



Forestry Department

Food and Agriculture Organization of the United Nations

**GLOBAL FOREST RESOURCES
ASSESSMENT**

COUNTRY REPORTS

MOZAMBIQUE

FRA2005/191

Rome, 2005



The Forest Resources Assessment Programme

Sustainably managed forests have multiple environmental and socio-economic functions important at the global, national and local scales, and play a vital part in sustainable development. Reliable and up-to-date information on the state of forest resources - not only on area and area change, but also on such variables as growing stock, wood and non-wood products, carbon, protected areas, use of forests for recreation and other services, biological diversity and forests' contribution to national economies - is crucial to support decision-making for policies and programmes in forestry and sustainable development at all levels.

FAO, at the request of its member countries, regularly monitors the world's forests and their management and uses through the Forest Resources Assessment Programme. This country report forms part of the Global Forest Resources Assessment 2005 (FRA 2005), which is the most comprehensive assessment to date. More than 800 people have been involved, including 172 national correspondents and their colleagues, an Advisory Group, international experts, FAO staff, consultants and volunteers. Information has been collated from 229 countries and territories for three points in time: 1990, 2000 and 2005.

The reporting framework for FRA 2005 is based on the thematic elements of sustainable forest management acknowledged in intergovernmental forest-related fora and includes more than 40 variables related to the extent, condition, uses and values of forest resources. More information on the FRA 2005 process and the results - including all the country reports - is available on the FRA 2005 Web site (www.fao.org/forestry/fra2005).

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The Global Forest Resources Assessment 2005 Country Report Series is designed to document and make available the information forming the basis for the FRA 2005 reports. The Country Reports have been compiled by officially nominated country correspondents in collaboration with FAO staff. Prior to finalisation, these reports were subject to validation by forestry authorities in the respective countries.

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1 Table T1 – Extent of Forest and Other wooded land

1.1 FRA 2005 Categories and definitions

Category	Definition
Forest	Land spanning more than 0.5 hectares with trees higher than 5 meters and a canopy cover of more than 10 percent, or trees able to reach these thresholds <i>in situ</i> . It does not include land that is predominantly under agricultural or urban land use.
Other wooded land	Land not classified as “Forest”, spanning more than 0.5 hectares; with trees higher than 5 meters and a canopy cover of 5-10 percent, or trees able to reach these thresholds <i>in situ</i> ; or with a combined cover of shrubs, bushes and trees above 10 percent. It does not include land that is predominantly under agricultural or urban land use.
Other land	All land that is not classified as “Forest” or “Other wooded land”.
Other land with tree cover (Subordinated to “Other land”)	Land classified as “Other land”, spanning more than 0.5 hectares with a canopy cover of more than 10 percent of trees able to reach a height of 5 meters at maturity.
Inland water bodies	Inland water bodies generally include major rivers, lakes and water reservoirs.

1.2 National data

1.2.1 Data sources

References to sources of information	Quality (H/M/L)	Variable(s)	Year(s)	Additional comments
Malleux, J. 1980. <i>Avaliação dos Recursos florestais da Republica Popular de Moçambique</i> . FAO FO: MOZ/76/007	M	Land use, forest cover, total and commercial growing stock	1972	Visual interpretation of Landsat MSS with support of aerial photographs with field inventory. Scale 1:1 000 000. Date of satellite imagery 1972
Saket, M., 1994. Report on the updating of the exploratory national forest inventory. FAO/UNDP MOZ/92/013	M	Land use, forest cover, total and commercial growing stock	1990	Updates the information from 1980. Visual interpretation of Landsat TM, with support from aerial images and minor fieldwork. Scale 1:1 000 000. Date of satellite imagery 1990
Saket M., Taquidir M., Banze C., 1995. Methodology and results of the forestry vegetation mapping at 1:250,000. FAO/UNDP MOZ/92/013	M	Forestry vegetation mapping, indications of forest change assessment	1995	Visual interpretation of Landsat TM scale 1: 250 000. Air control of interpretation results. No field inventory. Date of satellite imagery 1990.

Comments: There actually three national forest inventories or vegetation maps for Mozambique. The first national forest inventory was carried out in 1980, using interpretation of Landsat MSS taken in 1972. For this reason the area calculations (map at 1:1,000,000 scale) reflect the situation of the vegetation in 1972 and this reference year will be used in the present report. In 1980 also field work was carried out and total and commercial volume for the entire country were calculated.

The second national forest inventory was carried out in 1994 and it was intended to update the figures of the 1980 study regarding vegetation areas. A new map was produced (at 1:1,000,000 scale) and a partial survey for volume. This inventory used Landsat TM imageries taken in 1990 and this will be the reference year for this study. The 1994 study used the same classification system as the 1980 study.

Finally, another vegetation map was produced in 1995. This map used the same imageries used in the 1994 inventory, but the interpretation was more detailed, resulting in a vegetation map at 1:250,000 scale. In this case the classification of the vegetation was different from the previous two inventories. The 1995 study did not include field work and no volume measurements were taken.

All these three studies will be used for the present report and will be referred to hereafter as Reference #1¹, Reference # 2², and Reference # 3³.

It is reminded here that a new national forest inventory is currently under preparation and its results are expected to be ready in 2007.

¹ Reference # 1: Malleux, J., 1980 “Avaliação dos recursos florestais da República Popular de Moçambique”, FAO MOZ/76/007.

² Reference # 2: Saket, M., 1994. Report on the updating of the exploratory national forest inventory. FAO/UNDP MOZ/92/013.

³Reference # 3: Saket M., Taquidir M., Banze C., 1995. Methodology and results of the forestry vegetation mapping at 1:250,000. FAO/UNDP MOZ/92/013.

1.2.2 Classification and definitions

Classification and definition for Reference # 1 and Reference # 2. Reference year are 1972 and 1990, respectively.

