



**Forestry Department**

Food and Agriculture Organization of the United Nations

GLOBAL FOREST RESOURCES  
ASSESSMENT

COUNTRY REPORTS

SUDAN

FRA2005/212  
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](http://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

Reference of the Source information	Reliability (H/M/L)	Variable(s)	Years	Comments
FAO (2003). Land Cover Atlas. Africover Eastern Africa. GCO/RAF/287/ITA	M/L	Land Cover 1990-2000. Complete	2000	Based on remote sensing. Refer to Dawalbait et al. (in press) Estimating forest cover and forest cover change in Sudan. Forest Resources Assessment Working paper, FAO for details.
World Bank 1985. Sudan Forestry Sector Review	M	Forest cover	1976	Area of forest and woodland based on Landsat imagery from 1972 with some updates in 1982 and 1983. Reference year is set as 1976.
World Bank 1983.	L	Forest and other woody areas	1972	Area of woodlands and other woody areas and their contribution to rural energy. Based on 1972 Landsat imagery
FNC 2000. Country Submission to FRA 2000.	M	Forest cover	1997	Partial inventory covering the northern part of the country only.

#### 1.2.2 Classification and Definition

National Class	Definition
Forest	Land spanning more than 0.5 hectares with trees higher than 5 meters and a canopy cover of more than 10%, or trees able to reach these thresholds <i>in situ</i> . It does not include land that is predominantly under agricultural or urban 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 %. 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.

### 1.2.3 Original data

1972. Source: World Bank 1983: Sudan: Issues and Options in the Energy Sector

Wood resources (for energy):

1972	Forest (ha)	Other (ha)	Total (ha)
Eastern	2 748 065	700 000	3 448 065
Central	5 123 790	700 000	5 823 790
Khartoum	5 000	700 000	705 000
Kordofan	11 628 000	700 000	12 328 000
Darfur	17 693 300	700 000	18 393 300
Northern	0	700 000	700 000
<b>Sub-Total</b>	<b>37 198 155</b>	<b>4 200 000</b>	<b>41 398 155</b>
Buhayrat	6 525 400		6 525 400
Bahr-El-Ghazal	11 733 900		11 733 900
E. Equatoria	10 808 150		10 808 150
W. Equatoria	6 982 783		6 982 783
Jonglei	11 863 900		11 863 900
Upper Nile	23 171 600		23 171 600
<b>Sub-total</b>	<b>71 085 733</b>	<b>0</b>	<b>71 085 733</b>
<b>Total</b>	<b>108 283 888</b>	<b>4 200 000</b>	<b>112 483 888</b>

1976. Source: World Bank 1985: Sudan Forestry Sector Review

1976	Woodland & forest (000 ha)	Scrub and semi desert (000 ha)	Total (000 ha)
Northern Region	0	0	0
Eastern Region	2 750	3 520	6 270
Central Region(+Karthoum)	5 130	23 740	28 870
Kordufan	11 630	19 520	31 150
Darfur	17 690	3 560	21 250
Equatoria Region	18 790	-	18 790
Bahr Al Ghazal	18 080	-	18 080
Upper Nile	19 800	-	19 800
<b>TOTAL</b>	<b>93 870</b>	<b>50 340</b>	<b>144 210</b>

Note: "Woodland and Forest" includes 21.3 million ha of savannah grasslands with few scattered trees and about 3 million ha of trees in swampy vegetation.

1997. Source: FNC 2000. Country Submission to FRA 2000.

Information was only available from four regions (no information from the three southernmost regions) based on a field inventory.

<b>1997</b>	Forest (000 ha)	OWL (000 ha)	Total (000 ha)
Eastern Region	240	11 600	11 840
Central Region(+Karthoum)	11 600	4 680	16 280
Kordufan	17 300	10 380	27 680
Darfur	4 310	13 180	17 490
<b>Total 4 regions:</b>	<b>33 450</b>	<b>39 840</b>	<b>73 290</b>

2000. Source: Africover

(Summary information – refer to Annex 1 for more detailed information)

<b>2000</b>	Forest (000 ha)	OWL (000 ha)	Total (000 ha)
Sudan	70 491	54 153	124 644

## 1.3 Analysis and processing of national data

### 1.3.1 Calibration

No need, the data from Africover presented above have already been calibrated

### 1.3.2 Estimation and forecasting

The best data sources for estimating Sudan's state and change in forest are the Africover dataset (2000) and the survey made by the World Bank with remote sensing data from 1972. However estimating the change rate for the period 1990-2000-2005 is difficult as the two data sources have used different types of remote sensing data, different methodologies and very different ambition levels in terms of detail and documentations.

A direct comparison at the national level gives a change rate (reduction) of about one million hectares per year. Land changes are occurring in Sudan, but not at the rate indicated by the two incompatible surveys.

Consequently it sounded reasonable to adopt a more conservative estimate of the change rate. This was achieved using the 1985 document of the World Bank, which reported 21.3 million hectares of "savannah with few trees". It was then assumed that this category could be reclassified as other wooded land, following the FRA 2005 categories and the 21.3 million hectares were then deducted from the total forest area as coming from the 1972 document.

This estimate brought to the following results:

#### 1972

Forest minus the 21 million ha of savannah grassland with few trees, gives:

Forest: 86.984 million hectares

#### 2000

Total forest: 70.491 million hectares

Annual change rate 1972-2000:  $(70\,491 - 86\,984) / 28 = -589$  thousand hectares/year

The information on other wooded land is incompatible and insufficient for estimation and forecasting.

#### 1.4 Reclassification into FRA 2005 classes

Not needed.

#### 1.5 Data for National reporting table T1

FRA 2005 Categories	Area ( 000 hectares)		
	1990	2000	2005
Forest	76 381	70 491	67 546
Other wooded land		54 153	
Other land	161 219	112 956	170 054
...of which with tree cover			
Inland water bodies	12 981	12 981	12 981
<b>Total</b>	<b>250 581</b>	<b>250 581</b>	<b>250 581</b>

#### 1.6 Comments to National reporting table T1

The above table is a result of the various inventories/assessments over time and the calculation of the change rate based on the World Bank 1983 (reference year 1972) and the Africover data (reference year 2000), with the adjustment to the forest area of this latter, made using a third reference document of the World Bank (1985), as already explained in detailed in the estimation and forecasting paragraph.

There is an urgent need for a new national forest assessment in Sudan.

## 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
FNC annual reports. 2002, 2003. FNC.	M	Community Forests	2002 and 2003	
Gum Arabic Producer's Union.2004. Reports and interviews	M	Report, area, population	2004	Partial data (N. Kordofan only)
Population data sheet for Sudan by States-2002. Bureau of Statistics	M	5 of rural population and % of urban population	2002	
Gum Arabic Records	M	Report	1980s	

#### 2.2.2 Classification and definitions

National class	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, village and communes.
Other ownership	Land that is not classified either as "Public ownership" or as "Private ownership".

