Forestry Department
Food and Agriculture Organization of the United Nations

GLOBAL FOREST RESOURCES ASSESSMENT

COUNTRY REPORTS

BOTSWANA

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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).

The Global Forest Resources Assessment process is coordinated by the Forestry Department at FAO headquarters in Rome. The contact person for matters related to FRA 2005 is:

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No official report has been received from Botswana.

This report is thereby the result of a desk study prepared by the FRA 2005 secretariat in Rome, which summarizes existing available information using the established format for FRA 2005 country reports.

Contents

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 *in situ*. 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 *in situ*; 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
Land Utilization Division, Ministry of Agriculture, Republic of Botswana. 1990. Land Systems Map of the Republic of Botswana.	H	Land Systems Map	1990	Primary Data source
FRA 2000. Botswana country report	H	Rate of deforestation	2005	Secondary data source
FAOSTAT	H	Land area	2005	Secondary data source

1.2.2 Classification and definitions

1.2.3 Original data

Reference year: 1990

National Classification	Area ('000) ha
FL Forbland	170
GR Grassland	2 796
GR/SA Grassland/ Savanna	662
GR/ST Grassland/ Tree savanna	224
SS/GR Shrub savanna / grassland	93
GR/SA/W Grassland/ Savanna / woodland	1 304
SA Savanna	20 965

SS Shrub savanna	2 277
SA/SS Savanna / Shrub savanna	3 608
SS/SA Shrub savanna / Savanna	20 106
ST Tree Savanna	1 736
SS/ST Shrub savanna / Tree Savanna	76
ST/SA Tree Savanna / Savanna	76
SA/ST Savanna / Tree Savanna	693
SS/W Shrub savanna / woodland	272
W/SA Woodland / Savanna	520
SA/W Savanna / Woodland	1 296
S/SS/SA Swamp / Shrub savanna / Savanna	216
S/SA/W Swamp / Savanna / Woodland	625
Total	**57 715**

Reference year: 2000

FRA 2000 estimated the annual net change rate in Botswana to be -118345, primarily based on rates from neighbouring countries.

1.3 Analysis and processing of national data

1.3.1 Calibration

From FAOSTAT	
Total Country Area ('000)ha	58173
Inland water ('000)ha	1500
Land area ('000)ha	56673

Reference year: 1990

Total country area according to source ('000) ha	57715
Calibration factor	1.007944277

On calibration , the original data becomes:

National Classification	Area (‘000) ha
FL Forbland	171
GR Grassland	2818
GR/SA Grassland/ Savanna	667
GR/ST Grassland/ Tree savanna	226
SS/GR Shrub savanna / grassland	94
GR/SA/W Grassland/ Savanna / woodland	1314
SA Savanna	21132
SS Shrub savanna	2295
SA/SS Savanna / Shrub savanna	3637
SS/SA Shrub savanna / Savanna	20265
ST Tree Savanna	1750
SS/ST Shrub savanna / Tree Savanna	77
ST/SA Tree Savanna / Savanna	77
SA/ST Savanna / Tree Savanna	699
SS/W Shrub savanna / woodland	274

W/SA Woodland / Savanna	524
SA/W Savanna / Woodland	1306
S/SS/SA Swamp / Shrub savanna / Savanna	218
S/SA/W Swamp / Savanna / Woodland	630
Total	**58173**

1.3.2 Estimation and forecasting

Due to lack of further information, estimation and forecasting has been done using the calibrated areas from 1990 and the estimated net change rate from FRA 2000. This was done after reclassification.

1.4 Reclassification into FRA 2005 classes

Reference year: 1990

National Classification	Forest	Other wooded land	Other land
FL Forbland			100%
GR Grassland			100%
GR/SA Grassland/ Savanna	10%	20%	70%
GR/ST Grassland/ Tree savanna	30%		70%
SS/GR Shrub savanna / grassland		60%	40%
GR/SA/W Grassland/ Savanna / woodland	40%		60%
SA Savanna	15%	65%	20%
SS Shrub savanna	15%	85%	
SA/SS Savanna / Shrub savanna	25%	75%	
SS/SA Shrub savanna / Savanna	25%	75%	
ST Tree Savanna	100%		
SS/ST Shrub savanna / Tree Savanna	50%	50%	
ST/SA Tree Savanna / Savanna	50%	50%	
SA/ST Savanna / Tree Savanna	50%	30%	20%
SS/W Shrub savanna / woodland	40%	30%	30%
W/SA Woodland / Savanna	80%	20%	
SA/W Savanna / Woodland	50%	20%	30%
S/SS/SA Swamp / Shrub savanna / Savanna	10%	30%	60%
S/SA/W Swamp / Savanna / Woodland	30%	30%	40%

After reclassification, we get:

