



A PLATFORM FOR STAKEHOLDERS IN AFRICAN FORESTRY

FOREST PLANTATIONS AND WOODLOTS IN KENYA



AFRICAN FOREST FORUM WORKING PAPER SERIES

VOLUME 1

ISSUE 13, 2011

Copyright © African Forest Forum 2011

All rights reserved

African Forest Forum

P.O. Box 30030 00100 Nairobi GPO KENYA

Tel: 254 20 7623900

Fax: +254 20 30677-00100

www.afforum.org

Disclaimer

The designations employed and the presentation of material in this publication do not imply the expression of any opinion whatsoever on the part of the African Forest Forum concerning the legal status of any country, territory, city or area or its authorities, or concerning the delimitation of its frontiers or boundaries regarding its economic system or degree of development. Excerpts may be reproduced without authorization, on condition that the source is indicated. Views expressed in this publication do not necessarily reflect those of the African Forest Forum.

FOREST PLANTATIONS AND WOODLOTS IN KENYA

by

Dr. Winston Mathu

(revised and finalised by
Mr. Robinson K. Ng'ethe)

December 2011

PREFACE

Forest resources in Eastern African countries, including Kenya, are disappearing fast and the quality of the remaining forests is gradually degrading. Demand for forest products and land for agriculture and settlement - a function of population growth - and poor forest law enforcement and governance (FLEG) are considered to be among the most important factors exerting pressure on the forests in Kenya. And, as the demand for forest products increases, the supply from the conventional sources remain constrained by several factors, key among them the continuing ban on timber harvesting in natural forests imposed by the government in 1999 to safeguard the few remaining forests as water catchment areas; and the partial ban in plantations put in place to give time to the then Kenya Forest Service (KFS) to streamline forest management practices.

A key realisation in the case of Kenya is that existing public forest under current management practices cannot produce enough roundwood to meet the national demand. Natural forests are under pressure to be conserved, while the few plantations are in a poor state and urgently require a major overhaul in management and governance structures, which are currently under way. There is, however, little room for expansion of plantations on public land, and the only realistic option lays in enhancing production of timber products is from private forests and outgrower schemes.

This study was undertaken as a contribution to the regional African Forest Forum (AFF) in-depth study to characterise and document information on current status, challenges, opportunities and options for future management of forest plantations, in order to enhance socio-economic development in Eastern and North Eastern Africa through improved plantation forest management. The specific objective of the study in Kenya was to:

- Evaluate the supply, demand and trade in forestry products and services in the country;
- Determine the economic viability of plantation forestry and ways/means to enhance its contribution to the economy of Kenya; and,
- Identify viable ownership and governance/management structures and other conditions for efficient plantation forestry in Kenya.

This report is basically a desk review, relying primarily on information and documents from KFS and private sector sources, including Community Based Organisations (CBOs), Non Governmental Organisations (NGOs) and other players in the timber value chain. Kenya has been privileged in that intensive forest sector reforms have been going on since the coming into effect of the Forest Act 2005, which necessitated a lot of studies relating to forest governance and management, including forest inventory, Participatory Forest Management (PFM) and business planning. Some of the constraints in the study include limited information on economics of plantation management; and on the scope and scale of tree planting activities of private forest enterprises and individual farmers/outgrower schemes. Most of the available baseline data on plantations is also outdated.

I wish to take this opportunity to acknowledge the excellent support received from KFS, the Kenya Forestry Research Institute (KEFRI) and various other stakeholders, including the briefings, documents and reports received, and for the fruitful and frank discussions on substantive issues relating to this assignment. In particular, I wish to appreciate the efforts of the KFS Director (Mr. David K. Mbugua), the Deputy Director for Plantations and Enterprise (Mr. Simiyu Wasike) and the heads of the various units (see Appendix 2: persons met) for their commitment and dedication in providing documents, briefings and comments during the various sessions.

Secondly, I wish to acknowledge the guidance received from AFF Team led by the Executive Secretary (Prof. Godwin Kowero) and the Team Leader (Prof. Shabani Chamshama), including through briefings on study methodology and constructive comments including during the supervisory visit to Kenya to follow up on the data gathering and report writing process.

Finally, I wish to clarify that the large body of information from various sources (documents, briefs and personal communication with stakeholders) posed a special challenge in harmonising and verifying data, including assessing the credibility of various sources. This notwithstanding, I take full responsibility for any error or misrepresentation in this report.

(Addendum: after completing the first draft of the report, Dr. Mathu sadly passed away, and the report was finalised by Mr. Ng'ethe).

Executive Summary

1. This is an analytical review of the status of plantation forestry in Kenya, prepared as a contribution to an AFF regional study on plantation forestry in the Eastern and North-Eastern African countries of Kenya, Tanzania, Uganda, Burundi, Rwanda, Ethiopia and Sudan whose purpose is to promote regional cooperation and collaboration on the subject, and explore the way forward.
2. There is overwhelming consensus that within the last three decades, the level of plantation forest management has greatly deteriorated, manifested mainly in the decline in the level of protection of indigenous forests from encroachment and excisions, and the decline in productivity of plantations leading to the need for importation of round timber and other forest products to meet the demand and the consequent escalating of cost of forest products in the marketplace.
3. The Strategic Environmental Assessment (SEA) of the Kenya Forest Act (2005) undertaken by the Government of Kenya and the World Bank identified several underlying causes, including:
 - Inadequate and/or weak structural/institutional capacity for forest law enforcement and governance, and for the implementation of associated strategies and programmes. This includes inadequate staff numbers and training, low morale and poor equipment for forest guards, and inadequate knowledge of forest management;
 - Limited participation by strategic stakeholders in the conservation and management of forests associated with restricted access to forest resources (for livelihoods) for communities adjacent to forests. Communities therefore felt no role or responsibility in sustainable forest management; and,
 - Inadequate/outdated or weak forest policy and legal frameworks to foster an enabling environment for investments in the forest sector.

The SEA, based also on inputs and contributions of key national stakeholders concluded that poverty and the high dependence on natural forests for livelihoods, often exacerbated by natural disasters, particularly droughts, are also important factors in deforestation and forest degradation.

4. Since the coming into power of the National Rainbow Coalition (NARC) government in 2003 and the subsequent national coalition government in 2007, there has been significant appreciation of the contribution of forests to the national economy and livelihoods of local communities; and heightened political will to address forest management issues as demonstrated in the newly promulgated Constitution of Kenya (2010), the Economic Recovery Strategy (2003-2006) and Vision 2030 (2007). A draft forest policy (2005) is in place, and a new Forest Act (2005) came into effect in February 2007. Key provisions of the Act include:
 - Establishment of KFS as a semi-autonomous body;
 - Broader mandate of the service to cover all forests;
 - Increased roles and responsibilities for local communities and other stakeholders in management of forests;
 - Promotion of commercial tree growing;
 - Excision of gazetted forests requires Environmental Impact Assessment (EIA) and parliamentary approval;
 - Management plans required for all major forest ecosystems;
 - Creation of a professional forestry society; and,
 - Establishment of a Forest Management and Conservation Fund.
5. **Progress to date:** Discussions with the KFS officials indicated a high level of optimism and expectations on the new forest policy dispensation in improving plantation forest management through greater efficiency and accountability in the management of public forests and strengthening of the PFM, including through Forestry Extension and Outgrower Schemes - as provided for in the Forest Act 2005. This study notes in particular KFS current engagement in key initiatives concerning the streamlining and strengthening of plantation management in the country, including:

- Development of subsidiary legislation as an imperative to the implementation of the new Forest Act;
 - Strengthening the KFS capacity for law enforcement, including training and better equipping of forest guards, forest officers and other stakeholders on the provisions of the new act and associated legislations and guidelines;
 - Improving the sustainability of the KFS through development and implementation of a “business enterprise” strategy focusing on private/public partnerships;
 - Implementing the PFM provisions, including preparation of guidelines with clear definition of responsibilities and contributions of community forest associations; and supporting the establishment of ‘Community Forest Associations’;
 - Strengthening the management of natural high forests by making available sufficient data and information to allow for the preparation of the requisite management plans in a timely manner;
 - Strengthening the management of public forest plantations including update of national inventories, growth and yield data as a basis for determining allowable cut, clear modalities for executing the lease/contractual agreements; and piloting alternative systems for plantation establishment;
 - Streamlining management of dryland forests through legalising and regulating the charcoal business as part of the strategy to raise royalties and promote efficiency in charcoal production; and,
 - Strengthening services to farm and private forestry through offering the greatest opportunity for getting Kenya closer to the international standard of 10% of forest cover, including through more incentives.
6. **Key findings, issues and recommendations:** This study identifies the following as key issues and challenges to plantation forestry for Kenya if it is to promote further expansion of high quality and productive plantations/woodlots:
- Plantation forestry remains a major contributor to socio-economic and financial welfare at national and household level. *There is therefore need to make it a priority in national strategies with a focus on increasing outgrower/woodlot development.* Opportunities for expansion of private forestry activities, including improved policy and regulatory incentives (security of land and resource tenure), technical capacity (through training), fiscal and economic incentives (including tax breaks, concessional loans, etc.), and enhanced extension services;
 - This study highlights the paucity of information on private tree planting activities in the country in terms of who is involved, the scope of activities (area, number, level of investment) and their contribution to the socio-economic wellbeing in the country. *This study recommends that KFS undertakes the necessary baseline studies to document the status of plantation forestry activities outside the gazetted forests.* This information is essential for planning of development of outgrower/other woodlots in the country;
 - KFS has the mandate for the management and administration of all forests in the country, and has in place the strategy and a 2-year Business Plan (2011/2012) to effect this responsibility, including the designation of a unit dedicated to “Forest Plantations and Enterprise”. KFS identifies the issue of inadequate financial and human resources allocated to plantation forestry as a key challenge to be addressed if it is to promote further expansion of high quality and productive plantations/woodlots in the country;
 - **The ban on forest timber harvesting although now addressed** remains a major constraint to forest management and, in particular, it affects the level of royalty collection, the quality of timber products (including exposing plantations to risk of fires and disease/insect infestation), insufficient or lack of raw materials supply, and increased cost of forest commodities. *This study recommends an urgent review of the status quo, to remove these constraints;*

- **Incentives to private forestry and outgrower schemes** remain inadequate. *This study identifies the need for the Government to take necessary measures to ensure availability of financial incentives (e.g. concessional loans) for implementing private forest projects; the removal of market distortions (e.g. in the pricing of tree seedlings/timber products from public forests relative to those from private sources); and the development of more transparent and accountable systems of tree harvesting, administration and regulation.* These, coupled with active investment promotion, will encourage private investment in commercial forestry activities in the private sector and out growers;
- **Revenue collection:** The study notes that the “stumpage fees on logging concessions” especially for pulpwood fail to capture the economic value of timber. This undervaluation of timber products from the public forests translates to a subsidy with two important consequences: low level of revenue collected and the distortion of the market *vis à vis* goods and services from the private sector. *The study identifies the need to put in place proper systems and procedures for setting prices of forest products so that they reflect the true market value;*
- **Wood supply and demand:** The total national deficit in wood supply was projected to rise to 997,000 m³ by 2005 and 6,841,000 m³ by 2020. The current (2010) total demand for sawn timber is estimated at 2.35 million m³ (at 32% recovery level) verses a supply of 1.8 million (with the ban on) or 2.35 million if the ban is lifted. This situation is however more complicated: there is the supply from private woodlots; and the demand does not take into account the possible re-opening of the many small sawmills that closed down because of lack of raw materials arising from the ban. The overall conclusion however is that of a deficit in wood production from state forests. Recent studies project the demand for fuelwood increasing from 20 million m³ in 1995 to 40 m³ by year 2020;
- The **small to medium forest industrial enterprises (SMES)** continue to face serious problems of insufficient or lack of raw material supply since the government ban on logging in 1999. For example, recorded sale of timber decreased from 197,000 m³ in 2001 to 162,000 m³ in 2002 and 812,956 m³ in 2009-2010, supply from state forests. The sale of power and telephone poles decreased from 4,900 m³ in 1998 to zero in 2002. Because of this a large number of sawmills closed down; and,
- With the enactment of the National Land Policy (NLP) and promulgation of constitution, important forest land and resource tenure reforms have taken place in Kenya. *There is however the need to ensure greater involvement of local communities in the development of guidelines for private forest management, to ensure that their concerns are addressed. The current initiatives of strengthening community forest associations should be enhanced.*

7. Recommendations for AFF support

- **Promote knowledge and common understanding on plantation forestry management issues:** Collaborate on studies, reviews and/or joint activities to advance knowledge, techniques and approaches on common issues such as trade and PFM, leading to the adoption of common policies, concepts and practices that allow for comparative assessments, synergy and sharing of experiences;
- **Promote joint programming and collaboration on transboundary plantation forestry issues:** cooperate and collaborate in the management of trans-boundary forest plantation operations such as research and control of plantation diseases, forest fires, cross border trade and other areas of common concern; and,
- **Strengthen KFS inventory section** and data base management through provision of additional equipment, training and capacity building in order to update compartment registers and plantation maps.

Contents

PREFACE	3
Executive Summary	4
Contents	7
Abbreviations and Acronyms	8
1. INTRODUCTION.....	9
2. FOREST PLANTATIONS SITUATION	11
2.1 Historical background.....	11
2.2 Location, areas and species composition.....	12
2.3 Plantation management.....	14
2.4 Forest plantation expansion	21
3. OUT-GROWER SCHEMES AND OTHER WOODLOTS	22
3.1 Extent and impacts of out-grower schemes/other woodlots.....	22
3.2 Factors shaping growth of outgrower schemes and other woodlots.....	24
4. FOREST AND TREE TENURE	24
4.1 Current forest/tree tenure systems	24
4.2 Impacts of forest/tree tenure on poverty alleviation and SFM	25
4.3 Suggestions for improvement of tenure system	26
5. FINANCIAL AND HUMAN RESOURCES FOR PLANTATIONS AND OUTGROWERS/ WOODLOTS.....	26
5.1 Current financing mechanisms.....	26
5.2 Potential financing mechanisms	28
5.3 Human resources.....	28
6. INCENTIVES FOR PLANTATION ESTABLISHMENT BY PUBLIC/PRIVATE SECTOR AND OUTGROWERS	29
6.1 The rationale behind incentives	29
6.2 Current incentives: impacts and effectiveness	29
6.3 Suggestions for improvement of incentives	31
7. SUPPLY AND DEMAND OF FOREST PRODUCTS.....	31
7.1 Supply scenarios and projections	31
7.2 Demand scenarios and projections.....	32
7.3 Consumer prices.....	32
7.4 Forest products trade	33
8. FOREST ROYALTIES AND OTHER REVENUES	33
8.1 Forest royalties and licences.....	33
8.2 Forest concessions and permits	34
8.3 Administration of forestry revenue system	35
9. PROCESSING OF PRODUCE	37
9.1 Ownership and types of industries	37
9.2 Raw material supply and quality	38
9.3 Constraints facing the sub-sector.....	38
9.4 Potential for future investment	39
10. SOCIO-ECONOMIC AND ENVIRONMENTAL CONTRIBUTIONS OF FORESTS.....	39
10.1 Income generation.....	39
10.2 Employment.....	40
10.3 Plantations in forest conservation.....	40
11. CONCLUSIONS AND WAY FORWARD	41
Appendix 1. MAIN REFERENCES QUOTED	44
Appendix 2. Key KFS Persons met	46

Abbreviations and Acronyms

AFF	African Forest Forum
ASALs	Arid and Semi-Arid Lands
BAT	British American Tobacco Co.
CBO	Community Based Organisations
CDF	Community Development Fund
CFA	Community Forest Associations
DBH	Diameter at Breast Height
DNS	Debt for Nature Swaps
DRC	Democratic Republic of Congo
EMCA	Environment Management and Coordination Act
FAO	Food and Agriculture Organisation of the United Nations
FLEG	Forest Law Enforcement and Governance
FMCF	Forest Management and Conservation Fund
FOTNAK	Forest Tree Nurseries Association of Kenya
FRA	Forest Resource Assessment
FSGO	Forest Service General Order
FTC	Forestry Training Centre
GDP	Gross Domestic Product
GEF	Global Environmental Facility
GHG	Green House Gases
GoK	Government of Kenya
GPS	Global Positioning System
Ha	Hectare
HQ	Headquarters
JICA	Japan International Cooperation Agency
KAFU	Kenya Association of Forest Users
KEFGA	Kenya Forest Growers Association
KEFRI	Kenya Forestry Research Institute
KFMP	Kenya Forestry Master Plan
KFS	Kenya Forest Service
KIFCON	Kenya Indigenous Forest Conservation Project
Kshs	Kenya Shillings
MAI	Mean Annual Increment
MMMB	Miti Mingi Maisha Bora programme
NARC	National Rainbow Coalition
NGO	Non - Governmental Organisations
NTFP	Non - Timber Forest Products
NTZDC	Nyayo Tea Zones Development Corporation
NWFPs	Non Wood Forest Products
PCF	Prototype Carbon Fund
PELIS	Plantation Establishment and Livelihood Improvement Scheme
PFM	Participatory Forest Management
PPM	Pan African Paper Mills
RAES	Rural Afforestation Extension Scheme
REDD	Reducing Emissions from Deforestation and forest Degradation
RELMA	Regional Land Management Unit at ICRAF
SFM	Sustainable Forest Management
SMEs	Small and Medium Enterprise Schemes
TBP	Tree Biotechnology Programme
UNDP	United Nations Development Programme
US\$	United States Dollar
WB	World Bank

1. INTRODUCTION

Background

Kenya has a total surface area of 582 646 km², and a population total of just over 40 million with a growth rate of 2.7% (2009 census). The total state forest area is estimated at 2.35 million ha (about 2.7% of Kenya's land area) out of which 1.57 million ha are gazetted and 0.78 million ha ungazetted forests. In addition, there is approximately 2.1 million ha of other woodlands, 24.8 million ha of bush land and 10.7 million ha of wooded grassland. The number and volume of trees on farm are considerable in Kenya, particularly on small- and medium size farms in the highlands, but it is impossible to translate these tree resources into an area equivalent figure.