### 2.2.3 Original data

#### Private ownership by regions

Region	State(s)	Rural population number	Rural population %	Private forests hectares	Remarks
North	Nothern Nile			Na	
Khartoum	Khartoum			Na	
Kordofan	North Kordofan, South Kordofan and West Kordofan	3087080	71	808020	Est.
Dar fur	North Darfur, South Darfur and West Darfur	5055300	82	646416	Est.
Eastern	Gedaref, Kassala and Redsea	2116820	68	848421	Est.
Central	Gezira, Sennar, Blue Nile and White Nile	2310060	68	428416	Est.
Upper Nile	Jonglei, Upper Nile and Wahda	1154400	78	085000	Est.
Bahr el Ghazal	Buhairat, North Bahr el Ghazal, Warab and West Bahr el Ghazal			Na	
Equatoria	Bahr el Jabal, East Equatoria and West Equatoria			Na	
Total 1				<b>2 81 6273</b>	

Source Sudan population data sheet 2002

#### Private ownership by forest type

Type of Forest	Private forests hectares	Remarks
Community Forests	053965	Est.
Social forests	010602	An. Report 2002
Other private forests	001210	An. Report 2003
Total 2	<b>65 777</b>	

Source Sudan population data sheet 2002

## 2.3 Analysis and processing of national data

Total sum of Private forest = Total 1 + Total 2 = 2 882 050 hectares

### 2.3.1 Estimation and forecasting

The estimated total area of private forests equals 2 882 050 ha (See table above). This area includes both forests and other wooded land and equals approximately 2.31% of the total area of forest and OWL for the year 2000 (124 645 (000) ha in table T1). Due to lack of other information, this percentage has been applied to the areas of forest and of OWL for reporting year 2000 in table T1 and has been kept at the same level for 1990. The remaining areas of forest and OWL are publicly owned.

## 2.4 Reclassification into FRA 2005 classes

Not needed as the national classes correspond to the FRA 2005 classes.

## 2.5 Data for National reporting table T2

FRA 2005 category	Forest		Other wooded land	
	1990 (000 ha)	2000 (000 ha)	1990 (000 ha)	2000 (000 ha)
Private ownership	1 764	1 628	ID	1 251
Public ownership	74 617	68 863	ID	52 902
Other ownership	0	0	ID	0
<b>TOTAL</b>	76 381	70 491	ID	54 153

## 2.6 Comments to National reporting table T2

1. The original data figures are only estimated for the private ownership as complete information is lacking.
2. Private ownership is found for the most part of the gum producing area in addition to small areas of community and social forests.
3. The gum producing states where private ownership is mainly found are (Dar fur: North, West and South. Kordofan: North, West and South. Central: White Nile, Blue Nile and Sinnar. Eastern: Gedarif and Kassala. South Sudan: Upper Nile).
4. Both Community and Social forests are forests owned and administered by people.
5. Community forest is the forest owned by one individual
6. Social forests is a forest and/or forests owned by groups of people
7. Community, social and other private forest types are approximately found in all the states.

### 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. Talaat Dafa Alla Abdul Majid. 2001. Biodiversity in Forests and its Impact on non-wood Forest Products. Forests National Corporation.	M	Protected areas	2001	
3. Anon. 2002/2003. Annual Reports. Forests National Corporation.				
Prof. Mahdi Bashir. 2001. Sudan Country Study on Biodiversity. Higher Council for Environment and Natural Resources. HCENR	H		2001	
Anon. 2001. Forestry Outlook Study for Africa (FOSA Sudan Outlook Working Paper). Forests National Corporation FNC. Sudan	H		2001	

### 3.2.2 Classification and definitions

National class	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.

### 3.2.3 Original data

The basic information for Table T3 is taken from Africover classification (resulting in Table T1) and the functions had been specified accordingly

## 3.3 Analysis and processing of national data

### 2000

Total area of forest and OWL = 70 491 + 54 153 = 126 644 (1000 ha)  
 Production % = 50% of the total area for F and OWL = 63 322 (1000 ha)  
 Protection of soil and water = 3.4% for F and OWL = 4 306 (1000 ha)  
 Conservation of biodiversity = 17% for F and OWL = 21 529 (1000 ha)  
 Remaining = 29.6% = 27 979 (1000 ha)

**[Conservation of biodiversity:** Is the category typically known in National parks and game reserves specified for conservation of biodiversity. No other forests are specified in FNC just for CB. % 17%.

**Production:** is the major designated function in Sudanese forest and wood lands, but however it is indirectly serves protection, social, multiple, biodiversity etc. Production % = 50%

**Protection of soil and water:** The role of forests in hilly sites like Jebel Marra in the west, Imatong in the south and other sites. In rivers and watercourses forest play a protection role. In flat terrain also forests protect soil and water. Beside the protection they serve other function too. The % of protection is estimated as 3.4%.

**The remaining designated function %:** = 29.6%.

If you take it strictly our forest are a complex component of all functions. No measurement of the contribution of each category has ever been measured accurately. These measures undertaken are out of experience, knowledge and assumptions.]

The above figures refer to both forest and other wooded land. For protection of soil and water and conservation of biodiversity, the allocation to forest and OWL has been done based on the proportion of the areas of these two categories (approximately 42% of the total area of forest and OWL is comprised of forests and 58% of OWL).

For production, the area has been split 50/50 between forest and OWL:

### **2000**

<b>Total production area</b>	63 322 (1000 ha.)		
...of which forest	50%	or	31 661 (1000 ha)
...of which OWL	50%	or	31 661 (1000 ha)
<b>Total area for protection of soil and water</b>	4 306 (1000 ha)		
...of which forest	42%	or	1 809 (1000 ha)
...of which OWL	58%	or	2 497 (1000 ha)
<b>Total area for conservation of biodiversity</b>	21 529 (1000 ha)		
...of which forest	42%	or	9 042 (1000 ha)
...of which OWL	58%	or	12 487 (1000 ha)

- Forest with a prescribed designated function = 31 661 + 1 809 + 9 042 = 42 512 (1000 ha.)

- The forest area without any prescribed designated function = 27 979 (1000 ha.)

- OWL with a prescribed designated function = 31 661 + 2 497 + 12 487 = 46 645 (1000ha.)

- The OWL area without any prescribed designated function = 7 508 (1000 ha.)

## **3.4 Reclassification into FRA 2005 classes**

### **3.4.1 Estimation and forecasting**

Same percentages of 2000 were applied to the forest area of 1990 and 2005.

## **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
<b>Forest</b>						
Production	34 307	31 661	30 338			
Protection of soil and water	1 960	1 809	1 733			
Conservation of biodiversity	9 675	8 929	8 556			
Social services						
Multiple purpose				not appl.	not appl.	not appl.
No or unknown function	30 439	28 092	26 918	not appl.	not appl.	not appl.
<b>Total - Forest</b>	<b>76 381</b>	<b>70 491</b>	<b>67 546</b>	<b>not appl.</b>	<b>not appl.</b>	<b>not appl.</b>
<b>Other wooded land</b>						
Production		31 661				
Protection of soil and water		2 497				
Conservation of biodiversity		12 487				
Social services						
Multiple purpose				not appl.	not appl.	not appl.
No or unknown function		7 508		not appl.	not appl.	not appl.
<b>Total – Other wooded land</b>		<b>54 153</b>		<b>not appl.</b>	<b>not appl.</b>	<b>not appl.</b>

### **3.6 Comments to national reporting table T3**

All natural forests are classified as governmental (estate) forests.

The forests under reservation are the forests under the custody of FNC but the steps for reservation are incomplete. We consider them as forests. Allocation of land to forestry started as early as 1923. Reservation is a slow process till 1993 the total gazetted area = 1.3 million hectares = 0.5 of the area of the country. The president of Sudan directed the authorities to finalize the reservation of 4 million ha and generally facilitate the process of forest reservation the result is the declaring of 9.5 million hectares as forest reserves. By the end of year 2001 the reserved area = 3.8% in addition to (18 million ha) protected by wild life bringing total forest estate to 27.5 million ha.