National class	Definition
High forest with high density	High forest: There are three woody strata and no herbaceous stratum. The upper layer crown cover is greater than 75% of the total area
High forest with medium density	There are two or three woody strata which are not clearly distinguishable as in the previous category. Crown cover of the upper stratum is 50 to 75%
High forest with low density	The crown cover of the upper storey is 25 to 50%
Low forest with high density	Crown cover of the upper stratum is greater than 75%. The herbaceous layer is poorly developed.
Low forest with medium density	The crown cover is 50 to 75%. The herbaceous layer is better established than in the denser categories
Low forest with low density	The over-storey has a crown cover of 25 to 50%. The understorey is 5 to 7 meters high and there is a relatively high and well established herbaceous stratum
High thicket	The tree stratum, with a height of 8 to 12 m has a crown cover of 20 to 40%. Often a stratum composed of brush or dense natural regeneration with a total height of 5 to 7 m is present. There is usually a dense herbaceous stratum
Medium thicket	The dominant stratum is a shrubby layer of 3-5 m high with emergent trees up to 10 m tall, with a crown cover from 10 to 15%. The density of the shrubby layer can range from dense to very dense
Low thicket	This is characterized by a low (2-4 m) shrubby, often spiny stratum with occasional emergent trees up to 7-8 meters. The herbaceous layer is well established and present.
Wooded grassland	The dominant component is the grassy herbaceous stratum. Scattered trees up to 10 m high may have a crown cover as high as 20% in this type. Included are some cultivated areas in which scattered anacardium and mangifera trees are found
Grassland	Shrubs less than 5 m high can be found widely scattered throughout this vegetation type
Mangrove communities	All mangrove communities are grouped under this unit
Vegetation on dunes	All litoral dune formations are grouped under this unit
Agriculture	Land areas where agriculture are being carried out. It includes also grass covered land, used previously for agriculture and left as fallow.

Classification and definition Reference # 3, reference year 1990

National class	Definition
Closed montane forests	This type of forests is closed with crown and is usually undisturbed due to the inaccessibility for physical reasons, crown cover is of 70% or more,
Medium closed montane forests	The stands of the montane forests which have a crown coverage of 40

National class	Definition
	to less than 70% are included in this class.
Open montane forests	The open montane forests are composed of open stands of 10 to less than 40% crown cover.
Closed lowland forests	This class includes the forest types located on the lowlands or plateaux with crown cover of the tree layer of 70% or more
Medium closed lowland forests	Crown cover 40 to 70%
Open lowland forests	Crown cover 10 to 40%
Thicket	In this type of vegetation are grouped all the formations which have identical physiognomic criteria regardless their origin (edaphic, climatic, altitudinal or man-made). The main component of this vegetation has total height of 3 to less than 7 meters but may have scattered emergent trees whose crown cover is less than 10%.
Shrub	This type is distinctive by the height of its main woody component which is less than 3 m and above 50 cm, although emergent trees of more than 7 m occasionally occur. It occurs on poor and shallow soils and low rainfall., it is also frequent as regrowth on areas of shifting cultivation or following fierce bush fires
Wooded grassland	This unit is characterized by a dominant grass layer and a woody component which covers less than 10% of the area. The woody component could be of any height (trees, thicket or shrub)
Grassland	Are included in this class all fields of grassy vegetation cover
Mangroves	This class includes the mangrove community which grows along the shore, at the mouth of the rivers and deltas but also in some bays. Two units are distinguished, namely closed mangroves with crown cover of more than 40% and open mangroves with crown cover 10-40%
Man made forests	This class includes all forests established artificially by afforestation. This plantations are composed of coniferous species or eucalyptus sp.
Permanent cropping	This unit includes the land cultivated with crops that occupy the land for long period and need not be replanted after each harvest. It includes, for example, areas with coconut plantations, Anacardium occidentale, citrus, etc.
Fallow	Fallow refers to land, after being used for some years for cropping, is left unused for a certain period of time to restore the soil structure. Two types of fallow are distinguished
Short fallow	In this case, land is left unused for a short time and the area of short fallow is intensively used for cropping (more than 33% are under crop every year)
Long fallow	This refers to areas in which less than 33% of the land are used for cropping and the remaining is often abandoned as fallow for many years
Dunes	This class includes all the sand dunes along the coast
Barren land	This unit includes all sort of bare soil
Urban and other	Urban and other area
Rivers	Rivers
Water	Inland water

1.2.3 Original data

Original data for reference # 1, reference year: 1972

National class number	National class	Area in 1000 hectares Reference # 1, Reference year 1972
1.1	High forest with high density	93
1.2	High forest with medium density	257
1.3	High forest with low density	248
2.1	Low forest with high density	918
2.2	Low forest with medium density	3108
2.3	Low forest with low density	6743
3.1	High Thicket	7765
3.2	Medium thicket	8551
3.3	Low thicket	11290
4.1	Wooded grassland	17202
4.2	Grassland	14751
5	Mangrove	456
6	Vegetation on dunes	98
7	Agriculture	5496
	Total	76973

Original data for reference # 2, reference year :1990

National class number	National class	Area in 1000 hectares Reference # 2, Reference year 1990
1.1	High forest with high density	172
1.2	High forest with medium density	231
1.3	High forest with low density	254
2.1	Low forest with high density	1006
2.2	Low forest with medium density	3007
2.3	Low forest with low density	6893
3.1	High Thicket	8173
3.2	Medium thicket	10738
3.3	Low thicket	15541
4.1	Wooded grassland	15417
4.2	Grassland	4697
5	Mangrove	396
6	Vegetation on dunes	79
7	Agriculture	11844
	Total	78447

Original data for reference # 3, reference year :1990

National class	Areas in 1000 hectares, Reference # 3, Reference year 1990

Closed montane forests	57
Medium closed montane forests	52
Open montane forests	79
Closed lowland forests	1853
Medium closed lowland forests	4913
Open lowland forests	12393
Thicket	14909
Shrub	7954
Wooded grassland	10014
Grassland	3556
Mangroves	399
Man made forests	38
Permanent cropping	1014
Short fallow	10062
Long fallow	9060
Dunes	86
Barren land	470
Rivers	465
Urban and other	145
Total	77519

