



Forestry Department

Food and Agriculture Organization of the United Nations

**GLOBAL FOREST RESOURCES
ASSESSMENT**

COUNTRY REPORTS

MALAWI

FRA2005/038
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.

Report preparation and contact person

Malawi has not nominated a National Correspondent to FRA 2005 and no official report has been received from the country.

This report is 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.

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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 |
|--|-----------------|-------------|--------------|---------------------|
| Department of Forestry, Ministry of Forestry and Natural Resources. 1993. Forest Resources Mapping and Biomass Assessment for Malawi . Implementing agency: Satellitbild | H | | 1973 1991 | |

1.2.2 Classification and definitions

| National class | Definition |
|----------------|--|
| B | Built-up area. Urban areas around major cities, but also large infrastructural areas such as airports. |
| Ef | Agriculture in forest area Extensive agriculture(20-70% cultivated land). Forest is the natural vegetation in this class, broken frequently, however, by patches of cultivation, often smallholdings. |
| Eg | Agriculture in mainly grass area Extensive agriculture(20-70% cultivated land) Found only in the southernmost part of the country,in flood-prone areas around Elephant Marsh in the Shire river valley. |
| Fbf | Brachyteria in flat area. Forest, less than 20% open land. Non-evergreen forest with |

| | |
|-----|---|
| | brachystegia as main species. |
| Fbh | Brachyteria in hilly area. Forest, less than 20% open land. Non-evergreen forest with brachystegia as main species. |
| Fe | Evergreen forest. Forest, less than 20% open land. Defined by property of having green leaves throughout the whole year, even during the dry seasons. The distribution of species is significantly different from that in brachystegia forest. Occurs in areas with high and evenly distributed rainfall, mainly at high altitude such as Mt. Mulanje, Nyika and Viphya. Often found near Brachystegia forest in hilly areas, but also common in open natural vegetation grass areas on high altitudes, giving a mottled pattern in the satellite imagery. |
| F1 | Logged forest. Logged areas are normally smaller than 100 hectares, and these were therefore not mapped. |
| Fpe | Eucalyptus plantation. Forest, less than 20% open land. Plantations usually protected, owned and managed by government, but can also have private owners. The interpretation was concentrated on plantations larger than the smallest mapping unit 100 hectares. Numerous other private plantations within agricultural areas were too small to be mapped. |
| Fpg | Gmelina plantation. Found in the Lilongwe district only. Forest, less than 20% open land. Plantations usually protected, owned and managed by government, but can also have private owners. The interpretation was concentrated on plantations larger than the smallest mapping unit 100 hectares. Numerous other private plantations within agricultural areas were too small to be mapped. |
| Fpp | Pine plantation. Widely spread all over the country, mainly on high altitudes. Local knowledge of the locations of pine plantations proved important. Forest, less than 20% open land. Plantations usually protected, owned and managed by government, but can also have private owners. The interpretation was concentrated on plantations larger than the smallest mapping unit 100 hectares. Numerous other private plantations within agricultural areas were too small to be mapped. |
| Fpr | Rubber plantation. Relatively new plantation species. Found in the Nkhatabay district only. Forest, less than 20% open land. Plantations usually protected, owned and managed by government, but can also have private owners. The interpretation was concentrated on plantations larger than the smallest mapping unit 100 hectares. Numerous other private plantations within agricultural areas were too small to be mapped. |
| Fpt | Tung plantation. Found in areas around Mzuzu only. The extent of tung plantations has decreased during the last 20 years, remaining ones often existing side by side with other tree plantations. Accordingly, mapping units are complexes with tung plantations as predominant land cover. Forest, less than 20% open land. Plantations usually protected, owned and managed by government, but can also have private owners. The interpretation was concentrated on plantations larger than the smallest mapping unit 100 hectares. Numerous other private plantations within agricultural areas were too small to be mapped. |
| Ia | Arable land Intensive agriculture (more than 70% cultivated land) Dominates South and Central regions. Contains smallholder cultivation as well as plantations smaller than 100 hectares. Crop can be maize, ground nuts, cassava, cashew nuts, cotton ect. Small scattered forest patches and single trees occur. |
| Ipc | Coffee/Tea/Macademia Intensive agriculture plantations, larger than 100 hectares (more than 70% of total land area is cultivated land) Found in the Nkhatabay district, but mainly in the south of Malawi in large estates in the Thyolo and Mulanje districts. Larger field structure than in Arable land (Ia). |
| Ipl | Leucaena Intensive agriculture plantations, larger than 100 hectares (more than 70% of total land area is cultivated land). A shrub grown for agroforestry purposes. Found in the Machinga and Chikwawa districts only. |
| Ips | Sugar Intensive agriculture plantations, larger than 100 hectares (more than 70% of total land area is cultivated land). Large estates with characteristic field patterns in the Nkhatakota and Chikwawa districts |

