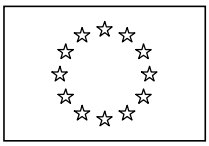

EUROPEAN COMMISSION
DIRECTORATE-GENERAL VIII
DEVELOPMENT

Data Collection and Analysis for Sustainable Forest Management in ACP Countries - Linking National and International Efforts

EC-FAO PARTNERSHIP PROGRAMME (1998-2002)

Tropical forestry Budget line B7-6201/97-15/VIII/FOR
PROJECT GCP/INT/679/EC

KENYA'S FOREST RESOURCE ASSESSMENT

by Peter Wass

July, 2000
Addis Ababa

This report has been produced as an out put of the EC-FAO Partnership Programme (1998-2002) - Project GCP/INT/679/EC Data Collection and Analysis for Sustainable Forest Management in ACP Countries - Linking National and International Efforts. The views expressed are those of the authors and should not be attributed to the EC or the FAO.

This paper has been minimally edited for clarity and style

TABLE OF CONTENTS:

1. EXECUTIVE SUMMARY:

The publication provides a summary of existing information about Kenya's indigenous forests based on work carried out by Forest department of the Government of Kenya and the KIFCON programme (Kenya Indigenous Forest Conservation Programme). It is a result of several surveys done during the programme period (1992-1994) inside indigenous forests and adjacent forest dwelling communities.

The data provided in the text is one of the most accurate information available for Indigenous forests in Kenya and very useful for FRA2000

Note:
There are other several Publications quoted throughout this report and are all summarised at the end of this report. The Publications give the best overall assessment of forest resource in Kenya though they are not the most accurate. A complete inventory of forest Cover in Kenya has not been undertaken in the recent past but efforts have been made to carry out piece meal assessments to particular areas/regions depending on the needs and goals.

Information content (check one or more topics as appropriate)

Natural Forest	Yes	Protected areas	Yes
Plantations	Yes	Biodiversity	No
Other wooded land	Yes	Forest ownership	Yes
Forest area change	Yes	Wood supply potential	No
Total volume	Yes	Non-wood goods and services	No
Total biomass	Yes	Trees outside forest	Yes
Commercial volume	yes	Forest fires	Yes

Names of reviewers: **NDAMBIRI J K & KAHUKI C D**

2. DESCRIPTION OF FOREST INVENTORIES/SURVEYS

Country	KENYA	Reference year	2000
Title of inventory	FOREST RESOURCE ASSESSMENT		
Type of inventory	FIELD/AERIAL Field / aerial photos / satellite images /...		
Reporting level	National and sub-national		

Brief summary of methodologies used

Inventory concentrated on potentially productive forest areas identified through aerial photography interpretation of 1:25,000 panchromatic photography Plots were located by Simple Random Sampling method without replacement the appropriate number of plot locations being determined by generation of random UTM co-ordinates using computer programmes developed by

different projects from where information was retrieved. Actual identification of plots on the ground was done using a combination of traditional surveying methods and satellite navigation systems either by GPS or any other navigation equipment.

2.1. Vegetation types included

	yes/no	Additional information included	yes/no
Natural forests	Yes	Area by forest formation	No
Plantations	Yes	Volume	No
All forests	Yes	Biomass	No
Other wooded land		Forest naturalness	No
		Forest biodiversity	No
		Forest ownership	No
		Wood supply potential	No

Remarks

Some of the above information was collected during the inventory but only for selected forests but was not projected for the whole country but to only those pockets of forests with high biodiversity value and faced threats from other land use activities.