The Kenya Forest Service (KFS) manages all gazetted forests and, through agreed arrangements, an additional 180 000 ha of un-gazetted trust land forest that belongs to local authorities. It has an expanded oversight mandate on private forests. Within this total, the KFS manages about 125 000 ha of forest plantations, which are managed specifically for industrial round wood production.

Economic, environmental, social and cultural values

Forests in Kenya rank high as important national assets with significant economic, environmental, social and cultural values. For example, before the ban on timber harvesting in 1999, it was estimated that the forestry sector contributed about KSh. 320 million per year to Kenya's Gross Domestic Product (GDP) or approximately 1% of the monetary economy and 13% of the non-monetary economy. Direct use values in terms of timber, fuelwood and poles are estimated at KSh. 3.64 billion (3rd World Bank (WB) Forestry Project and Forestry Development Project Report). Despite the proportionately small area compared to the overall country's surface area, forests will continue to play a significant role by providing a wide variety of resources for human development. In 2010-2011, it was estimated that KFS would need USD 11 million per year to help improve the management of the plantations.

Timber and **fuelwood** constitute the most conspicuous forest products due to the volumes involved and the central role they play in overall national development. Forests provide utility timber products, such as timber for the construction industry, furniture for households, transmission poles for the energy and communication sector, fuelwood for the tea industry and also for subsistence utilisation by the community as well as paper for the education and print media sectors. It is estimated that the *per capita* wood consumption is 1 cubic meter. Out of this, 80% is consumed as fuelwood.

Policy setting

Several instruments guide the management of forests in Kenya, including the Vision 2030, the draft Forest Policy 2005, the Forest Act 2005 and the Environmental Management and Coordination Act (EMCA) 1999 and the KFS Strategic Plan (2009/10-2013/14). These instruments recognise the development of industrial forest plantations as essential in the promotion of industrialisation, generation of employment opportunities and poverty alleviation in the country. In particular, Vision 2030 and the KFS Strategic Plan envisage an increase in forestry cover from the current 2.7% to 4% by 2012 and 10% by 2030. The policies have a convergence with regard to conservation and protection of the five water towers of Mt. Kenya, the Aberdares, Mt. Elgon, Cherangani and the Mau and the critical supportive role forests have relative to the other sectors of the national economy especially agriculture, tourism and energy. Sustainable forest management (SFM) is one of the promising opportunities of mitigation against climate change and it is expected that afforestation could significantly contribute to reducing the effects of global warming and climate change (Government of Kenya - The National Climate Change Response Strategy, 2009).

Objectives of the Study

The main objective of this study was to characterise and document information on the current status, challenges, opportunities and options for the future management of forest plantations in Kenya. Specific objectives include:

- Evaluate the supply, demand and trade in plantation forestry products and services in Kenya;
- Determine the economic viability of plantation forestry and ways/means to enhance its contribution to the economy of Kenya; and,

- Identify viable ownership and governance/management structures and other conditions for efficient plantation forestry in Kenya.

These objectives were to be achieved through the following specific tasks:

1. Undertake a study of the current public and private forest plantations situation, specifically with respect to the distribution and location of these plantations, species planted and sources of seedlings and seeds, age distribution of tree species, their management and quality of stands, and other features.
2. Undertake market surveys to determine supply scenarios and demand projections of plantation wood volumes and trends for the years 2015, 2020, 2025 and 2030 (by tree species, private and public sources), including prices of local and imported timber and wood products and sources of such products.
3. Evaluate the current revenue collection systems, revenues collected annually during the last 5-10 years, licensing/concession procedures, forest and tree tenure, management arrangements and pricing mechanisms for roundwood and industrial forest products.
4. Provide income and employment data during the last 5-10 years and estimate the potential for income generation and employment creation for the years 2015, 2020, 2025 and 2030.
5. Evaluate and propose incentives that could favour rapid forest plantation establishment by public and private sectors, and outgrower schemes by individual farmers. Consideration should also be given to:
 - Availability of appropriate land;
 - Availability of quality germplasm;
 - Financing for plantation forestry;
 - Private sector readiness in plantation forestry;
 - Policy and environmental issues, including land and forest and tree tenure issues, biodiversity considerations, and legislation and governance issues; and,
 - Potential for additional revenues from carbon trade.
6. Provide options for establishment, expansion and improved management of public and private forest plantations, including ways to overcome existing and potential constraints.
7. Evaluate the processing of industrial round wood from plantations in the individual countries, ownership, its current and potential capacity, wood raw material supply (sources, types, and adequacy), product lines and quality of produce, potential for future investment in the sub-sector, constraints facing the sub-sector, future of the processing industry, growth and constraints, among other key considerations.
8. Make a presentation based on this work in a workshop that will be organised by the African Forest Forum (AFF).

Scope and Coverage

This study was undertaken in the context of the African Forest Forum's work on "Rehabilitation of Public Forest Plantations" in the eastern and north-eastern African countries of Burundi, Ethiopia, Kenya, Rwanda, Sudan, Tanzania and Uganda. Over the last 100 years, plantations of fast growing tree species have been established in various parts of the country to meet the demand for timber, pulp, and fuel for the growing economy, and to reduce pressure on Kenya's remaining natural forests. Plantation forestry in Kenya takes place in state/gazetted forests, private industrial cum agricultural enterprises and on individual farms and outgrower schemes.

The objective of the plantations, climatic factors and prevailing social-political and economic factors determine the species used and the management regimes to be adopted. This study was therefore designed to review the plantation forestry practices in all ecological zones of Kenya where plantations grow with a view to identifying the main challenges and constraints to plantation forestry on farms and in plantation schemes, and to propose potential means to address these constraints. In particular, the review was to cover all key aspects of plantation forestry including tree planting and silvicultural practices, the socio-political and economic aspects of plantation management, the cost/benefit analysis including revenue collection and attribution, and the

processing, marketing and trade on forest products. These were to be achieved through three key activities:

- An evaluation of the supply, demand and trade in forest products and services in the country;
- A review of the economic viability of plantation forestry and ways/means to enhance its contribution to the economy of Kenya; and,
- A study of the ownership and governance/management structures and other conditions necessary for efficient plantation forestry in Kenya.

Approach to the Study

This report is basically a desk review, relying primarily on information and documents from KFS and private sector sources, including Community Based Organisations (CBOs), Non Governmental Organisations (NGOs) and institutions. The study involved four key activities:

- A review of documents, reports and literature relevant to plantation forestry in Kenya (See Appendix 1);
- Consultations with stakeholders, KFS staff and forest practitioners (See Appendix 2);
- Collating information and analyse data compiled from activities 1 and 2, and report writing; and,
- A national/regional validation workshop involving all key stakeholders to validate findings of the study.

Structure of the Report

This chapter (introduction) gives the background to plantation management in Kenya with focus on the historical perspective, the rationale and importance of forest plantations to the economic, environmental and social and cultural aspects including the livelihoods of the local communities in Kenya. It also touches on the objectives and structure of the study. The rest of the report is structured around the four main expected outcomes:

1. Better governance structures for managing forest plantations - Chapters 2 to 6;
2. The analysis of economic viability of managing forest plantations - Chapters 7 to 9;
3. Improved understanding of national demand and supply of forest plantation industrial round wood - Chapter 10; and,
4. Chapter 11 focuses on the main conclusions from the study and proposal on way forward.

2. FOREST PLANTATIONS SITUATION

2.1 Historical background

Establishment of forest plantations in Kenya started in the early 1900s with the establishment of *Eucalyptus* plantations to produce fuelwood for the Kenya/Uganda Railway steam engines. Commercial planting of exotic plantations for timber started in the early 1920s. The main tree species were *Cupressus lusitanica* Miller, *Pinus radiata* D. Don and *Pinus patula* Schlecht, which comprise the bulk of plantation species to date. The exotic species were preferred based on the experiences of colonial foresters and also because they grow rapidly, are easy to propagate and are adaptable to a wide range of ecological conditions. With a few exceptions, e.g. *Vitex keniensis*, most local timber trees did not perform well in plantations for various ecological and insect/pathogen relations.

According to the Forest Act 2005, the main objective for plantation establishment in Kenya is for supply of round-wood for timber, pulp wood and woodfuel for industrial, institutional and household use to meet the needs of both the domestic and export markets. In addition to State Forest plantations, there are substantial public plantations under the management of County Councils (mostly on hilltops) whose specific areas are not yet documented. There are also private plantations, estimated at about 150 000 ha (KFS 2010: Plantation and Enterprise Unit - draft inventory Report). These include plantations owned by private companies such as Tea Estates, Kakuzi, and tobacco companies (mainly British American Tobacco (BAT) and Mastermind Ltd) with large plantations comprising mainly of various eucalyptus species owned by private citizens; and a large number of private woodlots owned by individual farmers, comprising mainly *Grevillea robusta*

(Silky Oak from Australia) and *Eucalyptus* species - grown mainly for household use and income generation. Little information is available on the extent and condition of private woodlots.

2.2. Location, areas and species composition

The majority of plantations in Kenya are found in the highlands between 1500 to 2 500 meters above sea level, with rainfall of between 1 000 to 1 750 mm per year. The areas in Eastern Rift Valley generally enjoy two distinct rainy seasons - March to May with a peak in April; and October to December with a peak in November. January and February are the driest months. Nakuru and the Western Rift part of the country usually enjoy one long rainy season - March to September with dry season in January and February.

Soils on highland sites, where plantations are found, range from well drained to imperfectly drained, strongly acid humic loams of friable clays with strongly brown or dark red sub-soils. The soils are mostly derived from volcanic ash and/or basement complex rocks. Figure 1 shows the distribution of forest blocks in the country - within which the forest plantations are located.

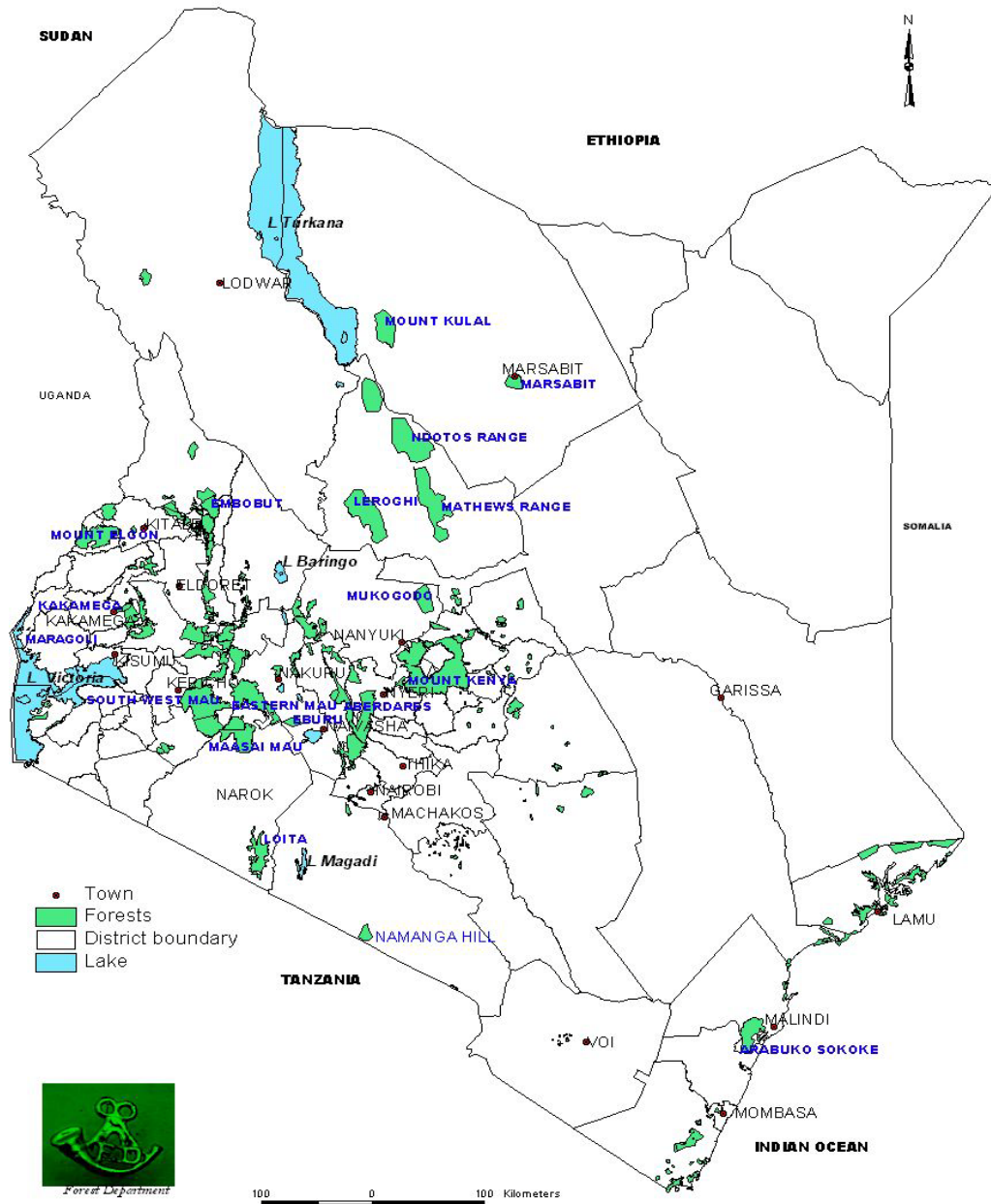


Figure 1: FOREST BLOCKS IN KENYA. Source: KFS- Forest Inventory working reports from the Plantation and Enterprise Unit: - draft documents made available to the Study Team 2011.

According to the latest inventory data, the total area of public forest plantations in Kenya is 125,000 ha, of which 41,000 ha are un stocked and over 90,000 ha are stocked as shown in Table 1.

Table 1. Plantation areas by species. Source: Karega, Head Inventory, Personal communication (2011).