| | |
|-----------|--|
| Ipt | Tobacco/Maize Intensive agriculture plantations, larger than 100 hectares (more than 70% of total land area is cultivated land). Small and large estates spread all over Malawi with a concentration on the Central region. Rotation cropping tobacco-maize. Large estates usually located in flat areas of existing or former <i>Brachystegia</i> forests. Often a characteristic pattern with long narrow strips, but irregular rectangular fields can also occur. |
| Ir | Rice scheme Intensive agriculture plantations, larger than 100 hectares (more than 70% of total land area is cultivated land). Irrigated paddy rice cultivation found in the Karonga district only. Identifiable by its shape of irrigated area in the dry surroundings. |
| M | Marshy area or swamp Found in all three regions. Waterlogged areas, usually with grass vegetation and often partly cultivated. |
| Nb | Bare rock Non-vegetated land. Small class, usually granite rock outcrops, occurring in all three regions. |
| Nr | River bed or beach Non-vegetated land. Small class, small narrow areas along lakes, beaches and rivers. Only in Nkhotakota and Salima districts were the beaches large enough to be mapped. |
| Od | Dambo (often cultivated) Areas along natural drainage patterns in flat and undulating areas. Dambos can be considered as riverbeds of intermittent rivers, prone to flooding during wet seasons and therefore uninhabited. The ground cover is grass, often used for grazing. Soil and moisture conditions make parts of the dambos favourable for cultivation in many cases, which is reflected in images by agricultural patterns. Open natural vegetation: contains more than 20% open land and less than 20% of its total area is under cultivation. |
| Og | Grass Found at high altitudes on mountain ridges and plateaus, in all three regions of Malawi. Open natural vegetation: contains more than 20% open land and less than 20% of its total area is under cultivation. |
| Os | Savanna Natural grassland with scattered trees. Found only in flat areas along the southwestern shores of Lake Malawi. Characterized by the lack of agricultural pattern in non-forested flat areas. Open natural vegetation: contains more than 20% open land and less than 20% of its total area is under cultivation. |
| Unclassed | Null |
| W | Water surface. Lakes and wide rivers. |

1.2.3 Original data

| National class | Original data (1000 ha) | |
|----------------|-------------------------|-------|
| | 1973 | 1991 |
| B | | 22 |
| Ef | | 2,433 |
| Eg | | 235 |
| Fbh | 2,400 | 1,686 |
| Fbf | 1,913 | 733 |
| Fe | 88 | 83 |
| Fl | - | 5 |
| Fpe | 5 | 24 |
| Fpg | 1 | 1 |

| | | |
|------------------------|---------------|---------------|
| Fpp | 42 | 107 |
| Fpr | - | 3 |
| Fpt | 4 | 2 |
| Ia | | 2,783 |
| Ipc | | 44 |
| Ipl | | 7 |
| Ips | | 21 |
| Ipt | | 244 |
| Ir | | 7 |
| M | | 177 |
| Nb | | 16 |
| Nr | | 0 |
| Od | | 415 |
| Og | | 311 |
| Os | | 39 |
| Unclassed | 4,948 | 2 |
| Total Land Area | 9,399 | 9,399 |
| W | 2,423 | 2,423 |
| Total | 11,822 | 11,822 |

1.3 Analysis and processing of national data

1.3.1 Calibration

| FAOSTAT | Area ('000 ha) | Calibr. Factor |
|--------------------|----------------|----------------|
| Land Area | 9408 | 1.0009398 |
| Total Country Area | 11848 | |
| Inland Water | 2440 | |

| | |
|---|----------|
| Country area according to data source ('000 ha) | 11 821.9 |
|---|----------|

