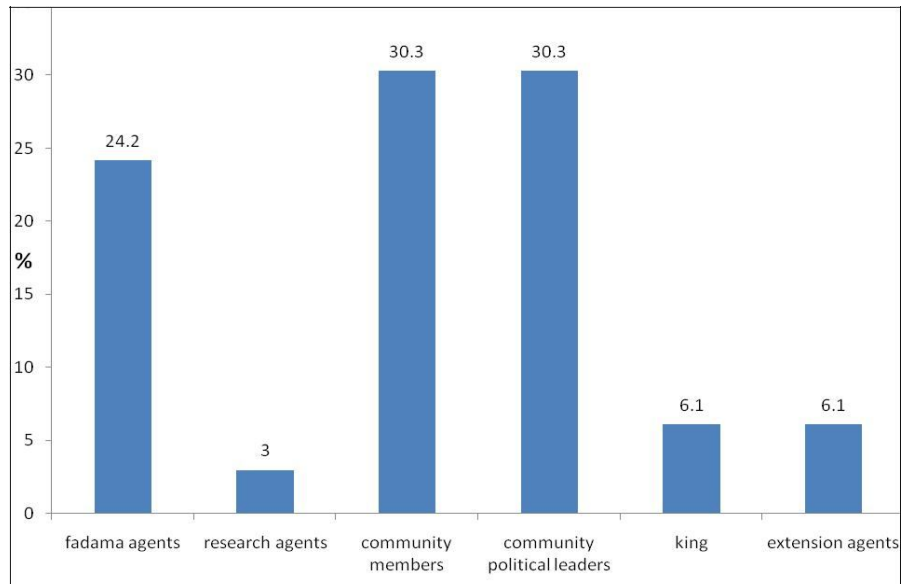


Figure 4.18: Source of Information about the Proposed Community Forest

4.7 Community Forest Management

4.7.1 Suggested Management Approaches to the Community Forest

Respondents identified different measures on how to achieve sustainable management of the community forest. Suggestions include: involving the community in the management of the forest; collaboration with community development associations; request for government assistance in financing and monitoring the management of the forest; establishment of rules and regulations for the management of the forest; educating the people about the importance of the forest; incorporation of cattle rearing into the management objective of the forest; incorporation of cultivation of cash crops into the management of the forest; putting in place good monitoring mechanism; employment of law enforcement agents such as forest guards; and, setting up of a broad based management committee and prohibition of bush burning (Figure 4.19).

Out of these suggestions, setting up of a management committee ranked highest (37.8%), followed by request for government assistance (13.5%) and employment of law enforcement agents (10.8%).

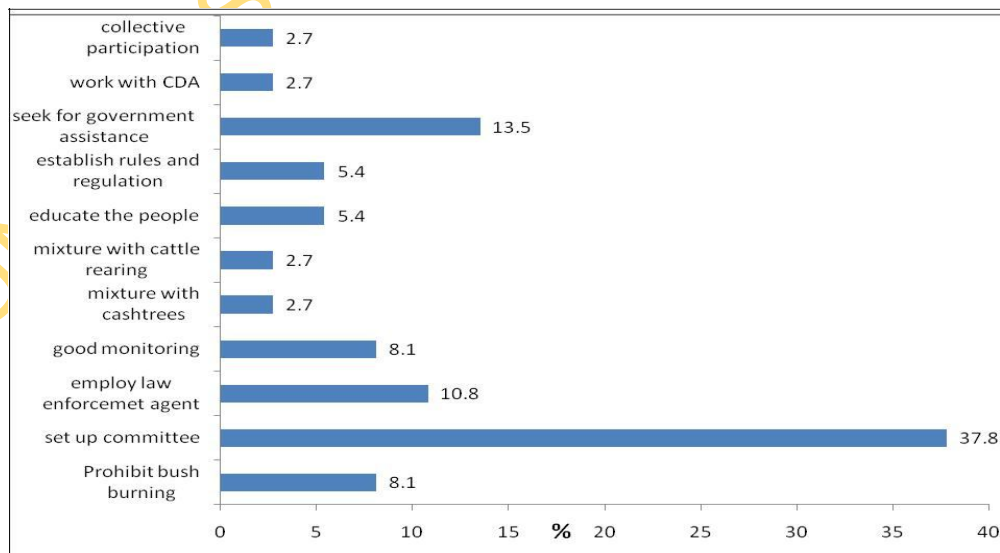


Figure 4.19: Management Approach for the Community Forest

4.7.2 Community's Willingness to Participate in the Forest Management

91% of the respondents were willing to play one role or the other in the management of the community forest (Figure 4.20). Identified roles and activities include nursery establishment and management, forest tending operations, monitoring committee and forest management committee. Figure 4.21 show that 37.5% of the respondents would like to serve in the monitoring committee, while 28.1%, 25% and 9.4% would like to serve in the forest management committee, nursery development and management committee and forest tending and operations committees respectively.

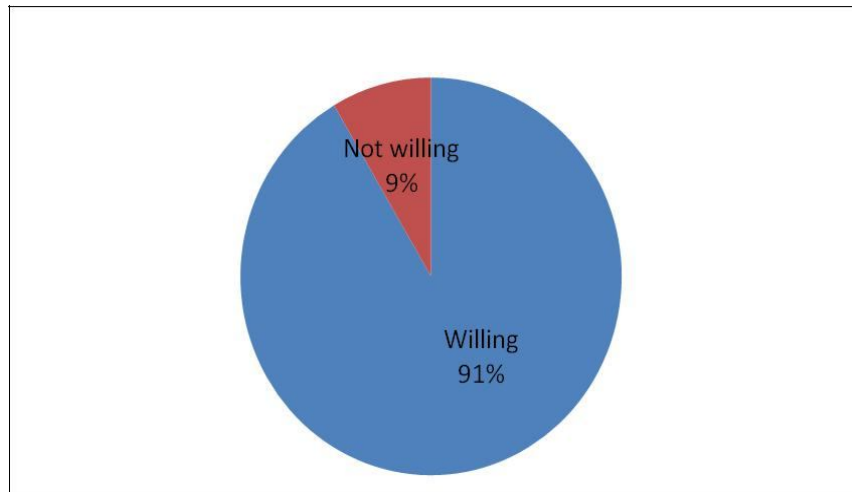


Figure 4.20: Willingness to Participate in the Management of the Community Forest

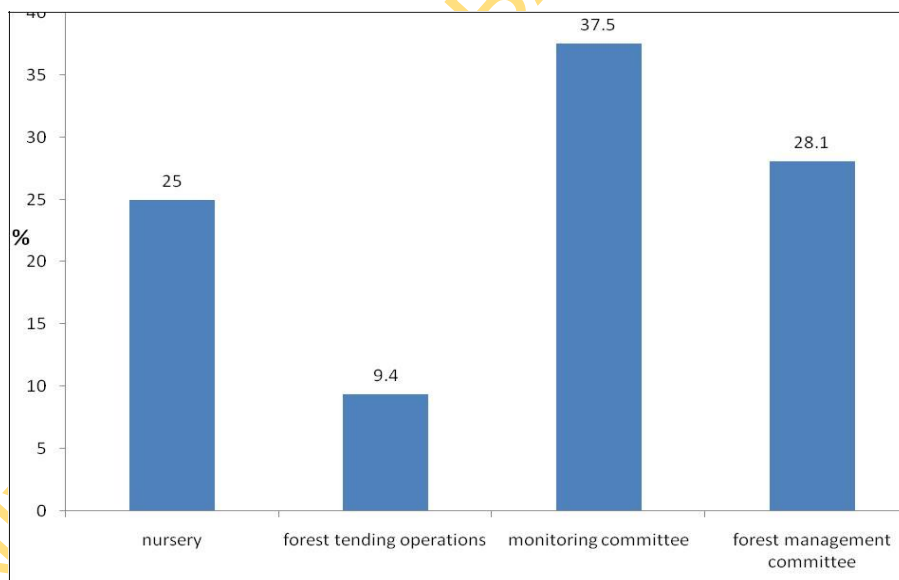


Figure 4.21: Management Activities Community Members will like to Join

4.8 Inventory of Flora and Fauna

4.8.1 Species composition, distribution, quality and quantity

A total of 76 species were recorded from the sample plots among 32 families (Table 4. 1). Six groups of family abundance were recorded with Euphorbiaceae being the most abundant family (25%) followed by Asteraceae, Caesalpinioideae, Mimosoideae and Verbenaceae (18.75%); Combretaceae, Fabaceae/Papilinoideae and Rubiaceae (15.63%); Moraceae and Morphospecies constitute 9.38% each, while Anacardiaceae, Bignonaceae, Meliaceae, Sterculiaceae and Tiliaceae were 6.25% each. Other families such as Amaranthaceae,

Anonaceae, Arecaceae, Athyriaceae, Caricaceae, Chrysobalanaceae, Convolvulaceae, Cochlospermaceae, Guttiferae, Hymenocardiaceae, Loganiaceae, Malvaceae, Ochnaceae, Poaceae, Rahmnaceae, Sapindaceae and Sapontaceae were 3.12% each.