1.3 Analysis and processing of national data

1.3.1 Calibration

	Reference #1, 1972	Reference #2, 1990	Reference #3, 1990
Land Area in 1000 ha	76 973	78 447	77 519
FAO Stats	78 409	78 409	78 409
Calibrating factor	1.018657	0.999515	1.011486

Calibrating data for reference # 1, reference year 1972, reference # 2, reference year 1990

National class	Calibrated area in 1000 hectares Reference # 1, Reference year 1972	Calibrated area in 1000 hectares Reference # 2, Reference year 1990
High forest with high density	94	172
High forest with medium density	262	231
High forest with low density	252	254
Low forest with high density	935	1005
Low forest with medium density	3165	3006
Low forest with low density	6868	6889
High Thicket	7910	8169
Medium thicket	8710	10733
Low thicket	11501	15533
Wooded grassland	17522	15410
Grassland	15027	4695

Mangrove	464	396
Vegetation on dunes	100	79
Agriculture	5599	11838
Total	78409	78409

Calibrating data for reference # 3, reference year 1990

National class	Calibrated areas in 1000 hectares, Reference # 3, Reference year 1990
Closed montane forests	58
Medium closed montane forests	52
Open montane forests	80
Closed lowland forests	1874
Medium closed lowland forests	4969
Open lowland forests	12535
Thicket	15080
Shrub	8045
Wooded grassland	10129
Grassland	3596
Mangroves	404
Man made forests	38
Permanent cropping	1026
Short fallow	10177
Long fallow	9164
Dunes	87
Barren land	475
Rivers	471
Urban and other	146
Total	78409

1.4 Reclassification into FRA 2005 classes

Reclassifying data for reference # 1 and reference # 2 *

National class	Forest	OWL	OL
High forest with high density	100%		
High forest with medium density	100%		
High forest with low density	100%		
Low forest with high density	100%		
Low forest with medium density	100%		
Low forest with low density	100%		
High Thicket	100%		
Medium thicket		100%	
Low thicket		100%	
Wooded grassland		100%	

Grassland			100%
Mangrove	100%		
Vegetation on dunes			100%
Agriculture			100%

* Since the two inventories used the same classification, only one reclassification scheme was prepared.

Comments to the reclassification: The reclassification for the forest classes poses no problem since they all belong to the FRA 2005 class of forests. The interpretation of the thickets poses more problems since this class is intermediate between forest and other wooded land. However, both references made a differentiation between High, Medium and Low thickets, which was quite helpful for reclassification. According to the definitions given for height and crown cover it appears that High Thickets should be classified as forests, while Low and Medium Thickets have a dominance of shrubby vegetation and thus should be classified as Other Wooded Land. This approach is supported by the judgment of the expert that carried out the inventory, who was certainly the best person to know in detail the vegetation types mapped and surveyed. In reference document # 1, page 96, a reclassification of the inventory results into standard FAO FRA classes is presented, and the same logic is applied, making a difference between the reclassification of high and medium/low thickets. Even though at that time the reference was made to FRA 1980, the same concepts apply, since the classification of forest and other wooded land of FRA 1980 was substantially identical to FRA 2005 for tropical woody vegetation. So this reclassification system will be used consistently in the present report. Moreover, wooded grassland are entirely classified as other wooded land in view of their sparse tree cover and to the presence, reported in reference # 2, of several agricultural woody crops within this vegetation class.

Results after reclassifying data for reference # 1, reference year: 1972

Standard FRA 2005 classes (areas in 1000 hectares)

Forests	OWL	OL
19951	37733	20725

Results after reclassifying data for reference # 2, reference year: 1990

Standard FRA 2005 classes (areas in 1000 hectares)

Forests	OWL	OL
20121	41676	16612

Reclassifying data for reference # 3

Class	Forest	OWL	OL
Closed montane forests	100%		
Medium closed montane forests	100%		
Open montane forests	100%		
Closed lowland forests	100%		
Medium closed lowland forests	100%		
Open lowland forests	100%		
Thicket		100%	
Shrub		100%	
Wooded grassland		100%	

Grassland			100%
Mangroves	100%		
Man made forests	100%		
Permanent cropping			100%
Short fallow			100%
Long fallow		100%	
Dunes			100%
Barren land			100%
Rivers			100%
Urban and other			100%

Comments: Reference # 3 used a different classification system . In this case also there is no substantial problem in assigning the forest classes into standard FRA 2005 forest category. But also here the major problem is the reclassification of thickets. Unfortunately in this case no distinction was made between high, medium and low thicket. However the definitions given in reference document # 3, Annexes 2 and 3, see national definition table above, suggest that this vegetation type is composed mainly of degraded natural vegetation and of regrowth after clearing for agriculture. In view of its generally limited height (between 3 and 7 meters) it seems advisable to classify this type as other wooded land. This hypothesis is supported by the classification scheme presented in Annex 2 of Reference # 3, and by the discussion of results presented in Chapter VI of the same reference document, where the forest cover of Mozambique is discussed with specific reference to FAO FRA concepts, and area calculation exclude completely thickets from forest area. For these reasons, the proposed classification of 71% of thickets as forests and 29% as other wooded land used by FRA 2000 and proposed for FRA 2005 as well, is replaced by assigning 100% of such class to OWL.

Moreover, analyzing the national classes it was found that the Long Fallow category, where less than 33% of land are used for cropping and the remaining is often abandoned as fallow for many year, should carry a considerable amount of secondary regrowth woody vegetation and should be classified as Other Wooded Land. Applying the classification system proposed, the following results were obtained for reference # 3.

Results after reclassifying data for reference # 3, reference year: 1990

Standard FRA 2005 classes (areas in 1000 hectares)

Forests	OWL	OL
20012	42419	15978

Summary results after reclassification

FRA 2005 Categories	Area in 1000 Hectares		
	Reference # 1 year 1972	Reference # 2 year 1990	Reference # 3 year 1995
Forest	19 951	20 121	20 012
OWL	37 733	41 676	42 419
OL	20 725	16 612	15 978
Inland Water	1 750	1 750	1 750
Total	80 159	80 159	80 159

The three references will be used for estimation and forecasting, although no direct trend line can be derived as discussed in the next section.