After calibration, we get:

| National class | Calibrated | |
|------------------------|--------------|--------------|
| | 1973 | 1991 |
| B | - | 22 |
| Ef | - | 2,435 |
| Eg | - | 236 |
| Fbh | 2,402 | 1,687 |
| Fbf | 1,915 | 734 |
| Fe | 88 | 83 |
| F1 | - | 5 |
| Fpe | 5 | 24 |
| Fpg | 1 | 1 |
| Fpp | 42 | 107 |
| Fpr | - | 3 |
| Fpt | 4 | 2 |
| Ia | - | 2,786 |
| Ipc | - | 44 |
| Ipl | - | 7 |
| Ips | - | 21 |
| Ipt | - | 245 |
| Ir | - | 7 |
| M | - | 177 |
| Nb | - | 16 |
| Nr | - | 0 |
| Od | - | 415 |
| Og | - | 311 |
| Os | - | 39 |
| Unclassed | 4,952 | 2 |
| Total Land Area | 9,408 | 9,408 |

1.3.2 Estimation and forecasting

The amount of forest has been estimated by linear extrapolation for 1990, 2000 and 2005 after reclassification.

1.4 Reclassification into FRA 2005 classes

| National class | FRA CLASSIFICATION | | | |
|----------------|--------------------|-------------------|------------|--------------|
| | Forest | Other wooded land | Other land | Inland water |
| B | | | 100% | |
| Ef | 50% | 50% | | |
| Eg | | | 100% | |
| Fbh | 100% | | | |
| Fbf | 100% | | | |
| Fe | 100% | | | |
| F1 | 100% | | | |
| Fpe | 100% | | | |

| | | | | |
|-----------|------|--|------|------|
| Fpg | 100% | | | |
| Fpp | 100% | | | |
| Fpr | 100% | | | |
| Fpt | 100% | | | |
| Ia | | | 100% | |
| Ipc | | | 100% | |
| Ipl | | | 100% | |
| Ips | | | 100% | |
| Ipt | | | 100% | |
| Ir | | | 100% | |
| M | | | 100% | |
| Nb | | | 100% | |
| Nr | | | 100% | |
| Od | | | 100% | |
| Og | | | 100% | |
| Os | | | 100% | |
| Unclassed | | | 100% | |
| W | | | | 100% |

After reclassification, the following table is obtained:

| | 1973 | 1991 |
|---------------------------|--------------|--------------|
| Forest | 4 456 | 3 863 |
| OWL | - | - |
| OL | 4 952 | 5 545 |
| Total Land area | 9 408 | 9 408 |
| Water | 2 440 | 2 440 |
| Total country area | 11848 | 11848 |

1.5 Data for National reporting table T1

| FRA 2005 Categories | Area (1000 hectares) | | |
|---|----------------------|---------------|---------------|
| | 1990 | 2000 | 2005 |
| Forest | 3 896 | 3 567 | 3 402 |
| Other wooded land | - | - | - |
| Other land | 5 512 | 5 841 | 6 006 |
| ...of which with tree cover ¹⁾ | 7 | 7 | 7 |
| Inland water bodies | 2 440 | 2 440 | 2 440 |
| TOTAL | 11 848 | 11 848 | 11 848 |

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

Due to absence of sufficient information, land use type Ef (Agriculture in forest area) was classified as 50% forest and 50% other land.

Other land with tree cover refers to land use class Ipl, which consists of leucaena, grown for agroforestry purposes in intensive agriculture plantations.

According to the original data source, estimations for plantations only included those larger than the smallest mapping unit of 100 hectares. Numerous other private plantations were too small to be mapped. For this reason, the plantation area (and thus the forest area) obtained in the original data is likely to be an underestimate.

The figures on forest cover for 1990 and 2000 differ from those reported in FRA 2000, since a typographical error in the inland water area in one of the tables, led to the use of a wrong calibration factor for FRA 2000.

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 |
|---|-----------------|-------------|-----------|---------------------|
| FAO 1989. Seminar on forest statistics in Africa. FAO, Blantyre, Malawi | | | 1985-1989 | |

2.2.2 Classification and definitions

No definitions were provided.