Forest reserves are those areas where the cutting of trees is concentrated, but replanting is usually made immediately after felling. Afforestation and reforestation activities are almost confined to the areas reserved as forests owned by FNC.

The forest reserves are only part of all forests total area.

## 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 Data sources

References to sources of information	Quality (H/M/L)	Variable(s)	Year(s)	Additional comments
Bayoumi, Al Hourri and Badi. 1989. The forests of the Sudan. Forests National Corporation, Sudan.	M	Plantations exotic and indigenous species,	1989	
Anon. 1990-2003. Annual reports. Forests National corporation. Sudan	M	Natural forests, Forest reserves under management plans,	1990-2003	
FOSA/FNC records	M	Area planted by community woodlots and Irrigated forest plantations	2001	
Anon. 2003. Interviews with Sectoral Forests Managers. Forests National Corporation. Sudan.	M	Semi-natural forests	2003	

#### 4.2.2 Classification and definitions

#### 4.2.3 Original data

Estimates for FRA categories have been taken from interviews with the state forest authorities. They depend on data of forest reservation, private forest, other forests and planted community woodlots.

### 4.3 Analysis and processing of national data

#### 4.3.1 Estimation and forecasting

The proportions for the estimates and forecasting of forest and OWL are calculated in Table T1: Extent (000 ha) for 1990, 2000 and 2005 are used for estimation.

**Primary forests** are inaccessible, no or less human impact. 20% of total forest area

**Productive plantation forest** include planted forests with in the reserved forest, community and social forests, gum arabic private farms and planted forest areas with in the large agricultural and sugar prouced schemes<sup>1</sup>.

Plantation in reserved forest includes all reverian forest areas and part of the rain fed forest areas. To calculate the area we considered the available three data source which are FOSA 2001 reported plantation within forest reserve 453000 ha, plantation rate for the last 20 years (24000 ha annually), and 50% of the reserved forest area in the 12 states in the nothern part of the country, Forest areas in North Kordofan, North Darfur, Khartoum state and Nothern State are considered as protective plantation.

Gum arabic private farms and Community and Social forest areas 2882050 ha.

Estimates of current forest plantation in the agricultural schemes and sugar companies cited by FOSA 2001 is one million hectares.

Taking theses consideration into account and the total of productive plantation provided by these figures = 453000 + 2882050 + 1000000 = 4 335 050 ha - About 7% of total forest area.

**Protective plantation forest** it is estimated from the forest plantations within reserved forest areas in Khartoum Nothern, North Kordofan and North Darfur: 1% of total forest area

**Modified natural forest** the majority of our forest areas is modified natural forest

**Semi-natural Forest** For the semi-natural category we dealt with it as introduced and explained by FRA that means they are the forests of a natural nature in which planting/seeding took place. Now we are trying to categorize them in our system. 2% of total forest area have been estimated as semi natural forests.

**Other wooded land** are found in all country in accessible areas they are all considered as modified100%

#### 4.4 Reclassification into FRA 2005 classes

FRA classes	Primary	Modified natural	Semi-natural	Productive plantation	Protective plantation	Total
Forest	20%	70%	2%	7%	1%	100%
Other wooded Land		100%				100%

<sup>1</sup> According to Sudan ministry of Agriculture - policies and laws, for any agriculture farm, at least 5% of the total area must be of tree cover. Some international and bilateral development agricultural projects are of significant dimensions (about 100,000 ha), so they are nominated as scheme instead of Farm or agricultural projects

#### 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	15 276	14 098	13 509			
Modified natural	53 467	49 344	47 282		54 153	
Semi-natural	1 528	1 410	1 351			
Productive plantation	5 347	4 934	4 728			
Protective plantation	764	705	675			
<b>TOTAL</b>	<b>76 381</b>	<b>70 491</b>	<b>67 546</b>		<b>54 153</b>	

## 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 of sources of information	Quality (H/M/L)	Variable(s)	Year(s)	Additional comments
FAO 2003. Wood volume and woody biomass: Review of FRA 2000 estimates. FRA WP 69.	M	Volume per hectare per region	1995	The working paper contained information on the mean volume per hectare calculated with the information of the Handbook of Forestry Sector (FAO 1995).
FAO. 1995. <i>Handbook of Forestry Sector Statistics Sudan</i> . Forestry development in the Sudan (GCP/SUD/047/NET).	M	Productive forests, Semi-natural forests	1995	Data provided by the document were used to compile the working paper FAO 2003.

#### 5.2.2 Classification and definitions

No national definitions exist. The FRA definitions are used.

#### 5.2.3 Original data

The mean value of 13.9 m<sup>3</sup>/ha was used.

### 5.3 Analysis and processing of national data

#### 5.3.1 Calibration: Not needed.

### 5.3.2 Estimation and forecasting

The mean volume of 13.9 m<sup>3</sup>/ha was applied to the total forest area of table one to calculate the growing stock for 1990, 2000 and 2005.

### 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	1 062	980	939	ID	ID	ID
Commercial growing stock	ID	ID	ID	ID	ID	ID

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- 4) changed since 1990	Yes/No		
7. If Yes , then attach a separate note giving details of the change	attachment		

## 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
FAO. FRA Working Paper 82. 2004. FAO/Forestry department	M	Biomass expansion factor. Root-shoot ratio.	2004	
FAO. Working Paper 81. 2004.FAO/Forests department	H	Biomass expansion factor. Root-shoot ratio.	2004	
Anon. Ministry of Environment & Physical Development (HCENR). Sudan's First National Communication under the UN Framework Convention on Climate Change. 2003. HNENR/IPCC. 2003. SOLO press.	M		2003	
El Tayib. 2000. Thesis papers, Master degrees in wood densities. Forestry Research Centre, Soba, Khartoum.	H	Wood density of species in Sudan.	2000-2003	

#### 6.2.2 Classification and definitions

No national definitions exist. The FRA definitions are used.

#### 6.2.3 Original data

Data on growing stock from table T5 were used as input for the estimations of biomass.

### 6.3 Analysis and processing of national data

Estimations of biomass for forest were carried out by applying default conversion factors from the Guidelines to the growing stock figures from table T5, using the following values:

Wood density: 0.7

Biomass expansion factor: 3.4

Root ratio: 0.37

Dead biomass: 11% of living biomass

### 6.4 Data for National reporting table T6

FRA 2005 Categories	Biomass (Million metric tones oven-dry weight)					
	Forest			Other wooded land		
	1990	2000	2005	1990	2000	2005
Above ground biomass	2 527	2 332	2 235	ID	ID	ID
Below ground biomass	935	863	827	ID	ID	ID
Dead wood biomass	381	351	337	ID	ID	ID
<b>Total</b>	<b>3 843</b>	<b>3 546</b>	<b>3 398</b>	<b>ID</b>	<b>ID</b>	<b>ID</b>

### 6.5 Comments to National reporting table T6

No work undertaken by FNC regarding biomass component. IPCC and HCENR have some effort same as submitted by FRA appendix – 5. The Forest Research Centre may have efforts on wood densities for part of the total number of trees and shrubs in Sudan, (More than 1000 trees and shrubs species).