1.5 Estimation and Forecasting

The three references presented above indicate similar figure for forests and other wooded land area in Mozambique. However a closer scrutiny reveals that the forest cover of the country is not stable and a number of factors need to be considered before deriving trend lines and forecasts. In this respect the discussion about change assessment found in reference document # 2, chapter 6.2, clarifies a lot and how data are to be analyzed to derive meaningful forest change assessment for Mozambique. While comparing forest cover data of the national inventory of 1980 with the one of the national inventory of 1990, same scale, same classification, the author of the latter pinpoints the following findings:

The 1980 inventory greatly under estimated the agriculture area. The reason was the mis-classification of cultivated fields composed of *Anacardium occidentale*, *Mangifera indica*, *Cocos nucifera*, ecc. as other wooded land or even forests. The author describes how such areas were reclassified in the 1990 update, so that the agriculture area originally calculated at 5 496 000 ha was recalculated as 9 108 804 ha. The same author states that according to his calculations, the agriculture area had increased to 11 843 910 ha in 1990, and reports a total loss of forests and other wooded land together, of 2 739 106 ha over an 18 years period (1972-90). This equals an annual loss of around 152 000 ha per year. A breakdown of this change by provinces is also given (reference # 2, page 32). This analysis is so far the best study carried out on forest change assessment in Mozambique, because it analyzed the two sets of imageries used in a consistent way, although no really interdependent analysis of all classes was carried out. However the comparison of the agriculture area in the two surveys was done in a consistent way and the estimation derived should be retained as the best possible indication of the magnitude of natural vegetation change.

Unfortunately, according to the same author, the 1980 did not suffer only from misclassification of agricultural areas, but also from an underestimation of some forest types, especially in dry areas, due to the poor quality of some of the images used and to the time they were taken, the dry season, when most of the trees are leafless and were not detected. In fact if the comparison of the total forest areas of reference # 1 and # 2 show nearly the same total forest area for the entire country, the provincial data show some random variation, sometimes a decreasing forest area and sometimes an increasing one. However for the reasons described above, these changes are not due to actual changes in the vegetation cover, but rather to differences in the interpretation of certain types, even though both studies used the same scale and set of definitions. For this reasons it is not feasible to derive any significant trend comparing the two studies.

Regarding reference # 3, it is reminded that it used a different classification system and that the author himself advises not to use the 1995 study for direct comparison with the previous studies (Reference # 3, page 21).

1.6 Data for National reporting table T1

FRA 2005 Categories	Area (1000 hectares)		
	1990	2000	2005
Forest	20 012	19 512	19 262
Other wooded land	42 419	41 419	40 919
Other land	15 978	17 478	18 228
...of which with tree cover ¹⁾	NDA	NDA	NDA
Inland water bodies	1 750	1 750	1 750
TOTAL	80 159	80 159	80 159

- 1) Area of “Other land with tree cover” is included in the area reported under “Other land” and should therefore be excluded when calculating the total area for the country.

1.7 Comments to National reporting table T1

The methodology adopted in the present document for estimation and forecasting to standard FRA 2005 reference years is the following:

1. The 1995 study is taken as the starting point, because it is the most detailed (scale 1:250 000) and recent.
2. The increase of agriculture area between 1972-90 is taken as the best indication of annual change of forests + other wooded land area. For simplicity, a total loss of 150 000 ha per year will be used for calculations.
3. The figure of 150 000 hectares per year refers to total wooded land and unfortunately no breakdown into forests and other wooded land can be attempted, due to the inconsistency of data described above.
4. For reporting purposes, the change is allocated in a proportional way to forests and other wooded land areas, taking into account their relative area.
5. Applying the methodology above an annual change of –50 000 per year for forests and of – 100 000 ha/year for other wooded land has been obtained, and such estimates have been applied to derive the estimations and forecasts presented in the next table

FRA 2005 Categories	Area (1000 hectares)		
	1990	2000	2005
Forest	20 012	19 512	19 262
OWL	42 419	41 419	40 919
OL	15 978	17 478	18 228
Inland Water	1 750	1 750	1 750
Total	80 159	80 159	80 159

2 Table T2 – Ownership of Forest and Other wooded land

2.1 FRA 2005 Categories and definitions

Category	Definition
Private ownership	Land owned by individuals, families, private co-operatives, corporations, industries, religious and educational institutions, pension or investment funds, and other private institutions.
Public ownership	Land owned by the State (national, state and regional governments) or government-owned institutions or corporations or other public bodies including cities, municipalities, villages and communes.
Other ownership	Land that is not classified either as “Public ownership” or as “Private ownership”.

2.2 National data

All lands are owned by the State

2.3 Reclassification into FRA 2005 classes

2.4 Data for National reporting table T2

FRA 2005 Categories	Area (1000 hectares)			
	Forest		Other wooded land	
	1990	2000	1990	2000
Private ownership	ID	ID	ID	ID
Public ownership	20 012	19 512	42 419	41 419
Other ownership	ID	ID	ID	ID
TOTAL	20 012	19 512	42 419	41 419

3 Table T3 – Designated function of Forest and Other wooded land

3.1 FRA 2005 Categories and definitions

Types of designation

Category	Definition
Primary function	A designated function is considered to be primary when it is significantly more important than other functions. This includes areas that are legally or voluntarily set aside for specific purposes.
Total area with function	Total area where a specific function has been designated, regardless whether it is primary or not.

Designation categories

Category / Designated function	Definition
Production	Forest / Other wooded land designated for production and extraction of forest goods, including both wood and non-wood forest products.
Protection of soil and water	Forest / Other wooded land designated for protection of soil and water.
Conservation of biodiversity	Forest / Other wooded land designated for conservation of biological diversity.
Social services	Forest / Other wooded land designated for the provision of social services.
Multiple purpose	Forest / Other wooded land designated to any combination of: production of goods, protection of soil and water, conservation of biodiversity and provision of social services and where none of these alone can be considered as being significantly more important than the others.
No or unknown function	Forest / Other wooded land for which a specific function has not been designated or where designated function is unknown.