Species	Area (Ha)	Volume (m ³)
Cypress	50 711	705 896
Pines	21 144	430 042
<i>Eucalyptus spp</i>	13 544	192 865
<i>Casuarina</i>	77	1 304
<i>Vitex keniensis</i>	1 367	27 291
Others	7 730	153 425
Total	94 573	1 510 823

Commercial plantation areas by ownership, age classes, species and management.

Table 2 gives the distribution of the public plantation areas managed by KFS by districts, species and age classes in the country. Data of total plantation areas, stocked areas and species areas in this table differ from that given by Maina (2008). The Table indicates that cypress comprise 54% of the plantation area followed by pines at 24%; and that 44% of plantations are understocked.

Table 2: Plantation distribution by District, species and age classes as of 2010. Source: KFS (2011).

District	Area (ha)						Species			
	<10 y	11-24	25-30	>30 y	Total	Under-stocked	Cypress	Pines	Eucaly.	Others
Kakamega	419	224	123	235	1 001	243	547	303	85	66
Baringo	53	142	98	141	434	73	268	88	38	41
Kajiado	359	-	-	156	515	41	-	-	515	-
Keiyo	2 981	1 815	1 325	1 746	7 867	3 628	3 548	2 616	1 304	398
Kericho	1 898	1 833	2 407	5 955	12 093	2 024	7 147	3 002	1 000	964
Kiambu	2 300	1 802	613	980	5 695	1 466	3 382	1 043	1 088	309
Koibatek	1 840	853	3 008	5 234	10 935	3 388	6 091	3 039	639	1 275
Laikipia	83	41	-	108	232	84	-	-	184	47
Lugari	2 413	918	124	240	3 695	2 677	1 865	471	1 294	65
Maragua	123	112	28	569	832	313	389	435	-	9
Marakwet	26	47	134	113	320	149	95	13	18	15
Mt. Elgon	484	75	228	263	1 050	347	659	225	161	5
Muranga	-	7	44	13	64	0	58	1	4	-
Nairobi	244	227	1	410	882	234	46	-	595	241
Nakuru	2 695	888	954	2 136	6 673	3 974	4 274	1 661	791	233
Nandi N	338	617	182	263	1 400	601	634	512	142	112
Nandi S	132	301	74	203	710	522	495	181	33	-
Narok	2	2	40	7	51	-	29	14	9	-
Nyandarua	1 904	1 624	490	2 583	6 601	2 539	3 508	1 174	1 081	1 176
Nyeri	3 021	3 238	1 461	3 785	11 505	1 892	6 460	1 569	1 667	2 662
Thika	460	431	98	593	1 582	957	806	615	64	96
Trans Nzoia	1 034	493	171	575	2 273	5 591	1 012	837	223	193
Uasin Gishu	2 256	2 693	736	1 722	7 407	3 783	4 274	2 272	378	513
Vihiga	139	304	70	37	550	53	337	135	54	22
West Pokot	12	57	49	226	344	198	59	233	30	21
Others									1 903	
TOTAL	25216	18744	12458	28293	84 711	34 777	45 983	20439	13300	8 463

Details on specific plantations within a district (e.g. location using Global Positioning System (GPS), climatic/soils types, accessibility) are available with KFS on request while information on plantations outside the gazetted forests is largely unavailable.

Encroachments and excisions of forest, including plantation areas

Forest cover in Kenya has been decreasing over time due to several causes, including encroachment and excisions. Among the main drivers of forest destruction are human factors: poverty, breakdown in forest law enforcement and governance (including corrupt practices), unsustainable livelihoods and population pressure in the areas surrounding forest reserves; and natural factors including drought. Table 3 indicates the extent of forest cover changes in the five main water catchment areas (water towers) between the period 2000 and 2003.

Table 3: Forest cover changes in the natural high forests between 2000 and 2003.
Source: UNEP/KWS – (2002/3).

Forest	Cleared area (ha) 2003	Total area (ha) 2000	Percentage change	Water catchment
Mau	5 318	271 360	1.96	Mara
Mount Kenya	6 013	271 400	2.22	Tana/Athi
Mount Elgon	1 874	102700	1.83	Ewaso Nyiro
Cherangani	174	97 400	0.18	Ewaso Nyiro
Aberdare	Cloudy	243 200	-	Athi

Table 4 indicates that a total of very close to 300 000 ha of forest has been excised in Kenya, both legally and illegally. Out of this, a total of 67 000 ha were excised under unclear circumstances without following the legal procedures (Ndung'u Land Report, 2005). The figure also includes excisions undertaken to create the Nyayo Tea Zones, initiated in 1986 in order to create the Nyayo Tea Zone Development Corporation (NTZDC). The objective of establishing NTZDC was supposedly to promote conservation of the forest by establishing a buffer zone between agricultural land and the forest tea zones around Mt Kenya, Mt. Elgon, West and East Mau, Trans Mara, Tinderet, North and South, Nandi, Kakamega, Kiptabus, Uplands, Kikuyu escarpment and the Aberdares. Officially, a "100 m" strip from the forest boundary was nominally to be used as a guideline. In practice, however, the width of the tea zone strip went up to 5 km in some places. By 1990 the total area cleared for tea planting was 11 000 ha.

Table 4: Summary of forest excisions in Kenya. Source: Ndung'u (2004).

Category of excision	Area (ha)
Excisions after boundary plans, gazette notices and legal notices	141 704
Excisions done by way of exchanges	911
Excisions done before finalising the degazettment process	76 612
Proposed excisions that have been challenged in court	67 725
Excisions done to create Nyayo Tea Zones	11 000
Excisions from Ngong and Karura Forest	1 126
Total	299 078

2.3 Plantation management

Plantation management in Kenya is regulated through General Orders issued regularly by the KFS - specific for different tree species, purpose to which the timber crop is destined, and the quality of the planting site. The following is a generalised summary of the main plantation management practices:

2.3.1 Establishment

Seed sources

The primary source of seed for planting in public forests and by private companies are the 1 234 ha of seed stands of various species and seed orchards maintained in the various tree growing zones

by the Kenya Forest Research Institute (KEFRI) - Seed Centre in Muguga. Table 5 gives the area of seed stands of the most important plantation species in the country.

Table 5: Seed/planting material for public forest plantations. Source: KEFRI (2008), Muchiri (2011) personal communication.

Species	Seed stands (ha)	Seed orchards (ha)
<i>Cupressus lusitanica</i>	100	15
<i>Grevillea robusta</i>	15.2	2.0
<i>Pinus patula</i>	90	12
<i>Vitex keniensis</i>	60	1
<i>Eucalyptus spp</i>	50	4
<i>Casuarina equisetifolia</i>	5	-
Others	112	10
Total	432.2	44

In addition to these, there is seed collection from selected identified superior trees, and also general seed collection organised to ensure that demand is met. During the 1980's and 1990's some of the premium seed stands have been lost to loggers leading to heavy genetic losses whose effect will be felt for a long time.

Table 6 shows the number of seeds per kilogramme for the four main categories of plantation species, and the germination capacity under normal nursery practice.

Table 6: Seeds per kilogramme and germination capacity for major plantation species in Kenya. Source: KEFRI (2008).

Species	Seeds per kg	Germination capacity	No. seedlings per kg
<i>C. lusitanica</i>	236 000	30%	70 000 – 75 000
<i>P. patula</i>	186 000	30%	50 000 – 60 000
<i>P. radiata</i>	35 000	40%	15 000 – 20 000
<i>Eucalyptus</i>	200 000	30%	55 000 – 65 000

Nursery practices

Artificial regeneration through planting is the standard practice in Kenya. Nursery practice is a highly developed technology. Seed is usually sown in level, shaded beds which are usually netted to protect the seedlings from birds and small animals. The top layer of the nursery bed consists mostly of sand with no humus material. Seed pre-treatment is not required for many of the plantation species.

As soon as the seeds have germinated and before any side roots are developed, the seedlings are pricked out into trays of size 38 x 40 cm and 10 cm high containing soil to 8 cm above the ground level, or to polythene tubes. For *Cypress* and *Eucalypts*, ordinary forest soil is used, while *mycorrhiza* infested soil is preferred for pine species, as they are necessary for the survival and growth of pine seedlings. Use of fertilisers in the nursery is standard practice. Seedlings are considered ready for planting out in the field when they are approximately 20-30 cm high.

Planting establishment methods

There are two main systems of plantation establishment in Kenya:

1. **Plantation Establishment and Livelihood Improvement Scheme (PELIS)** (formerly the Shamba System): this is a highly developed taungya system whereby the land earmarked for tree planting is issued to resident forests employees for crop cultivation. After one or two years of crop growing, trees are planted and the employees continue growing their crops until the trees are too tall for agricultural crops. Under this system, employees gained from the agricultural crops while the trees are planted in cultivated ground and get free weeding the first

few seasons of their life. Participatory Forest Management (PFM) rules are currently available but implementation is limited by the 1996 ban on the Shamba system, which is yet to be lifted. Since 2009, several pilot schemes of PELIS have been tried successfully in Mt. Kenya, North and Central Rift.

2. **Grassland planting:** forest glades and open grasslands are rarely suitable for agricultural crops. Tree planting in these sites is preceded by minimum land preparation consisting of strip ploughing or simply digging pits where the trees will be planted.

Initial spacing

The main objective of plantation establishment in Kenya has been to grow trees to merchantable size in as a short a time as possible. Thus, stand establishment is characterised by close spacing (1 x 1 m for pulp and paper to 2.5 x 2.5 m for timber species), accompanied by heavy thinning and pruning as appropriate to ensure high quality of the final product. An important guiding principle in determining initial spacing is the need to ensure sufficiently dense stands to utilise fully the site productivity and to improve the quality of the tree stems by self pruning. Other considerations include the cost of raising seedlings in the nursery and planting out in the field. For example, wider initial spacing means fewer seedlings to be raised and therefore less nursery and planting expenses.

Annual planting, replanting rates and backlogs

As indicated elsewhere, the total *plantation* coverage in the country stands at 125 000 ha with a projected annual planting rate of 6 000 ha (KFS strategic Plan 2006-2011).

By the year 2000, the planting backlog stood at 46 000 ha, mainly due to the ban on the Shamba system between 1986 and 1996, unsustainable harvesting in the late 1990s, and generally slow replanting rates. Since then, the backlog was reduced at a rate of 5 000 ha per year from 2000 through annual planting so that in 2011 there was a planting backlog of 35 500 which is 27% of the total plantable area.

2.3.2 Weeding

Cypress is established under the PELIS system and thus receives clean weeding automatically over the first three years by the farmers as they tend their crops. Likewise, pines are often established under the PELIS system but also on grasslands, in which case spot weeding is done using manual techniques or slashing of the weeds between rows, using hand tools. The later is the case also for Eucalypts. Table 7 gives the establishment cost per ha under the weeding methods. Information on the total area weeded in 2009 and projected backlog is not available.

Table 7: Cost of plantation establishment per hectare (2005), US\$/ha. Source: Kagombe and Gitonga (2005)

Activity	Total cultivation	Slashing	Slash and spot weeding
Clearing	125	44	57
Sticking	19	19	19
Spot planting	19	38	38
Planting	19	19	19
Yr 1 tending	125	44	26
Yr 2 tending	125	44	26
Yr 3 tending	125	44	26
Total cost	≈560	≈250	≈210

2.3.3 Pruning

By definition, pruning involves removal of live branches so as to ensure production of timber free of dead knots. The wide initial spacing accompanied by heavy thinning as practiced in Kenya imply an increase in size of branches and delay in natural pruning. Pruning is therefore a standard practice for plantation species destined for sawtimber production. Table 8 gives the pruning schedule for various timber species as prescribed in the respective Technical Orders. Information on area pruned 2009 and on pruning backlog 2009 is available in 2009 individual Forest Districts but has not been summarised.

Table 8: Pruning schedules for *C. lusitanica*, *P. patula*, and *P. radiata* in Kenya.

Species	Age/dominant height in m	Pruning height from ground level	No. of stems/ha to be pruned	
			Saw timber/ plywood	Pulp wood
<i>C. lusitanica</i> Technical Order No. 42 of March 1969: Treatment of Cypress Plantations	2 yrs	½ height but not >2m	All stems	All stems
	4 yrs	½ height but not >4m	All stems	All stems
	9.25 m	2/3 tree height	All stems	All stems
	11.25 m	2/3 tree height	553 stems	N/A
<i>P. patula</i> Technical Order No. 53 of May 1981: Treatment of <i>P. patula</i> Plantations	3 yrs	½ height + 1 whorl	All stems	N/A
	4 yrs	½ height + 1 whorl	N/A	All stems
	8 m	½ height + 1 whorl	600	N/A
	12 m	½ height + 1 whorl	600	N/A
<i>P. radiata</i> Technical Order No. 44 of March 1969: Treatment of <i>P. radiata</i> Plantations	3 yrs	½ height + 1 whorl	All stems	All stems
	12.0 m	½ height + 1 whorl	426	All stems
	17.5 m	½ height + 1 whorl	426	N/A
	24.5 m	½ height + 1 whorl	213	N/A

2.3.4 Thinning

Thinning is a standard practice in Kenya plantation management. The overriding principle in determining thinning regimes is the size of the end product, with heavy thinning preferred for saw timber so as to promote tree diameter growth. The site quality is also an important consideration in determining thinning regimes. Site classification has never been carried out in Kenya and as such, the thinning regimes can be considered as a compromise between the poorest and the best site quality classes. Table 9 shows the thinning regime for the three saw timber species in Kenya.

Table 9: Thinning regime for the three saw timber species.

Species	Treatment	Dominant height or age at thinning	Stems/ha after thinning	
			Number	% of planted
<i>C. lusitanica</i> Technical Order No. 42 of March 1969: Treatment of Cypress Plantations	Establishment 2.5 x 2.5 m		1600	
	1st thinning	11.25 m; not before 6 y	888	55.5
	2nd thinning	5 yrs after 1st thinning	533	33.3
	3rd thinning	10 yrs after 1st thinning	355	22.2
	4th thinning	15 yrs after 1st thinning	266	16.6
<i>P. patula</i> Technical Order No. 53 of May 1981: Treatment of <i>P. patula</i> Plantations	Establishment 2.5 x 2.5 m		1600 (pre 1981) 1110 (after 1981)	
	1st thinning	16 m	600	54.0
	2nd thinning	5 yrs after 1st thinning	400	36.0
	3rd thinning	10 yrs after 1st thinning	250	22.5
	4th thinning	15 yrs after 1st thinning	170	15.3
<i>P. radiata</i> Technical Order No. 44 of March 1969: Treatment of <i>P. radiata</i> Plantations	Establishment 2.5 x 2.5 m		1600	
	1st thinning	12 m	853	53.3
	2nd thinning	17.5 m	426	26.6
	3rd thinning	7 yrs after 2 nd thinning	266	16.6
	4th thinning	13 yrs after 2 nd thinning	213	13.3

The 1999 ban affected silvicultural operations, especially thinning. As a result, plantations of poor health aged over 40 years of cypress and pine are a common sight in the forests. As of 2008, the total thinning backlog stood at over 8 000 ha, but this is expected to be reduced to zero in 5 years according to the following KFS thinning plan (Table 10).

Table 10: KFS projected Thinning Plan- 2009-2013. Source: Maina (2008).

Year	1 st com. thinning (yrs)	Area (ha)	2 nd com. thinning (yrs)	Area (ha)	3 rd com. thinning (yrs)	Area (ha)	Annual Thinning Schedule (ha)
2009	14	726	19	459	24	1 328	2 513
2010	13	866	18	652	23	1 781	3 299
2011	12	1 470	17	328	22	1 649	3 447
2012	11	1 228	16	118	21	1 755	3 101
2013	10	642	15	76	20	1 332	2 050
Total area		4 932		1 633		7 845	

2.3.5 Forest health

The following problems have been identified in Kenya.

Diseases: two important fungal diseases have been identified in Kenyan plantations.