Reliability class 2 1=high 2=medium 3=low

2.2. Area of woody vegetation according to national classification

Forest and other woody vegetation types (country classification)	Area (000 ha)
1 Indigenous Forests	**1,295**
2 Woodlands/bushlands	**3,7425**
3 Farmlands/settlements	**9,720**
4 Forest Plantations	**148**
Subtotal of country classes corresponding with FRA 2000 forest and other wooded land	**48,588**
Subtotal other land	**-**
Total land area	**48,588**

Comments:
Trees under plantations and other trees found on farmlands and settlements are not considered in the FRA2000 classification.
The area under woodlands and bushlands can further be split into wooded land, wooded grassland bushlands and grassland land comprising of 3.7 % woodland, 18.5% wooded grassland, 42.1 % bushlands and 2.1 % grassland. (KIFCON 1995)

2.3. Comparability between country classification and FRA 2000 classification

Forest and other woody vegetation types (country classification)	Corresponding FAR 2000 classes
Indigenous Forests including Mangroves	Closed Forest
Woodlands/bushlands/Wooded grasslands.	Open Forest
Forest Plantations	-
Farmlands/settlements	Forest fallow

Reference year: 1995
Note: Open and closed forests make up "natural forest" shrub and forest fallow makes up "other wooded land"

Comments:
The FAR 2000 classification does not recognise tree growing on farmlands and hence classifying trees on farmlands as forest fallow. These are small pockets of woodlots planted either sequentially or randomly for purposes of either domestic consumption or self-income for the farmer. (KFMP Pg 25)

2.5. Area of natural forests and other wooded land according to FAR 2000 classification

Name of Geographic Unit	Natural forests			Other wooded land (OWL)		
	Closed forests	Open forests	Total Natural Forests	Plantations (shrub)	Forest fallow	Total OWL
1. NATIONAL	1,295	37,425	38,720	148	9,720	9,868
Total Country	-	-	-	-	-	48,588

Reference year: 1995-Area in 000ha

3. VOLUME DATA (OF NATURAL FORESTS)

3.1. Forest Inventory Description

Name of the Inventory:	Kenya Indigenous Forest Conservation (CHIFI Inventory
National Forest Inventory	(Yes)
Geographic location:	Selected Natural forests in each of the agro-climatic zone.
Total inventoried area (000 ha):	1900
Sketch map attached (Yes or No):	No

Reference year: 1995

3.2. Inventory methodology

Stratification criteria:	Area stratified using Aerial photo interpretation tak 1:25,000 panchromatic.
Sampling design:	Simple Random Design
Sampling intensity (%):	.02
Species coverage:	50%
Minimum diameter:	20cm
Type of volume measured:	Trunk and branchwood over bark. (Including or excluding branches, underbark or overbark, etc.)

3.3. Inventory Results

Reporting Unit:	National
Average volume per hectare (m3/ha**):**	**176**
Sampling error for average volume per hectare:	95% probability (%)
Stand and stock tables attached :	Yes

Comments: The above inventory is the only comprehensive one carried out between 1990-2000 in the natural forests. Previous inventories by FAO/UNDP on Forest Plantations was not completed and covered only 40,000 hectares of industrial plantations

4. TOTAL REPORTED AREA, ALL FOREST PLANTATIONS

Reference year: 1995

Type 1	Ownership 2	Reported Area (000 ha) 3
Industrial roundwood production	Private sector, large scale	-
	Private sector, small scale	-
	Community	-
	Public sector, large scale	113.9
	Public sector, small scale	-
Total industrial roundwood		
Rubber	Private sector, large scale	-
	Private sector, small scale	-
N/A	Community	-
	Public sector, large scale	-
	Public sector, small scale	-
Total "non-forest" species		
Fuelwood and poles	Private sector, large scale	-
	Private sector, small scale	-
	Community	-
	Public sector, large scale	14.8
	Public sector, small scale	-
Total fuelwood and poles		
Other purposes	Private sector, large scale	-
	Private sector, small scale	-
	Community	-
	Public sector, large scale	19.2
	Public sector, small scale	-
Total Other purposes	-	-
Grand total, all forest plantations	-	148.0

Source document: Kenya Forestry Master Plan development programmes 1994 and Stock assessment report 1999. The figures are estimates based on preliminary survey work carried out in selected regions in both cases of the official documents quoted.