What is available for us is default information; we don't have a growing stock by the large number of species and we have data on average wood density by more than hundred species which produced the average of (0.7) wood density. The only way to overcome this constraint is by using the IPCC values: BEF, R, and WD (average) for the information in appendix 5 in the tropical Africa.

The weakness in this table is no work under taken towards biomass estimations in FNC.

## 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

#### 7.2.1 Data sources

References to sources of information	Quality (H/M/L)	Variable(s)	Year(s)	Additional comments
IPCC/FAO. 2004. Guidelines for country reporting, working paper 82. FAO, Rome.	L	Carbon in above and below-ground biomass. Carbon in dead wood. Carbon in litter. Carbon = 50% of the biomass in 6.5	2004	

#### 7.2.2 Classification and definitions

No national definitions exist. The FRA definitions are used.

#### 7.2.3 Original data

Data on biomass stocks from table T6 were used as input for the estimations of carbon stocks.

### 7.3 Analysis and processing of national data

The default carbon content of 50% was used for estimating carbon stocks.

### 7.4 Data for National reporting table T7

FRA 2005 Categories	Carbon (Million metric tones oven-dry weight)					
	Forest			Other wooded land		
	1990	2000	2005	1990	2000	2005
Carbon in above-ground biomass	1 263	1 166	1 117	ID	ID	ID
Carbon in below-ground biomass	468	431	413	ID	ID	ID
<b>Sub-total: Carbon in living biomass</b>	<b>1 731</b>	<b>1 597</b>	<b>1 531</b>	<b>0</b>	<b>0</b>	<b>0</b>
Carbon in dead wood	190	176	168	ID	ID	ID
Carbon in litter	ID	ID	ID	ID	ID	ID
<b>Sub-total: Carbon in dead wood and litter</b>	<b>190</b>	<b>176</b>	<b>168</b>	<b>0</b>	<b>0</b>	<b>0</b>
Soil carbon	ID	ID	ID	ID	ID	ID
<b>TOTAL CARBON</b>	<b>1 921</b>	<b>1 773</b>	<b>1 699</b>	<b>0</b>	<b>0</b>	<b>0</b>

### 7.5 Comments to National reporting table T7

1. Carbon content of living biomass = 50% for above-ground and below-ground biomass and dead-wood.  
Carbon in dead wood = Dead – wood biomass x 50%
2. Like other tables, this part should have work to be done. The results are weak.

## 8 Table T8 – Disturbances affecting health and vitality

### 8.1 FRA 2005 Categories and definitions

Category	Definition
Disturbance by fire	Disturbance caused by wildfire, independently whether it broke out inside or outside the forest/OWL.
Disturbance by insects	Disturbance caused by insect pests that are detrimental to tree health.
Disturbance by diseases	Disturbance caused by diseases attributable to pathogens, such as a bacteria, fungi, phytoplasma or virus.
Other disturbance	Disturbance caused by other factors than fire, insects or diseases.

### 8.2 National data

#### 8.2.1 Data sources

References to sources of information	Quality (H/M/L)	Variable(s)	Year(s)	Additional comments
F.G.G.Beake. 1956. Paper, Bulletin of Entomology. London.	H	Disturbances by insects	1956	
H.A. El Atta. 1986. Paper, Journal of applied entomology. Blackwell, Verlag, Berlin.	H	Disturbances by insects, viruses and bacteria	1986	
H.A. El Atta. 1993. Paper, Forest ecology and management. El Sevier, Amsterdam.	H	Disturbances by insects, viruses and bacteria	1993	
H.A. El Atta. 1999. U. of K. Journal of agricultural sciences (Paper). Khartoum university press.	H	Disturbances by insects, viruses and bacteria	1999	
H.A. El Atta and H. Obeid. 2001. Journal of tropical forest products (Paper). FRIM, Malaysia	H	Disturbances by insects, viruses and bacteria	2001	
H.A. El Atta and H. Obeid. 2001. Journal of tropical forest products (Paper). FRIM, Malaysia.	H	Disturbances by insects, viruses and bacteria	2001	
H.A. El Atta and A. Ahmed. 2002. Journal of applied entomology (Paper). Blackwell, Verlag, Berlin.	H	Disturbances by insects, viruses and bacteria	2002	
H.A. El Atta. 2002. Jonares (Paper). University of Juba.	H	Disturbances by insects, viruses and bacteria	2002	

## 8.2.2 Original data

1. FNC possesses weak information about diseases and insects in forestry like research and education institutions. There is a lack of information on the extent of fires. This table shows partial information.

The following information was compiled from various reports:

States by sectors	Area Km2	Area (million ha)	Acacia seyal (Talh) (Million ha)	A. nilotica (Sunt) ha	A. senegal (Hashab) ha	Khaya spp. ha	T. grandis ha
<b>Darfur</b>	503180	50.318000	1.908624	76418	0795880	1000	-
<b>Central</b>	137472	13.747200	1.482289	29018	0364478	-	-
<b>Eastern</b>	330860	33.086000	1.482289	27707	0086127	-	-
<b>Kordofan</b>	376145	37.614500	1.105368	32702	1569753	-	-
<b>River Nile</b>	122123	12.212300	-	01208	-	-	-
<b>South</b>	619745	61.974500	-	-	-	4000	1000
			<b>5.978570</b>	<b>167053</b>	<b>2816238</b>	<b>5000</b>	<b>1000</b>

Darfur 20% of the total area

Kordofan 18%

Eastern 10%

Central 14%

State	Area (km2)	Disturbance (km2)
<b>Darfur (W&amp;S)</b>	206 760	41 352
<b>Kordofan (W&amp;S)</b>	190 843	34 351
<b>Eastern (Kas.&amp;Ged.)</b>	111 973	11 197
<b>Central (WN/BN/SEN)</b>	114 099	15 974
<b>Total</b>	<b>623 675</b>	<b>102 874</b>

Disturbance in hectares x 0.42 for forest.

Disturbance in hectares x 0.58 for other wooded land

## 8.3 Analysis and processing of national data

Data is insufficient for further analysis.

## 8.4 Reclassification into FRA 2005 classes

## 8.5 Data for National reporting table T8

FRA-2005 Categories	Average annual area affected (1000 hectares)			
	Forests		Other wooded land	
	1990	2000	1990	2000
Disturbance by fire	ID	ID	ID	ID
Disturbance by insects	ID	ID	ID	ID
Disturbance by diseases	ID	ID	ID	ID
Other disturbance	ID	ID	ID	ID

## 8.6 Comments to National reporting table T8

FNC possesses weak information about diseases and insects in forestry like research and education institutions. There is a lack of information on the extent of fires. This table shows partial information.