1. *Cypress canker disease*, caused by a parasitic fungus *Monochaetia unicornis* (Cook and Ellies) Sacc. It is not known if this fungus was present in Kenya or if it was introduced. The fungus causes lesions on the stem of the cypress trees, especially *Cupressus macrocarpa* Hartw, but has been known to affect also *C. lusitanica* to a smaller degree. This disease was responsible for the stoppage of any further planting of *C. macrocarpa* despite the fact that it was the more superior species in terms of growth.
2. *Dothistroma pini* species, another parasitic fungus was responsible for the cessation of all planting of *P. radiata* in 1961 when the fungus was discovered apparently having been introduced in Kenya from elsewhere. This disease is known to weaken the trees and sometimes kill them at a young age of between 5-15 years. After that age, most trees not already killed recover and start to grow normally again.

Another fungus of minor economic importance is the universal *Armillaria mellea* in both *C. lusitanica* and pine plantations.

Insects: among the important insect pests is the newly introduced **wooly aphid**, which attack mainly pines. This insect attacks young twigs and needles, weakening the trees and eventually killing them. Another important insect is the *Oemida gahani* Distaut which enters the heart wood of the living *C. lusitanica* trees through pruning injury scars, thus degrading the quality of the logs.

Rodents and game damage: rodents including moles and rats find the bark of the young softwood plants especially palatable. Similarly, big game such as Elephants, Buffaloes and Syke's Monkeys are a continuous problem in forest plantations, either by pushing over the trees or feeding on the succulent bark.

Fire problem: Most of the forests in Kenya, including both indigenous and plantations, are located in relatively high fire prone areas. Forest fires thus continue to be one of the biggest forest health hazards, originating mainly from honey hunters and causing considerable damage to the forest plantations (Table 11). January and February are usually the driest months of the year in most areas of the Kenyan highlands.

Table 11: Number of fires and area burned (ha) in Kenya 1980 - 1999¹. Source: Wass (1995).

Year	Plantation	Indigenous	Bush/grass	No. of fires
1990	85	331	12 183	36
1991	1 705	236	6 697	64
1992	6 170	5 494	13 302	180
1993	1 731	515	1 718	48
1994	690	69	1 913	40
1997	4 726	2 961	7 729	121
1999	1 449	317	2 041	59
Average number of fires per year:				78

In addition to the above, plantation damage also occur through wind, storms, droughts, and floods.

The ban on timber harvesting resulted in a high market price of timber, which led to illegal poaching on public plantations, resulting in low stocking in some plantations. This, and lack of timely maintenance and treatment predisposed the plantations to other hazards, including game damage, fires and diseases, leading to poor quality forest plantations.

A monitoring system which captures information on forest protection (fires, insect attacks and diseases) from the various forest districts is in place within KFS. Consultations with the concerned Unit at KFS Headquarters (HQ) indicated that there were no major forest plantation diseases or insect attacks reported in the last five years, and that information on the number and rates of such occurrences was thus not available.

2.3.6 Maintaining long term site productivity - Soil degradation

Although no study has been done to determine if soil fertility will decrease in successive rotations, evidence from southern Australia on *Pinus radiata* (Keeves, 1966) and from Swaziland on *P. patula* (Evans, 1975) indicate that the yield in successive rotations can be expected to be lower, as a result of removal of large amounts of mineral nutrients in harvests.

The sound management of plantations as prescribed in the various KFS Technical Orders, coupled with efficient forest law enforcement and governance are key to sustaining long term productivity of forest plantations. Important measures are in place to ensure this in Kenya. These include a forest policy that promotes and encourages private sector/outgrower development and management of forest plantations including through incentives such as land leases, agreements and concessions; species selection/tree improvement programme spearheaded by KEFRI; a KFS with a unit dedicated to sustainable and professional management of forest plantations, including ensuring application of appropriate harvesting plans and techniques; and a revamped Forest Protection unit to ensure enhanced forest law enforcement, governance and trade (FLEGT). A major challenge therefore is in the implementation of these measures - with focus on existing capacity (both human and financial) within KFS and KEFRI.

2.3.7 Growth, yield and rotation age

Many growth and yield studies have been undertaken in Kenya, including:

- The Tree Volume Equation for Kenya cypress by Wright (1969);
- Site Index Curves for Kenya Cypress by Waneme and Wachiuri (1975);
- Volume and Taper Estimation Systems for *P. patula* and *C. lusitanica* growing in Kenya Forest Plantations by Gor-Kesiah (1978);
- *Cupressus lusitanica*- Growth and Yield Studies in Kenya by Mathu (1977);
- Growth, Yield and Silvicultural Management of Exotic Timber Species in Kenya by Mathu (1983); and,
- Recent studies by KFS spearheaded by Karega (inventory) and Simiyu (plantations) in the context of developing the KFS Business Plan 2011-2012.

¹ Kenya Forest Resource Assessment Report - Year 2000

The important factor to note in all these studies is their focus on plantation timber species (pines and cypresses), and that most of them were done in the seventies and early eighties, with little happening since then. Key factors in this regard include a shift towards agroforestry and conservation/rural afforestation aspects (away from plantation management) in forest curricula in most forestry institutions; the disruption in forest management (limited planting, thinning and pruning in most areas) arising from the ban on forest harvesting; and the reduced emphasis on silvicultural/forest management research due to shortage of financial resources, as demonstrated, for example, by the neglect and resulting degradation of the permanent sample plots. As a result, there is no current information on key aspects of plantation growth and yield such as stand densities, diameter at breast height (DBH)/basal area development, dominant height/site classification and site productivity. The information in this section should therefore be viewed with the above limitations in mind.

The rotation age and expected yield from plantations vary greatly depending on various factors including the species, the establishment/land preparation method, the stand management regime and the object of the final product. In general, a sawtimber crop is considered mature for clear felling when the mean stand DBH is 48 cm while for plywood, final mean stand DBH is 51 cm. Rotation age for pulpwood plantations varies but is usually between 15-20 years. Table 12 gives some statistics on expected growth and yield parameters for selected plantation species for an average site in Kenya.

Table 12: Growth, yield and rotation age parameters for selected plantation species for an average site.

Species	Rotation (yrs)	Mean DBH (cm)	Site class	MAI (m ³)	Total yield (m ³ /ha)
Cypress sawtimber (TO No. 42)	40	47.6	18	24	960
Cypress pulpwood (TO No. 42)	15-20		18	24	480
<i>Pinus patula</i> sawtimber (TO No. 53)	30		21	24	720
<i>Pinus patula</i> pulpwood (TO No. 53)	20		21	24	480
<i>Pinus radiata</i> sawtimber (TO No. 44)	30	46.2	27	28	840
Eucalyptus	20-30				

Table 13 presents the status on growth and yield of the main commercial plantation species as of 2009. This is the total available saleable volume i.e. 16.5 million m³.

Table 13: Mean Annual increment for major commercial species in Kenya as of 2009. Source: KFS (2011).

Species	Area (ha)	MAI (m ³)	Total volume (m ³)	Saleable volume (m ³)
Cypress and Pines	85 000	1 351 000	18 210 000	10 410 000
Eucalyptus spp.	13 000	390 000	5 007 000	2 500 000
Mixed species	12 000	96 000	3 600 000	3 600 000
Total	110 000	1 837 000	26 817 000	16 510 000

Table 14 indicates the volume available from over-mature stands.

Table 14: Saleable volume of over mature plantations in Kenya as of 2009. Source: KFS (2011).

Age	Cypress (m ³)	<i>P. patula</i> (m ³)	Other pines (m ³)	Total
>40	2 590	6 119	2 723	11 432
36-39	2 807	1 936	415	5 157
33-35	2 731	1 194	154	4 079
30-32	3 821	1 061	239	5 121
Total	11 949	10 310	3 531	25 789

2.4 Forest plantation expansion

2.4.1 New areas available for forest plantation expansion

The potential for expansion of plantations within the gazetted forest area (affected by converting indigenous forests to plantations) is not available for several reasons, including the ever increasing population pressure (38 million with a 2.7% growth rate) and the need to conserve the remaining indigenous forested areas as water and biodiversity conservation areas. The main opportunity for forest plantation expansion is through intensified private sector involvement and outgrower schemes, but the actual area of available land for plantation expansion outside the gazetted forest is unknown. There is high potential for establishment of dryland plantations in lower Eastern Province, and of *Melia volkensii* and *Casuarina* spp. in the Coast Region. *Melia volkensii* is used to produce construction timber and fuelwood. The tree is used as fodder (fruit and leaves), medicine (bark), flowers are good for bee forage, mulch and green leaf manure (leaves). A few *Melia volkensii* plantations have already been established at Kibwezi and Kitui.

2.4.2 Stakeholder views on establishment, expansion and improved management of forest plantations

The Forest Act 2005 which was promulgated in consultation with the private sector is explicit on the importance of plantation forestry, and that involvement of the private sector, including local communities, is vital in the decision making, development and management of forests, including plantation establishment and expansion. In this respect, and with the involvement of the KFS Forest Extension Unit, the private sector and communities through the Community Forest Associations (CFAs) are to a large extent sensitised and aware of the need to protect and avoid opening up of sensitive areas such as riverbanks and indigenous forests.

The overall view on private sector involvement in plantation forestry is that developments at macro-level (fiscal policy/taxes and incentives) are very positive for private sector investment. This is more so given that there is political will, as demonstrated in the Forest Act 2005 and the Vision 2030. Issues relating to forest law enforcement, governance and trade on the other hand pose a high risk in that private investors want to be sure that the investment is secure and will yield profits in the long run. Table 15 gives a subjective assessment of the perception on specific risks for private sector investment in industrial forest plantation.

Table 15: Perception on risks for private sector investment in industrial forest plantation.
Table adapted from ITTO (2009).

Factor	Risk for forest investment		
	Low	Medium	High
SUPRA (Macroeconomy)			
Growth of GDP	X		
Exchange rate	X		
Interest rate	X		
Free Trade Agreements	X		
Political Stability and Government Transparency			X
Governance issues ¹			X
Fiscal policy		X	
INTER SECTOR			
Economic infrastructure			
– Transportation		X	
– Energy/Utility		X	
Social infrastructure: (water, sanitation, education, health)		X	
Licenses and permits		X	
Labour			
– Laws and labour contracts		X	
– Wages		X	
– Labour productivity		X	
– Labour qualification		X	

Access to credit		X	
Justice and law enforcement			X
Capital gain policy		X	
Land and resource tenure			X
– Land tenure			X
– Land market			X
– Land use as collateral			X
Sectorial policies			
– Environment policies and restrictions			X
– Agricultural policies and restrictions			X
INTRA-SECTOR			
Forest resources (availability)			X
Subsidies and Financial Mechanisms		X	
Trade restrictions (on forest products)		X	
Markets			X
Entrepreneurial Development Service		X	
Forest vocation land (suitable/available for forest)			X
Legal and institutional basis			X

¹ How effectively government policies and measures are being implemented

2.4.3 Constraints and opportunities for plantation expansion

As indicated above, the greatest opportunity for plantation expansion is through intensified private sector and outgrower schemes. This is recognised in the Forest Act 2005 which provides for a person who establishes or owns a private forest to apply to the relevant authority for exemption from all or part of the land rates and such other charges as may be levied in respect of the land on which the forest is established. Similarly, under the Agricultural Act Cap 318, the 10% Farm Forestry rules 2009 were gazetted and require that 10% of each agricultural land holding be allocated to farm forestry. The challenge is to ensure implementation - including provision of extension services and incentives. There is unexploited wide opportunity for outgrower schemes and private woodlots establishment in the Coast, Eastern, and Nyanza regions. For the last 10 years, demand for wood after the ban has been very high, and private farms have become the main sources of material for sawmills and mobile benches. Due to this, farmers realised the commercial value of trees resulting in high demand for seedlings for planting and thus an increased number of private nurseries.

Although farmers are willing to plant, the area of land available remains a limiting factor. Furthermore, there is also ignorance on environmental legislation and technical know-how on tree planting and management and use of inefficient tree harvesting techniques.

3. OUT-GROWER SCHEMES AND OTHER WOODLOTS

3.1 Extent and impacts of out-grower schemes/other woodlots

Farm and private forestry are considered one of the key opportunities for increasing the forest cover in Kenya to the internationally acceptable standard of 10%.

Forest plantations outside gazetted forests comprise private woodlots, planting under agroforestry systems, windbreaks, private commercial forests for industrial purposes (tea estates, tobacco curing), etc. There is no available data on small scale forest plantations outside the gazetted forest areas. The Kenya Forestry Master Plan (KFMP) (1994) estimated that the number and volume of trees on farm are considerable in Kenya, particularly on the c. 8-10 million ha of small- and medium size farms in the highlands, but it is impossible to translate these tree resources into an area equivalent figure. Trees on farm were projected to more than double in the next 20 years. The Master Plan further estimated that farm forests (private woodlots) will produce about 17.8 million m³ of wood by year 2020, approximately 80% of the total wood production in the country.

Farm forestry can be classified into two main categories on the basis of ownership, viz. *private company plantations* and *individual farmer woodlots*. Examples of these include:

- **Large-scale agricultural enterprises:** These include the tea factories, the two major tobacco companies (BAT and Mastermind), and some leading large-scale farming enterprises, including Kakuzi, Finlay and flower-growing companies such as Homegrown. Most of these have diversified into tree growing to provide mainly fuelwood in view of inadequate supplies from KFS.
- **The Nyayo Tea Zone.** Since the 1980s, the NTZDC has been establishing a tea buffer belt around all forests in the highlands. Part of this effort has seen the establishment of tree wind break. The estimated area of plantations under this scheme is 632 ha (see GoK, 2004), mainly *Eucalyptus* planted as shelterbelts.
- **Individual farmers and groups:** Many private individual farmers and groups are investing substantial resources on the establishment of trees and woodlots on their own farmlands for subsistence or commercial purposes, taking advantage of the shortage in supply of fuelwood, poles, posts and timber from public forests and the associated attractive prices.

There is little documented information on the extent of private sector (in terms of numbers of plantations and areas planted) in Kenya.

Kenya does not have a formal framework for **outgrower plantation schemes**, i.e. contractual partnerships between growers or landholders and a company for the production of commercial forest products. There are, however, a few instances of outgrower schemes between individual farmers and the Kenya Power and Lighting Company limited, where the farmers are contracted to grow *Eucalyptus* poles to be used for electric power transmission. There is no documented information on these.

Several mechanisms exist in Kenya for support to outgrower and woodlot schemes, including:

KFS Extension Forest Service: This is the main driver of tree planting outside the gazetted forest areas in Kenya. The Service was officially started in Kenya in 1971 following the creation of the Rural Forestry Extension Scheme (RAES) through Sessional Paper No. 1 of 1968. The scheme was established to bridge the increasing deficit in the supply of forest products, especially fuelwood. It was started to promote tree planting on farms by rural communities and farmers to supplement what was being produced in gazetted forests. Through the scheme, seedlings were produced in central tree nurseries and distributed to the public free or at subsidised prices.

In recent times, the scheme has undergone several transitions to include two major programmes: the Farm Forestry and the Dry Land Forestry Development Programmes. The extension strategy has also shifted from the initial production and distribution of tree seedlings to facilitation of farmers and rural communities to establish their own nurseries, care for seedlings, and managing and conserving trees on their farms. To date however, there is little information on total area and/or number of community/farmer woodlots in the country.

The Tree Biotechnology Programme (TBP): This is a national programme under the KFS but collaborating with public extension agents, NGOs, the private sector, learning institutions and individual's growers to deliver technical backstopping in the establishment of improved clones of eucalyptus tree species. TBP works closely with Forest Commodity Associations such as the Forest Tree Nurseries Association of Kenya (FOTNAK) and the Kenya Forest Growers Association (KEFGA).

Established in 2003, the TBP programme has a central nursery and a network of regional distribution centres in high demand areas. To date, TBP has produced over 19 million improved seedlings and clones, with 73% going to private individuals, 22% to private companies and corporations and 5% to CBOs and NGOs.

One of the main impacts of the out-grower schemes is the establishment of tree commodity associations such as FOTNAK and KEFGA whose objectives are to facilitate policy, legal, technical and marketing aspects of private forest growing in the country.