There has been a backlog in planting programmes and excisions (official change of forest landuse of about 42,000 ha) in the last three years hence there is need to apply a reduction factor for the total area under plantations. Currently, it is estimated that only 78,000 ha of the 148,000 hectares are actually stocked under forest.
There is no available data on small-scale industrial forest plantations except for some few companies who have woodlots for use in their industrial processes to supply fuelwood.
In addition, there are over 9.7 Million hectares of land outside official public land with trees mainly owned by small-scale farmers. These trees have not been quantified for farmers do not plant them for commercial purpose but to supply local domestic consumption and other local needs. They also act as soil stabilisers on farmer's land as well as fodder for livestock.

4.1. Forest plantations for industrial roundwood production

Country: KENYA Reference year: 1999

Species	**Area**	Purpose											
		Saw/veneer logs						Pulpwood					
1	**2**	Rotation 3	6-10 4	11-20 5	21-40 6	>40 7	Total 8	Rotation 9	1-5 10	6-10 11	11-20 12	>20 13	Total 14
Cyprus	**39,600**	30	2350	17,350	12,900		-	15-20	810	960	4510	-	-
Pines	**28,900**	30	1000.1	5,500	18,800	1895	-	18	280	390	2950	-	-
Eucalyptus	**6,800**	20-30	750	2950	3450	-	-	8	80	160	1115	-	-
others	**6,800**	-	850	1,400	5,150	-	-	-	-	-	-	-	-
Total	**82,000**	-	-	-	-	-	-	-	-	-	-	-	-

Assumptions:

(a) It is assumed that plantations up to 20 years in the pulpwood districts of Keiyo, Uasin Gishu Lugari and Trans-Nzoia are all for pulpwood while those older are for saw wood.

(b) Plantations between ages 0-5 years are included in the total area of plantations though are not included in the rotation age classes.

The total area supposed to be under industrial round wood by December 1999 was 120,000 ha from the original 148,000 reported for 1995. This area has reduced drastically due to increasing pressure for farming land and excisions for public amenities like schools, hospitals etc.

Out of the 120,000 hectares supposed to be under forests only 78,000 is actually forested. The remaining area has not been planted due to increasing lack of personnel and resources and has been lagging behind since 1992.

Source: Plantations Stock taking Resource Assessment Report (Dec.1999) and KFDP programme end Report 1999.

4.2. Proposed future industrial roundwood plantation programmes

Country: KENYA Reference year 1999

Ownership	2001-05		2006-10		2011-2015		2016-2020	
	Saw/veneer	Pulp	Saw/veneer	Pulp	Saw/veneer	Pulp	Saw/veneer	Pulp
Private sector, scale	-	-	-	-	-	-	-	-
Private sector, scale	-	-	-	-	-	-	-	-
Community	-	-	-	-	-	-	-	-
Public sector, scale	8	17	8	17	8	17	8	17
Public sector, scale	-	-	-	-	-	-	-	-
Total	-	-	-	-	-	-	-	-

Area in 000 ha

These are the planned planting over the time period stipulated. However, due to failure to accomplish planting targets there are in addition another 40,000 hectares of backlog, which will be spread over the same period for planting in addition to targeted planting programmes.
The country's planned plantation programme is in the ratio of 60% sawn wood and 40% pulpwood. Due to previous lack of annual workplans, there is a current target of 4000 ha for both pulpwood and sawn wood. Eucalyptus species are planted for either poles, pulpwood or fuelwood. There are no indicative figures for areas planted for the above products and are lying either on private sector large scale or private sector small-scale areas.

Source: KFDP Implementation completion report 1999

4.3. Standing volume of industrial roundwood, derived from inventory

The country has no current Inventory thus refer to the ***Table*** below.

4.4. Estimated mean annual increment (MAI), m^3/ha/yr., by main industrial plantation species

Country: KENYA Reference year: 1999

Species	Object	MAI (Cubic Metres)
Cupressus Lusitanica	Sawlog/veneer	20
	Pulp	
Pinus Patula	-	20
Pinus radiata	-	20
Eucalyptus Spp	-	25

Source: World Bank Implementation Completion Report on Kenya Forestry Development Project 1999

4.5. Areas of fuelwood and pole plantations

Reference year 2000

	Purpose		
Species	Industrial	Rural/domestic	Total
Eucalyptus	6.6	-	6.6

Area in 000 ha

4.6. Areas of plantations established for environmental and other purposes

There are no specific areas under plantations for environment and other purposes but farmers, individuals and private organisations plant ornamental trees on their compunds/farms for recreation and other environmental benefits but the areas cannot be quantified.