### **1-Insect pests:**

*Chrysobothris dorsata* (Die- back) 40%

*Sphenoptera fulgens* (Die- back) 30%

*Caryedon serratus* (Seed-borer) 14%

*Bruchdius uberatus* (seed borer) 11%

*Anacridium melanorhodon* (Acacia Senegal) 0 -34%

### **2- Pathogens (Fungi):**

*Armillaria mellea* (Decay-teak) 10-25%

*Natrassia mangiferae* (Branch wilt) 10%

### **3- Bacterial Diseases:**

*Xanthomonas khayae* (Leaf spot)

## 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
El Amin, H.M (1990). Trees and shrubs of Sudan. Ethaca Press. London.	H	Tree species	1990	
Anon (2001). Sudan's Biodiversity Action Plan. HCENR. Sudan.	H	Endangered and critically endangered tree species	2001	
Anon (1995) Integrated Strategy for Seed Procurement, Tree improvement and Genetic Resource Conservation. Sudan Forest Research Centre. Khartoum.	H	Endangered, critically endangered and vulnerable tree species	1995	

#### 9.2.2 Original data

##### Trees & shrubs of the Sudan mentioned in some studies

Source	Trees		Shrubs	
	Indigenous	Exotic	Indigenous	Exotic
F. W. Andrews (1952)	337	-	527	-
K. C. Sahni (1968)	500	-	-	-
Thirakul S. (1984)	124	05	017	-
H. M. El Amin (1990)	533	25	184	33
Sommerlatte-11- (1990)	108	-	032	-

Source: El Amin (1990), Adel Nour & Kamil (1994) and Talaat (2001)

### 9.3 Data for National reporting table T9

FRA 2005 Categories	Number of species (year 2000)
Native tree species	533
Critically endangered tree species	1
Endangered tree species	1
Vulnerable tree species (1)	15

Notes: (1) Includes all plant species

### 9.4 Comments to National reporting table T9

In addition to the 533 tree species, there are 184 native shrub species.

#### Critically endangered plant species

Medemia argun

#### Endangered

Dracaena ombet

#### Vulnerable

- 1 Afzelia africana
- 2 Anopyxis klaineana
- 3 Baphia abyssinica
- 4 Beilschmiedia ugandensis
- 5 Combretum hartmannianum
- 6 Combretum rochetianum
- 7 Cordyla richardii
- 8 Entandrophragma angolense
- 9 Hallea stipulosa
- 10 Khaya grandifoliola
- 11 Khaya senegalensis
- 12 Lophira alata
- 13 Ocotea kenyensis
- 14 Prunus africana
- 15 Vitellaria paradoxa

## 10 Table T10 – Growing stock composition

### 10.1 FRA 2005 Categories and definitions

List of species names (scientific and common names) of the ten most common species.

### 10.2 National data

#### 10.2.1 Data sources

References to sources of information	Quality (H/M/L)	Variable(s)	Year(s)	Additional comments
Anon. 1998. National Forest Inventory for Sudan. Forest National Corporation of Sudan and FAO (GCP/SUD/047/NET), Khartoum, Sudan.	M	Growing stock. Partial (1995)	1995	
J. K. Jackson. 1960. Forest management in the Sudan. FAO, Rome & the Government of the Sudan, Expanded Technical assistance Program.	L	Forest resources in Sudan. Volume estimates in South Sudan. Partial data.	1960	

#### 10.2.2 Original data

The partial inventory from 1995 gives the following growing stock in m<sup>3</sup> of the 10 most common species by sector:

Scientific name	Sector							TOTAL million m <sup>3</sup>
	RNS	ES	CS	KS (W/N)	DS	SS	SKS	
<i>Acacia seyal</i>	6 400	735 000	9 413 650	3 113 942	2 899 592	3 624 490	565 999	<b>20.36</b>
<i>Acacia senegal</i>	-	63 000	184 291	2 179 757	790 760	988 450	154 356	<b>4.36</b>
<i>Acacia tortilis</i>	128 000	189 000	538 132	1 660 766	395 393	494 241	77 181	<b>3.48</b>
<i>Acacia nilotica</i>	6 400	6 300	184 291	103 797	263 593	329 491	51 454	<b>0.95</b>
<i>Balanites aegyptica</i>	51 200	102 900	1 275 302	6 331 681	14 497 991	18 122 488	283 001	<b>40.66</b>
<i>Ziziphus spina-christi</i>	-	-	530 761	311 392	790 796	988 495	154 363	<b>2.78</b>
<i>Khaya senegalensis</i>	-	-	-	311 392	890 968	1 113 710	317 200	<b>2.63</b>
<i>Isoberlinia doka</i>	-	-	-	-	32 000	400 000	6 246	<b>0.44</b>
<i>Albizzia amara</i>	-	-	22 113	7 681 060	1 449 799	1 812 249	283 000	<b>11.25</b>
<i>Anogeissus leiocarpus</i>	-	21 000	331 725	3 840 528	3 690 398	4 612 998	720 366	<b>13.22</b>

The total estimated growing stock from this partial inventory amounted to 321.1 million m<sup>3</sup>.

### 10.3 Analysis and processing of national data

The data above are used to report for year 2000. As the information comes from a partial inventory, the total does not correspond to the total growing stock in table T5.

### 10.4 Data for National reporting table T10

FRA 2005 categories		Growing stock (Million m3)	
Common name	Scientific name	1990	2000
Higleeg	<i>Balanites aegyptiaca</i>		40.66
Talh	<i>Acacia seyal</i>		20.36
Sahab	<i>Anogeissus leiocarpus</i>		13.22
Arad	<i>Albizia amara</i>		11.25
Hashab	<i>Acacia senegal</i>		4.36
Seyal	<i>Acacia tortilis</i>		3.48
Sidir/Nabag	<i>Ziziphus spina-christi</i>		2.78
Mahogany	<i>Khaya senegalensis</i>		2.63
Sunt	<i>Acacia nilotica</i>		0.95
Bu	<i>Isoberlinia doka</i>		0.44
Remainder of species			220.98
<b>TOTAL</b>			<b>321.10</b>

### 10.5 Comments to National reporting table T10

The information on this table was obtained from partial inventories and no current ones available. The partial inventories are attributed to security reasons in the Southern States at that time. Efforts may be done after the peace. Lacks of inventories are related also to the financial ability of FNC to cover the big country.

## 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	Roundwood and Wood Fuel	1990 and 2000	

#### 11.2.2 Original data

Year	Wood Removal under bark in cubic meters	
	Industrial Roundwood	Wood Fuel
1988	1 735 000	16 043 540
1989	1 773 000	15 965 830
1990	1 809 000	16 286 247
1991	1 749 000	16 521 308
1992	1 784 000	16 261 849
<b>Avg 1990</b>	<b>1 770 000</b>	<b>16 215 755</b>
1998	2 131 000	16 421 949
1999	2 173 000	16 548 511
2000	2 173 000	16 680 060
2001	2 173 000	16 871 138
2002	2 173 000	17 068 332
<b>Avg 2000</b>	<b>2 164 600</b>	<b>16 717 998</b>

### 11.3 Analysis and processing of national data

#### 11.3.1 Estimation and forecasting

Converting wood removal under bark to overbark by multiplying by the conversion factor of 1.15 and extrapolating for 2005 gives:

FRA 2005 Categories	Wood Removal over bark in cubic meters		
	1990	2000	2005
Industrial Roundwood	2 035 500	2 489 290	2 716 185
Wood Fuel	18 648 118	19 225 698	19 514 488
<b>Total</b>	<b>20 683 618</b>	<b>21 714 988</b>	<b>22 230 673</b>

**11.4 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	2 036	2 489	2 716			
Woodfuel	18 648	19 226	19 514			
<b>TOTAL for Country</b>	<b>20 684</b>	<b>21 715</b>	<b>22 231</b>			

## 12 Table T12 – Value of wood removal

### 12.1 FRA 2005 Categories and definitions

Category	Definition
Value of industrial wood removal	Value of the wood removed for production of goods and services other than energy production (woodfuel).
Value of woodfuel removal	Value of the wood removed for energy production purposes, regardless whether for industrial, commercial or domestic use.