3.2 Factors shaping growth of outgrower schemes and other woodlots.

Key factors shaping growth in the establishment of private woodlots and out-grower schemes include:

- **Technological advances and practices in forestry such as agroforestry and clonal biotechnology;** and the improved market for forest products (poles, timber, etc.) - a result of the wood deficit from gazetted forests created by the moratorium on timber harvesting; and,
- **Forest policy reforms:** The Forest Act of 2005 calls for community and private sector participation in forest management (PFM). It also requires that KFS provides extension services by assisting forest owners, farmers and associations in sustainable management of forests. In particular, the "Forest Management and Conservation Fund (FMCF)" proposed in the Forest Act 2005 is expected to be used to promote the development of forests, their maintenance, conservation of indigenous forests, commercial forest plantations, and provision of forest extension services. KFS is in the process of developing the operational guidelines for this fund, and is expected to include provision of funding to private and institutional tree planting projects and programmes on a grant and/or soft loan basis. The forest concession rules have also been gazetted and based on this an implementation framework is being elaborated.
- **Research and Education:** need for client-oriented research to strengthen silviculture and professional management for envisaged products.

A key challenge to establishment of out-grower schemes/other woodlots is inadequate incentives to enhance production of wood and wood products in the private sector. Such incentives could include policy and regulatory incentives (security of land and resource tenure), technical capacity (through training), fiscal and economic incentives (including tax breaks, concessional loans, etc.), and enhanced extension services. Other challenges as identified in the KFS Extension Service strategy include:

- **Inadequate information on the extent of forest resources on farmland.** Forest resource utilisation should be guided by enough information on available stock and yields to ensure sustainable harvesting levels. Lack of adequate information from farmlands has led to over-exploitation of tree resources in farms;
- **Undervaluation of farm-based tree products.** Farm-based tree products are usually undervalued to the extent that they do not capture their true worth among other competing farm products. Their environmental services are also largely ignored. This has impacted negatively in rationalising decision making where farmers are inclined to prefer other more profitable enterprises;
- **Lack of market information to guide farmer decisions.** Tree planting within farmlands is usually not guided by any market information. As such, farmers do not target any particular end-user when investing in tree growing. Farmers with products ready for sale are also disadvantaged in that they have no information on markets for their products or the basis of pricing their tree produce; and,
- **Access to credits and markets.** Failure to recognise tree farming as a profitable commercial enterprise has made it difficult for farmers to access credit facilities from financial institutions. This is further compounded by the high interest rates on a crop with a long gestation period. Repayment becomes difficult unless the Government deliberately intervenes to assist farmers secure credits in view of the accruing environmental services that benefit societies and not farmers individually.

4. FOREST AND TREE TENURE

4.1 Current forest/tree tenure systems

Currently, two main instruments govern forest and tree tenure in Kenya - the draft National Land Policy and the Forest Act 2005. Under the Draft National Land Policy, the proposed forest ownership in Kenya is categorised into three classes:

- Public: all gazetted forests or forest land held in trust by local authorities;
- Community: all forests or forest land and resources on land owned by the community; and,
- Private: forests or forest resources on land held by an individual or other entity under freehold or leasehold tenure.

Table 16 gives the estimated areas under each ownership category, as per the KIFCON Report (1999). Since then, the situation has changed considerably with respect to the public, community and private forests, but no recent figures are available.

Table 16: Forest ownership/tenure structure. Source: KIFCON (1999)

Category of ownership	Area (ha) – as of 1999	Percent
Public forests: gazetted/trust lands	1 640 000	87
Community forests: communally owned forests	180 000	10
Private forests: private companies and individual farmers	70 000	3
TOTAL	1 890 000	

The Forest Act 2005 states *inter alia* that ‘the management of all forests in Kenya other than private and local authority forests is vested in the State’. The Act is also explicit that any change of user of a forest requires parliamentary majority approval. Furthermore, it also mandates the Director of KFS to demand management plans for all types of forests including those on private and other public lands. Other relevant legislation is the Trust Land Act (Cap 288), which sets out procedures for local authorities in setting aside land for various uses including forests. Specifically section 65 of the Act is concerned with forests and forest produce, making rules for the protection of trees and forest products not on gazetted forest.

Currently, KFS is in the process of developing systems, guidelines and regulations to guide the management of forests and forest resources in community and private forests. There are over 300 CFAs in different stages established in various parts of the country to partner with KFS in conservation and sharing of benefits from the forest.

4.2 Impacts of forest/tree tenure on poverty alleviation and SFM

Forest/tree tenure has an important impact on poverty alleviation and SFM at both individual and community levels, since goods and services from forests and trees eventually translate to cash, either directly (sale of timber and non-timber forest products (NTFPs)) or indirectly (e.g. improved grazing/agricultural productivity). For example, the expansion of the small and medium scale forest enterprises has the potential to create jobs and provide alternative livelihoods. In 2006, direct values of timber, woodfuel and poles from gazetted forests were estimated to contribute about KSh 3.2 billion (about 40 million US \$) while other wood products such as wood carvings and tea baskets have a combined turnover of KSh 2 billion (about 25 million US \$) annually (MENR, 2006). The 1999 ban on timber harvesting has undermined the realisation of the potential business opportunities generated from plantation development.

Before the coming into force of the Forest Act 2005, people living next to or in forests, who felt they had a claim to ownership and/or rights to basic livelihoods, more often than not chose to illegally avail themselves of forest goods and services to avoid paying associated tariffs. This situation was further aggravated by lack of education and awareness among the public on their role, rights and responsibilities in the conservation and management of forests, including the need to protect the resource for the common good.

The period up to 2002 was also characterised by weak forest law enforcement and governance, including corruption, leading to wanton destruction of forest and illegal exploitation of forest resources. Since then, the security of tenure of the forest estate has considerably improved with practically no excisions recorded in the last ten years. Moreover, the scope of forest management has been greatly expanded and more elaborate institutional arrangements have been put in place. In particular, the Forest Act (2005) broadened the mandate of the KFS to cover the administration of all forests within the country, including state, local authority, and private forests.

4.3 Suggestions for improvement of tenure system

A lot has already been achieved in Kenya with regard to forest/tree tenure through the draft land policy and the Forest Act 2005. A lot more needs to be done to improve this tenure system. For example, it has been argued that giving KFS a mandate to administer forests on private land (both community and individual land holdings), as provided for in the Act, amounts to a limitation on ownership of the forest/tree by the community or individual land owner. It is in this respect that every effort must be made to ensure community participation in the formulation of guidelines and regulations to govern the management of forests and forest resources on community and private lands. The main challenge for KFS will be to ensure that forests/trees on community/individual lands are sustainably managed such that national/global benefits/interests are safeguarded without compromising the interests/benefits of the community/individual owner. The Forests Act 2005 is also being revised to be in line with the provisions of the National Land Policy (NLP) and the Constitution. Some of the main challenges in implementing the NLP and the forest related provisions in the constitution include:

- Cohesion, synergies and positive energy in governing forest and wildlife resources as national assets;
- The Bill of Rights (which includes the right to have the environment protected for the benefit of present and future generations);
- The two-tier system of government. The latter requires a new relationship between the Ministry of Forestry and Wildlife, KFS and the county governments;
- The need to balance the principles of devolved government against a transfer of functions; and,
- Powers with regard to public expenditure, the sustainability of institutions, natural resources and ecosystem integrity, and revenue collection and distribution.

5. FINANCIAL AND HUMAN RESOURCES FOR PLANTATIONS AND OUTGROWERS/WOODLOTS

5.1 Current financing mechanisms

The following are the main funding mechanisms for forestry in Kenya, including plantations and outgrower/woodlots:

- (a) Government sources
 - Funds from the Government.
- (b) KFS Internal sources of funds
 - Revenue generated from improved management of plantation forests;
 - Levies and royalties imposed on services such as water catchment conservation, land leases and concessions; and,
 - Funds generated from investments.
- (c) External sources
 - Funds from development partners and other agencies; and,
 - Funds available internationally, e.g. for sequestration of greenhouse gases, conservation of biological diversity, protection of water catchments, and combating desertification.
- (d) The "Forest Management and Conservation Fund".

Historically, the exchequer has been the main source of funding for forestry development activities in the country, including for public plantations and private/rural afforestation schemes, with an upward trend over the last ten years, except for 2004/2005 fiscal year (see Table 17). Similarly, the development allocation shows an upward trend (except for the period 2005/2006), giving an overall upward trend in financing to forestry activities in the country. An important contributing factor for this trend is the greater appreciation of the role and importance of forestry to national development and its job creation potential as articulated in vision 2030 and the Forest Act 2005. Note, however, that information on plantation management budget and expenditure for the past 20 yrs (public and private sector plantations) is not available.

Table 17: Government of Kenya allocations to the Kenya Forest Service in US\$. Source: KFS (2009)

Financial Year	Recurrent Allocation (mill US\$)	Development Allocation (mill US\$)	Total Allocation (mill US\$)	Total Requirement (mill US\$)	Deficit (mill US\$)
2002/2003	13.5	0.7	14.2		
2003/2004	16.5	3.4	19.9		
2004/2005	15.4	4.0	19.4		
2005/2006	19.2	2.4	21.6		
2006/2007	18.4	10.6	29.0		
2007/2008	21.2	12.0	33.2		
2008/2009	24.0	13.3	37.3	54.0	16.7
2009/2010	24.0	14.0	38.0	67.5	29.5

According to the KFS Business Plan 2009/10 to 2011/12, the financial requirements of the Service will rise to a total of KSh 7.5 billion annually (US\$ 94 million) by 2012 for its operational activities as shown in Table 18. At the current level of annual allocation (US\$ 38 million), the issue of funding will remain a major challenge for KFS.

Table 18: Projected budget requirements for Kenya Forest Service, 2010-2012. Source: KFS (2009).

Programme	Year 2010/11 (mill US\$)	Year 2011/12 (mill US\$)
National conservation and management programme	9.4	9.4 (10%)
Industrial forest plantations	12.0	12.5 (13%)
Forest extension services programme	8.6	8.5 (9%)
Others (IT development, administration)	8.9	11.9 (13%)
Recurrent expenses	50.4	51.6 (55%)
TOTAL	89.1	94.0

External sources support

In the past, forest development has received (and will continue to need) support from development partners. The following are examples of on-going support:

- **The WB** has been the main supporter of plantation forestry establishment in the country. The first project was approved in 1969 (US\$ 4.0 million), the second forestry plantation project (US\$ 55.0 million) was approved in 1975, the third was approved in 1982 (US\$ 74.1 million), the fourth forestry development project (US\$ 83.3 million) was approved in 1990, and currently there is an on-going WB support to the natural resource management project that is not supporting plantation development directly due to the logging ban. Currently, the WB is supporting KFS through the Natural Resources Management Project and the Support to Community Based Farm Forestry Enterprises.
- **Miti Mingi Maisha Bora (MMMB) Project** is a collaborative initiative in the forest sector between the Government of Kenya and Finland. The aim of the project is to provide support to the on-going forest sector reform process. Key project components include forest sector policy development and coordination; support to the forest sector reform process (including building the capacity of KFS); support to forest, watershed and plantation management; development of forest sector industries; establishment of Community Forestry Associations (CFA) through PFM; and support to forest management outside gazetted forests in arid and semi arid lands (ASALs). The project runs from July 2009 to 2014 with a proposed budget of Euros 18.85 million (US\$ 27 million equivalent) from the Government of Finland.

Other supporting partners include the African Development Bank (AfDB), the UN System (e.g. through Food and Agriculture Organization (FAO) and United Nations Development Programme (UNDP)), and bilateral donors such as the Denmark, USA, and Japan. Most of these support forest sector development in general which may include support to activities related to forest plantations. Information on specific areas and amounts of support was not availed.

5.2 Potential financing mechanisms

Under the Forest Act 2005, KFS is expected to be responsible for raising most of the funds needed for its recurrent and development activities. There are a variety of revenue sources to fund and operate KFS as summarised in this section.

Revenue from commercial plantation operations: Revenue collection as at 2009/10 was KSh 760 million (US\$ 9.5 million), expected to increase to about KSh 1 billion (US\$ 12.5 million) by 2012 based on the area, yield and price of a variety of products and services. This level of revenue collection is clearly way below the projected budgetary requirements of KFS (estimated at KSh 7.5 billion or US\$ 87.5 million) in 2012 if it is to discharge its mandate effectively. This revenue can be increased by selling the “whole tree” (firewood from crown) and venturing into carbon trade.

FMCF: Established in the Forest Act, the FMCF will consist of: monies appropriated by Parliament; monies levied upon forest beneficiaries; income from KFS investments; and grants, gifts and donations from the Government of Kenya (GoK) or other sources. The FMCF will be used to promote the development of forests, maintenance and conservation of indigenous forests, the promotion of commercial forest plantations, provision of forest extension services, the establishment of arboreta and botanical gardens, and a variety of other purposes outlined in the Forest Act. The FMCF will be managed by the Finance Committee appointed by the KFS Board. The Fund has not been designed as of now (mid 2011) and therefore remains non-operational.

Development partner support: After a withdrawal of development assistance to forestry by several donors during the mid-nineties, overseas aid to the sector has again picked up. Unlike many other countries in Africa, Kenya has succeeded in attracting new financing and the development partner group for forestry (Forestry Donor Coordination Sub-Group that include Finland, WB, FAO and UNDP) is giving priority to the reform agenda. More than US\$ 50 million has been dedicated to KFS for the period of 2007-2012 including to forestry plantations. In line with the Paris Declaration, coordination of financial and technical support from development partners needs to be strengthened so that sector-wide interventions can be carried out with minimum prescription and maximum flexibility. The development of a “basket funding” mechanism for KFS has not been on the agenda of the Forestry Donor Coordination Sub-Group.

Tapping into new/innovative and emerging potential funding mechanisms: These include the Global Environment Facility (GEF), the Prototype Carbon Fund (PCF), the Reducing Emissions from Deforestation and forest Degradation (REDD) programme, as well as development of a national scheme to ensure Payment for Environment Services (PES) such as tree planting for soil and water conservation in the Water Towers. KFS is aware of these potential funding sources and has included capacity building for resource mobilisation within its 2010-2015 Business Plan.

Eco-tourism development: Tourism currently accounts for about 10% of the GDP, making it the third largest contributor to GDP after agriculture and manufacturing. It is also Kenya's leading foreign exchange earner generating about KSh 56.2 billion (c. US\$ 700 million) in 2006, up from KSh 21.7 billion (US\$ 275 million) in 2002. KFS has yet to tap into eco-tourism development, particularly as it is the custodian of key eco-tourism sites within the five water towers (Mt. Kenya, the Mau, the Cherangani, Mt. Elgon and the Aberdare), and at the coast (Arabuko-Sokoke).

Bio-energy development: Charcoal is (i) the main source of energy for many households and industries, (ii) a leading cause of forest degradation in many areas and (iii) a livelihood system for more than 100 000 charcoal burners. At present, the illegal informal economy in charcoal is worth around KSh 32 billion (US\$ 400 million) a year, equivalent to that of the tea industry. At least KSh 5.2 billion (US\$ 65 million) could be raised in taxes if these processes are legalised under the Forest Act. KFS is in the process to develop a comprehensive National Charcoal Development Programme with prioritised investments for the medium-term.

5.3 Human resources

By 2010, KFS had a total of 5 076 staff, considered adequate based on a workload analysis (according to the KFS Business Plan 2010-2012). The greatest challenge for KFS is translating staff into parastatals payroll as it has two parallel payrolls for KFS and those on secondment to the Ministry of Forestry and Wildlife. The Strategy aims to improve the staff welfare and remuneration

so as to increase morale for greater productivity and efficiency, including through training. Table 19 gives the KFS human resources capacity; figures for the private sector are not available.