2.2.3 Original data

a) Source: FAO 1989.

| | Area of forest Plantations in Malawi ('000 ha) | | | | |
|----------------|--|------|------|------|------|
| | 1985 | 1986 | 1987 | 1988 | 1989 |
| Government | 89.3 | 90.8 | 91.6 | 95.7 | 97.5 |
| Non-government | 26.5 | 32.1 | 39.3 | 47.8 | 58.1 |

2.3 Data for National reporting table T2

| FRA 2005 Categories | Forest | | Other wooded land | |
|---------------------|--------|------|-------------------|------|
| | 1990 | 2000 | 1990 | 2000 |
| Private ownership | | | | |
| Public ownership | | | | |
| Other ownership | | | | |
| TOTAL | | | | |

2.4 Comments to National reporting table T2

No original data is available on the ownership of natural forests in Malawi. Information on ownership of plantations exist for 1985 to 1989 indicating that as of 1990, around 100 000 ha of plantations were owned by government and around 60 000 ha were owned by other entities including private owners, local authorities, schools, missions and farmers.

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 |
|--|-----------------|--|---------|---------------------|
| Department of Forestry, Ministry of Forestry and Natural Resources. 1993. Forest Resources Mapping and Biomass Assessment for Malawi . Implementing agency: Satellitbild | H | Forest reserves, proposed forest reserves, national parks, Blantyre fuelwood planning area | 1991 | |

3.2.2 Classification and definitions

Same as for T1.

3.2.3 Original data

Data for 1991. Source: Department of Forestry, Ministry of Forestry and Natural Resources, 1993

| Forest reserves | Area (ha) |
|------------------------|------------------|
| Fe | 34292.2 |
| Fbh | 539865.2 |
| Fbf | 59893.3 |
| Fl | 4817.4 |
| Fpe | 12812.3 |
| Fpp | 102317.5 |
| Fpr | 1.6 |
| Fpt | 5.4 |
| Ef | 14589.1 |

| National Parks | Area (ha) |
|-----------------------|------------------|
| Fe | 25988.3 |
| Fbh | 128643.0 |
| Fbf | 238870.9 |
| Fpp | 762.1 |
| Ef | 4189.9 |

| Game Reserves | Area (ha) |
|----------------------|------------------|
| Fbh | 208985.0 |
| Fbf | 135588.7 |
| Ef | 14865.0 |

| Proposed Forest Reserves | Area (ha) |
|---------------------------------|------------------|
| Fe | 950.4 |
| Fbh | 105119.9 |
| Fbf | 16671.3 |
| Ef | 21769.4 |

| Blantyre Fuelwood Planning Area | Area (ha) |
|--|------------------|
| Fbh | 36458.6 |
| Fbf | 3558.9 |
| Fpe | 1170.1 |
| Ef | 19092.3 |

Summarising the original data, we get:

| Type | Area (ha) |
|--|------------------|
| Forests in Forest reserves | 761299.5 |
| Forests in National Parks | 396359.3 |
| Forests in Game Reserves | 352006.2 |
| Forests in Proposed Forest Reserves | 133626.3 |
| Forests in the Blantyre Fuelwood Planning Area | 50733.8 |

In addition to the above, the author also gives the following national figures for plantations:

| National Classification | CALIBRATED AREA | |
|-------------------------|-----------------|--------|
| | 1973 | 1991 |
| Fpe | 4.63 | 24.07 |
| Fpg | 0.61 | 0.72 |
| Fpp | 41.63 | 107.39 |
| Fpr | 0.00 | 2.67 |
| Fpt | 3.79 | 1.71 |

Summarising, this gives:

| National Classification | CALIBRATED AREA ('000 ha) | |
|-------------------------|---------------------------|------|
| | 1973 | 1991 |
| Forest Plantations | 52 | 137 |

3.3 Analysis and processing of national data

3.3.1 Calibration

| FAOSTAT | Area ('000 ha) | Calibr. Factor |
|--------------------|----------------|----------------|
| Land Area | 9408 | 1.0009398 |
| Total Country Area | 11848 | |
| Inland Water | 2440 | |

| | |
|--|----------|
| Country area according to data source (* 1000 ha) | 11 821.9 |
|--|----------|

After calibration of the original data :

| Type | Area (ha) |
|--|-----------|
| Forests in Forest reserves | 762014.9 |
| Forests in National Parks | 396731.7 |
| Forests in Game Reserves | 352337.0 |
| Forests in Proposed Forest Reserves | 133751.9 |
| Forests in the Blantyre Fuelwood Planning Area | 50781.4 |

3.3.2 Estimation and forecasting

Linear interpolation total was done in order to obtain an estimate for 1990 for forest plantations. For the other classes listed above, the 1991 values were reported as 1990 values.