### 12.2 National data

#### 12.2.1 Data sources

References to sources of information	Quality (H/M/L)	Variable(s)	Year(s)	Additional comments
Anon. FNC list of prices of forest products. 1990-2000. Forests National Corporation. Sudan.	H	Prices	1990 2000	

#### 12.2.2 Original data

Year	Price in Sudanese Dinar/m3 of product	
	Industrial wood (m3)	Fuel wood (m3)
1990	166.66	46
2000	7827.16	5000

#### Exchange rate

	US\$	
	1990	2000
Sudanese Dinar	0.45	257.35

### 12.3 Analysis and processing of national data

#### 12.3.1 Estimation and forecasting

Multiplying wood removal from T12 by prices per units in Sudanese Dinar gives:

FRA 2005 Categories	Value of wood removal in Sudanese Dinar		
	1990	2000	2005
Industrial wood	339 236 430	19 484 071 116	21 260 014 585
Wood Fuel	857 813 429	96 128 488 500	97 572 437 700

Converting value to US\$ by multiplying by exchange rate gives:

FRA 2005 Categories	Value of wood Removal in \$US		
	1990	2000	2005
Industrial wood	ID	75 710 399	82 611 287
Wood Fuel	ID	373 532 110	379 142 948
Total	ID	449 242 509	461 754 235

Notes: The difference between the 1990 exchange rate and 2000 was too big. It was decided to report 1990 values as insufficient.

## 12.4 Data for National reporting table T12

FRA 2005 Categories	Value of roundwood removal (1000 USD)					
	Forest			Other wooded land		
	1990	2000	2005 (1)	1990	2000	2005
Industrial roundwood	ID	75 710	82 611			
Woodfuel	ID	373 532	379 143			
<b>TOTAL for Country</b>	<b>ID</b>	<b>449 243</b>	<b>461 754</b>			

Notes: 2000 exchange rate used

## 13 Table T13 – Non-wood forest product removal

### 13.1 FRA 2005 Categories and definitions

The following categories of non-wood forest products have been defined:

Category
<u>Plant products / raw material</u>
1. Food
2. Fodder
3. Raw material for medicine and aromatic products
4. Raw material for colorants and dyes
5. Raw material for utensils, handicrafts & construction
6. Ornamental plants
7. Exudates
8. Other plant products
<u>Animal products / raw material</u>
9. Living animals
10. Hides, skins and trophies
11. Wild honey and bee-wax
12. Bush meat
13. Raw material for medicine
14. Raw material for colorants
15. Other edible animal products
16. Other non-edible animal products

### 13.2 National data

#### 13.2.1 Data sources

References to sources of information	Quality (H/M/L)	Variable(s)	Year(s)	Additional comments
Anon. Forests National Corporation annual reports. 2001/2002/2003. FNC, Sudan.	M	Revenue from NWFPs. Quantity of NWFPs.	2001 2002 2003	
Anon. Study on Forest Valuation and Investment in Sustainable Forest Management in Sudan. 2003. Government of Sudan.	H	Gum Arabic production. Value of Gum Arabic.	2003	
(Anon) Wild life Conservation General Administration (WLCGA). 1990. Annual wild life Survey Northern Sudan. WLCGA.	H	Number of animals. Animal products. Skins, hides, trophies etc.	1990	
(Anon) Wild life Conservation General Administration (WLCGA). 2000. Annual wild life Survey Northern Sudan. WLCGA.	H	Number of animals. Animal products. Skins, hides, trophies	2000	
Anon. Annual Wild life Estimate in the Southern	L	Number of animals.	1990	

Sudan. 1990. WLCGA		Animal products. Skins, hides, trophies		
Anon. Annual Wild life Estimate in the Southern Sudan (War-affected areas). 2000. WLCGA	L	Number of animals. Animal products. Skins, hides, trophies	2000	
Anon. 2000. Workshop on the Role of Wild life Resources Conservation and Development programs in the 21st Century. WLCGA	M		2000	

### 13.2.2 Original data

#### Exports of Non-wood Forest Products (1999-2003)

National Category	Quantity					5 year Avg (2001)
	1000 tonnes					
	1999	2000	2001	2002	2003	
Gum arabic	26 000	24 204	12 689	36 193	36 164	27 050
Senna	3 042	23 350	10 946	1 095	1 823	8 051
Henna	623	637	357	1 143	1 364	825
Luban	345	310	137	63	887	348
Karkade	204 45	23 350	10 946			10 948
<b>Total</b>	<b>50 455</b>	<b>71 851</b>	<b>35 075</b>	<b>38 494</b>	<b>40 238</b>	<b>47 223</b>

Notes: 2001 will be used for 2000

Category	Unit	1990	2000	2005
Hides and skins	Unit	998400	1706200	1352300
Trophies	Unit	30609	41822	36215
Bush meat	Kg	604095	485865	663712

Hides, skins and trophies are counted in units not in mass tons and kgs.

Expected increase in number of animals in 2005 due to peace agreement.

Bush meat = 10% of the living animal number. Weight = 10 kg/animal.

### 13.3 Analysis and processing of national data

### 13.4 Estimation and forecasting

### 13.5 Reclassification into FRA 2005 classes

### 13.6 Data for National reporting table T13

FRA 2005 Categories	Scale factor	Unit	NWFP removal		
			1990	2000	2005
<u>Plant products / raw material</u>					
1. Food					
2. Fodder					
3. Raw material for medicine and aromatic products					
4. Raw material for colorants and dyes					
5. Raw material for utensils, handicrafts & construction					
6. Ornamental plants					
7. Exudates	1000	tons		47	
8. Other plant products					
<u>Animal products / raw material</u>					
9. Living animals		units	640 095	485 865	663 712
10. Hides, skins and trophies		units	1 029 009	1 748 022	1 388 515
11. Wild honey and bee-wax					
12. Bush meat		tons	604	486	664
13. Raw material for medicine					
14. Raw material for colorants					
15. Other edible animal products					
16. Other non-edible animal products					

### 13.7 Comments to National reporting table T13

It should be born in mind that the estimates from Gum Arabic Company may be less than the real production; this is due to the unknown production of other small companies who entered into the trade of gum Arabic in Sudan during the last two decades and may be also the illegal trade in Gum Arabic.

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

### 14.1 FRA 2005 Categories and definitions

The following categories of non-wood forest products have been defined:

Category
<u>Plant products / raw material</u>
1. Food
2. Fodder
3. Raw material for medicine and aromatic products
4. Raw material for colorants and dyes
5. Raw material for utensils, handicrafts & construction
6. Ornamental plants
7. Exudates
8. Other plant products
<u>Animal products / raw material</u>
9. Living animals
10. Hides, skins and trophies
11. Wild honey and bee-wax
12. Bush meat
13. Raw material for medicine
14. Raw material for colorants
15. Other edible animal products
16. Other non-edible animal products

### 14.2 National data

#### 14.2.1 Data sources

References to sources of information	Quality (H/M/L)	Variable(s)	Year(s)	Additional comments
Anon. Forests National Corporation annual reports. 2001/2002/2003. FNC, Sudan.	M	Revenue from NWFPs. Quantity of NWFPs.	2001 2002 2003	