Table 19: Kenya: Forest sector human resources. Source: KFS (2009)

Degree holders	Diploma holders	Certificate holders	Non Skilled workers
264	510	1 238	3 064

The key institutions responsible for research and training of forestry personnel in Kenya include:

- **KEFRI** is the main centre for research and development in Kenya with programmes on tree seed development; farm forestry; natural forests conservation and management; dryland forestry, and plantation forestry. The institute has a total staff of over 1 000, including 86 research scientists, 38 technologists, 23 foresters and 62 technicians (KEFRI's Strategic Plan 2008-2012). The institute's effectiveness remains hampered by inadequate capacity, both human and financial, and the challenge of linking research to development.
- **At degree/professional level:** the Moi, Kenyatta and Egerton Universities are the three main institutions providing BSc and post graduate degrees in forestry in the country.
- The **Kenya Forestry College** in Londiani is the only forestry training institutions that trains at the sub-professional level. It trains technical staff with a two-year forest assistant course and a three-year diploma course in forestry.

6. INCENTIVES FOR PLANTATION ESTABLISHMENT BY PUBLIC/PRIVATE SECTOR AND OUTGROWERS

6.1 The rationale behind incentives

The Forest Act 2005 recognises the importance of involving farmers and rural communities in forestry activities in reversing the trend of deforestation and contributing to the development of rural areas, including improving livelihoods of local communities and individual farmers. A pre-requisite for involving the rural population is that the activities will produce direct short-term benefits in terms of increased agricultural production, better availability of fuelwood and construction materials, as well as additional income and employment opportunities. Unfortunately, none of these benefits are easily discernable or recognisable by the beneficiaries in the short-term, particularly because tree planting activities require significant investment in terms of capital and time. Hence, there is a need for the government and other stakeholders to put in place incentives to promote and/or encourage public/private sector and outgrowers investment in tree/forest planting activities.

6.2 Current incentives: impacts and effectiveness

The Forest Act 2005 makes provision for incentives to be offered to encourage new planting and improved management for both industrial and farm forestry. For example, the Act provides for a person who establishes or owns a private forest to apply to the relevant authority for exemption from all or part of the land rents and such other charges as may be levied in respect of the land on which the forest is established.

To date, the government has taken important measures towards putting in place incentives for plantation establishment by public/private sector and outgrowers:

- The question of land and tree tenure is largely settled in a manner that allows the farmer to reap the benefit of their investments in forestry activities. The main challenge will be to ensure that KFS's mandate to administer forests on community and individual land holdings does not infringe on the private ownership of the forest resources;

- The establishment, strengthening and operation of a more efficient forest extension division within KFS- providing training and basic inputs for the forestry activities of farmers and rural communities;
- The establishment of financing mechanisms to promote rural afforestation, forest management and farm and community level tree/forest planting activities. Both the Constituency Development Fund (CDF) and the yet to be operationalised FMCF established under the Forest Act 2005 are expected to have a major impact as incentives to public/private sector forestry activities; and,
- The development and pilot-scale implementation of appropriate concepts and technological solutions for private and communal woodlots, agroforestry, watershed management, improved utilisation of woodfuel, forest management and small-scale forest based production. For example, the Tree Biotechnology Project based in Karura had, by 2010, distributed a total of 19 million high quality *Eucalyptus* seedlings to over 19 000 farmers across various regions in the country (given free of charge) representing an estimated cumulative investment of over US\$ 2.5 million (Mwanila *et al.*, 2009).

In addition to the above, the Environment Management and Coordination Act (EMCA) 1999 under section 57 provides for the Minister of Finance to put in place Government tax and other fiscal incentives, disincentives or fees to induce or promote the proper management of the environment and natural resources or the prevention or abatement of environmental degradation. In this regard, investment in the forest sector by saw millers that aims to enhance transfer and use of modern, efficient and environmentally friendly technologies would benefit from such tax and fiscal incentives. Furthermore, EMCA provides for the "User-Pays Principle" as part of national pricing policies for natural resources aimed at economising on the use of resources. However, to date these provisions have not been implemented. Current incentives in Kenya are shown in Table 20.

Table 20: Incentives for plantation development.

Type of incentive	Brief description of incentive	Source and period	Target group	Outcomes/impacts & shortcomings
Policy and land/tree tenure reforms	PFM involving local communities in decision-making and the management of public forest plantations	Forest Act 2005 The EMCA- 1999 Continuous	Private sector and local communities	Communities have embraced tree planting as demonstrated by the heavy demand for tree seedlings and the many private and communal woodlots and plantations seen all over the country.
Concessions	Development of PFM and Concession Rules	Forests Act 2005	Commercial tree growers and entrepreneurs including foreign investors	The development of concession framework is in progress and four concessions are expected to be in place in 2012
Provision of training and extension services	Providing training and tree seedlings	KFS- Forest Extension Unit Continuous	Private sector and local communities	As above
Financial support	Constituency Development Fund (CDF). Forest Management and Conservation Fund (FMCF)	Government and development partners, through devolved governance mechanisms Continuous	Private sector and local communities	As above. Financing of plantation forestry activities by private and community parties remains a major constraint
Pilot technological innovations	Tree Biotechnology Programme providing improved seed,	A KEFRI programme funded by JICA- 2003 to 2010	Private sector and local communities	As above

In response to the above measures, many individual farmers and communities have embraced tree planting as demonstrated by the heavy demand for tree seedlings and the many private and communal woodlots and plantations seen all over the country.

6.3 Suggestions for improvement of incentives

The main constraints to the effectiveness of the above incentives are that few farmers appreciate tree farming as a profitable commercial enterprise in the farming system. As a result, few of them attempt to access credit facilities from financial institutions. This is further compounded by the high interest rates on credit, given also that tree crops have long gestation periods. This points to the need for Government intervention to enhance incentives targeting increased support to plantation forestry, in view of the economic benefits to the country as well as the accruing environmental services that benefit both national and global communities. These interventions could include:

- Identification and establishment of new financial incentives (e.g. concessional loans for implementing private forest projects);
- Removal of market distortions (e.g. in the pricing of tree seedlings/timber products from public forests relative to those from private sources); and,
- The implementation of the provisions of the Forest Act 2005 and the EMCA (1999).

7. SUPPLY AND DEMAND OF FOREST PRODUCTS

7.1 Supply scenarios and projections

The Forest Act 2005 stipulates that all forest plantations on public lands are primarily for production of wood and other forest products and services for commercial purposes. At the same time, forests remain the predominant source of energy (both as firewood and charcoal) for domestic/household and institutional use.

According to the KFMP of 1994, the total national deficit in wood products was projected to rise to 997 000 m³ by 2005 and 6 841 000 m³ by 2020.

In its current strategic plan (2006-2011), KFS aims to maintain and enhance the productivity of the industrial forest plantations as a means to efficient utilisation of wood resources for wealth and employment creation. This will be done through maintenance and replanting of the 125 000 ha plantation estate. The target is to replant 6 000 ha per year over the next 5 years. This is in addition to mapping of young plantations and inventory of the existing stock and development of management/business plans. There are also plans to implement forest concessions once studies are finalised and management guidelines introduced (KFS Strategic Plan 2006/2011).

Table 21 gives the projected sustainable wood yields ('000m³) from gazetted forest plantations and natural forests combined.

Table 21: Projected production/supply of wood and wood products in 1000 m³. Source: Kenya Forestry Master Plan (1994).

Forest product	Year 1995	Year 2000	Year 2005	Year 2010	Year 2015	Year 2020
Timber (industrial round-wood – sawn wood, paper and paperboard)	3 197	3 714	3 677	3 964	4 331	4 879
Woodfuel (firewood and charcoal)	18 511	20 204	21 842	23 540	25 449	27 314
Poles	1 315	1 425	1 475	1 561	1 663	1 782

Firewood and charcoal constitute over 70% of Kenya's total energy consumption. Most of this wood comes from indigenous forests, woodlands and shrub lands in the ASALs, and most of this is converted into charcoal for the urban markets. Consequently, charcoal has become a very important (albeit illegal) source of cash income for the communities, especially during droughts.

This development has caused serious deforestation, putting in danger other local uses of trees such as fodder for livestock and wildlife, and production of various NTFPs.

7.2 Demand scenarios and projections

Table 22 gives the projected demand for wood ('000 m³) from gazetted forests - plantations and natural forests combined – for the years 1995, 2000, 2005, 2010, 2015, 2020.

Table 22: Projected demand of wood and wood products in 1000 m³. Source: Kenya Forestry Master Plan (1994).

Forest product	Year 1995	Year 2000	Year 2005	Year 2010	Year 1015	Year 2020
Timber (industrial round-wood – sawn wood, paper and paperboard)	1 058	1 209	1 378	1 543	1 709	1 961
Woodfuel (firewood and charcoal)	20 107	23 947	27 693	31 720	35 880	40 133
Poles	1 219	1 435	1 689	1 989	2 335	2 736

Table 23 gives the most authoritative study on the current industrial round wood demand situation in Kenya (see Maina, 2008). The figures indicate an annual demand of between 2 and 2.4 million m³ of wood per year depending on the recovery factor of between 32 and 50%. This is beyond the projected demand of 1.5 million m³ as per Table 22 but well below the projected supply level of 4 million m³ as in Table 21. Given the ever increasing population, increasing level of industrialisation and development trends, it is expected that this demand will increase. It should also be noted that this demand will go up when the ban on harvesting is lifted, prompting the revival of the many small-scale sawmills closed down following the ban.

Table 23. Current demand for wood by industry. Source: Maina (2008).

Product	Demand estimate
Sawlog industry	At current recovery rate (32%), annual demand for sawlogs is 1 600 000 m ³ . At a recovery rate of 45% demand drops to 1 200 000 m ³ .
Plywood and panel industry	Annual demand of plywood is expected to be 300 000 m ³
Pulp wood industry	Pan African Paper Mill requires 60-70% pine, 20-30% cypress and 10% eucalyptus for a total annual demand of 450 000 m ³ .
Total industrial wood	The total annual demand is thus between 1 950 000 and 2 350 000 m ³

Woodfuel demand:

According to the Beijer Institute studies (1985), wood and charcoal consumption was expected to grow at an annual rate of 3.6 and 6.7% in rural and urban settings respectively, reflecting an increasing trend towards urbanisation. According to these studies, the wood demand for fuel were expected to exceed supply by year 2000, leading to a shortfall of 30.6 million tonnes unless interventions were put in place to stem the situation. The KFMP 1994 projected the demand for fuelwood increasing from 20 million m³ in 1995 to 40 million m³ by 2020.

Existing gazetted indigenous forests and plantations could sustainably yield 350 000 tonnes of woodfuel annually from logging waste and small wood extraction from the indigenous vegetation. The Ministry of Energy estimates that industrial wood and wood wastes are used only marginally for energy, representing 0.3% and 0.5% of total use, respectively (see RELMA, 2003).

7.3 Consumer prices

One of the effects of the government ban on logging since 1999 was to drive the price of construction timber very high as most of it had to be sourced from across the border mainly from Tanzania, Uganda and the Democratic Republic of Congo (DRC). Consumer prices for forest

products vary greatly from one commercial centre to another, due to different transportation costs from source of the material. Table 24 shows the consumer prices of local plantation timber and wood products in Nairobi in 2011.

Table 24: Consumer prices (US\$) of local and imported timber and wood products in 2011. Source: Market survey undertaken by study team in Nairobi (sample of 6 outlets).

Forest product	Wholesale Price (US\$/m ³)	Retail Price (US\$/m ³)	Countries of origin
Sawnwood:			
Cypress	375	450	Local and Tanzania
Pine	300	325	Local and Tanzania
Eucalyptus	300	350	Mainly local
Grevillea	187	225	Local and Tanzania
Hardwood (mahogany)	500	600	Uganda and DRC
Fuelwood (kuni)		18	
Plywood 1x2 m sheets, 4 mm		18 per sheet	
Particle board 1x2 m, 1.5 cm		37.5 per sheet	
Poles	3 per 5 m pole		

7.4 Forest products trade

There is a vibrant trade in forest products within Kenya and across the border with neighbouring states. For example, it is known that part of the charcoal in the 23 billion KSh charcoal trade is exported illegally to neighbouring countries or to the Middle East. There is also a significant timber trade, largely informal, between Kenya and Tanzania, Uganda, DRC and Congo Brazzaville, which increased following the 1999 ban on logging. The main impact is in loss of foreign exchange, and exposing the country to the risk of forest pests and diseases.

As indicated above, the main trade in timber and wood products between Kenya and its neighbours remain largely informal. As such, data on import/export between these partners is not available. Attempts to obtain some information from the Ministry of Trade were not successful. However, it is estimated that in 2010 the country spent US\$ 12 million on timber import bills.

8. FOREST ROYALTIES AND OTHER REVENUES

8.1 Forest royalties and licences

8.1.1 Structure and amount of forest royalties and licences

KFS is the only Government authority mandated to collect revenue from state forestry related activities in the country. The fees from other community and local authority forests are regulated by the market and through by-laws respectively. It does this through levying royalties and through licences issued to parties wishing to access forest resources. The levies and fees to be charged are set by KFS and communicated through Forest Service General Orders (FSGO) at the beginning of each financial year. The fees and levies are set through an internal mechanism of KFS with the final approval done by the Management Board. They are normally adjusted each year to take care of inflation.

Table 25 gives the stumpage royalty for the main plantation timber species and Table 26 gives charges for various forest products as per Forest Service General Order (FSGO) No.260 of 2010.

Table 25: Kenya: Stumpage royalty of major plantation species. Source: FSGO 260 of 2010.

Species	Clear fell dbh (cm)	Price range (US\$/m ³)	Thinning dbh (cm)	Price range (US\$/m ³)
Cypress	15-60	30.0 – 37.0	15 - 60	24.7 - 33.2
Pine		28.0 - 33.2	15 - 60	23.6 - 27.3
Eucalyptus			20 - 35	24.3 - 31.1
Vitex keniensis				

Table 26: Charges for licences for the various forest products as per FSGO no. 260 of 2010-11. Source: FSG NO.260- (2010)

Item	Type/unit	Charges per unit in US\$
Working cycle	Pulpwood per m ³	24.6
License	General Forest license Small saw mill >10m ³ per day Medium saw mil 10-20m ³ per day Large sawmill >20m ³ per day Pulp & Paper Plywood Fuel treatment plant Commercial fuelwood	125 per year 375 per year 625 per year 1 000 per year 2 500 per year 1 875 per year 750 per year 750 per year
Timber movement permit	2-4 tonnes 5-7 tonnes >7 tonnes	125 18.8 25

8.1.2 Suggestions for improvement of forest charges and royalties

The MMMB Support to Forest Sector Reform in Kenya report *Analysis of Policy, Regulatory and Fiscal Framework for Small and Medium Enterprises Development in Sawmilling* (December 2007) noted that “stumpage fees on logging concessions have failed to capture most of the economic rent from the extraction of timber. As a consequence, it captures less than half of the stumpage value of the timber in their systems of taxes and charges on logging and associated activities”. This undervaluation of timber products from the public forests translates to a subsidy with two important consequences: low level of revenue collected and the distortion of the market *vis-à-vis* goods and services from private sector. The subsidy also has negative implications on efficiency in the processing of forest products (disincentive to improving efficiency in the recovery conversion of round wood to timber) and technology relating to utilization of forest products. This points to the need to put in place proper systems and procedures for setting prices of forest products so that they reflect the true market value.

8.2 Forest concessions and permits

The Forest Act 2005 provides for joint management of any forest through a licence, concession, contract, or joint agreement. Key requirements are that concessionaires must, *inter alia*, comply with set guidelines or management plans prescribed by KFS. The licence granting the concession shall indicate the nature of the concession, including its physical location and boundaries, and the purpose for which it is granted.

8.2.1 Current concessionaires/permit holders

KFS is currently in the process of preparing procedures and guidelines for concessions and joint management of forests, to be followed by pilot projects to provide lessons in the implementation of joint management projects, including systems for monitoring of compliance. As such, there are no current concessionaires/permit holders. It is anticipated that a total of four concessions will be ready by 2012.