National Classification	Forest (‘000 ha)	Other wooded land (‘000 ha)	Other land(‘000ha)
FL Forbland			171
GR Grassland			2818
GR/SA Grassland/ Savanna	67	133	467
GR/ST Grassland/ Tree savanna	68		158
SS/GR Shrub savanna / grassland		56	37
GR/SA/W Grassland/ Savanna / woodland	526		789
SA Savanna	3170	13736	4226
SS Shrub savanna	344	1951	
SA/SS Savanna / Shrub savanna	909	2727	
SS/SA Shrub savanna / Savanna	5066	15199	

ST Tree Savanna	1750		
SS/ST Shrub savanna / Tree Savanna	38	38	
ST/SA Tree Savanna / Savanna	38	38	
SA/ST Savanna / Tree Savanna	349	210	140
SS/W Shrub savanna / woodland	110	82	82
W/SA Woodland / Savanna	419	105	
SA/W Savanna / Woodland	653	261	392
S/SS/SA Swamp / Shrub savanna / Savanna	22	65	131
S/SA/W Swamp / Savanna / Woodland	189	189	252

On re-arranging:

FRA 2005 Categories	**Area (1000 hectares) 1990**
Forest	13718
Other wooded land	34791

Forest area in a reporting year X= Forest area in 1990- (rate of deforestation* (X-1990))
The same value is reported for Other wooded land in all three reporting years.

1.5 Data for National reporting table T1

FRA 2005 Categories	**Area (1000 hectares)**		
	1990	**2000**	**2005**
Forest	13718	12535	11943
Other wooded land	34791	34791	34791
Other land	8164	9347	9939
...of which with tree cover [1)]			
Inland water bodies	1500	1500	1500
TOTAL	**58173**	**58173**	**58173**

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.

1.6 Comments to National reporting table T1

This classification is based on the Land Systems Map of the Republic of Botswana for the year 1990 which was used or FRA 2000. There are a two biomass studies undertaken by Millington *et al*[12] (for reference years 1984 and 1986); however, the exact forest area is not easily quantified from these studies. Use of the Land Systems Map has been prefered since the information for 2000 was validated by the country before publication.

[1] Reference for 1986: **Millington, A. , R. Critcheley, T. Douglas & P Ryan** 1994. Estimating woody biomass in sub-saharan Africa. Washington, IBRD / World Bank
[2] Reference for 1984: **Millington, A., and Towsend, J. (eds.)** 1989. Biomass assessment: Woody biomass in the SADC region. Earth scans Publication Ltd. London. UK

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

2.2.1 Data sources

References to sources of information	Quality (H/M/L)	Variable(s)	Year(s)	Additional comments
EU/FAO 1998. Data Collection and Analysis for Sustainable Forest Management in ACP Countries. Linking National and International Efforts: Proceedings of sub-regional workshop on forestry statistics-SADC region. FAO,Rome	H	Land ownership	1998	Primary data source since it contains a country report

2.2.2 Classification and definitions

National class	Definition
Freehold	Land owned by individuals or group who have exclusive rights or control over its use and the land can be transferred from one owner to another without obtaining permission from the state.
Tribal	Different tribes throughout the country own land and its administration is through the Tribal Land Board under the authority of the Land Act
State	This type constitutes 24% of Botswana and it is owned by the state and is used at present in a number of ways.

Note: If different national data sources use different classes and definitions. a table such as above is needed for each relevant data source.

2.2.3 Original data

There are basically three types of land tenure in Botswana:

Freehold: This makes up 5% of the total land area of Botswana.

Tribal: This land covers 71% of the country.

State: This type constitutes 24% of Botswana.

2.3 Analysis and processing of national data

2.3.1 Estimation and forecasting

The different percentages were applied to all three reporting years.

2.4 Reclassification into FRA 2005 classes

National Classification	**FRA Classification**
Freehold	100% private
Tribal	100% other
State	100% public

2.5 Data for National reporting table T2

FRA 2005 Categories	**Area (1000 hectares)**			
	Forest		**Other wooded land**	
	1990	**2000**	**1990**	**2000**
Private ownership	686	627	1740	1740
Public ownership	9740	8900	24702	24702
Other ownership	3292	3008	8350	8350
TOTAL	**13718**	**12535**	**34791**	**34791**

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

No information available.

4 Table T4 – Characteristics of Forest and Other wooded land

No information available.

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
Millington, A. , R. Critcheley, T. Douglas & P Ryan 1994. Estimating woody biomass in sub-saharan Africa. Washington, IBRD / World Bank	M	Woody biomass	1986	Primary Data source

5.2.2 Original data

Total woody biomass = 463.603 million tonnes. This refers to all land categories.

5.3 Analysis and processing of national data

5.3.1 Estimation and forecasting

It is assumed that the woody biomass as presented by Millington mainly refers to forest and Other wooded land. It is further assumed that the data from 1986 is valid for 1990.

Growing stock 1990 (m3/ha) = Total woody biomass/(basic density* (Area of forest+other wooded land))
Where basic density = 0.58

This is then applied to the areas in T1 to give values for 2000 and 2005 reporting years.

All calculations refer to Forest and Other wooded land together.