Trees constituted the majority (79.94%) among the life form classification, shrubs constituted 15.7%, while herbs were 4.1%, grasses 0.34% and climber 0.1%. Figure 4.21 presents a summary of the life forms distribution among the floral species within the study area:

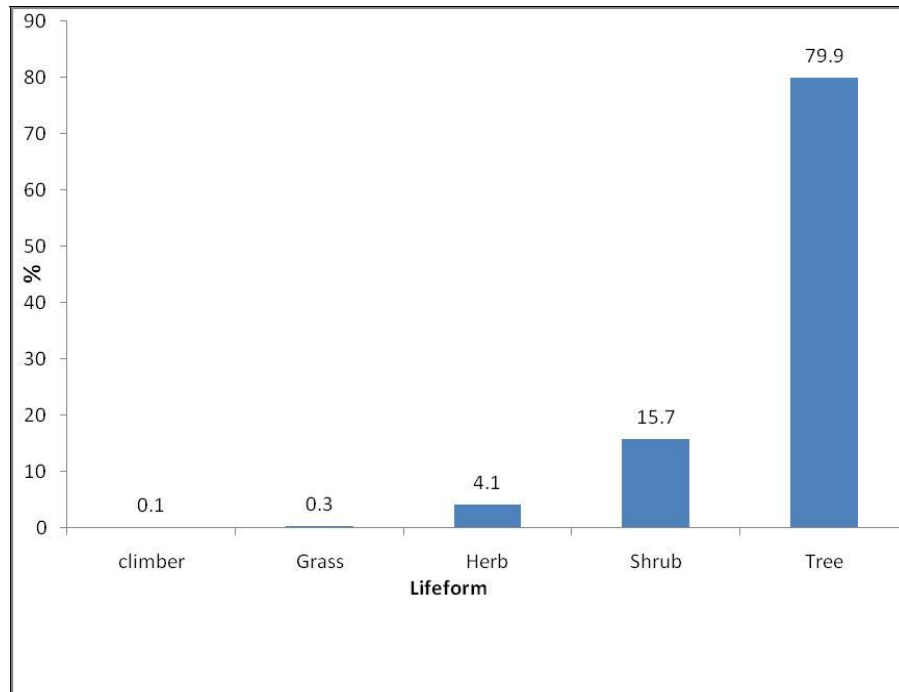


Figure 4.22: Life Form Distribution Among Flora Species Within the Study Area.

Table 4.1 Distribution of species among families in Sanmora Community Forest

Family	Species	Lifeform	Common/Local Name
Amaranthaceae	<i>Amaranthus cordata</i>	Herb	Efo tete abalaye
Anacardiaceae	<i>Lannea acida</i>	Shrub	Oyinyin
	<i>Mangifera indica</i>	Tree	Mango/Mangoro
Annonaceae	<i>Annona senegalensis</i>	Shrub	Wild Custard Apple/Abo
Arecaceae/Palmae	<i>Elaeis guineensis</i>	Tree	Oil palm/Ope
Asteraceae	<i>Vernonia colorata</i>	Herb	Ewuro-ljebu
	<i>Chromolaena odorata</i>	Herb	Siam weed/Siam weed/Akintola
	<i>Aspilia Africana</i>	Herb	Haemorrhage plant/Yunriyun
	<i>Emelia coccinea</i>	Herb	Yellow tassel flower/Odundun oloko
	<i>Ageratum conyzoides</i>	Herb	Goat weed/Imi esu
	<i>Crassocephalum rubens</i>	Herb	Ebolo
Athyriaceae	<i>Diplazium sammatii</i>	Herb	Fern
Bignoniaceae	<i>Spathodea spp</i>	Tree	Oruru
	<i>Stereospermum kunthianum</i>	Tree	Ajade
Caesalpinioideae	<i>Piliostigma thonningii</i>	Shrub	Camel's foot/Abafe
	<i>Daniellia oliverii</i>	Tree	West African copal, African copaiba balsam/Iya
	<i>Isobertia doka</i>	Tree	
	<i>Cordyla spp</i>	Tree	
	<i>Piliostigma reticulatum</i>	Shrub	Camel's foot/Abafe
	<i>Detarium microcarpum</i>	Shrub	Arira
Caricaceae	<i>Carica papaya</i>	Herb	Pawpaw/Ibepe
Chrysobalanaceae	<i>Maranthes polyandra</i>	Shrub	Abo-Idofin, Idofun
Cochlospermaceae	<i>Cochlospermum tinthorum</i>	Herb	Oja ikoko, Feru
Combretaceae	<i>Terminalia macroptera</i>	Tree	Ponla, Idi
	<i>Terminalia avicennoides</i>	Tree	Idi
	<i>Terminalia mollis</i>	Tree	Idi
	<i>Terminalia spp</i>	Tree	Idi
	<i>Anogeissus leiocarpus</i>	Tree	Ayin
Convolvulaceae	<i>Ipomea aquatica</i>	Climber	Swam morning glory/Onduku oko
Euphorbiaceae	<i>Bridelia micrantha</i>	Tree	Ira
	<i>Phyllanthus muellerianus</i>	Herb	Amuranju, Egungun eja
	<i>Alchornea cordifolia</i>	Tree	Christmass bush/Ewe-ifa, Eepa
	<i>Bridelia spp</i>	Tree	Ira
	<i>Margaritaria discoidea</i>	Tree	Awe, Alawe
	<i>Bridelia thonningii</i>	Tree	Ira
	<i>Euphorbia hirta</i>	Herb	Emi-ile
	<i>Phyllanthus amarus</i>	Herb	Eyin olobe
Fabaceae/Papilionoideae	<i>Puereria spp</i>	Herb	
	<i>Lonchocarpus cyanescens</i>	Tree	West African indigo vine/Elu
	<i>Pericopsis laxiflora</i>	Tree	Satin wood, Afrormosia/Ayan, Sedun
	<i>Pericopsis alata</i>	Tree	Satin wood, Afrormosia/Ayan, Sedun
	<i>Desmodium gangeticum</i>	Herb	Emo-Agbo
Graminae	<i>Scleria depressa</i>	Grass	Labelabe
Guttiferae/Clusiaceae	<i>Psorospermum febrifugum</i>	Tree	Leegun oko
Hymenocardiaceae	<i>Hymenocardia acida</i>	Tree	Orupa
Loganiaceae	<i>Strychnos innocua</i>	Shrub	Atako
Malvaceae	<i>Sida acuta</i>	Herb	Broom weed
Meliaceae	<i>Ekebergia senegalensis</i>	Tree	Oronu, Oromu
	<i>Azadiracta indica</i>	Tree	Neem
Mimosoideae	<i>Entada Africana</i>	Tree	Ayunre-banabana
	<i>Parkia biglobosa</i>	Tree	Locust bean/Igba

Family	Species	Lifeform	Common/Local Name
	<i>Prosopis africana</i>	Tree	Ironwood/Aayan
	<i>Acacia sp</i>	Tree	
	<i>Albizia chevalieri</i>	Tree	Ayere
	<i>Sesbania pachycarpa</i>	Herb	
Moraceae	<i>Ficus vallis-choudae</i>	Tree	Fig/Ogunro
	<i>Ficus spp</i>	Tree	Fig/Ogunro
	<i>Ficus capensis</i>	Tree	Fig/Ipin
Ochnaceae	<i>Lophira lanceolata</i>	Tree	Red oak, red ironwood/Pahan
Poaceae	<i>Andropogon gayanus var gayanus</i>	Herb	Gamba grass/Eruwa
Rahmnaceae	<i>Ziziphus spp</i>	Shrub	Eekannase-adie
Rubiaceae	<i>Nauclea latifolia</i>	Shrub	African peach/Egbesi
	<i>Crossopteryx febrifuga</i>	Herb	African bark, Ayeye, Aro, Imi-eran
	<i>Gardenia ternifolia</i>	Herb	Oruwan
	<i>Nauclea spp</i>	Shrub	African peach/Egbesi
Sapindaceae	<i>Blighia spp</i>	Tree	Akee Apple/Ishin
Sapotaceae	<i>Vitellaria paradoxa</i>	Tree	Shearbuter/Emi
Sterculiaceae	<i>Waltheria indica</i>	Herb	Akeepo
	<i>Sterculia setigera</i>	Tree	Karaya gum tree/Ose Awere
Tiliaceae	<i>Grewia spp</i>	Tree	Ora-Igbo
	<i>Triumfetta cordifolia</i>	Herb	Akee-eri
Verbenaceae	<i>Tectona grandis</i>	Tree	Teak/Gedu/Igi Oba
	<i>Vitex simplicifolia</i>	Tree	Black plum/Oori
	<i>Vitex doniana</i>	Tree	Black plum/Oori
	<i>Vitex spp</i>	Tree	Black plum/Oori
	<i>Morus spp</i>	Shrub	Aye, Ewe-Aye
	<i>Morus mesozygia</i>	Shrub	Aye, Ewe-Aye

Table 4.2: Percentage distribution among species in Sanmora Community Forest

Species	Frequency	Percentage Distribution
<i>Daniellia oliverii</i>	326	19.87
<i>Hymenocandia acida</i>	290	17.67
<i>Tectona grandis</i>	204	12.43
<i>Pericopsis laxiflora</i>	83	5.06
<i>Prosopis Africana</i>	80	4.88
<i>Terminalia avicennioides</i>	71	4.33
<i>Piliostigma thonningii</i>	55	3.35
<i>Piliostigma reticulatum</i>	54	3.29
<i>Anonna senegalensis</i>	52	3.17
<i>Lonchocarpus cyanescens</i>	48	2.93
<i>Vitellaria paradoxa</i>	44	2.68
<i>Parkia biglobosa</i>	26	1.58
<i>Margaritaria discoidea</i>	26	1.58
<i>Entada Africana</i>	25	1.52
<i>Phyllanthus muellerianus</i>	16	0.98
<i>Bridelia spp</i>	14	0.85
<i>Chromolaena odorata</i>	13	0.79
<i>Albizia chevalieri</i>	13	0.79
<i>Vitex doniana</i>	12	0.73
<i>Nauclea latifolia</i>	12	0.73
<i>Bridelia micrantha</i>	12	0.73
<i>Cochlospermum tinthorum</i>	10	0.61
<i>Ficus capensis</i>	9	0.55
<i>Aspilia Africana</i>	9	0.55
<i>Strychnos innocua</i>	8	0.49
<i>Andropogon gayanus var gayanus</i>	8	0.49
<i>Terminalia macroptera</i>	7	0.43
<i>Pericopsis alata</i>	7	0.43
<i>Spathodea spp</i>	6	0.37
<i>Sida acuta</i>	6	0.37
<i>Ficus vallis-choudae</i>	6	0.37
<i>Azadiractha indica</i>	6	0.37
<i>Vitex simplicifolia</i>	5	0.31
<i>Stereospermum kunthianum</i>	5	0.31
<i>Gardenia ternifolia</i>	4	0.24
<i>Carica papaya</i>	4	0.24
<i>Maranthes polyandra</i>	3	0.18
<i>Lophira lanceolata</i>	3	0.18
<i>Ekebergia senegalensis</i>	3	0.18
<i>Bridelia thonningii</i>	3	0.18
<i>Blighia spp</i>	3	0.18
<i>Ziziphus spp</i>	2	0.12
<i>Triumfetta cordifolia</i>	2	0.12
<i>Sesbania pachycarpa</i>	2	0.12
<i>Puereria spp</i>	2	0.12
<i>Psorospermum febrifugum</i>	2	0.12
<i>Phyllantus amarus</i>	2	0.12
<i>Morus mesozygia</i>	2	0.12
<i>Isobertlinia doka</i>	2	0.12
<i>Ficus spp</i>	2	0.12
<i>Euphorbia hirta</i>	2	0.12
<i>Emelia coccinea</i>	2	0.12
<i>Detarium microcarpum</i>	2	0.12