8.2.2 Monitoring of compliance

KFS is responsible for the monitoring of compliance with the conditions and guidelines set out in the Act, including those set out in the EIA Licence. The grantee of a concession is held personally responsible for any breach of the conditions, and the penalty may include withdrawal of the licence. Experience on monitoring and compliance will only be apparent when concession provisions are being implemented.

8.2.3 Suggestions for improvement of concessions/permits

Involve all key stakeholders in the process of preparing procedures and guidelines for concessions and joint management of forests – this will greatly improve the content and procedures adopted for the issuance and implementation of the concessions/permits.

8.3 Administration of forestry revenue system

According to the KFS Business Plan 2010-2012, the main sources of revenue include:

- Sale of plantation (round wood);
- Power transmission poles;
- Fees collected from plantation establishment and livelihood support schemes (PELIS); and,
- Annual licence fees.

The following are the main mechanisms which are applied by KFS to capture revenue (Table 27):

Table 27: Revenue mechanisms which are applied by KFS to capture revenue. Source: KFS (2010).

Revenue mechanism	Description	Application/Remarks
Revenue Mechanisms for Timber Production and Forest Lands		
1. Volume Based Stumpage Prices	Based on timber harvested (cu m, cu. Ft, metric tonnes) based on scaled volume of logs. Fee is the price of standing timber	Currently used to sell plantation timber - determined using the replacement cost method.
2. Per-tree charges	A charge per tree cut	Applied in sale of poles and incidental disposal of few trees
3. Competitive Bonus bidding	Sale of timber by oral auction or sealed tender. Require competition which is not always possible	Applied along with No. 1
4. Charges on Minor forest produce	Administratively set, low to discourage evasion and enhance equity	Applied to dispose minor forest produce
5. Charges on the processed Forest Produce	Administratively set, ad valorem (% of value, rarely used to dispose timber from state forest because it penalizes efficiency in processing	Can be used to charge levy on charcoal and timber from farms
6. Export taxes on Logs or processed Products	May encourage inefficiency in domestic market	May be used to charge a fee on export permits which are currently free
Revenue Mechanisms for Logging and Forest Operation		
7. Charges, Fee, or Taxes on Capital Equipment, Labour etc	Some countries have special charges for logging equipment sawmill etc raise revenue to cover cost of licensing, control and inspection	Applied to collect sawmill timber treatment licenses.
8. Corporation income Tax	Tax on net profit	Used best as economy wide tax system. Not related to royalties since it is a transfer payment
9. Government Ownership or participation in Forest Industry Companies	Joint ventures or shareholding, Hire	As proposed for Forest Training Centre (FTC)
Revenue Mechanisms for Forest Lands and Tenure		
10. Initial Fee on Forest Concession	Fixed fees or per hectare fee	Ecotourism sites
11. Renewal fee on Concessions	Annual renewal fee	Ecotourism, transmitters etc
12. Competitive Bonus Bids on Forest Concession	More common in mineral exploration but used to competitively allocate long term tenures	Used to allocate ecotourism sites

13. Annual ground rentals	An annual fee based on the area	Dams, cultivation, industrial, way-leave, fish ponds,
14. Annual rentals on short term tenures	One- time fee for short term occupation	Camping fee, road camps
15. Area based or other service fees	Fixed fee per area extracted	Applied in quarrying of stones as opposed to quantity based fee. Propose fee on timber grading per consignment

Table 28 gives the total revenue collected by KFS over the last two years from the main sources, and the projected collection up to year 2012:

Table 28: Actual and projected revenue collection - 2009 up to year 2012 in million US\$.
Source: KFS (2010).

Source of revenue	Actual collection in million US\$		Revenue projections with ban in force (million US\$)		Revenue projections with ban lifted (million US\$)	
	2009	2010	2011	2012	2011	2012
Sale of plantation (round wood)	3.50	9.20	10.10	11.10	26.20	27.50
Power transmission poles	0.20	0.22	0.75	0.82	0.75	0.82
Fees collected from PELIS	0.07	0.06	0.12	0.16	0.12	0.16
Annual licence fees	0.13	0.03	0.03	0.03	0.03	0.03
Total	3.90	9.51	11.00	12.11	27.10	28.51

The most significant point to note from Table 28 is that the plantation timber (roundwood) remains the most important source of revenue, and that projected revenue (2012) would rise from 12.11 million US\$ to 28.51 million US\$ if the logging ban is removed.

The KFS Board Paper 2008/09 identifies the following as potential **Revenue Mechanisms for NTFP** yet to be tapped:

Eco-tourism:

- Annual and daily entrance fees for parks and recreation facilities;
- Campground fee, picnic site fee, other facilities;
- Hire of ground for weddings/festivals;
- Voluntary contribution to specific uses and special funds;
- Charges on filming rights;
- Fishing – annual and daily License fees; and,
- Subsistence resource use, not recommended for a variety of reasons.

Watershed Management

- Annual water use licenses based on licensed volumes of withdrawals or *in situ* storage;
- Water/Geothermal/Wind rentals for power generation;
- Mining of gas;
- Road tolls;
- Carbon credits; and
- Bio prospecting.

Suggestions for improvement of revenue collection systems

One of the key issues relating to forest management in Kenya has been the poor enforcement of rules, regulation and procedures relating to revenue collection. The main underlying causes include leakages (through corruption and bribery), inadequate capacity for apprehension and interdiction (KFS, police and judiciary) and inadequate policy and regulatory frameworks. Enhancing forest law enforcement and governance (FLEG), improving partnerships with local communities (PFM) and improved capacity within KFS for forest management and FLEG (through training and increasing manpower) are some of the measures identified in the Forest Act 2005 and in the KFS Strategic

Plan 2006-2011 for implementation. These will go a long way towards improving forest charges and licensing procedures.

In addition, there is need for regular assessment and review of royalties and other charges to ensure they reflect the market prices and that proper implementation of sales guidelines are being followed. This plus the adoption of transparent public auctions and competitive timber sales could help in this respect and improve revenue collection.

9. PROCESSING OF PRODUCE

9.1 Ownership and types of industries

Forest industries, both large scale and small/medium scale enterprises (SMEs), are important contributors to the national economic growth and employment creation. They play an important role in the supply of timber for the construction, fuelwood and associated secondary industry products. Key among these are:

- **Sawmilling:** As at 1999, it was estimated that there were about 450 sawmills in Kenya, dropping to 367 as of 2003 (a result from the logging ban) producing about 200 000 m³ of sawn wood, which serve mostly the domestic market. The potential annual capacity of the mills range from less than 500 m³ of log input to more than 30 000 m³. The three large-scale sawmills in the country - RAIPLY, TIMSALES and COMPLY - continue to receive raw materials in spite of the ban, and are the main sources of revenue to KFS. Plywood manufacturing is usually integrated with sawmilling, mostly by the large sawmills.
- **Pulp and paper industry:** Kenya has only one pulp and paper mill, which is part of the Pan African Paper Mills (PPM) group. The mill is based at Webuye town in western Kenya and is a joint venture between the Government of Kenya (33.4%), the Orient Paper Company of India (24%) and the International Finance Corporation (29%). The mill has an average annual capacity of about 250 000 m³ of roundwood input, which is supplied completely by the forest plantations managed by KFS. PPM is currently undergoing negotiations with the Government concerning its ownership. There are also several smaller industries manufacturing packing paper bags, cartons and toilet paper, e.g. Madthu Paper Company, and the Chandaria Industry.
- **Woodfuel industry:** It is estimated that 70% of Kenyans use wood fuel either as firewood or charcoal for domestic use. About 2.4 million tonnes of charcoal and 12.9 million tonnes of firewood worth KSh 64 billion (US\$ 800 million) are consumed annually. According to Mugo (2003), tea, tobacco and fish processing companies annually consume an additional 20 million cubic meters of wood fuel worth KSh 1.6 billion (US\$ 20 million).
- **Basketry:** In tea growing areas, bamboo is used for making tea-harvesting baskets. These baskets are disposed off after every three months. There are 360 000 small-scale tea farmers in the country who produce in excess of 170 million kgs of tea, which is about 60% of the total tea production. The total turn-over in the basketry industry to support small holder tea production is estimated at KSh 324 million (US\$ 4 million), assuming an average of two baskets per household. Large-scale tea producers consume a further KSh 216 million (US\$ 2.7 million) worth of baskets giving a total turnover of KSh 540 million (US\$ 6.8 million) within the tea sector.
- **Charcoal production, marketing and transportation industry:** The National Charcoal Survey estimates this industry to be worth around KSh 32 billion/year (US\$ 400 million), equivalent to that of the Tea industry. The industry remains largely informal and illegal. The KFS is currently in the process of formulating guidelines to regulate the industry.
- **Wood carving industry:** Among the many handicraft activities, woodcarving and basketry form the most important components in Kenya. A study by Obunga (1998) indicated that the industry has about 80 000 wood carvers spread all over the country but mainly in Central, Eastern and Coast Provinces. Overall, the industry provides livelihood to over 300 000 people (directly) in Kenya and was valued at over KSh 100 million (US\$ 1.25 million) in 1995. Currently, the industry has a turnover of about KSh 1.5 billion (US\$ 18.75 million) per year, and is mainly linked to the very important tourism industry.

- **Non-timber forest products industries:** These are goods derived from forests but are non-wood, and include gums, resins, fodder, soil, murram, asparagus fans, mushrooms, honey, stones, fibre, water, medicinal herbs, frankincense and Myrrh, essential oils and fruits. According to a survey on production and marketing of NWFPs in Kenya carried out by the Kenya Association of Forest Users (KAFU, 2000), NWFPs play an important role in Kenya's economy, generating about KSh 3.2 billion (US\$ 40 million) per year.

Table 29 indicates the type of industries, ownership, current capacity and prospective production capacity.

Table 29: Current and potential capacity of forest industries utilising plantation and natural forest wood and NWFPs 2009.

Type of forest industry	Owner	Current production capacity	Integration with forest plantation	Potential production capacity
Sawmills	Private	Low due to ban on logging and poor state of machinery	Fully dependent	High assuming lifting of the ban
Pulp and paper mill-Webuye	Public with private shareholding	Medium-machinery need modernization	Fully dependent	High, assuming upgrade of machinery
Woodfuel industry	Private	High	Partially dependent	High
Basketry	Private	High	Low dependence (bamboo)	High
Charcoal production, marketing and transportation industry	Private	High	Low dependence (Eucs.)	High
Wood curving industry	Private	High	Low dependence	High
Non-timber forest products industries	Private	High	Low dependence	High

9.2 Raw material supply and quality

The country's annual per capita consumption of wood is 1 m³ which puts the total demand at 38 million m³ (given Kenya's population of 38 million). However, the estimated wood supply is 30 million m³ which creates a deficit of 8 million m³.

The overall impact of the 1999 ban on logging was the shortage of raw material to SMEs particularly sawmills and the consequent insufficiency of raw materials for upstream manufacturers of wood-based products. This resulted in increased cost of raw materials for the sector, which compensated by sourcing from private farm supplies, mainly of eucalyptus and *Grevillea robusta*. According to the MMMB Report (2007), the SMEs continue to experience serious problems of insufficient or lack of raw materials.

9.3 Constraints facing the sub-sector

According to the MMMB study (2007), the existing SMEs in the sawmilling industry rely largely on raw materials from farm forestry and the tea estates. Most of them have obsolete machinery and equipment. This is as a result of unreliability of the raw materials and inaccessibility to trade and investment finances from the financial institutions. Long term licenses and permits from KFS would serve as collateral for bank loans. In addition, the cost for the machinery and equipment are exorbitant due to high taxation making them unaffordable to the majority of the SME saw millers. Specific details on the condition of machinery, level of technology and human resource capacity are not available.

9.4 Potential for future investment

The overall outlook for Kenya's forest industrial development remains uncertain in view of the continuing ban on timber harvesting. This notwithstanding, the industry is ready to move as soon as the ban is lifted, more so as the Government remains committed to improving the efficiency of forest industries. Key provisions (Forest Act 2005) include:

- Promoting efficient forest-based industries to guarantee high quality products so as to satisfy domestic demand and contribute to the export earning; and,
- Encourage wood-based industries to manufacture diverse finished products for local and export market to take advantage of the country's regional position and good infrastructure development.

10. SOCIO-ECONOMIC AND ENVIRONMENTAL CONTRIBUTIONS OF FORESTS

The Forest Act 2005 and the KFS strategic plan (2006 to 2011) stipulate that Kenya's forests will be broadly managed for the following purposes:

- Biodiversity, soil and water conservation and provision of other environmental services;
- Wood production (timber, pulp, woodfuel and poles) and employment – current and potential;
- Conservation of wildlife habitats; and,
- Production of non-wood forest products and ecotourism development.

More specifically, the Act clearly states that plantation forests will be managed primarily for the production of wood and other forest products and services for commercial purposes.

10.1 Income generation

10.1.1 Current income

All recent key policy statements in Kenya – e.g. the Economic Recovery Strategy for Wealth and Employment Creation (2003-2006), the Forest Act 2005, and Vision 2030 - recognise the intrinsic link between poverty and environmental destruction, and particularly forest destruction. This, and poor governance are considered as the twin drivers of environment destruction. It is in this context that the Forest Act puts emphasis on the socio-economic and cultural functions of the forests, including the involvement of communities adjacent to forests and other stakeholders in forest conservation and management, particularly through PFM.

It is estimated that the forestry sector contributes in excess of KSh 20 billion² (US\$ 250 million) worth of goods to the economy, primarily as timber, pulp, woodfuel and poles, but also in the form of non wood forest products (NWFPs) (medicinal plants, honey, etc.) and services.

About 530 000 forest-adjacent households, equivalent to 2.9 million people, derive direct benefits from the forests, as do at least 10 000 households of forest dwellers and squatters whose livelihoods depend fully on forest resources. In addition, commercial producers and national and global communities benefit indirectly from the forests.

10.1.2 Potential for income generation.

The potential for income generation is greatly enhanced by the Forest Act which provides for intensified farm forestry, commercial production of NWFPs and outgrower tree schemes. Increased production of seedlings for farm forestry is expected to create employment opportunities for many youth and women groups.

10.2 Employment

Kenya's Vision 2030 recognises the importance of forest industries to the national economy - accounting for more than 2% of the GDP. They provide employment opportunities in various industries, thereby contributing to improved income and livelihoods of many Kenyans. Table 30 shows Kenya's current forest based industries and level of employment. However, data on potential employment in industrial forest plantations, natural forest management and processing industries are not available.

Table 30: Kenya's forest based industries and level of employment

Type of forest industry	Indicative size of industry	Current employment level	Potential employment capacity
Sawmills	Over 450 sawmills, including large-scale sawmills such as RAIPLY and TIMSALES	Over 20 000 employees	High assuming lifting of the ban
Pulp and paper industry	Includes the Webuye Pulp and Paper Mill, and several smaller industries manufacturing packing papers bags, cartons and toilet paper	Not available	
Woodfuel industry	About 2.4 million tonnes of charcoal and 12.9 million tonnes of firewood worth KSh 64 billion (US\$ 800 million) are consumed annually	Not available	High
Basketry	Over 360 000 small - scale tea farmers in the country using baskets	Not available	High
Charcoal production, marketing and transportation industry	Industry worth around KSh 32 billion a year (US\$ 400 million)		High
Wood curving industry	Industry valued at over KSh 100 million (US\$ 1.25 million) in 1995, and a turnover of about KSh 1.5 billion (US\$ 18.75 million) per year - linked to the very important tourism industry	Over 80,000	High
Non-timber forest products industries	Industry generating over KSh 3.2 billion (US\$ 40 million) per year	Not available	High

10.3 Plantations in forest conservation

Forests in Kenya, including plantations are important in conservation of biological diversity, regulation of water supplies, carbon dioxide sequestering and are a major habitat for wildlife, which promotes tourism. The hydroelectric power stations (Seven Forks, Sondu Miriu) are located along major rivers originating in vital forest water catchment areas. They also provide water to support irrigation schemes that are important for agricultural sector development.