3.4 Reclassification into FRA 2005 classes

| | Production | Conservation of Biodiversity | No or unknown function |
|--|------------|------------------------------|------------------------|
| Forests in Forest reserves | 100% | | |
| Forests in National Parks | 0.2% | 99.8% | |
| Forests in Game Reserves | | 100% | |
| Forests in Proposed Forest Reserves | | | 100% |
| Forests in the Blantyre Fuelwood Planning Area | 100% | | |

The 0.2 percent of Forests in National Parks allocated to Production function, consist o a small area (762 ha) of pine plantations located within national parks.

The plantation area was classified as Production and the remaining natural forest classified under no/unknown function.

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 | 945 | | | | | |
| Protection of soil and water | | | | | | |
| Conservation of biodiversity | 748 | | | | | |
| Social services | | | | | | |
| Multiple purpose | | | | not appl. | not appl. | not appl. |
| No or unknown function | 2203 | | | not appl. | not appl. | not appl. |
| Total - Forest | 3896 | 3566 | 3402 | 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 | | | | not appl. | not appl. | not appl. |
| Total – Other wooded land | | | | not appl. | not appl. | not appl. |

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 |
|--|-----------------|-------------|--------------|---------------------|
| Department of Forestry, Ministry of Forestry and Natural Resources. 1993. Forest Resources Mapping and Biomass Assessment for Malawi . Implementing agency: Satellitbild | H | | 1973 1991 | |

4.2.2 Classification and definitions

Same as for T1

4.2.3 Original data

| National class | Calibrated | |
|----------------|------------|-------|
| | 1973 | 1991 |
| Ef | - | 2,435 |
| Fbh | 2,402 | 1,687 |
| Fbf | 1,915 | 734 |
| Fe | 88 | 83 |
| Fl | - | 5 |
| Fpe | 5 | 24 |
| Fpg | 1 | 1 |
| Fpp | 42 | 107 |
| Fpr | - | 3 |
| Fpt | 4 | 2 |

4.3 Analysis and processing of national data

4.3.1 Estimation and forecasting

Values for 1990, 2000 and 2005 were calculated through linear intrapolation and extrapolation.

4.4 Reclassification into FRA 2005 classes

| | Primary | Modified natural | Semi-natural | Productive plantation | Protective plantation |
|-----|---------|------------------|--------------|-----------------------|-----------------------|
| Ef | | 100% | | | |
| Fbh | 100% | | | | |
| Fbf | | 100% | | | |
| Fe | | 100% | | | |
| F1 | | 100% | | | |
| Fpe | | | | 100% | |
| Fpg | | | | 100% | |
| Fpp | | | | 100% | |
| Fpr | | | | 100% | |
| Fpt | | | | 100% | |

After reclassification, we get:

| | Forest ('000 ha) | |
|-----------------------|------------------|-------------|
| | 1973 | 1991 |
| Primary forests | 2402 | 1687 |
| Modified natural | 2003 | 2039 |
| Productive plantation | 52 | 137 |
| Protective plantation | | |
| Total | 4456 | 3863 |

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 | 1727 | 1330 | 1132 | | | |
| Modified natural | 2037 | 2057 | 2067 | | | |
| Semi-natural | | | | | | |
| Productive plantation | 132 | 180 | 204 | | | |
| Protective plantation | | | | | | |
| TOTAL | 3896 | 3567 | 3402 | | | |

4.6 Comments to National reporting table T4

The breakdown of forest area for 2000 and 2005 shown in table T4 should be treated as rough estimates since they are based on data from 1973 and 1991.

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 |
|---|-----------------|---------------|---------|---------------------|
| Department of Forestry, Ministry of Forestry and Natural Resources. 1993. Forest Resources Mapping and Biomass Assessment for Malawi. Implementing agency: Satellitbild | H | Growing stock | 1991 | |

5.2.2 Classification and definitions

The data source does not give a clear definition of tree volume, but the procedure used for calculating volume of felled sample trees indicates that the volume figures refer to trees with diameter > 5 cm and includes stem and branches down to a minimum diameter of 2 cm.