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	799	780	770			
Commercial growing stock	NDA	NDA	NDA			

Note: The figures refer to Forest and Other wooded land together.

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

5.5 Comments to National reporting table T5

The above estimates refer to the combined area of forests and other wooded land.

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.

6.2 National data

6.2.1 Data sources

References to sources of information	Quality (H/M/L)	Variable(s)	Year(s)	Additional comments
Millington, A. , R. Critcheley, T. Douglas & P Ryan 1994. Estimating woody biomass in sub-saharan Africa. Washington, IBRD / World Bank	M	Land cover	1986	Primary Data source

6.2.2 Original data

Total woody biomass (‘000) = 463 603 tonnes

6.3 Analysis and processing of national data

6.3.1 Estimation and forecasting

It is assumed that the biomass of 1986 is the same in 1990. Furthermore, the total woody biomass is is assumed to refer to stem biomass. The following conversion factors are then used:

	Forest	OWL
Biomass expansion factor	2.00	2.00
Root/shoot ratio	0.24	0.48

This gives the following estimates

Above-ground biomass (1000 tons)	927,206
Below-ground biomass (1000 tons)	222,529
Area of Forest+OWL 1990 (1000 ha)	48509
Above-ground biomass (tons/ha)	19.1
Below-ground biomass (tons/ha)	4.6

The biomass/ hectare values are then applied to the forest and other wooded land area values in table T1 to get the biomass for the reporting years.

6.4 Data for National reporting table T6

FRA 2005 Categories	Biomass (million metric tonnes oven-dry weight)					
	Forest			Other wooded land		
	1990	2000	2005	1990	2000	2005
Above-ground biomass	927	905	893			
Below-ground biomass	223	217	214			
Dead wood biomass	NDA	NDA	NDA			
TOTAL	**ID**	**ID**	**ID**			

6.5 Comments to National reporting table T6

It is assumed that the mass used is oven-dry. An assumption is equally made that the biomass reported is stem biomass; however, a low biomass expansion factor has been used.

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. fumic. 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

7.2.1 Data sources

Biomass data from table T6 were used as input for the calculations.

7.3 Analysis and processing of national data

7.3.1 Estimation and forecasting

Carbon stock is assumed to be 50% biomass stock for all 3 reporting years.

7.4 Data 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	463.6	452.3	446.6			
Carbon in below-ground biomass	111.3	108.6	107.2			
Sub-total: Carbon in living biomass	**574.9**	**560.8**	**553.8**			
Carbon in dead wood						
Carbon in litter						
Sub-total: Carbon in dead wood and litter	**NDA**	**NDA**	**NDA**			
Soil carbon to a depth of _____ cm						
TOTAL CARBON	**ID**	**ID**	**ID**			

8 Table T8 – Disturbances affecting health and vitality

No information 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
IUCN Red list	H	Vulnerable and endangered species	2000	Primary data source

9.3 Data for National reporting table T9

FRA 2005 Categories	Number of species (year 2000)
Native tree species	NDA
Critically endangered tree species	0
Endangered tree species	0
Vulnerable tree species	0

9.4 Comments to National reporting table T9

No species was reported as critically endangered, endangered or vulnerable.

10 Table T10 – Growing stock composition

No information 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
FAOSTAT	H	Production of industrial roundwood, woodfuel production	1988-2003	Secondary data source

11.2.2 Original data

	Volume - m3 under bark				
	1988	**1989**	**1990**	**1991**	**1992**
Production of Industrial Roundwood	79 000	81 000	84 000	87 000	89 000
	1998	**1999**	**2000**	**2001**	**2002**
Production of Industrial Roundwood	103 000	105 000	105 000	105 000	105 000

	Volume - m3 under bark				
	1988	**1989**	**1990**	**1991**	**1992**
Wood fuel production	611 014	603 736	603 128	602 131	602 829
	1998	**1999**	**2000**	**2001**	**2002**
Wood fuel production	627 897	630 891	635 448	639 609	644 515

11.3 Analysis and processing of national data

11.3.1 Estimation and forecasting

FAOSTAT gives values under bark. By multiplying these values by 1.15 we get an estimate over bark.
Five year averages are used for 1990 and 2000 to obtain values over bark

Estimate for 1990 Y1 = 1.15* Sum (values from 1988 to1992)/5
Estimate for 2000 Y2= 1.15* Sum (values from 1998 to 2002)/5

Estimate for 2005 = linear extrapolation using Y1 and Y2.

11.4 Reclassification into FRA 2005 classes

Production of industrial roundwood = 100% Industrial wood removal

Wood fuel production = 100% Woodfuel removal

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	97	120	132			
Woodfuel	695	731	749			
TOTAL for Country	**792**	**851**	**881**			

11.6 Comments to National reporting table T11

FAOSTAT does not differenciate between wood from forests and from other wooded land.

12 Table T12 – Value of wood removal

No information available.

13 Table T13 – Non-wood forest product removal

No information available.

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

No information available.

15 Table T15 – Employment in forestry

No information available.