Non-material benefits of forests and plantations in particular have not been properly captured in the mainstream national accounting systems leading to relatively low funding by the exchequer of the sector compared to other sectors like agriculture and water³. In particular, two key issues remain to be addressed adequately: valuing ecosystem services and putting in place guidelines and pilot schemes for payment for environmental services; and cost benefit analysis to demonstrate/ elaborate on the importance of plantation forestry in reducing pressure on the environment.

A major debate in Kenya relate to the role of *Eucalyptus* in soil and water conservation. One school of thought is of the view that this species is responsible for the drying out of many wetlands and riverbeds in the country and therefore should be banned. Another school of thought argues that the issue is one of management, suggesting the need to search for appropriate species and site selection. This debate is expected to continue as there are so far no definitive studies on the issue.

³ See Vision 2030

The biodiversity conservation function: Kenya's natural high forests are recognised for their importance as sites of high biodiversity in terms of both fauna and flora, with some sites being recognised as world Heritage sites (Mt Kenya). They harbour a disproportional large number of the nation's biodiversity, including some of the rare and often threatened plant and animal species⁴.

The water catchment function: Forests in Kenya play a vital role as home to the nation's "Water towers", i.e. the five main water catchments (Mt Kenya, Cherangani, Aberdare's, Mau and Mt Elgon) constituting the bulk of Kenya's high forests. About 65% of the high forest is under some form of protection as gazetted areas. The catchment value of these forests is overriding, as well as the economic role in power generation and tourism. It is therefore vital that they are protected at whatever cost, including invoking the "payment for environmental services" principle.

The climate change mitigation function: Kenya's Vision 2030 notes that, globally, deforestation and forest degradation accounts for 20% of green house gases (GHG) emissions and that forest conservation can provide 20% of the solution to global warming. It therefore calls for the urgent need to conserve, protect and rejuvenate Kenya's forests.

According to FAO's Forest Resource Assessment Report (2006), Kenya lost on average 12 000 ha of forest between 2000 and 2005. FAO further estimates that each hectare of Kenyan forest stores an average of 348 t CO₂ in above-ground and below-ground biomass that would be otherwise released by deforestation and subsequent land conversion for agriculture or pasture. Thus, deforestation in Kenya releases in the order of 348 metric tonnes of carbon for each hectare of land cleared or converted to agriculture or other purpose. This also highlights the importance of the forests in Kenya in carbon sequestration, a function that will greatly be enhanced with the increase in forest cover (currently estimated at 1.57 million ha (2.7% of the country) to 10% as envisaged in the Forest Act 2005. Note, however, that this relates to the role of all types of forests in conservation as a whole. There is no disaggregated data between plantations and other types of forests.

11. CONCLUSIONS AND WAY FORWARD

1. A review of the main national policy instruments elicits consensus on the importance of plantation forestry and out-grower schemes in the sustainable development of the country, including through promotion of industrialisation, generation of employment opportunities and poverty alleviation in the country. It further notes the constant decline of forest resources coupled with new developments in land tenure systems, the exploitation of remnant natural woodlands and, hence, the renewed interest in trees growing on farmland. The future of forests and tree resources basically depends on the growth and management of woody biomass which lies outside the country's gazetted forests.
2. The target of the annual plantation establishment programme has not been realised since the 1990s due to under-funding, loss of labour due to unplanned downsizing and natural attrition, and irregular surveys and inventory. Other factors that have negatively impacted on the planting programme include the long period of the harvesting moratorium exacerbated by the slow pace of reforms in the forestry sector. KFS is, however, now fully engaged in addressing this situation, particularly through the strengthened Forest Extension Service.
3. Bilateral and multilateral sources will remain the main vehicles in funding forestry programmes. Other opportunities do exist that should be explored and utilised, including the GEF, PCF⁵, DNS and PES scheme. The implementation of the REDD proposal (expected in the second commitment period of the Kyoto Protocol, until 2012) is expected to offer additional funding opportunities for developing countries ready to engage in programmes that can demonstrate reduced emissions from avoided deforestation. The challenge is the complex procedures and technicalities associated with these sources.
4. Revenue collection remains a major challenge to the sustainability of forestry operations. Key issues include poor enforcement of rules and regulation relating to forest management, including revenue collection. Some main underlying causes were identified as including

⁴ Kenya's Indigenous Forests- Status, Management and Conservation- IUCN/Peter Wass- 1995

⁵ Carbon Sequestration options under the Clean Development Mechanism to address land degradation- World Soil Resources Report #92- FAO Rome 2000

widespread corruption, inadequate capacity for apprehension and interdiction (KFS, police and judiciary) and inadequate policy and regulatory frameworks. Enhancing FLEG, improving partnerships with local communities (PFM) and improved capacity within KFS for forest management and FLEG (through training and increasing manpower) are some of the measures identified for implementation. In addition, there is need for regular assessment and review of royalties and other charges to ensure they reflect the market prices and that proper implementation of sales guidelines are being followed. This, plus the adoption of transparent public auctions and competitive timber sales, could help in this respect and improve revenue collection. There is also the need to encourage recognition of the range of values derived from goods and services provided by all types of forests and trees outside forests, as well as ways to reflect such values in the marketplace, consistent with relevant national legislation and policies. Adoption of a forest information system using IT will boost this sector.

5. Kenya can claim significant progress towards success in improved forest law enforcement and governance for the management of its forest resources, including plantation forestry and outgrower schemes. In particular, it has undertaken key institutional, legal and policy reforms to create an enabling environment for participatory forest management - a draft forest policy and a comprehensive Forest Act (2005) that are consistent with the principles for SFM. The challenge now is implementation.
6. This study identified the following as key findings, challenges and recommendations for the expansion of plantation forestry in Kenya:
 - **The ban on forest timber harvesting which has now been reviewed** was for a long time a major constraint to forest management and in particular, it affects the level of royalty collection, the quality of timber products (including exposing plantations to risk of fires and disease/insect infestation), insufficient or lack of raw materials supply, and increased cost of forest commodities. *This study recommends an urgent review of the status quo, to remove these constraints.*
 - Plantation forestry remains a major contributor to socio-economic and financial welfare at national and household level. *There is therefore a need to make it a priority in national strategies with focus on increasing outgrower/woodlot development.* Opportunity for expansion in private forestry activities include more attention to increasing production of wood and wood products in the private sector, including policy and regulatory incentives (security of land and resource tenure), technical capacity (through training), and fiscal/economic incentives (including tax breaks, concession loans, etc.), and enhanced extension services.
 - Among major challenges facing KFS is inadequate budgetary provisions, which inevitably translate to inadequate resources for plantation forestry activities, including enhancement of extension services to promote outgrower/other woodlots. For example, the current annual funding requirement for KFS stands at US\$ 94 million against an annual allocation of US\$ 38 million.
 - **Incentives to private forestry and outgrower schemes** remain inadequate. *There is thus the need for the Government to deliberately intervene to, in particular, remove barriers to investment in private forestry activities.* Measures in this respect could include the removal of market distortions (e.g. in the pricing of tree seedlings/timber products from public forests relative to those from private sources); and the development of more transparent and accountable systems of administration and regulation. These, coupled with active investment promotion, will encourage private investment in commercial forestry activities in the private sector and outgrowers.
 - Important forest land and resource tenure reforms have taken place in Kenya, *but there is need to ensure involvement of local communities in the development of guidelines for private forest management, to ensure that forests/trees on community/individual land are sustainably managed such that national/global benefits/interests are safeguarded without compromising the interests/benefits of the community/individual owner.*
 - **Revenue collection:** The study notes that the “stumpage fees on logging concessions” fail to capture the economic value of timber. This undervaluation of timber from public forests translates to a subsidy with two important consequences: low level of revenue collected and the distortion of the market *vis-à-vis* goods and services from the private sector. *These*

factors point to the need to put in place proper systems and procedures for setting prices of forest products so that they reflect the true market value

- **Wood supply and demand:** The total national deficit in wood supply was projected to rise to 997 000 m³ by 2005 and 6 841 000 m³ by 2020. The current (2010) total demand for sawn timber is estimated at 2.35 million m³ (at 32% recovery level) versus a supply of 1.8 million (with ban on) or 2.35 million if ban is lifted. This situation is, however, more complicated: there is the supply from private woodlots, and the demand does not take into account the possible re-opening of the many small sawmills that closed down because of lack of raw materials arising from the ban. The overall conclusion, however, is that of a deficit in wood production from state forests. Recent studies project the demand for fuelwood increasing from 20 million m³ in 1995 to 40 million m³ by 2020.
 - The **SMEs** continue to face serious problems of insufficient or lack of raw material supply since the government ban on logging in 1999. Because of this a large number of sawmills closed down. In addition, most of them have obsolete machinery and equipment.
7. In view of the above findings, the study recommends the following as ways forward for AFF actions:
- **Promote knowledge and common understanding on issues of plantation forest management:** Collaborate on studies, reviews and/or joint activities to advance knowledge, techniques and approaches on common issues such as trade and PFM, leading to the adoption of common policies, concepts and practices that allow for comparative assessments, synergy and sharing of experiences.
 - **Promote joint programming and collaboration on transboundary plantation forest issues:** cooperate and collaborate in the management of transboundary forest plantation operations such as research and control of plantation diseases, forest fires, cross border trade and other areas of common concern.
 - Ensure the report is shared by relevant Ministries and Organisations (e.g. Ministry of Forests and Wildlife, KEFRI, KFS, National Environment Management Authority, Ministry of Environment and Chairman of Parliamentary Committee on Lands, Environment and Water).
 - Hold a national Stakeholders workshop – KFS, KEFRI, Forestry Institutions, Private sector to provide an update on current status of forest plantations.
 - Develop practical incentives to boost Outgrower participation.
 - Encourage transparency in the sector and adopt technology in the timber value chain.

Appendix 1: MAIN REFERENCES QUOTED

- Beijer Institute, 1985. Kenya fuelwood project. Stockholm, Sweden.
- Evans, J., 1975. Two rotations of *Pinus patula* in the Usutu Forerst, Swaziland. Commonwealth Forestry Review. 54(1):69-81.
- KAFU, 2000. Marketing of non timber forest products in Kenya. Nairobi, Kenya.
- FAO, 2006. Forest Resources Assessment (FRA) Report. Rome.
- Keeves, A. 1966. Some evidence of loss of productivity with successive rotations of *Pinus radiata* in south east of S. Australia. Australian Forestry, 30: 51-63.
- Government of Kenya and the World Bank, 2006. The Strategic Environmental Assessment (SEA) of the Kenya Forest Act. Nairobi.
- Government of Kenya, 1994. Kenya Forestry Master Plan (KFMP). Ministry of Environment and Natural Resources, Nairobi.
- Government of Kenya, 2003. Economic Recovery Strategy for Wealth and Employment Creation 2003-2007 (ERS).
- Government of Kenya, 2004. Report of the Commission of Inquiry into the Illegal/Irregular Allocation of Public Land (Ndung'u Land Report). Government Printer, Nairobi.
- Government of Kenya, 2005. Forest Act 2005. Government Printer, Nairobi.
- Government of Kenya, 2005. Kenya Forest Service (KFS) - Strategic Plan for 2006/2011, KFS, Nairobi.
- Government of Kenya, 2005. The Forest Bill No. 19, 2005. Kenya Gazette Supplement No. 45. Government Printer, Nairobi.
- Government of Kenya, 2007. The National Land Policy of 2007. Ministry of Lands. Government Printer, Nairobi.
- Government of Kenya, 2007. Vision 2030. Government Printer, Nairobi.
- Government of Kenya, 2008. Kenya Forest Service Board Paper: Revision of royalties for financial year 2008/09. KFS, Nairobi.
- Government of Kenya, 2009. Kenya Forest Service (KFS) - A Two Year Business Plan 2010/11 – 2011/12. KFS, Nairobi.
- Government of Kenya, 2009. The National Climate Change Response Strategy. Report prepared by Camco Advisory Services (Kenya) Ltd. Nairobi.
- ITTO, 2009. Encouraging industrial forest plantations in the tropics: Report of a global study. ITTO Technical Series No. 33.
- Kagombe, J.K. and J. Gitonga, 2005. Plantation Establishment in Kenya - the Shamba System Case Study. Forest Department. Ministry of Environment and Natural Resources, Nairobi.
- Kagombe, J.K., J. Gitonga and M. Gachanja, 2005. Socio-economic Impacts and Implications of the ban on timber harvesting. KFWG Policy Brief no.1.
- Keeves, A., 1966. Some evidence of loss of productivity with successive rotations of *Pinus radiata* in the south-west of South Australia. Australian Forester, 30:51-63.
- KEFRI, 2004. Strategic Plan 2005-2010. Kenya Forestry Research Institute, Nairobi.

- KEFRI, 2008. Status of the tree seed industry in Kenya and role of Kenya Forestry Seed Centre - Internal report. Kenya Forestry Research Institute, Nairobi.
- Kenya Forest Service, 2007. Support to the forestry sector in Kenya. Analysis of policy, regulatory and fiscal frameworks for SMEs development in sawmilling. KFS/MMMB Study.
- Kenya Forest Service, 2010. General Order No. 260; a KFS publication available on the KFS website.
- Kenya Forest Service, 2010. REED: Readiness Preparation Proposal, submitted to the Forest Carbon Partnership Facility in October 2010. Available on the KFS website.
- Kenya Forest Service, 2011. Forest Inventory working reports from the Plantation and Enterprise Unit. Draft documents made available to the Study Team.
- Kenya Forest Working Group, 2006. Analysis of Implementation of the Forest Act 2005. KFWG Policy Brief No.4.
- KIFCON, 1999. Kenya Indigenous Forest Conservation Programme Report. Forest Department, Nairobi.
- Maina, A., 2008. Industrial Forest Status in Kenya - a presentation to the 3rd SPGS Commercial Forestry Seminar, 24/9/2008.
- Mathu, W., 2007. Forest Law Enforcement and Governance Report- Kenya.
- Mbugua, D.K., 2002. Forest Outlook Studies in Africa – Kenya Case Study. FAO and the Kenya Forest Department. Available on the FAO website.
- Mbugua, D.K., 2003. The forest revenue system and government expenditure on forestry in Kenya. FAO working paper on financing sustainable forest management (FSFM/WP/11).
- MENR, 2006. Status of the forestry sector and vision for 2020. Nairobi, Kenya.
- Mugo, F., 1999. Charcoal Trade in Kenya. RELMA Working Paper No. 5. ICRAF, Nairobi.
- Mwanila, F., G. Muluvi, C. Gichoki, V.O. Oeba and B. Kanyi, 2009. Development of non-mist vegetative propagation for Eucalypts. *Journal of East African Natural Resources Management*, 3: 283-305.
- Obunga, R. 1998. Wood carving in Kenya. Nairobi, Kenya.
- Odera E.C., J.K. Eganji, J.K. Kagombe, G. Mbita and B. Wandago, 2002. Report on Professional Response to the Ban on Timber Harvesting: Management, socio-economic impacts and implications. Internal Report by KEFRI and Forest Department. Nairobi.
- RELMA, 2003. Draft woodfuel policy for Kenya. Ministry of Energy. Nairobi, Kenya.
- UNEP and Kenya Wildlife Service, 2003. Aerial Survey Report 2002/3. Nairobi.
- Wass, P. (Ed.), 1995. Kenya's Indigenous Forests: Status, Management and Conservation. IUCN and ODA, Gland, Switzerland and Cambridge, U.K.

Appendix 2. Key KFS Persons met

Name of person	Designation	Contact
David Mbugua	Director of Forests, KFS	0722680223
Simiyu Wasike	Deputy Director, Plantation and Enterprise	0721906121
Samuel Muriithi	Economics and Enterprise	0722752175
Nduati	Reforestation	0724713085
John Kihara	Sawmills	
Luke Njuguna	Head Royalties	
Karega	Inventory	0733562974
Ezekiel Korir	Head Infrastructure	0721950092
Mercelyn Kalumba	Head Concessions	

African Forest Forum



Contact us at:

African Forest Forum

P.O. Box 30677-00100 Nairobi GPO KENYA

Tel: +254 20 722 4203 Fax: +254 20 722 4001

www.afforum.org