5.2.3 Original data

The data source provides the following data for natural forests for the reference year 1991:

| Forest class | Volume (1000 m3) | Area (1000 ha) |
|---|------------------|----------------|
| Fe (Evergreen forest) | 20 610 | 82.8 |
| Fbh (Brachystegia forest in hilly areas) | 188 152 | 1 689.6 |
| Fbf (Brachystegia forest in flat areas) | 65 760 | 734.7 |
| Total | 274 522 | 2 507.1 |

From these original data we can calculate the average volume of natural forest.
Average volume = 109.5 m³/ha

5.3 Analysis and processing of national data

5.3.1 Calibration

Given that surface area calibration has already been done for T1, no further calibration is necessary.

5.3.2 Estimation and forecasting

The original data on growing stock only refer to natural forests, but as no other information is available on growing stock of planted forests, the average volume per hectare as above has been applied to the area reported as forest in table T1 for all three reference years.

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 | 427 | 391 | 373 | NDA | NDA | NDA |
| Commercial growing stock | NDA | NDA | NDA | 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 | 5 | |
| 2. Minimum diameter at the top end of stem (Y) for calculation of Growing stock | cm | 2 | |
| 3. Minimum diameter of branches included in Growing stock (W) | cm | 2 | |
| 4. Minimum diameter at breast height of trees in Commercial growing stock (Z) | cm | | Not defined |
| 5. Volume refers to “Above ground” (AG) or “Above stump” (AS) | AG / AS | AS | |
| 6. Have any of the above thresholds (points 1 to 4) changed since 1990 | Yes/No | No | Only one inventory done in 1991 |
| 7. If yes, then attach a separate note giving details of the change | Attachment | | |

5.5 Comments to National reporting table T5

The figures reported here are higher than what was reported in FRA 2000 due to an adjustment done in FRA 2000 to make the volume correspond to stem volume only.

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

No national data on biomass are available, so the calculation is based on the growing stock data for the FRA 2005 reference years as presented in table T5.

6.3 Analysis and processing of national data

The analysis is based on the growing stock data presented in table T5, to which the following formula and conversion factors have been applied:

Above ground biomass (AGB) = Growing stock* wood density * BEF

Below ground biomass (BGB) = AGB * 0.24

Wood density = 0.58 Tons /m³ (FAO Forestry Paper 134)

BEF = 1.2 (Expert estimate, considering that branches down to 2 cm are included in the growing stock figure)

Data for dead wood biomass has not been calculated.

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 | 296 | 272 | 260 | | | |
| Below-ground biomass | 71 | 65 | 62 | | | |
| Dead wood biomass | NDA | NDA | NDA | | | |
| TOTAL | 367 | 337 | 322 | | | |

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

Biomass data from table T6 has been used as input for the carbon estimations.

7.3 Analysis and processing of national data

Carbon stock is calculated by multiplying the biomass by 0.5. Carbon stocks of litter and soil have not been estimated.

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 | 148 | 136 | 130 | | | |
| Carbon in below-ground biomass | 36 | 33 | 31 | | | |
| Sub-total: Carbon in living biomass | 184 | 169 | 161 | | | |
| 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 | NDA | NDA | NDA | | | |
| TOTAL CARBON | ID | ID | ID | | | |

8 Table T8 – Disturbances affecting health and vitality

No information has been found to support estimates of the disturbances affecting health and vitality.

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 redlist | H | | | |

9.2.2 Original data.

Endangered species

Buxus nyasica, *Deinbollia nyasica*, *Widdringtonia whytei*

Vulnerable species

Cola mossambicensis, *Encephalartos gratus*, *Khaya anthotheca*, *Morinda asteroscepa*, *Ocotea kenyensis*, *Philippia nyassana*, *Rawsonia burtt-davyi*, *Ternstroemia polypetala*, *Trichocladus goetzei*, *Zanthoxylum deremense*.

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 | 3 |
| Vulnerable tree species | 10 |

9.4 Comments to National reporting table T9

IUCN does not give a description of the species that would allow the selection of tree species from their red list. For this reason, the Forestry compendium website <http://www.cabicompendium.org/fc/home.asp> was used to identify the tree species from the redlist.