Species	Frequency	Percentage Distribution
<i>Cordyla sp</i>	2	0.12
<i>Anogeissus leiocarpus</i>	2	0.12
<i>Amaranthus cordata</i>	2	0.12
<i>Ageratum conyzoides</i>	2	0.12
<i>Waltheria indica</i>	1	0.06
<i>Vitex spp</i>	1	0.06
<i>Vernonia colorata</i>	1	0.06
<i>Terminalia spp</i>	1	0.06
<i>Terminalia mollis</i>	1	0.06
<i>Sterculia setigera</i>	1	0.06
<i>Scleria depressa</i>	1	0.06
<i>Mangifera indica</i>	1	0.06
<i>Lanea acida</i>	1	0.06
<i>Ipomea aquatica</i>	1	0.06
<i>Grewia spp</i>	1	0.06
<i>Elaeis guineensis</i>	1	0.06
<i>Diplazium sammatii</i>	1	0.06
<i>Desmodium gangeticum</i>	1	0.06
<i>Crossopteryx febrifuga</i>	1	0.06
<i>Crassocephalum rubens</i>	1	0.06
<i>Alchornea cordfolia</i>	1	0.06
<i>Acacia sp</i>	1	0.06
Total	1641	99.97

Table 4.3: Principal Non-Timber Forest Species

<i>Species</i>	
<i>Hymenocardia acida</i>	<i>Psorospermum febrifugum</i>
<i>Pericopsis laxiflora</i>	<i>Phyllanthus amarus</i>
<i>Prosopis Africana</i>	<i>Morus mesozygia</i>
<i>Terminalia avicennioides</i>	<i>Isoblerlinia doka</i>
<i>Piliostigma thonningii</i>	<i>Ficus spp</i>
<i>Piliostigma reticulatum</i>	<i>Euphorbia hirta</i>
<i>Anonna senegalensis</i>	<i>Emelia coccinea</i>
<i>Lonchocarpus cyanescens</i>	<i>Detarium microcarpum</i>
<i>Vitellaria paradoxa</i>	<i>Cordyla sp</i>
<i>Parkia biglobosa</i>	<i>Anogeissus leiocarpus</i>
<i>Margaritaria discoidea</i>	<i>Amaranthus cordata</i>
<i>Entada Africana</i>	<i>Ageratum conyzoides</i>
<i>Phyllanthus muellerianus</i>	<i>Waltheria indica</i>
<i>Bridelia spp</i>	<i>Vitex spp</i>
<i>Albizia chevalieri</i>	<i>Vernonia colorata</i>
<i>Vitex doniana</i>	<i>Terminalia spp</i>
<i>Nauclea latifolia</i>	<i>Terminalia mollis</i>
<i>Bridelia micrantha</i>	<i>Sterculia setigera</i>
<i>Cochlospermum tinthorum</i>	<i>Scleria depressa</i>
<i>Ficus capensis</i>	<i>Mangifera indica</i>
<i>Aspilia Africana</i>	<i>Lansea acida</i>
<i>Strychnos innocua</i>	<i>Ipomea aquatica</i>
<i>Andropogon gayanus var gayanus</i>	<i>Grewia spp</i>
<i>Terminalia macroptera</i>	<i>Elaeis guineensis</i>
<i>Pericopsis alata</i>	<i>Diplazium sammatii</i>
<i>Spathodea spp</i>	<i>Desmodium gangeticum</i>
<i>Sida acuta</i>	<i>Crossopteryx febrifuga</i>
<i>Ficus vallis-choudae</i>	<i>Crassocephalum rubens</i>
<i>Azadiractha indica</i>	<i>Alchornea cordifolia</i>
<i>Vitex simplicifolia</i>	<i>Acacia sp</i>
<i>Stereospermum kunthianum</i>	
<i>Gardenia ternifolia</i>	
<i>Carica papaya</i>	
<i>Maranthes polyandra</i>	
<i>Lophira lanceolata</i>	
<i>Ekebergia senegalensis</i>	
<i>Bridelia thonningii</i>	
<i>Blighia spp</i>	
<i>Ziziphus spp</i>	
<i>Triumfetta cordifolia</i>	
<i>Sesbania pachycarpa</i>	
<i>Puereria spp</i>	

Table 4.4: Short listed Non-timber Forest Products in Sanmora Community

S/N.	Scientific Name	Common Name	Current Status	Local Uses
1.	<i>Parkia biglobosa</i>	Igba/Locust bean	Rare (1.58%)	Iru condiment, traditional medicine
2.	<i>Vitellaria paradoxa</i>	Emi/share butter	Rare (2.58 %)	Share butter oil, pomade, traditional medicine
3.	Various animal species	Eran igbe/Bush meat	Rare	Protein supplement, traditional medicine
4.	Various species	Igi-idana/ firewood	Fairly abundant	Cooking, baking, fish/meat smoking etc.
5.	<i>Vitex doniana</i>	oori	Threatened (0.73%)	Dry season vegetable, edible fruit, local ink.

4.8.2 Tree Density, population distribution and growth status in the Study Area

The average number of stems per hectare is 2,075. This is no doubt very high and may be rather unusual for a savannah woodland that is constantly disturbed by farming and grazing. The reason may however not be farfetched as the trees continually produce multiple coppices (re-growth) after each cutting for farming or grazing by cattle. The result is that many of the trees are coppices and wildings which are currently not merchantable. Figure 4.23 presents a summary of tree growth status and distribution within the study area.

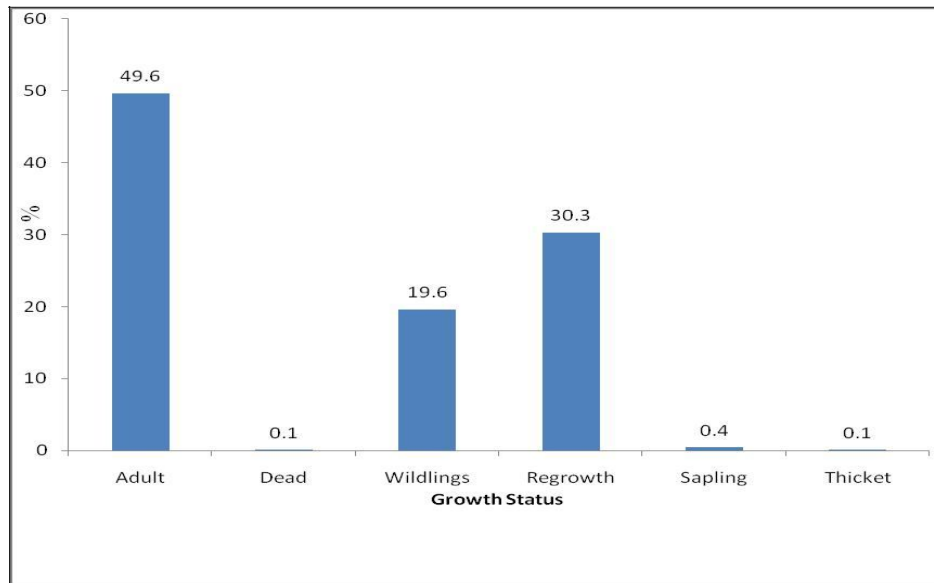


Figure 4.23: Growth Status of Tree Species within the Proposed Community Forest Area.

As shown in the above figure, about 50% of the trees found in the proposed reservation area are adult trees. Re-growths constitute about 30% while the wildlings (seedlings) are about 20%. This is an indication of a re-growing vegetation with the impression that it is well stocked with adult trees that may be harvested in the nearest future. This however is not the case here. Though many trees are adult they have very poor forms and majority of them produce epicomic branchinat or alitle after the diameter at breast height (DBH). Therefore many of them are not merchantable in their present form. Wildlings and re-growths together constitute about 50% percent. This is encouraging for the future forest management in the place. If these young trees are properly taken care of, they might contribute to the stocking of the forest in future. It is however pertinent to point out that majority of them are non-merchantable species which contribute more to ecological rather than economic objectives. Species in this category include *Hymenocardia acida*, *Gardinia tenuifolia*, *Nauclea latifolia* and *Phylanthus maulerianus* which can at best serve as fire wood or stakes only

4.8.3 Volumes Estimation and Growth Rate

The volume per unit area was estimated using several measurements of DBH and merchantable height (H). The average DBH was 8.82cm. The minimum and maximum DBH were 10.2 and 70cm respectively. The average merchantable height was 4.3 m. e the minimum and maximum heights were 0.3 and 30.0 m respectively. Average volume per hectare is 6.16m^3 . The minimum and maximum values being 1.9m^3 17m^3

Growth rate is the rate of increase in tree parameters over time. The growth rate is usually obtained by repeated measurements of selected tree parameters (e.g. DBH, Height, volume etc on an annual basis over a period of years). This gives an average value known as mean annual increment. In this case increment values are not available. Therefore measurement of growth rate is no feasible since the data set available is for only one year.