#### 14.2.2 Classification and definitions

#### 14.2.3 Original data

National Category	Value					5 year Avg (2001)
	1000US\$					
	1999	2000	2001	2002	2003	
Gum arabic	26 000	23 140	13 593	31 851	35 416	26 000
Senna	3 042	17 987	7 994	449	872	6069
Henna	623	636	332	1 184	1 326	820
Luban	345	312	140	787	804	478
Karkade	20445	17987	7 994	19 998	16 652	16 615
<b>Total</b>	<b>50 455</b>	<b>60 062</b>	<b>30 053</b>	<b>54 269</b>	<b>55 070</b>	<b>49 982</b>

Notes: 2001 will be used for 2000

Category	Value in US\$			
	1990	2000	2005	Avg (2000)
1. Living Animals				
North Sudan	4 309	4 063	4 186	
South Sudan	597 938	480 061	657 732	
2. Hides&skins	19 968	34 124	27 046	27 046
3. Trophies	918	1 254	1 086	1 086

### 14.3 Analysis and processing of national data

#### 14.3.1 Estimation and forecasting

#### 14.4 Data for National reporting table T14

FRA 2005 Categories	Value of the of NWFP removed (1000 USD)		
	1990	2000	2005
<u>Plant products / raw material</u>			
1. Food			
2. Fodder			
3. Raw material for medicine and aromatic products			
4. Raw material for colorants and dyes			
5. Raw material for utensils, handicrafts & construction			
6. Ornamental plants			
7. Exudates		50	
8. Other plant products			
<u>Animal products / raw material</u>			
9. Living animals	602 248	484 124	661 918
10. Hides, skins and trophies	20 886	35 379	28 132
11. Wild honey and bee-wax			
12. Bush meat	1 812	1 458	1 991
13. Raw material for medicine		0.003	
14. Raw material for colorants			
15. Other edible animal products			
16. Other non-edible animal products			
<b>TOTAL</b>	<b>624 946</b>	<b>521 011</b>	<b>692 041</b>

## 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
Anon. Forests National Corporation Annual Reports. 1990, 2000. FNC.	H	Employment Annual records	1990 2000	

#### 15.2.2 Original data

Reference year: 1990

Grade	Professionals	Technicians	Labors	Other Labors	Total
1	1	-	-	-	1
2	1	-	-	-	1
3	9	-	-	-	9
4	24	-	-	-	24
5	54	-	-	-	54
7	116	-	-	1	117
8	136	37	7	17	197
9	53	-	-	-	53
10	33	73	26	18	180
11	-	114	134	1	249
12	68	-	374	-	442
13	-	-	646	-	646
14	210	169	-	-	379
15	-	-	1834	-	1834
16	-	-	608	-	608
<b>Total</b>	<b>685</b>	<b>393</b>	<b>3629</b>	<b>37</b>	<b>4794</b>

FNC employment: Reference year 2000

Category	Region/Sector							
	HQs.	Central	Kordofan	Dar fur	Northern	Eastern	Khartoum	Total
Professionals	49	47	24	17	11	22	4	<b>174</b>
Technicians	16	63	32	16	21	37	11	<b>196</b>
Assistant Tech.	12	172	52	47	39	47	46	<b>415</b>
Guards, labors and other employment	124	1200	638	458	297	559	244	<b>3 520</b>
Personnel Officers	3	-	-	-	-	1	-	<b>4</b>
Accountants	23	28	13	5	6	26	4	<b>105</b>
Clerks	35	61	23	14	17	20	8	<b>178</b>
Store keepers	10	7	3	-	3	5	1	<b>29</b>
<b>Total</b>	<b>272</b>	<b>1578</b>	<b>785</b>	<b>557</b>	<b>394</b>	<b>717</b>	<b>318</b>	<b>4 621</b>

### 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	4.8	4.6
Provision of services		
Unspecified forestry activities		
<b>TOTAL</b>	<b>4.8</b>	<b>4.6</b>

## Annex 1. Results from Africover

### Areas classified as forests:

2SCJ	20019-12374	Closed shrubs	Continuous Closed Medium To High Shrubland (Thicket)	Forest	33881
2SCJZ	20020-12374	Closed shrubs - fragmented	Fragmented Closed Medium To High Shrubland (Thicket)	Forest	2331
2SOJ67	20391-709	Open shrubs with closed to open herbaceous and sparse trees	((70-60) - 40%) Medium To High Shrubland With Short Herbaceous And Emergents	Forest	221827
2SPJ6	20389-12757	Open general shrubs with herbaceous	Medium To High Shrubland With Short Herbaceous	Forest	26456538
2SVJ67	20391-3719	Very open shrubs with closed to open herbaceous and sparse trees	(40 - (20-10%) Medium To High Shrubland With Medium to Tall Herbaceous And Emergents	Forest	7148700
2TC128	20638-15048	Closed trees (semi-evergreen) with closed to open shrubs	Semi-Evergreen Forest With Shrubs	Forest	18168
2TC28	20646	Closed trees with closed to open shrubs	Broadleaved Deciduous Forest With Shrubs	Forest	422822
2TC328	20654-15045	Closed (needleleaved evergreen) trees with closed to open shrubs	Mixed Forest With Shrubs	Forest	
2TC8	20286	Closed trees with closed to open shrubs	Trees with Shrubs	Forest	200
2TCI177	20637-52949	Closed multilayered trees (broadleaved evergreen)	Multi-Layered Broadleaved Evergreen High Forest (With Second Layer Of Medium High	Forest	100681

			Trees) With Emergents		
2TCI217	20643-13202(1)[Z10]	Closed multilayered trees (semi-deciduous)	Multi-Layered Semi-Deciduous High Forest (With Second Layer Of High Trees)	Forest	
2TCL1-pc	20634-13314-Zt4	Closed low trees - Masquit (broadleaved evergreen)	Broadleaved Evergreen Low Forest, Single Layer Floristic Aspect: Masquit (Prosopis chilensis)	Forest	31057
2TCM28	9999-1	User Code 2TCM28 - Tree closed. Not in the legend	Tree closed. Not in the legend	Forest	
2TO268	20868-3011	Open trees (broadleaved deciduous) with open herbaceous and sparse shrubs	Broadleaved Deciduous ((70-60) - 40%) Woodland With Open Herbaceous Layer And Sparse Shrubs	Forest	2138448
2TO28	20862-1	Open trees with closed to open shrubs	Broadleaved Deciduous ((70-60) - 40%) Woodland With Shrubs	Forest	1510393
2TOM26	20865-1186	Open medium trees (broadleaved deciduous) with closed to open herbaceous	Broadleaved Deciduous ((70-60) - 40%) Woodland With Herbaceous Layer	Forest	115275
2TP268	20868-15058	Open general trees with open herbaceous and sparse shrubs	Broadleaved Deciduous Woodland With Open Herbaceous Layer And Sparse Shrubs	Forest	8836492
2TP28	20862	Open general trees with closed to open shrubs	Broadleaved Deciduous ((70-60) - (20-10%)) Woodland With Shrubs	Forest	3690130
2TP68	20332	Open general trees with closed to open herbaceous & sparse shrubs	Woodland With Herbaceous Layer And Sparse Shrubs	Forest	11781