3.2 National data

3.2.1 Data sources

References to sources of information	Quality (H/M/L)	Variable(s)	Year(s)	Additional comments
1. www.wcmc.org	M	Protected areas	2003	
2. Albano G., 2002. Tropical Secondary Forests Management in Africa: Reality and perspective. Country paper Mozambique	H	Concession areas	2000	
3. Ministry of Tourism, 2004. National Directorate for Conservation Areas	M	Protected areas	2004	
4. DNFFB. 2005. Boletim Informativo Semestral do Departamento de Florestas. N°1/2005. DNFFB, Mozambique. Unpublished	H	Concession areas	2005	

3.2.2 Original data

Protected Areas

National Classes	Area in 1000 ha
	2003
National parks (Forest Reserves)	447,164
Natural monument, Species Management areas and protected landscape and seascape (category III; IV & V)	0,168
Areas managed for sustainable use and unclassified areas (category IV and others)	
Total	447,332

Note: On the given protected areas above, are not included Wildlife areas

Concession under consideration and authorised by 2005

Province	Concession under consideration	Authorized concession
	Area in hectares	Area in hectares
Niassa	199 385	0
Cabo Delgado	1 289 860	1 079 230
Nampula	458 805	354 754
Zambezia	1 352 500	1 118 500
Sofala	864 537	601 061
Manica	432 800	147 000
Inhambane	36 058	36 058
Gaza	21 525	0
Total	4 655 470	3 336 603

3.3 Analysis and processing of national data

3.3.1 Estimation and forecasting

3.4 **Reclassification into FRA 2005 classes**

1. T1 will be used as input.
2. Conservation area is kept constant
3. Production area = Concessions + Plantations
4. The rest of forest is under multiple use
5. OWL= unknown

Category	Area in hectares		
	1990	2000	2005
Plantation	38 000	38 000	38 000
Concession area	NDA	1 919 735	3 336 603
Conservation area	447 332	447 332	447 332
Multiple use	19 526 668	17 106 933	15 440 065
Total	20 012 000	19 512 000	19 262 000

3.5 Data for National reporting table T3

FRA 2005 Categories / Designated function	Area (1000 hectares)					
	Primary function			Total area with function		
	1990	2000	2005	1990	2000	2005
Forest						
Production	38*NDA	1 958	3 375			
Conservation of biodiversity	447	447	447			
Multiple purpose	19 527	17 107	15 440	not appl.	not appl.	not appl.
				not appl.	not appl.	not appl.
Total - Forest	20 012	19 512	19 262	not appl.	not appl.	not appl.
Other wooded land						
Production						
Protection of soil and water						
Conservation of biodiversity						
Social services						
Multiple purpose				not appl.	not appl.	not appl.
No or unknown function	42 419	41 419	40 919	not appl.	not appl.	not appl.
Total – Other wooded land	42 419	41 419	40 919	not appl.	not appl.	not appl.

* no data on concessions in 1990

4 Table T4 – Characteristics of Forest and Other wooded land

4.1 FRA 2005 Categories and definitions

Category	Definition
Primary	Forest / Other wooded land of native species, where there are no clearly visible indications of human activities and the ecological processes are not significantly disturbed.
Modified natural	Forest / Other wooded land of naturally regenerated native species where there are clearly visible indications of human activities.
Semi-natural	Forest / Other wooded land of native species, established through planting, seeding or assisted natural regeneration.
Productive plantation	Forest / Other wooded land of introduced species, and in some cases native species, established through planting or seeding mainly for production of wood or non wood goods.
Protective plantation	Forest / Other wooded land of native or introduced species, established through planting or seeding mainly for provision of services.

4.2 National data

4.2.1 Original data

T1 will be used as input

4.3 Analysis and processing of national data

4.3.1 Estimation and forecasting

4.4 Reclassification into FRA 2005 classes

Native species= modified natural

4.5 Data for National reporting table T4

FRA 2005 Categories	Area (1000 hectares)					
	Forest			Other wooded land		
	1990	2000	2005	1990	2000	2005
Primary						
Modified natural	19974	19474	19224	42419	41419	40919
Semi-natural						
Productive plantation	38	38	38			
Protective plantation						
TOTAL	20 012	19 512	19 262	42 419	41 419	40 919

5 Table T5 – Growing stock

5.1 FRA 2005 Categories and definitions

Category	Definition
Growing stock	Volume over bark of all living trees more than X cm in diameter at breast height (or above buttress if these are higher). Includes the stem from ground level or stump height up to a top diameter of Y cm, and may also include branches to a minimum diameter of W cm.
Commercial growing stock	The part of the growing stock of species that are considered as commercial or potentially commercial under current market conditions, and with a diameter at breast height of Z cm or more.

5.2 National data

5.2.1 Data sources

References to sources of information	Quality (H/M/L)	Variable(s)	Year(s)	Additional comments
Malleux, J. 1980. <i>Avaliação dos Recursos florestais da Republica Popular de Moçambique</i> . FAO FO: MOZ/76/007	M	Land use, forest cover, total and commercial growing stock	1980	Visual interpretation of Landsat MSS with support of aerial photographs with field inventory. Scale 1:1 000 000. Date of satellite imageries 1972. Field work 1980
Saket, M. (1994). Report on the updating of the exploratory national forest inventory.	M	Land use, forest cover, total and commercial growing stock	1994	Updates the inventory information from 1980. Visual interpretation of Landsat TM, with support from aerial images and minor fieldwork. Scale 1:1000 000. Date of satellite imagery 1990. Updated volume information for 3 provinces

5.2.2 Classification and definitions

All tree species with dbh greater than 25 cm were included.