4.8.4 Calculation of Allowable Cut

Allowable cut was estimated using the Von Mantel's formula modified by the 'triangle' formula as suggested by Leuschner (1984):

$$AC = \frac{2(V)}{R}$$

Where:

AC = Allowable cut(m³)
 V = Volume per hectare (m³)
 R = Rotation age (yrs).
 From the above Ac is calculated

$$\text{as: } AC = 2(6.16\text{m}^3)/R$$

For the purpose of this plan rotation agr (R) is fixed at 15 years at the end of which period it assumed that the component trees would have grown into merchantable size.

Therefore AC = 0.82 m³ per hectare/year.

It should be clear from the above estimate that it is currently not feasible to harvest timber in any substantial quantity from the Sanmora Forest because the stocking is very poor with majority of the trees being undersized and of low quality in terms of form. Furthermore, the ultimate goal of the project is watershed protection with permissible level of livelihood support. Therefore timber production is of secondary importance. It should also be noted that majority of the wood that constitute the actual growing stock are young and deformed trees.

4.8.5 Faunal Distribution in the Proposed Sanmora Community Forest

The area is inhabited by many species of wild animals including birds, mammals and reptiles. Sixty species of birds from thirty two families, eight species of mammals belonging to six families and three species of reptiles belonging to three families were recorded as indicated in Tables 3.4 and 3.5. Sanmora forest is a highly disturbed environment. There are uncontrolled hunting, logging and grazing activities in the area. Considerable farming activities were also observed. A mining site and some smoking kilns (for conversion of wood to charcoal) were observed. The above are factors that are inimical to conservation of biodiversity. Therefore, the proposed management plan should take cognizance of these potential sources of management conflicts to prevent loss of biodiversity while giving consideration for the livelihood of the host community in Sanmora.

The forest holds great potentials for development into a wildlife sanctuary (conservation area) if necessary protective and funding measures are put in place. The forest provides cover to abundant populations of birds (some of which are endangered species), green monkeys, hare, warthog and grasscutter. The forest has enough bird populations to attract the interest of bird lovers/watchers.

Table 4.5: Animal Species Inhabiting Sanmora Forest (Birds).

S/No.	Family	Scientific Names	Common Names
1	Coraciidae	<i>Coracious cynogaster</i>	Blue-bellied Roller
2	"	<i>Eurystomus glaucurus</i>	Broad-billed Roller
3	"	<i>Coracias abyssinica</i>	Abyssinian Roller
4	Columbidae	<i>Streptopelia semitorquata</i>	Red-eyed Dove
5	"	<i>S. vinacea</i>	Vinaceous Dove
6	"	<i>S. decipens</i>	African Mourning Dove
7	"	<i>S. senegalensis</i>	Laughing Dove
8	Phasianidae	<i>Francolinus bicalcaratus</i>	Double-spurred Francolin (Bush fowl)
9	Bucerotidae	<i>Tockus nasutus</i>	African Grey Hornbill
10	Pycnonotidae	<i>Pycnonotus barbatus</i>	Common Bulbul

S/No.	Family	Scientific Names	Common Names
11	"	<i>Chlorocichla flavicollis</i>	Yellow Throated Leaflove
12	Musophagidae	<i>Crinifer piscator</i>	Western Plantain Eater
13	"	<i>Musophaga violacea</i>	Violet Turaco
14	Nectariniidae	<i>Nectarinia senegalensis</i>	Scarlet Chested Sunbird
15	"	<i>N. coccinigaster</i>	Splendid Sunbird
16	"	<i>Cyanomitra verticalis</i>	Green Headed Sunbird
17	"	<i>Cinnyris venusta</i>	Variable Sunbird
18	"	<i>C. chloropygius</i>	Olive-bellied Sunbird
19	Cuculidae	<i>Centropus senegalensis</i>	Senegal coucal
20	Corvidae	<i>Corvus albus</i>	Pied Crow
21	"	<i>Ptilostomus afer</i>	Piac Piac
22	Ardeidae	<i>Ardeola ibis</i>	Cattle Egret
23	"	<i>Nycticorax nycticorax</i>	Back-crowned Night Heron
24	Timaliidae	<i>Turdoides plebejus</i>	Brown Babbler
25	"	<i>T. reinwardtii</i>	Black-cap Babbler
26	Accipitridae	<i>Kaupifalco monogrammicus</i>	Lizard Buzzard
27	"	<i>Circus ranivorus</i>	African Marsh Harrier
28	"	<i>Falco tinnuculus</i>	Grey Kestrel
29	Oriolidae	<i>Oriolus auratus</i>	African Golden Oriole
30	Capitonidae	<i>Pogoniulus chrysoconus</i>	Yellow Fronted Tinker-bird
31	"	<i>Lybius vieilloti</i>	Vieilloti's Bird
32	Sylviidae	<i>Cisticola natalensis</i>	Croaking Cisticola
33	"	<i>Melocichla mentalis</i>	African Moustached Grass Warbler
34	"	<i>Camaroptera brevicaudata</i>	Grey-backed Camaroptera
35	"	<i>Eremomela pusilla</i>	Senegal Eremomela
36	"	<i>Prinia subflava</i>	Tawny-flanked Prinia
37	"	<i>Sylvietta brachyuran</i>	Nothern Crombec
38	Muscicapidae	<i>Tersiphone viridis</i>	African Paradise Flycatcher
39	"	<i>Batis senegalensis</i>	Senegal (Puffback Flycatcher) Batis
40	"	<i>Ficedula hypoleuca</i>	Pied Flycatcher
41	Turdidae	<i>Turdus pelios</i>	African Thrush
42	"	<i>Cossypha albicapilla</i>	White-Crowned Robin-chat
43	Plastysteiridae	<i>Plastysteira cyanea</i>	Common Wattle Eye
44	Phoeniculidae	<i>Phoeniculus purpureus</i>	Green Wood Hoopoe
45	Psittacidae	<i>Poicephalus senegalus</i>	Senegal parrot
46	Alcedinidae	<i>Halcyon leucocephala</i>	Grey Headed Kingfisher
47	"	<i>Ceyx picta</i>	African Pygmy Kingfisher
48	Motacillidae	<i>Macronyx croceus</i>	Yellow Throated Longclaw
49	Scopidae	<i>Scopus umbretta</i>	Hammerkop
50	Numididae	<i>Numida meleagris</i>	Helmeted Guineafowl
51	Passeridae	<i>Passer griseus</i>	Northern Grey Headed Sparrow
52	Estrildidae	<i>Lonchura cucullata</i>	Bronze mannikin
53	"	<i>Lagonostica senegala</i>	Red-bellied Fire-finch
54	Remizidae	<i>Anthoscopus parvulus</i>	Yellow Penduline Tit
55	Viduidae	<i>Vidua chalybeate</i>	Village Indigobird
56	Fringillidae	<i>Serinus mozambicus</i>	Yellow Fronted Canary
57	Campephagidae	<i>Campephaga phoenicea</i>	Red Shouldered Cuckoo-shrike
58	Malaconotidae	<i>Lanius barbarus</i>	Yellow Crowned Gonolek (Barbary Shrike)
59	"	<i>L. ferrugineus</i>	Tropical Boubou (Bell Shrike)
60	Laniidae	<i>Corvinella corvine</i>	Yellow Billed Shrike

Note: Naming of bird species follows Nason (1992) and Ezealor (2002).

Table 4.6: Animal Species Inhabiting Sanmora Forest (Mammals and Reptiles)

S/N	Family	Scientific Names	Common Names
Mammals			
1	Bovidae	<i>Cephalophus spp.</i>	Duiker
2	"	<i>Sylvicapra grimmia</i>	Red flanked duiker
3	"	<i>Tragelaphus scriptus</i>	Bush buck
4	Cercopithecidae	<i>Cercopithecus tantalus</i>	Green (Tantalus) monkey
5	Leporidae	<i>Lepus crawshayi</i>	Hare
6	Sciuridae	<i>Xerus erythropus</i>	Ground squirrel
7	Suidae	<i>Phacochoerus aethiopicus</i>	Warthog
8	Thryonomidae	<i>Thryonomys swinderianus</i>	Grass cutter (Cane rat)
Reptiles			
1	Elapidae	<i>Naja nigricollis</i>	Spitting cobra
2	Pythonidae	<i>Python sebae</i>	Python
3	Varanidae	<i>Varanus niloticus</i>	Monitor lizard

4.9 Production of an up to date map of the proposed Sanmora Community Forest

At the completion of field work, all the data captured during the field observation were downloaded from the Total station. This was necessary since there was no manual recording of data during the field observation. The list of data obtained is as shown in Tables 4.7 below.

Table 4.7: Coordinates of Sanmora Forest Boundary Beacons.

Station ID	Easting	Northing
PL1	20012.25	12492.748
PL2	20089.195	12677.402
PL3	20166.207	12861.908
PL4	20224.904	13003.523
PL5	20306.069	13172.016
PL6	20364.933	13128.566
PL7	20465.029	13091.945
PL8	20614.976	13121.488
PL9	20576.112	12953.069
PL10	20531.32	12758.024
PL11	20481.928	12556.379
PL12	20441.23	12360.879
PL13	20359.274	12381.398
PL14	20209.357	12429.358
PL15	20051.031	12479.879

4.10 Analysis of Inventory

The general analysis of the results obtained shows that the job was properly executed. The total area covered was about **28.033** hectares. The linear accuracy for the traverse was computed using the formulae below:

$$\text{Linear Accuracy} = \left(\frac{\sqrt{(\text{DN}^2 + \text{DE}^2)}^{-1}}{\Sigma \text{D}} \right)$$

Where:

DN = Mis-closure in the Northing, between given coordinate and the observed coordinate of the closing control.

DE = Mis-closure in the Easting, between given coordinate and the observed coordinate of the closing control and the observed;

ΣD = Summation of (total) distances within the traverse loop.

The table below thus shows the brief analysis of results obtained.