Plantations established for environmental and other purposes broadly include plantations established primarily for environmental, recreational, or other non-productive purposes.

5. FOREST AREA BY NATURALNESS

Reference year**: 1999**

Forest type (local classification)	Undisturbed (000 ha)	Semi-natural (000 ha)
1.Indigneous Forests	900,	270
2. Plantation Forests	13.4	13.4
3. Woodlands/bushlands	3,715	3,715
4.Farmlands /settlements	1,002	1,002

Source: Kenya Forestry Master Plan Document (KFMP 1994)

The figures referred above are estimates from actual areas under each category of local forest classification. It was assumed that only 10 % of the total area under each classification are either undisturbed or semi-natural. The 10 % estimate was based on authors prior informed knowledge and many years of observance on the disturbance status in each of the forest types.

The areas referred to are derived from data in the Kenya Forestry Master plan development programme and are projected figures from trends observed in area change over the period 1992-1994 and projected over a 20-year period.

Some of the factors used for forecasting have changed e.g. there is already a new change of management which has reduced drastically the rate of conversion of natural forests from the original anticipated figure of 5000 ha per year to only re-planting clear-felled plantations.
The latest area under plantation forests from year 2000 indicates a total area of 120,000 ha on industrial plantations of which about 40,000 ha is not replanted, and therefore disturbed.

5.1. Forest area by wood supply potential

Country: KENYA Reference year: 2000

Natural forest type (country classification)	Forests available for wood supply (000 ha)	Forests not available for wood supply (000 ha)
1 .Indigenous Forests	NIL	1200
2 Plantations.	160	NIL
3.Woodlands/bushlands	NIL	NIL
4. Farmlands/Settlements	1	NIL
All forest types	161.0	1200

References: KFMP 1994

Comments:
The areas are based on the assumption that all indigenous forests in Kenya are for conservation purposes for water shed and recreation and biodiversity conservation. They are currently not in any management plans for round wood utilisation. The industrial plantations offer the scope for round

wood production but currently are not fully being utilised for this purpose for it is only about 78,000 ha which are currently stocked. Farmlands and settlements are assumed to have a high potential of round wood supply but again only 10 % of the total area is available. The remaining area is either under boundary planting ornamental, natural regeneration or fodder/Agroforestry practices.

5.2. Forestland ownership

Country: KENYA Reference year: 1999

Forest land in public ownershi (000 ha)	Forest land owned by indigenous peoples (000 ha)/Private	Forest land in private ownersh (000 ha)
1640	180	-

***Source:* Kenya's Indigenous Forests, Status, Management and Conservation (1995)**

The total forest land area outside gazetted forests is either owned by county councils who manage them in trust from the local communities who are the beneficiaries and the privately owned forests owned by private companies like tea factories, tannin extracting companies. The total area under this private ownership is estimated to be about 70,000 ha.

5.3. Area of forest under management

Country: KENYA Reference year: 2000

Forest type (using co classification)	Total area	Area under management[1]
1.Indigenous Forests	1.2 Million ha	NIL
2.Plantations	120,000	120,000
3.Woodlands/bushlands	37,150	Nil
4.Farmlands /settlements	10,020	Nil

Area under management is defined here as the forest that is managed in accordance with a formal, nationally approved, management plan over a sufficiently long period (five years or more)

Source: Kenya Forestry Master Plan (Development Programmes) (1994)

6. FOREST FIRE SITUATION IN KENYA

6.1. Fire Environment and Fire Regimes in Kenya

Kenya has a total area of 582,646 sq. km. Highlands forming most of the southwest and central parts as well watered and fertile. More than 70% of Kenya is classified as both arid and semi-arid (ASALS) characterised by low biological activity.