5.2.3 Original data

Reference year: 1990 – Reference # 2

National class	Area	Vol/ ha (m3/ha)	Total volume (Mm3)
High forest with high density	172	86.6	14.9
High forest with medium density	231	56.0	12.9
High forest with low density	254	40.4	10.3
Low forest with high density	1 005	52.8	53.1
Low forest with medium density	3 006	38.1	114.5
Low forest with low density	6 889	21.5	148.1
High Thicket	8 169	18.2	148.7
Weighted average	19 726 *	25.5	502.5

* Area taken from Reference # 2, excluding 396 000 ha mangroves where no volume measurement was done

Area figures used for growing stock calculations, taken from Reference # 3.

FRA 2005 Categories	Area (1000 hectares)					
	Forest			Other wooded land		
	1990	2000	2005	1990	2000	2005
Modified natural	19 974	19 474	19 224	42 419	41 419	40 919
Productive plantation	38	38	38			
TOTAL	20 012	19 512	19 262	42 419	41 419	40 919

5.3 Analysis and processing of national data

Calculating growing stock for forest and other wooded land

Note: No data for mangroves. Weighted average will be applied to total natural forest area. No data for volume of plantations. Average of 150 m³/ha will be adopted for plantations. No data for other wooded land. Average volume of thickets will be used.

Calculating growing stock for modified forests and plantation by multiplying by their respective average volume per hectare gives:

FRA 2005 Categories	Area (1000 hectares)					
	Forest			Other wooded land		
	1990	2000	2005	1990	2000	2005
Modified natural area	19 974	19 474	19 224	42 419	41 419	40 919
Modified natural volume per ha	25.5	25.5	25.5	18.2	18.2	18.2
TOTAL GROWING STOCK NATURAL FOREST (MM3)	509.3	496.6	490.2	772.0	753.8	744.7
Productive plantation area	38	38	38			
PRODUCTIVE PLANTATION VOLUME PER HA (MM3)	150	150	150			
Total growing stock for plantations	5.7	5.7	5.7			
Grand total growing stock (Mm3)	515.0	502.3	495.9	772.0	753.8	744.7

Calculating Commercial Growing stock

T3 will be used as input. Commercial growing stock is composed of plantations + areas under concessions + multiple use areas. It is expected that multiple use areas are potentially productive, since there is no restriction to logging in such areas. Reference # 2 reports commercial volume for two minimum diameter limits, namely 25 cm dbh and 40 cm dbh. Calculations are made for both values. Currently in Mozambique the minimum diameters allowed for commercial logging vary between 30 and 50 cm, depending on the species.

Category	Area in hectares		
	1990	2000	2005
Plantations	38000	38000	38000
Commercial growing stock per ha	150	150	150
Commercial growing stock (Mm3)	5.7	5.7	5.7
Concession area	NDA	1919735	3 336 603
Commercial growing stock per ha dbh>40 cm	NDA	1.1	1.1
Commercial growing stock per ha dbh>25 cm	NDA	3.5	3.5
Total commercial growing stock dbh>40 cm (Mm3)	NDA	2.1	3.0
Total commercial growing stock dbh>25 cm (Mm3)	NDA	6.7	9.5
Multiple use area	19 526 668	17 106 933	15 440 065
Commercial growing stock per ha dbh>40 cm	1.1	1.1	1.1
Commercial growing stock per ha dbh>25 cm	3.5	3.5	3.5
Total commercial growing stock dbh>40 cm (Mm3)	21.4	18.8	17.6
Total commercial growing stock dbh>25 cm (Mm3)	68.2	59.7	56.1
Grand Total dbh >40 cm (Mm3)	27.1	25.6	24.4
Grand Total dbh >25 cm (Mm3)	73.9	72.2	71.3

5.4 Data for National reporting table T5

FRA 2005 Categories	Volume (million cubic meters over bark)					
	Forest			Other wooded land		
	1990	2000	2005	1990	2000	2005
Growing stock	515.0	502.3	495.9	772.0	753.8	744.7
Commercial growing stock dbh >40 cm	27.1	25.6	24.4	NDA	NDA	NDA
Commercial growing stock dbh >25cm	73.9	72.2	71.3	NDA	NDA	NDA

Specification of country threshold values	Unit	Value	Complementary information
1. Minimum diameter at breast height of trees included in Growing stock (X)	cm	25	

2. Minimum diameter at the top end of stem (Y) for calculation of Growing stock	cm		
3. Minimum diameter of branches included in Growing stock (W)	cm		
4. Minimum diameter at breast height of trees in Commercial growing stock (Z)	cm	25 and 40*	
5. Volume refers to “Above ground” (AG) or “Above stump” (AS)	AG / AS		
6. Have any of the above thresholds (points 1 to 4) changed since 1990	Yes/No		
7. If yes, then attach a separate note giving details of the change	Attachment		

* Data for both minimum diameters were used

5.5 Comments to National reporting table T5

Additional information on commercial and total growing stock is available for the provinces of Zambezia and Inhambane where forest inventories have been recently completed.

6 Table T6 – Biomass stock

6.1 FRA 2005 Categories and definitions

Category	Definition
Above-ground biomass	All living biomass above the soil including stem, stump, branches, bark, seeds, and foliage.
Below-ground biomass	All living biomass of live roots. Fine roots of less than 2mm diameter are excluded because these often cannot be distinguished empirically from soil organic matter or litter.
Dead wood biomass	All non-living woody biomass not contained in the litter, either standing, lying on the ground, or in the soil. Dead wood includes wood lying on the surface, dead roots, and stumps larger than or equal to 10 cm in diameter or any other diameter used by the country.

Note: No national data on biomass. Biomass can be calculated using volume figures above and standard FAO expansion factors.