Table 4.8: Analysis of Result

No. Of stations	Total distance	Misclosure			Linear accuracy obtained	Allowable linear accuracy	Remarks
		Angle	Eastings	Northing			
38	5313.149m	0 ⁰ 1' 26"	-0.237	0.390	1/25,000	1/3000	Ok

Presentation of survey data is a very vital aspect of any survey work because often times they convey the needed information about the job to the end users i.e. the client. AutoCAD 2000 & 2006 was used to plot the data obtained. As earlier mentioned, different script files were produced in line with the AutoCAD acceptable formats to enhance speedy plotting of all the necessary data. A script file has the uniqueness of plotting several data within a few seconds of time when compared to one per time interactive plotting. Thus, the boundary lines, and other details were plotted to scale 1:2000.

Plan Production (Appendix 1)

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Chapter 5: Management Plan for the Forest Reserve

5.1 Five Year Operational Management Plan

5.1.1 Preamble

The proposed forest reserve shall be known as Sanmora community forest. The forest Reserve is owned by the Sanmora community.

This management plan was prepared in consultation with members of the communities adjoining the forest reserve at Sanmora, Agbeola, Iludun Eju and Ajase Ipo. The area under planning currently carries no designated forest reserve in a strict sense. It is composed of a total area of about 28 ha. It carries a mosaic of vegetation dominated by Savannah woodland and dotted at places by farms, fallow farm land and a few clusters of young stands of *Tectona grandis*. This management plan is designed to provide the required guide for the take off and continued management of the reserve for a period of five years starting from 2009.

5.1.2 Management Objective

The objective of the proposed forest reserve is to protect the watershed of Oshin River, enhance, and sustain the livelihood of members of the communities who practice Fadama farming. The forest shall also supply limited amount of timber and non-timber resources subject to an optimal level that will be compatible with the watershed protection objective. Indigenous timber species such as *khaya spp*, *nauacblea diderrichii* and *afzelia spp* shall complement the already culturally adapted *Tectona grandis*

5.1.3 Scope of the Management Plan

This plan provides information on the various management activities to be carried out within the proposed forest reserve over a period of five years. The management plan is to be implemented by a Forest Management Committee with the assistance of volunteer forest patrol guards. The local government and the State government officials are to act only in advisory capacity. Recommendations are made on the necessary actions to be carried out for the rehabilitation of the forest reserve.

5.2 Division of the proposed forest reserve into management units

For ease of management and referencing the forest was subdivided into four compartments (A,B,C,D) each of about 7 ha (Figure 5.1). The division was based on uniformity of vegetation cover, species composition and topography. Further subdivision into sub-compartments was not feasible due to the limited size of the forest.

5.3 Status of the Growing Stocks

Presently, the proposed forest reserve is composed of degraded savanna woodland, clusters of teak stands and farm fallows. The relics of the original forest along river courses contain numerous poorly stocked timber and non-timber forest produce. The main focus of this plan is to rehabilitate the forest land with a view to ensuring the health of the watershed ecosystem while also producing some minimal levels of timber and non timber resources for sustainable livelihood development.

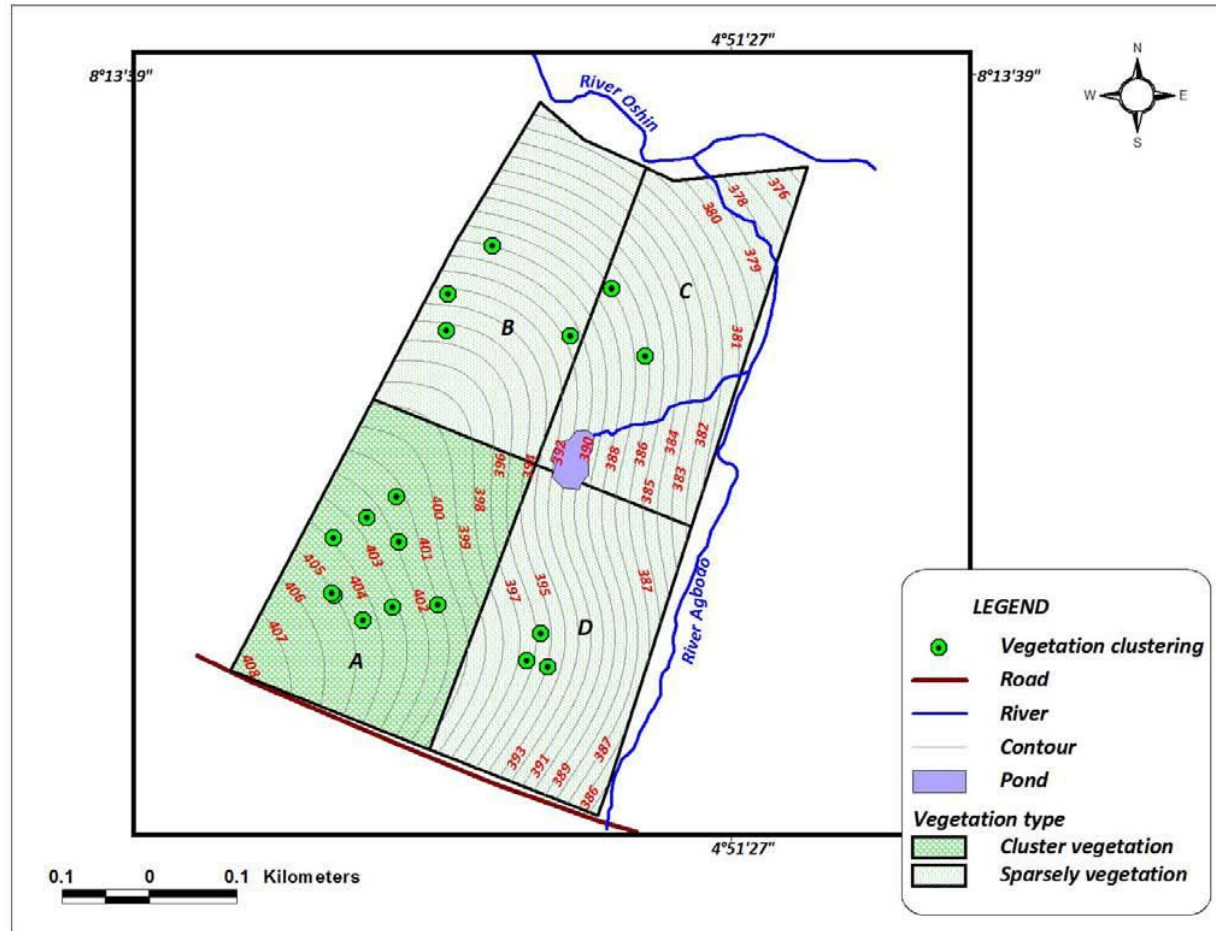


Figure 5.1: Map of Sanmora Community Forest Showing Management Subdivisions

5.4 Action Plan 2009 -2013

5.4.1 Compartment: A

Area: 0.082Km²

Main Objective: Restocking of the dispersed vegetation cover to protect the watershed and produce at least xm³ of wood per hectare per year thatching.

S/N	2009	2010	2011	2012	2013
1.1	Composition and inauguration of Community Forest management Committee(CFMC) Reconciliation of boundaries on ground and familiarization with site conditions Training on community nursery establishment and management techniques Seed collection	Boundary cleaning Fire tracing Routine boundary patrols Seed collection continues	Fire tracing Boundary cleaning Collection of seeds	Boundary. cleaning/maintenance, Seed collection continues	Boundary patrol
1.2	Development of community forest byelaws. Establishment of community nursery Seed collection continues	Seed collection continues Raising of seedlings of <i>T.grandis and Khaya spp.</i>	Nursery site preparation Routine maintenance activities Boundary patrol	Raising of seedlings of 750 each of <i>T.grandis and Khaya spp</i>	Routine maintenance Boundary patrols
1.3	Construction of access roads and rides	Routine nursery maintenance activities Locust bean harvesting CFMC meeting Boundary patrol Retraining of Volunteer community forest guards	CFMC meeting Boundary patrols Harvesting of locust beans fruits Raising of 1500 seedlings of <i>T.grandis and Khaya spp</i>	Harvesting of locust beans seed Production of firewood Regular boundary patrols CFMC meeting harvesting of leafy vegetables	Routine maintenance Harvesting of locust beans CFMC meeting
1.4	Construction of access roads and rides continues	Nursery maintenance activities	Routine nursery maintenance activities	Routine maintenance operations Boundary patrols	Boundary patrol Routine maintenance
1.5	Land preparation for enrichment planting	Site preparation for enrichment planting Harvesting of shear butter	Site preparation for enrichment planting Production of fire wood and rafters from saplings and poles harvested	Routine maintenance operations Boundary patrols	Weeding and cleaning, light thinning,
1.6	Planting operations Meeting of CFMC	Enrichment planting with <i>T.grandis and K spp .</i>	Enrichment planting harvesting of shear butter	Harvesting of Shea butter Enrichment planting with	Harvesting of shear butter Weeding and cleaning

S/N	2009	2010	2011	2012	2013
		Harvesting of shear butter continues CFMC meeting	CFMC meeting	locust bean, vitex and shea butter. CFMC meeting	continues, CFMC meeting
1.7	Planting operation continues Training of volunteered community forest guards	Beating up	Enrichment planting continues	Enrichment planting continues	Weeding and cleaning continues
1.8	Release weeding	Weeding and cleaning	Weeding and cleaning	Weeding and cleaning	Weeding and cleaning continues
1.9	Training, singling and cleaning operations for the existing stock CFMC meeting	Training, singling and cleaning operations for the existing stock. Production of firewood CFMC meeting	Routine maintenance operations Beating up CFMC quarterly meeting	CFMC meeting Weeding and cleaning	project appraisal
1.10	Production of fire wood and rafters from saplings and poles	routine maintenance operations	Boundary patrols	weeding and cleaning Light thinning	Routine maintenance, boundary patrols
1.11	Boundary cleaning and patrols	Training of CFMC members on forest management skills	Mid- project review meeting Boundary cleaning Collection of seeds for seedling production	Trips by selected community representatives to other locations where CBFM has succeeded.	Routine maintenance, boundary patrols
1.12	CFMC meeting Boundary cleaning Routine boundary patrols Seed collection	Fire tracing Routine boundary patrol CFMC meeting	Fire tracing Intensive boundary patrols. CFMC meeting	Boundary cleaning Regular boundary patrol Fire tracing CFMC meeting	Final stock taking CFMC meeting

5.4.2 Compartment B

Area: 0.078Km²

Main Objectives: Restocking of degraded savanna woodland with *Tectona grandis* and *Khaya spp* for watershed protection and sustainable livelihood.