10 Table T10 – Growing stock composition

No information has been found to support estimates of the growing stock composition.

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 | | -Industrial roundwood production, -Wood fuel production | 1988-2003 1988-2003 | |

11.2.2 Original data

Industrial roundwood production (m3 under bark)

| 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 |
|---------|---------|---------|---------|---------|---------|---------|---------|
| 363 000 | 378 000 | 422 000 | 429 000 | 476 000 | 481 000 | 481 000 | 484 000 |

| 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 |
|---------|---------|---------|---------|---------|---------|---------|---------|
| 490 000 | 499 000 | 509 000 | 520 000 | 520 000 | 520 000 | 520 000 | 520 000 |

Wood fuel production (m3 under bark)

| 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 |
|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| 4,898,173 | 5,141,863 | 5,164,443 | 5,122,063 | 5,207,139 | 4,988,708 | 5,101,330 | 4,896,283 |

| 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 |
|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| 4,801,751 | 4,827,059 | 4,881,301 | 4,921,718 | 4,964,075 | 4,995,659 | 5,029,117 | 5,064,449 |

11.3 Analysis and processing of national data

11.3.1 Estimation and forecasting

A five year average (1988-1992) was used as the value for 1990 and another five year average (1998-2000) was used as the value for 2000. Linear estimation was used to calculate the value for 2005.

| FRA 2005 Categories | Volume in cubic meters of roundwood under bark | | |
|----------------------|--|-----------|-----------------|
| | 1990 | 2000 | 2005 (forecast) |
| Industrial roundwood | 413 600 | 517 800 | 569 900 |
| Woodfuel | 5 106 736 | 4 958 374 | 4 884 193 |

FAOSTAT gives values under bark. To get the volume over bark, these values are multiplied by 1.15. The resulting data is given in the final reporting table.

11.4 Reclassification into FRA 2005 classes

Industrial roundwood → 100% industrial wood removal.

Wood fuel production → 100% wood fuel 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 | 475 | 595 | 655 | | | |
| Woodfuel | 5 873 | 5 702 | 5 617 | | | |
| TOTAL for Country | 6 348 | 6 298 | 6 272 | | | |

11.6 Comments to National reporting table T11

FAOSTAT does not differentiate between “Forest” and “Other Wooded Land”. All data reported under “Forest” is therefore the sum of the classes: “Forest” and “Other Wooded Land”.

12 Table T12 – Value of wood removal

No information has been found to support estimates of the value of wood removal

13 Table T13 – Non-wood forest product removal

No information has been found to support estimates of non-wood forest product removal

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

No information has been found to support estimates of the value of the non-wood forest product removal

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 |
|--|-----------------|--|-----------|---------------------|
| Lebedys, A. 2003. Trends and current status of the contribution of the forest sector to national economies (final draft).FAO, Rome | | Employment in forestry, logging and related services | 1990-2000 | |

15.2.2 Classification and definitions

| National class | Definition |
|------------------------|--|
| Log sales | Logs harvested by the department of forestry and sold by the roadside |
| Royalties | Sales of standing timber from state forests and forest reserves. |
| Log sales to Viply | Sales of standing timber to Viply Ltd. |
| Miscellaneous Receipts | This includes a variety of sales. The most important for 1990 being the royalties on wood from customary land and Viphya farm sales. |

15.2.3 Original data

Employment in forestry, logging and related services

| 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 |
|------|------|------|------|------|------|------|------|------|------|------|
| 808 | 821 | 911 | 921 | 921 | 927 | 938 | 955 | 975 | 996 | 996 |

15.3 Reclassification into FRA 2005 classes

Employment in forestry, logging and related services = 100% Primary production of goods.

15.4 Data for National reporting table T15

| FRA 2005 Categories | Employment (1000 person-years) | |
|---------------------------------|--------------------------------|-----------|
| | 1990 | 2000 |
| Primary production of goods | 0.808 | 0.996 |
| Provision of services | | |
| Unspecified forestry activities | | |
| TOTAL | ID | ID |

15.5 Comments to National reporting table T15

Using data from the National Statistical Service of Malawi, data was calculated by taking the employment per cubic metre of roundwood production for the year 2000 and using the production data in the years 1990-1999 to estimate the likely level of employment. For this reason, the data is considered to be an under-estimate.