6.2 National data

6.2.1 Data sources

6.2.2 Classification and definitions

6.2.3 Original data

T5 will be used as input:

FRA 2005 Categories	Area 1000 (hectares)		
	1990	2000	2005
Modified natural forests	19 974	19 474	19 224
Productive Plantations	38	38	38
Total	20 012	19 512	19 262

FRA 2005 Categories	Volume (million cubic meters over bark)					
	Forest			Other wooded land		
	1990	2000	2005	1990	2000	2005
Growing stock	515.0	502.3	495.9	772.0	753.8	744.7
Commercial growing stock dbh >40 cm	27.1	25.6	24.4	NDA	NDA	NDA
Commercial growing stock dbh >25cm	73.9	72.2	71.3	NDA	NDA	NDA

The following conversion factors were used

	Stem vol.	Density	Stem wood			

	m3/ha	ton/m3	ton/ha	BEF	R/S ratio	D/L ratio
Modified forest	32	0.58	18.56	3.4	0.24	0.14
Plantations	150	0.58	87	3.4	0.24	0.14

1. BEF calculated using formula from FAO Forestry Paper 134
2. Wood density: Average for Africa (FAO Forestry Paper 134)
3. R/S ratio: Appendix 5 of Guidelines
4. D/L ratio: Appendix 5 of Guidelines

6.3 Analysis and processing of national data

Calculating biomass for modified Natural Forests

FRA 2005 Category	Biomass (million tonnes)		
	1990	2000	2005
Aboveground biomass	1260.4	1228.9	1213.1
Belowground biomass	302.5	294.9	291.1
Dead wood biomass	218.8	213.3	210.6

Calculating biomass for plantations

FRA 2005 Category	Biomass (million tonnes)		
	1990	2000	2005
Aboveground biomass	11.2	11.2	11.2
Belowground biomass	2.7	2.7	2.7
Dead wood biomass	2.0	2.0	2.0

Total Biomass for forest

FRA 2005 Categories	Biomass (million tonnes)		
	1990	2000	2005
Aboveground biomass	1 272	1 240	1 224
Belowground biomass	305.2	297.6	293.8
Total living biomass	1576.9	1537.8	1518.2
Dead wood biomass	220.8	215.3	212.5
Total biomass	1797.6	1753.0	1730.7

Biomass for Owl

The following conversion factors were used

T1 will be used as input

	Area (hectares)		
	1990	2000	2005
OWL	42 419	41 419	40 919

The following conversion factors were used

	Stem vol.	Density	Stem wood	BEF	R/S ratio	D/L ratio
	m3/ha	ton/m3	ton/ha			
OWL	18.2	0.58	10.556	4	0.48	0.14

1. BEF calculated using formula from FAO Forestry Paper 134
2. Wood density: Average for Africa (FAO Forestry Paper 134)
3. R/S ratio: Appendix 5 of Guidelines
4. D/L ratio: Appendix 5 of Guidelines

FRA 2005 categories	Biomass (million tonnes)		
	1990	2000	2005
Aboveground biomass	1791.1	1748.9	1727.8
Belowground biomass	859.7	839.5	829.3
Total living biomass	2650.8	2588.3	2557.1
Dead wood biomass	371.1	362.4	358.0
Total	3021.9	2950.7	2915.1

6.4 Data for National reporting table T6 (This table is not updated)

FRA 2005 Categories	Biomass (million metric tonnes oven-dry weight)					
	Forest			Other wooded land		
	1990	2000	2005	1990	2000	2005
Above-ground biomass	1 996	1 869	1 801	965.2	936.7	922.4
Below-ground biomass	479.2	448.7	432.3	463.3	449.6	442.7
Dead wood biomass	346.6	324.5	312.7	200.0	194.1	191.1
TOTAL	2 823	2 643	2 546	1629	1580	1556

7 Table T7 – Carbon stock

7.1 FRA 2005 Categories and definitions

Category	Definition
Carbon in above-ground biomass	Carbon in all living biomass above the soil, including stem, stump, branches, bark, seeds, and foliage.
Carbon in below-ground biomass	Carbon in all living biomass of live roots. Fine roots of less than 2 mm diameter are excluded, because these often cannot be distinguished empirically from soil organic matter or litter.
Carbon in dead wood biomass	Carbon in all non-living woody biomass not contained in the litter, either standing, lying on the ground, or in the soil. Dead wood includes wood lying on the surface, dead roots, and stumps larger than or equal to 10 cm in diameter or any other diameter used by the country.
Carbon in litter	Carbon in all non-living biomass with a diameter less than a minimum diameter chose by the country for lying dead (for example 10 cm), in various states of decomposition above the mineral or organic soil. This includes the litter, fomic, and humic layers.
Soil carbon	Organic carbon in mineral and organic soils (including peat) to a specified depth chosen by the country and applied consistently through the time series.

7.2 National data

7.3 Analysis and processing of national data

Data from T6 was used as input. The default carbon content of biomass (50%) was used.

7.4 ata for National reporting table T7

FRA 2005 Categories	Carbon (Million metric tonnes)					
	Forest			Other wooded land		
	1990	2000	2005	1990	2000	2005
Carbon in above-ground biomass	635.8	620.1	612.2	895.5	874.4	863.9
Carbon in below-ground biomass	152.6	148.8	146.9	429.9	419.7	414.7
Sub-total: Carbon in living biomass	788.4	768.9	759.1	1325.4	1294.2	1278.5
Carbon in dead wood	110.4	107.6	106.3	185.6	181.2	179.0
Carbon in litter						
Sub-total: Carbon in dead wood and litter						
Soil carbon to a depth of _____ cm						
TOTAL CARBON	898.8	876.5	865.4	1511.0	1475.4	1457.5

8 Table T8 – Disturbances affecting health and vitality

No data available.

9 Table T9 – Diversity of tree species

9.1 FRA 2005 Categories and definitions

Category	Definition
Number of native tree species	The total number of native tree species that have been identified within the country.
Number of critically endangered tree species	The number of native tree species that are classified as “Critically endangered” in the IUCN red list.
Number of endangered tree species	The number of native tree species that are classified as “Endangered” in the IUCN red list.
Number of vulnerable tree species	The number of native tree species that are classified as “Vulnerable” in the IUCN red list.