S/N	2009	2010	2011	2012	2013
1.1	CFMC meeting Reconciliation of boundaries on ground and familiarization with site conditions Training on community nursery establishment and management techniques Seed collection	Collection of seeds (<i>T.grandis</i> and <i>Khaya spp</i>) . Routine nursery operations Maintenance of forest boundaries Regular boundary patrols	Boundary cleaning / maintenance. Regular boundary patrol. Nursery maintenance activities.	Boundary cleaning/maintenance. Routine boundary patrol. Nursery activities	Boundary patrols and fire tracing. Seed collection (<i>Khaya</i> and <i>Azelia</i>). Routine nursery activities
1.2	Nursery maintenance. Routine boundary patrol Maintenance of access roads Seed collection continues	Nursery activities continue	Nursery maintenance activities Harvesting of Vitex vegetables and locust bean seeds	Routine boundary patrol. Nursery maintenance operations	Routine boundary patrols, nursery activities , Road maintenance operations
1.3	CFMC meeting Boundary cleaning and regular patrols Harvesting of locust bean seeds and vitex vegetable	Maintenance of access roads and rides. Harvesting of locust bean seeds Harvesting of Vitex vegetable CFMC meeting	Nursery maintenance operations Harvesting of locust bean seeds CFMC meeting	Harvesting of locust bean seeds and Vitex vegetable. Nursery maintenance operations CFMC meeting	CFMC meeting Nursery activities continue Harvesting of locus beans, vitex vegetable
1.4	Routine nursery maintenance operation Harvesting of Locust beans and vitex vegetable continues	Routine boundary patrols and maintenance of access roads. Collection of locust bean seeds for seedling production. Land preparation for planting operation	Nursery maintenance operations Road maintenance operations. Harvesting of locust bean seeds. Land preparation for beating up	Nursery maintenance activities Harvesting of locust bean seeds and vitex vegetable. seed collection (Parkia)	Stock- taking. Harvesting of locust bean seeds and vitex vegetable
1.5	Singling and light thinning. Production of fire wood from resultant cuttings	. Singling and light thinning. Production of some fire wood. Site preparation for restocking continues Harvesting of shea butter; collection and processing of shea-butter seeds for	Beating up of previous year's plantings of <i>khaya</i> and <i>T.grandis</i> Harvesting of shea butter.	Beating up continues. Weeding and cleaning	Weeding and cleaning continues. Harvesting of shea butter seeds

S/N	2009	2010	2011	2012	2013
		sowing			
1.6	Routine maintenance operations CFMC meeting Spot weeding to encourage wildlings development	CFMC meeting Harvesting of shea butter continues. Planting operations	CFMC meeting Beating up operations, Weeding and cleaning	CFMC meeting Beating up continues Spot weeding for wildlings' development Seed collections	CFMC meeting Spot weeding for wildlings' development Seed collections
1.7	Routine management operations	Spot weeding. Routine management operations	Beating up, Weeding and cleaning continue.	Routine management operations	Weeding, cleaning and light thinning Production of fire wood from thinning
1.8	Routine management operations	Routine management operations	weeding and cleaning	Weeding and cleaning	Weeding and cleaning. Routine management operations
1.9	CFMC meeting Weeding and cleaning to release wildlings	CFMC meeting Ring weeding to release wildlings. General cleaning	CFMC meeting Weeding and cleaning.	CFMC meeting routine management operations. Nursery activities	CFMC meeting Routine management operations. Nursery activities (seedlings production- <i>Khaya</i> , <i>afzelia</i> , <i>Vitex</i> and <i>vitellaria</i>)
1.11	Boundary cleaning, routine boundary patrol.	Boundary patrol . Boundary cleaning . Seed collection(<i>Khaya</i> spp, <i>T.grandis</i>)	Routine management operations	Boundary cleaning Routine management operations	Boundary patrol. Boundary cleaning Nursery maintenance activities
1.12	CFMC meeting Boundary cleaning Fire tracing. Routine boundary patrol	CFMC meeting Boundary cleaning and routine management. Seed collection (<i>Khaya</i> spp, <i>T.grandis</i>)	CFMC meeting Boundary patrol Retraining of volunteer patrol guards	CFMC meeting. Boundary cleaning and patrol. Seed collections(<i>khaya</i> and <i>Afzelia</i> ,)	CFMC meeting Boundary cleaning. Routine maintenance operations

5.4.3 Compartment C

Area: 0.082Km²

Main Objective: Restocking of degraded savanna woodland with *parkia biglobosa*, *Vitellaria* and *Khaya spp* for watershed protection and sustainable livelihood.

S/N	2009	2010	2011	2012	2013
1.1	Boundary cleaning Retraining of boundary patrol guards. Collection of seeds for seedling production (khaya, Afzelia, Parkia, vitellaria and vitex)	Collection of seeds and nursery establishment operations. Maintenance of forest boundaries Regular boundary patrols	Boundary cleaning / maintenance. Regular boundary patrol. Nursery maintenance activities. production of seedlings of, <i>Khaya spp. and Afzelia spp</i>	Boundary cleaning/maintenance. Routine boundary patrol. Nursery activities	Seed collection continues Boundary patrols and fire tracing. Nursery maintenance operations
1.2	Nursery maintenance. Routine boundary patrol Maintenance of access roads	Nursery activities Routine boundary patrol.	Nursery maintenance activities and raising of seedlings Harvesting of Vitex vegetables and locust bean seeds	Routine boundary patrol. Nursery maintenance operations Seed collection(<i>Khaya and afzelia</i>)	Routine boundary patrols, nursery activities ,
1.3	CFMC meeting Boundary cleaning and regular patrols Harvesting of locust bean seeds and vitex vegetable	CFMC meeting Maintenance of access roads and rides. Harvesting of locust bean seeds Harvesting of Vitex vegetable	CFMC meeting Nursery maintenance operations Harvesting of locust bean seeds. Road maintenance operations.	CFMC meeting Harvesting of locust bean seeds and Vitex vegetable. Nursery maintenance operations	CFMC meeting Nursery activities continues. Harvesting of locust beans, vitex vegetable
1.4	Routine nursery maintenance operation Harvesting of Locust beans and vitex vegetable continues	Routine boundary patrols and maintenance of access roads. Collection of locust bean seeds for seedling production	Nursery maintenance activities Harvesting of locust bean seeds. Land preparation for restocking	Nursery maintenance activities Harvesting of locust bean seeds and vitex vegetable.	Final stock- taking. Harvesting of locust bean seeds and vitex vegetable
1.5	Singling and light thinning. Production of fire wood from the resultant cuttings	Singling and light thinning. Production of some fire wood. Harvesting of Shea butter; collection and processing of shea-butter seeds for sowing	Restocking with <i>khaya, Afzelia, parkia and vitellaria spp.</i> harvesting of share butter.	Beating up of previous year's planting, weeding and cleaning	Final beating up Weeding and cleaning

S/N	2009	2010	2011	2012	2013
1.6	CFMC meeting routine maintenance operations Sport weeding to encourage wildlings development	CFMC meeting Harvesting of shea butter continues	CFMC meeting planting operations, Weeding and cleaning	CFMC meeting Beating up continues Spot weeding for 'wildlings' development	Harvesting of shea butter seeds
1.7	Routine management operations	Weeding and cleaning. Routine management operations	Planting operations, continue Weeding and cleaning.	Beating up continues	Weeding, cleaning singling
1.8	Routine management operations	Routine management operations	weeding and cleaning	Weeding and cleaning	Weeding and cleaning. Routine management operation
1.9	CFMC meeting Weeding and cleaning to release wildlings	CFMC meeting Ring weeding to release wildlings	CFMC meeting Weeding and cleaning.	CFMC meeting Routine maintenance operations. Nursery operations	CFMC meeting Routine management operations. Nursery activities (seedlings production- <i>Khaya, afzelia, Vitex and vitellaria</i>)
1.11	Boundary cleaning, routine boundary patrol. seed collection (<i>Khaya, Afzelia</i>)	Boundary patrol Seed collection (<i>Khaya and afzelia</i>)	Boundary cleaning	Routine maintenance operations	Boundary patrol. Boundary cleaning Nursery maintenance activities
1.12	CFMC meeting Boundary cleaning Fire tracing. Seed collection for community nurseries (<i>khaya and afzelia</i>)	CFMC meeting Boundary cleaning and routine nursery activities.	CFMC meeting Boundary patrol Retraining of volunteer patrol guards	CFMC meeting Boundary cleaning and patrol. Seed collections (<i>khaya and Afzelia</i>)	CFMC meeting Boundary cleaning. Routine maintenance operations. Performance evaluation

5.4.4 Compartment D

Area: 0.074 Km²

Main Objective: Restocking of degraded riparian vegetation with *Azelia* and *Khaya* spp for watershed protection and sustainable livelihood.