2TP8	20326	Open general trees with closed to open shrubs	Woodland With Shrubs	Forest	10754
2TPM28	20862-13297	Open general trees (broadleaved deciduous) with open shrubs	Broadleaved Deciduous Woodland With Open Shrubs	Forest	9601
2TPM86	21928-13312	Open general medium trees with closed to open shrubs and closed to open herbaceous	Open Medium High Trees with High Shrubs and Herbaceous	Forest	
2TR28	21398	Sparse trees and sparse shrubs (wadi)	Broadleaved Deciduous Sparse Trees And Sparse Shrubs	Forest	1723048
2TR6	20505	Sparse trees with sparse herbaceous	Sparse Trees And Sparse Herbaceous	Forest	
2TRL2	20234-13314	Sparse low trees (broadleaved deciduous)	Broadleaved Deciduous Sparse Low Trees	Forest	239152
2TV268	20868-3012	Very open trees (broadleaved deciduous) with closed to open herbaceous and sparse shrubs	Broadleaved Deciduous (40 - (20-10)%) Woodland With Herbaceous Layer And Sparse Shrubs	Forest	3482467
2TV28	20862-3012	Very open trees (broadleaved deciduous) with closed to open shrubs	Broadleaved Deciduous (40 - (20-10)%) Woodland With Shrubs	Forest	2676783
2TVL1-pc	20849-4277-Zt4	Very open low trees - Masquit (broadleaved evergreen)	Broadleaved Evergreen (40 - (20-10)%) Woodland, Single Layer Floristic Aspect: Masquit (Prosopis chilensis)	Forest	69171
2TVM26	20865-4196	Very open medium trees (broadleaved deciduous) with closed to open herbaceous	Broadleaved Deciduous (40 - (20-10)%) Woodland With Herbaceous Layer	Forest	121253

2WC	20003	Closed woody vegetation	Continuous Closed Woody Vegetation	Forest	
2WC7	20268	Closed woody with sparse trees	Closed Woody Vegetation With Emergents	Forest	44106
2WCZ	20004	Closed woody - fragmented	Fragmented Closed Woody Vegetation	Forest	30423
2WP26	20745	Open general woody (broadleaved deciduous - mixed) with closed to open herbaceous	Broadleaved Deciduous Open Woody Vegetation With Herbaceous Layer	Forest	42361
2WP6	20304	Open general woody with closed to open herbaceous	Open Woody Vegetation With Medium to Tall Herbaceous Layer	Forest	5962532
2WP67	20306-121335	Open general woody with closed to open herbaceous and sparse trees	Open Woody Vegetation With Medium to Tall Herbaceous Layer With Emergents	Forest	31538
2WP6Z	20309	Open general woody - fragmented with closed to open herbaceous	Open Woody Fragmented Vegetation With Herbaceous Layer	Forest	2120266
4SCJFF1Y	40176-39611-R2	Closed shrubs (broadleaved evergreen) on permanently flooded land - brackish water	Broadleaved Evergreen Closed Medium To High Shrubs On Permanently Flooded Land Water Quality: Brackish	Forest	1047
4TCFF1Y	40113-R2	Closed trees (broadleaved evergreen) on permanently flooded land - brackish water	Broadleaved Evergreen Forest On Permanently Flooded Land Water Quality: Brackish	Forest	4434
4TCIFF18	40501-33991-R1	Closed trees with closed to open shrubs on permanently flooded land - fresh water	Broadleaved Evergreen High Forest With High Shrubs On Permanently Flooded Land Water Quality: Fresh	Forest	

4TOF6	40344-1	Open trees with closed to open herbaceous on temporarily flooded land	Woodland With Herbaceous Vegetation On Temporarily Flooded Land	Forest	41528
4TOF8	40346-1	Open trees with sparse shrubs on temporarily flooded land	Woodland With Sparse Shrubs On Temporarily Flooded Land	Forest	38111
4TPF6	40344-4999-R1	Open general trees with closed herbaceous on temporarily flooded land - fresh water	Woodland With Closed Herbaceous Vegetation On Temporarily Flooded Land Water Quality: Fresh	Forest	
4TVF6	40344-287	Very open trees with closed to open herbaceous vegetation on temporarily flooded land	Woodland With Herbaceous Vegetation On Temporarily Flooded Land	Forest	130352
4TVF8	40343-572-R1	Very open trees with closed to open shrubs on temporarily flooded land - fresh water	Woodland With Open Shrubs On Temporarily Flooded Land Water Quality: Fresh	Forest	346740
4WPF6	40332-R1	Open general woody with closed to open herbaceous on temporarily flooded land - fresh water	Open Woody Vegetation With Herbaceous Vegetation On Temporarily Flooded Land Water Quality: Fresh	Forest	1473978
HR13T4-as	10786-12602-S14Zs6	Clustered Herbaceous Small Fields (1 add. Crop: Acacia senegal) - Rainfed	Scattered Clustered Small Sized Field(s) Of Rainfed Herbaceous Crop(s) (One Additional Crop) ( Tree Crop With Simultaneous Period) . Second Crop: Other Non-Food Crops - Acacia senegal	Forest	227477

HR3T4-as	10766-12602-S14Zs6	Continuous Herbaceous Small Fields (1 add. Crop: Acacia senegal) - Rainfed	Small Sized Field(s) Of Rainfed Herbaceous Crop(s) (One Additional Crop) ( Tree Crop With Simultaneous Period) . Second Crop: Other Non-Food Crops - Acacia senegal	Forest	397990
TBD47PL-an	10153-1891-S1099Zs5W7	Forest Plantation - Acacia nilotica	Permanently Cropped Area With Rainfed Broadleaved Deciduous Tree Crop(s) Dominant Crop: Wood and Timber - Other wood/timber - Acacia nilotica Crop Cover: Plantation(s)	Forest	250181
TBD47PL-as	10153-1891-S1099Zs6W7	Forest Plantation - Acacia Senegal	Permanently Cropped Area With Rainfed Broadleaved Deciduous Tree Crop(s) Dominant Crop: Wood and Timber - Other wood/timber - Acacia senegal Crop Cover: Plantation(s)	Forest	6971
TBE47PL-e	10153-1-S1002W7	Forest Plantation - Eucalyptus spp.	Permanently Cropped Area With Rainfed Broadleaved Evergreen Tree Crop(s) Dominant Crop: Wood and Timber - Eucalypt (Eucalyptus spp.) Crop Cover: Plantation(s)	Forest	524
TBE57PL-e	10157-1-S1002W7	Irrigated Forest Plantation - Eucalyptus	Permanently Cropped Area With Irrigated Broadleaved Evergreen Tree Crop(s) Dominant Crop: Wood and Timber - Eucalypt (Eucalyptus spp.) Crop Cover: Plantation(s)	Forest	1012

TNE47PL	10494-5671-W7	Forest Plantation	Permanently Cropped Area With Rainfed Needleleaved Evergreen Tree Crop(s) Crop Cover: (Plantation(s))	Forest	867
TR13H57V	10555-12627-W8	Irrigated Tree Crops, (1 add. Herbaceous Crop) - Clustered Small Field	Permanently Cropped Area With Scattered Clustered Small Sized Field(s) Of Surface Irrigated Tree Crop(s) (One Additional Crop) ( Herbaceous Terrestrial Crop With Simultaneous Period) . Crop Cover: Orchard(s)	Forest	41606
TR3H57V	10547-12627-W8	Irrigated Tree Crop (1 add. Herbaceous Crop) - Small Fields	Permanently Cropped Area With Small Sized Field(s) Of Surface Irrigated Tree Crop(s) (One Additional Crop) ( Herbaceous Terrestrial Crop With Simultaneous Period) . Crop Cover: Orchard(s)	Forest	167138