9.2 National data

9.2.1 Data sources

References to sources of information	Quality (H/M/L)	Variable(s)	Year(s)	Additional comments
www.redlist.org	M	CR, EN, VU		
Golding, J.S. [editor] (2002). <i>Southern African Plant Red Data Lists</i> . Southern African Botanical Diversity Network Report No. 14. SABONET, Pretoria.	M	CR, EN, VU		

9.2.2 Classification and definitions

9.2.3 Original data

9.3 Data for National reporting table T9

FRA 2005 Categories	Number of species (year 2002)
Native tree species	ID
Critically endangered tree species	4
Endangered tree species	2
Vulnerable tree species	40

Notes: Only tree species are included

9.4 Comments to National reporting table T9

Critically endangered

- 1 [Encephalartos lebomboensis](#)
- 2 [Encephalartos munchii](#)
- 3 [Encephalartos pterogonus](#)
- 4 [Encephalartos senticosus](#)

Endangered

- 1 [Encephalartos chimanimaniensis](#)
- 2 [Icuria dunensis](#)

Vulnerable

- 1 [Acacia torrei](#)
- 2 [Allophylus mossambicensis](#)
- 3 [Anthospermum ammannioides](#)
- 4 [Anthospermum vallicola](#)
- 5 [Cassipourea obovata](#)
- 6 [Centella obtriangularis](#)
- 7 [Cola mossambicensis](#)
- 8 [Combretum caudatisepalum](#)
- 9 [Croton aceroides](#)
- 10 [Croton inhambanensis](#)
- 11 [Croton leuconurus](#)
- 12 [Deinbollia borbonica](#)
- 13 [Dolichandrone alba](#)
- 14 [Dombeya lastii](#)
- 15 [Eleaeodendron fruticosum](#)
- 16 [Entada mossambicensis](#)
- 17 [Entada schlechteri](#)
- 18 [Erica pleitotricha](#)
- 19 [Erica wildii](#)
- 20 [Fagara schlechteri](#)
- 21 [Hugonia elliptica](#)
- 22 [Impatiens salpinx](#)
- 23 [Lansea stuhlmanii](#)
- 24 [Lobelia cobaltica](#)
- 25 [Maytenus mossambicensis](#)
- 26 [Memecylon insulare](#)
- 27 [Mimosa mossambicensis](#)
- 28 [Ochna beirensis](#)
- 29 [Pseudosbeckia swynnertonii](#)
- 30 [Pteleopsis barbosa](#)

- 31 *Rhus refracta*
- 32 *Stangeria eriopus*
- 33 *Sterculia appendiculata*
- 34 *Sterculia quinqueloba*
- 35 *Triaspis nelsonii*
- 36 *Vahia capensis*
- 37 *Vernonia mulleri*
- 38 *Warburgia salutaris*
- 39 *Xylia mendocae*
- 40 *Xylopi collina*

10 Table T10 – Growing stock composition

No data available

11 Table T11 – Wood removal

11.1 FRA 2005 Categories and definitions

Category	Definition
Industrial wood removal	The wood removed (volume of roundwood over bark) for production of goods and services other than energy production (woodfuel).
Woodfuel removal	The wood removed for energy production purposes, regardless whether for industrial, commercial or domestic use.

11.2 National data

11.2.1 Data sources

References to sources of information	Quality (H/M/L)	Variable(s)	Year(s)	Additional comments
FAO Year book	L	Fuel wood and Industrial round wood	1990 and 2000	

11.2.2 Original data

Year	Wood Removal (under bark) in cubic meters	
	Industrial Roundwood	Wood Fuel
1988	9 05 000	14 422 000
1989	9 04 000	14 641 000
1990	9 23 000	14 825 000
1991	952 000	15 079 000
1992	967 000	15 398 000
AVG 1990	930 200	14 873 000
1998	1 294 000	16 724 000
1999	1 319 000	16 724 000
2000	1 319 000	16 724 000
2001	1 319 000	16 724 000
2002	1 319 000	16 724 000
AGG 2000	1 314 000	16724000

11.3 Analysis and processing of national data

11.3.1 Estimation and forecasting

Converting wood removal under bark to wood removal over bark by multiplying by 1.15 gives:

FRA 2005 Categories	Wood removal over bark in cubic meters		
	1990	2000	2005
Industrial			
Roundwood	1 069 730	1 511 100	1 731 785
Wood Fuel	17 103 950	19 232 600	20 296 925

11.4 Reclassification into FRA 2005 classes

11.5 Data for National reporting table T11

FRA 2005 Categories	Volume in 1000 cubic meters of roundwood over bark					
	Forest			Other wooded land		
	1990	2000	2005	1990	2000	2005
Industrial roundwood	1 070	1 511	1 732			
Woodfuel	17 104	19 233	20 297			
TOTAL for Country	18 174	20 744	22 029			

12 Table T12 – Value of wood removal

No data available.

13 Table T13 – Non-wood forest product removal

No data available

14 Table T14 – Value of non-wood forest product removal

No data available

15 Table T15 – Employment in forestry

15.1 FRA 2005 Categories and definitions

Category	Definition
Primary production of goods	Employment in activities related to primary production of goods, like industrial roundwood, woodfuel and non-wood forest products.
Provision of services	Employment in activities directly related to services from forests and woodlands.
Unspecified forestry activities	Employment in unspecified forestry activities.

15.2 National data

15.2.1 Data sources

References to sources of information	Quality (H/M/L)	Variable(s)	Year(s)	Additional comments
Trends and current status of the contribution of the forest sector to national economies”(FAO, 2003)	L	Employment in primary production of goods	1990 and 2000	

15.2.2 Classification and definitions

15.2.3 Original data

15.3 Analysis and processing of national data

15.3.1 Estimation and forecasting

15.4 Reclassification into FRA 2005 classes

15.5 Data for National reporting table T15

FRA 2005 Categories	Employment (1000 person-years)	
	1990	2000
Primary production of goods	8.3	11.8
Provision of services		
Unspecified forestry activities		
TOTAL	8.3	11.8

15.6 Comments to National reporting table T15