S/N	2009	2010	2011	2012	2013
1.1	Boundary cleaning Retraining of boundary patrol guards	Collection of seeds. Routine nursery operations Singling and freeing of wildlings. Maintenance of forest boundaries	Boundary cleaning. Nursery maintenance operations Boundary patrol	Boundary cleaning / maintenance. Boundary patrols. Routine nursery operations	Boundary cleaning/maintenance. Routine boundary patrol
1.2	Nursery maintenance operation Boundary patrol	Nursery maintenance activities	Raising of 750 seedlings each of <i>Khaya</i> and <i>Azelia</i> spp. Boundary patrol	Boundary cleaning Nursery maintenance activities. Boundary patrols	Regular boundary patrols
1.3	C F M C Meeting Boundary cleaning and regular patrols	C F M C Meeting Maintenance of access roads Harvesting of locust bean seeds and vitex vegetables	C F M C Meeting Maintenance of access roads. Harvesting of locust bean seeds and vitex vegetable	C F M C Meeting Harvesting of <i>parkia biglobosa</i> and vitex vegetable	C F M C Meeting Regular boundary patrol. Boundary cleaning. Harvesting of <i>parkia biglobosa</i> and vitex vegetable
1.4	Routine nursery maintenance operations	Harvesting of locust bean seeds and vitex vegetables	Routine nursery activities Harvesting of locust bean seeds and vitex vegetable.	Site preparation for planting out. Preparation of seedlings for field planting. Harvesting of <i>parkia biglobosa</i> and vitex vegetable	Nursery maintenance and rejuvenation. Harvesting of <i>parkia biglobosa</i> and vitex vegetable
1.5	Pruning and training. Production of firewood Harvesting of Shea butter	Routine management operations	Harvesting of shea butter. Routine management activities	Planting operations	Beating up. Pruning and training of saplings and pole- sized trees Production of firewood/poles for domestic uses
1.6	C F M C Meeting Pruning and training Production of firewood Harvesting of Shea butter	C F M C Meeting Routine management operations	C F M C Meeting Routine management operations	C F M C Meeting Planting operations and routine maintenance of access roads	C F M C Meeting Singling and spot weeding for seedling regeneration. Beating up continues
1.7	Weeding and routine	Ring weeding and freeing	Weeding and cleaning. Training	Weeding and cleaning	Beating up continues.

S/N	2009	2010	2011	2012	2013
	maintenance	of wildlings maintenance	of wildlings		Weeding and cleaning
1.8	Routine management operations	Weeding and cleaning	Weeding and cleaning. Training of wildlings	Routine management operations	Routine management operations.
1.9	C F M C Meeting Routine management operations	C F M C Meeting Routine management operations. Training of wildlings.	C F M C Meeting. Routine management operations. Training of wildlings	C F M C Meeting Routine management operations	C F M C Meeting Routine management operations
1.10	Weeding and routine maintenance	Maintenance of regeneration	Maintenance of regeneration	Stand maintenance operations	Routine management operations
1.11	Sport weeding to encourage regeneration Boundary cleaning and patrol	Boundary patrol and cleaning	Boundary patrol and cleaning	Regular patrol of forest boundaries	Boundary cleaning Final stock taking
1.12	Seed collection (<i>khaya and Afzelia</i>)	C F M C Meeting Routine patrol. Fire tracing	C F M C Meeting	CFMC meeting. Project performance evaluation. Boundary cleaning	CFMC meeting. Review and update of management plan

5.5 Duties and Functions of the Community Forest Management Committee

Equal opportunity in decision making by all interest groups should be a key criteria guiding establishment of a forest management committee. The duties and functions of each interest group are as follows:

- Community-Based Associations/Institutions:

This group will be responsible for primary management of the forest. Their role includes formulating ideas and propositions on how the forest will be managed, including the rights and benefits they desire from the forest. They shall attend the meetings of the Forest Management Committee (FMC) regularly to exchange ideas and make recommendations on forestry issues. Such recommendations should be borne out of mutual agreement of all members. They shall provide advisory services to Kwara State Fadama Project unit with the view of collaborating for effective protection of the proposed Sanmora community forest. They should also be involved in the establishment of community nurseries to supply seedlings for regeneration programmes. They shall provide paid labour for forest operations such as fire-tracing, site preparation and road maintenance. As a matter of necessity whatever benefit that accrues from the forest should be shared fairly among the various stakeholders.

- Sanmora Forestry and Fadama Field Staff

This group will represent the interest of the government at meetings. They should be familiar with the forest reserve, its extent and resource composition. They will provide professional advice. They are also expected to liaise and provide feedback to the State Fadama units and Department of Forestry on discussions made at the CFMC meetings through their zonal officers.

- Academic and Research Institutions

These will provide training needs to CFMC members by organizing short training courses, workshops and seminars to be sponsored by the Kwara State Fadama project. Through this means they will disseminate information on new research findings, innovations and ideas on forest and watershed management.

- Zonal Officers at Ajasse-Ipo.

These include the forestry and Fadama officers within Sanmora zone. They shall form the link between the local communities and the State Fadama unit and Department of Forestry. They will provide feedback to state offices on recommendations of CFMC meetings. They will also communicate information on government policy decisions and programmes to CFMC meetings. They are expected to regularly attend meetings, obtain and provide first hand information on the proposed community forest.

- Representatives of Sanmora Fadama User Group.

This committee will represent the interest of Fadama users group in CFMC meetings. They will communicate information to and from their members.

- Kwara State Fadama Unit and Department of Forestry

These shall on the basis of proposals and recommendations, forwarded to them by the CFMC, advise on the execution of work plans for the management of the forest. The unit and Department shall also monitor and co-ordinate the activities of the CFMC and recommend disciplinary actions for offenders and violators or forest management laws. In collaboration with academic and research institutions, they will provide training and development programmes for CFMC members. Unit officers will regularly brief the Desk Officers at the state level on the policy recommendations from meetings and requests for financial and technical supports to execute programmes.

- High Chiefs of Sanmora Land

These will assist the Oniju in decision making on the proposed community forest. As representative of different quarters in Sanmora, they will collate and relate information to and from their quarters for effective deliberation and informed decision making.

- His Royal Highness the Oniju of Eju Land, Sanmora

For crucial issues on policy formulation, the Oniju of Eju is also expected to consult directly with the Fadama programme officer to make suggestions and provide advice. The Oniju shall provide feedback to his subjects through various interest groups at the local level.

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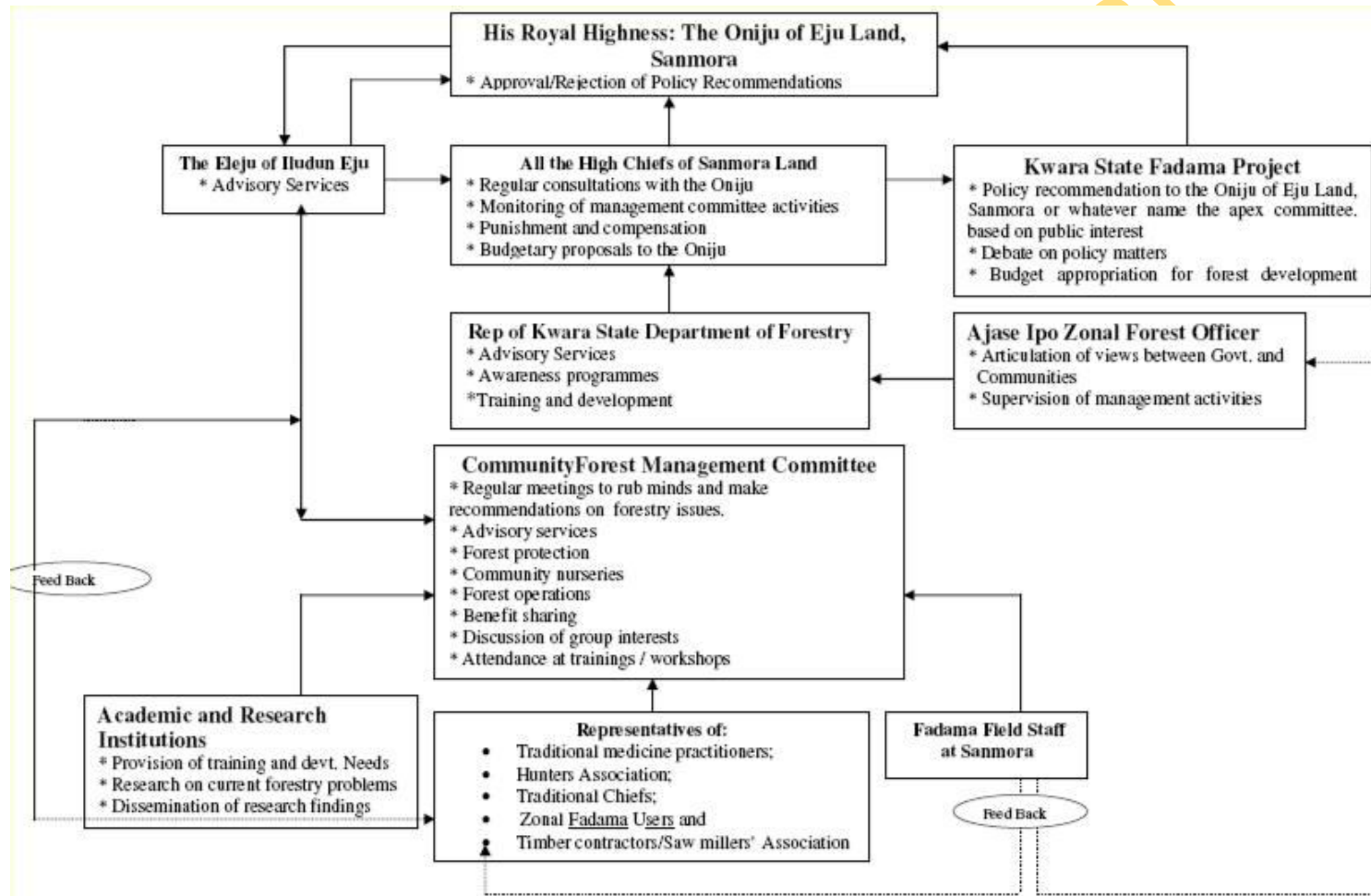


Figure 5.2: Proposed Community Forest Management Committee for Sanmora Community Forest