The country's forests are concentrated in the moist central highlands where the human population and agricultural production are also concentrated. In the extensive semi-arid region, forests are mainly found on isolated hills and in discontinuous narrow bands along riverbeds.

Kenya gazetted forests comprise some 1.64 million hectares of land (about 3% of the land area). Outside the gazetted forests, there are other large tracks of forests in trustlands i.e. national parks, National reserves and private owned land covering about 0.5 million hectares.

This includes: -

1. Coastal forest region
2. Dry zone forest region
3. Mountain forest region
4. Western Mau forest region

Because of intensive degradation of the closed forest, serious plantation establishment was started in 1946.

Cutting of the valuable natural hardwood has been banned due to its unsustainability. The wood industry relies on softwoods from government forests.

6.2. Forest Fires Management

Most of the forests, especially the high productive on including both indigenous and plantations are located in the relatively high fire prone areas. These fires continue to be one of the biggest forest health hazards. Within the Forest Department, there exists a forest fire protection unit. A conservator of forests is appointed at the Headquarters who:

(a) Plans, organises, equips, trains and provides a follow up supervision of a cost effective fire pre-suppression and suppression organisation at all levels with the Forest Department.

(b) Develops a comprehensive nation-wide program designed to create awareness of the need for the fire protection and control.

(c) Plans the implementation of risk and hazard reduction.

In the field, our District and Station Forest Officers organise and supervise the activities of prevention and suppression of forest fires within their areas.

Equipment available includes, vehicles, tractors, water bowsers, pump units with hoses, knapsack sprayers and handtools.

Firebreaks and forest boundaries are established and maintained on regular basis to keep fires from spreading in between plantations and from neighbouring settled reserves.

Fire detention is carried out through ground patrols and fixed stations (fire towers). A few of them have radio system, vehicle, motorcycle and bicycles. When a fire occurs a comprehensive fire report is compiled detailing the location, area burnt suppression cost and the actual damage to the forest.

6.3. Forest Fires Statistical Data

Number of fires and area burned: Kenya 1980 - 1999

	AREA BURNT			
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 annual number of fires: -=78 Fires annually.

All fires in Kenya are started by people. Of these fires, 40% are classified as arson, 20% are caused by negligence and carelessness, and 40% are due to unknown causes.

6.4. Community Involvement in Fire Management Activities

Campaigns through public meetings are organised before the declaration of the fire danger season to create awareness in the need to prevent any forest fires and action to be taken in case a fire is detected.

BIBLIOGRAPHY:

Implementation and completion Report *(Kenya Forestry Development Project)* **Credit 2198-KE January 1999**

Report Number: 18805
Author The World Bank /Government of Kenya.
Where to be found: **World Bank Offices and Forest Department Kenya**

The status of plantation grown timber and its implications on sustainable management and rational utilisation of the resource

Nature of Report*: A Resource Stock taking Report*.

Author: *Ministry of Environment and Natural Resources (Forest Department) December 1999*

Where to be Found: Forest Department HQ's Nairobi.

Kenya Forestry Master Plan (KFMP) Development programmes

Nature of Report: ***A 25-year Master Plan for forestry Sector Development in Kenya***

Author: *Ministry of Environment and Natural Resources Kenya Nairobi*
Year: 1994
Where to be Found: *Forest Department Headquarters, Nairobi.*

Forest cover and Forest Reserves in Kenya: Policy and Practice

Nature of Report: ***Presents and analysis of the current trends in excision and addition of forest reserves to ascertain whether present practices are consistent with the overall goals and policies***.

Author: *IUCN: The World Conservation Union, Eastern Africa Regional Office, Nairobi, Kenya*
Year: 1996.
Where to be Found: *IUCN Regional Office, Kenya*.

Kenya's Indigenous Forests
Status, Management and Conservation

Nature of Report: ***Provides a summary of existing information about Kenya's Indigenous Forests from extensive work carried out by Forest Department of the Government of Kenya under the KIFCON programme (Kenya Indigenous Forest Conservation Project) of British Government.***

Author: *Peter Wass*
Year: *1995*
Where found:*IUCN Publication services unit (219c Cambridge CB3 oDL, UK)*