5.6 Forest Management Programmes

The management plan involves several tasks running simultaneously to ensure that periodic management objectives are met. Thus each of the compartments has 12 levels of activities representing the 12 calendar months in a year. A summary of the different management programs as proposed in the plan is presented below:

- **January**- Patrol of forest boundaries to prevent encroachment. Boundary clearing to prevent possible fire outbreak. Seed collection from plants fruiting during this period. Nursery activities to provide water and prepare seed beds. In the first year, inauguration and training of CFMC members and Volunteer patrol guards should hold. Forest byelaws should be promulgated.
- **February**- Most of the activities in January continues. Dry season management activities continue. Construction of access roads and rides.
- **March**- first CFMC quarterly meeting. Harvesting of locust beans and vitex vegetables. Boundary patrols and maintenance continue. Maintenance of roads and rides.
- **April**- harvesting of locust beans and vitex vegetable to continues. Intensification of nursery activities in readiness for rainy season planting. Land preparation for field planting to commence. Collection of seeds of locust beans for planting.
- **May**- Land preparation to continue. Commencement of planting operations. Light thinning and singling of existing stock. Harvesting of shea butter commences. Production of firewood from the cuttings.
- **June**- Second quarterly meeting of CFMC. Field planting operations continue, harvesting of shea butter continues. Weeding and cleaning commence. Collection of seeds of shea butter for planting.
- **July**- Weeding and cleaning continues. Shea butter harvesting may continue. Field planting continues. Collection of seeds of shea butter for planting.
- **August**- General maintenance of the forest including pruning and training of wildlings and saplings.
- **September**- Third quarterly meeting of CFMC. All management activities in August to continue this month.
- **October** - Routine management and boundary patrol.
- **November**- Intensification of boundary patrols as the dry season sets. Boundary cleaning and fire tracing.
- **December**- CFMC meeting. Intensification of boundary patrols. Boundary cleaning and fire tracing. Collection of seeds of teak, khaya and Afzelia.

5.7 Criteria for Species selection

Six species including one exotic and five indigenous species are selected for restocking/enrichment planting in the community forest. The criteria for selection are indicated in table 5.1 below.

Table 5.1: Criteria for Selection

S.N.	Species Name	Compartment	Criteria
1	<i>Tectona grandis</i> (teak)	A & B	Multiple uses, adaptation to the ecosystem, community acceptability.
2	<i>Khaya spp</i> (mahogany)	A & B, C & D	Valuable native species, Unattractive to loggers at early ages, hardy and protective functions
3	<i>Parkia biglobosa</i> (Locust bean)	C& D	Important NTFP, adaptation, soil conditioner, livelihood support
4	<i>Afzelia spp</i> (Apa)	D	Unattractive at early stage to loggers, adapted to riparian vegetation, protective functions.
5	<i>Vitellaria paradoxa</i> (shea butter)	C	Livelihood support, unattractive to loggers, adaptation to savanna wood land
6	<i>Vitex doniana</i>	C	Livelihood support potentials, adaptation to savanna ecosystem, unattractive to loggers', Community acceptability.

5.8 Challenges to Successful Implementation and Solutions

Challenges to the implementation of this plan include: farming encroachment, illegal logging, cattle grazing and annual bush burning. Potential solutions to these challenges include:

- Relocating farmers outside the boundaries of the forest with the assistance of the Oba to check farm encroachment;
- Intensive patrol and arrest and prosecution of offenders to check Illegal logging;
- Total prohibition and arrest and prosecution of offenders; to regulate cattle grazing; and
- Intensive boundary patrol, timely fire tracing and boundary cleaning, total prohibition, arrest and prosecution of offenders to combat annual bush burning.

5.9 Capacity Development and Implementation Arrangement

Specific forest management knowledge gaps identified include: species identification, record keeping, forest protection, and structure of community forest management. Capacity development plans to tackle these gaps include:

- Representatives of the CFMC members should undergo in-situ training in the first year of the project, taxonomy experts from research institutions should be engaged for five days.
- Two members -secretary and one other person (preferably female) with a minimum of school certificate- should be sponsored to take short courses in record keeping. This should take place within the first three months of project commencement.
- Boundary patrol guards should be selected for training on basic forest protection techniques at the College of Forestry Ibadan, Jos or New Bussa. The training should hold at least three months prior to the commencement of the project.
- Members of the CFMC should be sponsored for a visit to Cross River Forestry Commission for a week or two to study the Community forest management protocols there. This should hold in the first one year.

Chapter 6: Conclusion and Recommendations

6.1 Conclusion

Presently, there exists no community forest at Sanmora community. Considering the prevailing socio-economic, cultural and ecological situation of the project area, the proposed community forest will be most beneficial. Community members are favourably disposed to the project due to the benefits accruable from it such as using *Tectona grandis* for timber and poles. Other beneficial products they derive from the forest include fire wood, charcoal, vegetables, medicinal plants, bush-meat, water, livestock grazing etc. There exist socio-cultural organizations within the community which could serve as a fulcrum around which the CFMC is built. Majority of the inhabitants of the project area are low income earners with farming being their major source of income. The level of awareness of the proposed project is high among the respondents. They are full of expectations concerning improved livelihood, employment, and income generation from the project. This positive disposition and awareness makes the project highly acceptable.

The proposed site houses diverse flora and fauna species which are of economic and ecological significance. 76 plant species, 11 animals (8 mammals and 3 reptiles), and 60 bird species were identified. There are over 2000 stems per hectare, but these are either trees with poor forms, or juveniles and re-growths. Five important non-timber forest products identified include locust bean seeds, shea butter, vitex vegetables, bitter leaf and firewood.

The average DBH was 8.82cm. The average merchantable height was 4.3 m. Average volume per hectare is 6.16m³.

The allowable cut per hectare per year is 0.82 m³. This is very unrealistic and it shows that any form of timber extraction is not feasible at the site for now.

6.2 Recommendations

- The CFMC should be carefully selected to reflect a balanced representation of all interest groups.
- Inauguration of the CFMC should be done early enough to allow a smooth take-off of the project activities.
- The promulgation of community forest byelaws should be immediate, thorough and broad based.
- Timber exploitation in the forest area is not feasible for now. Therefore it should be outlawed for at least ten years if the protective function goal is to be achieved. Grazing, farming and bush burning should be totally prohibited within and around the forest area.
- Sand mining and charcoal burning should be stopped within the forest area.
- Benefit sharing arrangement/formula should be thoroughly debated and mutually agreed by all stakeholders.
- A dedicated community development account should be created for proceeds of forest product sales. Such account is to be administered by trusted and respected members of the community. Approval to withdraw from the account should be as agreed at CFMC meetings attended by majority of the members.
- Stock tacking should be done in each compartment at least twice within the life span of this plan.
- Project performance appraisal and evaluation should be conducted every two years.

Annex 1: Plan Production

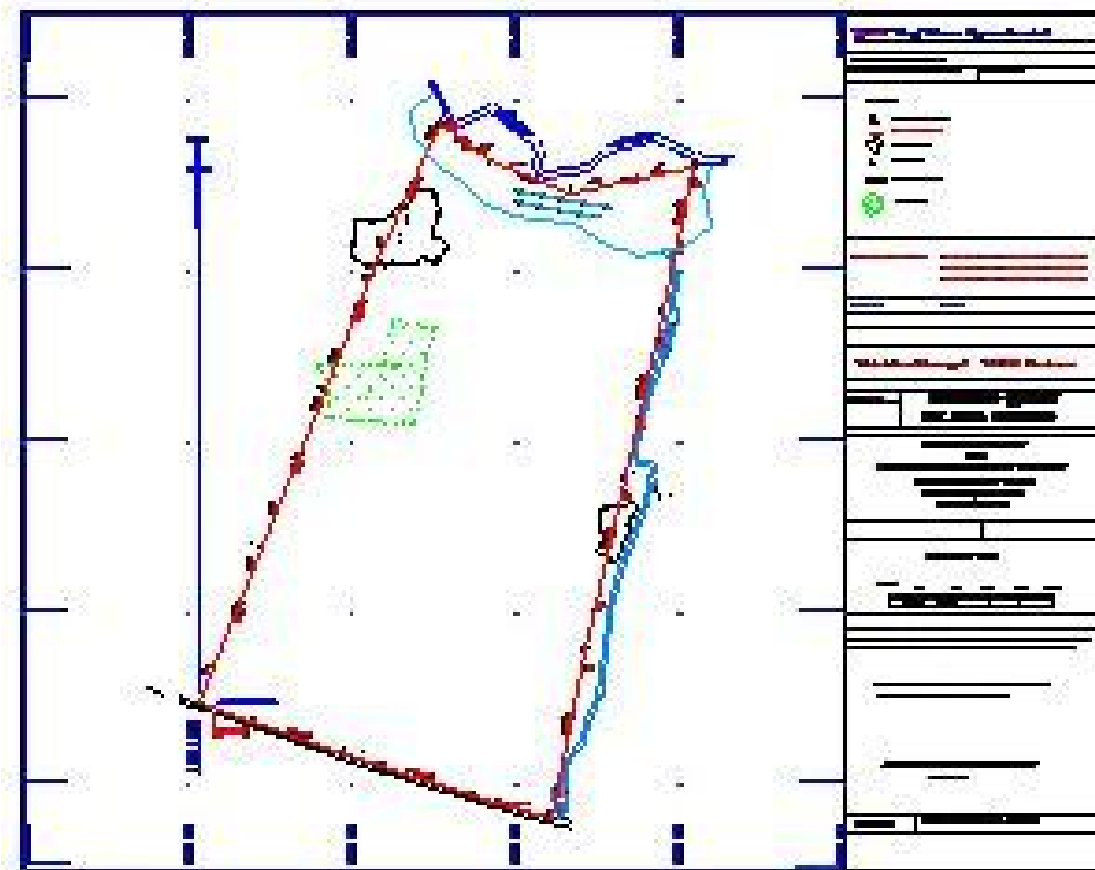


Figure A.1: Survey Map of the Proposed Sanmora Community Forest

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Annex 3: Key Personnel

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