



**Forestry Department**

**Food and Agriculture Organization of the United Nations**

**GLOBAL FOREST RESOURCES  
ASSESSMENT 2010**

**COUNTRY REPORT**

**MYANMAR**

FRA2010/141  
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## The Forest Resources Assessment Programme

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

FAO, at the request of its member countries, regularly monitors the world's forests and their management and uses through the Forest Resources Assessment Programme. This country report forms part of the Global Forest Resources Assessment 2010 (FRA 2010).

The reporting framework for FRA 2010 is based on the thematic elements of sustainable forest management acknowledged in intergovernmental forest-related fora and includes variables related to the extent, condition, uses and values of forest resources, as well as the policy, legal and institutional framework related to forests. More information on the FRA 2010 process and the results - including all the country reports - is available on the FRA Web site ([www.fao.org/forestry/fra](http://www.fao.org/forestry/fra) ).

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The Global Forest Resources Assessment Country Report Series is designed to document and make available the information forming the basis for the FRA 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 2010 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
GOM. 1991. Forest Cover of Myanmar, the 1989 Appraisal. Kyaw Tint and Tun Hla, Yangon January 1991.	H	Extent	1975 & 1989	
GOM. 1997. ISDP (Information System Development Project for the Management of Tropical Forest), Rakhine, Yangon, Bago, Magwe, Chin, Mandalay, Kayah, Sagaing, Ayeyarwady State and Divisions	H	Extent	1997	
GOM. 1997. Land Use and Land Cover Mapping for Mon State	H	Extent	1997	
GOM. 1998. Anti-narcotic sampling frame mapping, Landuse Map of Shan States using 2001 Landsat 7 ETM data.	H	Extent	1998	
GOM. 2000a. Tanintharyi Division, Study on forest resources and landuse changes in the southern	H	Extent	2000	

part of Myanmar. FAO,FD				
GOM. 2000b. Kachin State Land Cover Mapping, Inter Departmental Project, Forest Department	H	Extent	2000	
GOM. 2000c. Karen State Land Cover Mapping, Inter Departmental Project	H	Extent	2000	
Remote sensing interpretation	H	Extent	2006	Most of the country areas have been classified by using 2006 Landsat 7 ETM, some areas have been used 2007 and 2008 Landsat 7 ETM and only Shan State have been used 2005 Landsat 5 TM data. That is why Land cover can be said 2006 data because of mostly using 2006 Landsat 7 ETM and field checked had been thoroughly done during 2006.

### 1.2.2 Classification and definitions

National class	Definition
<b>Closed Forest</b>	under forestry or no land use, spanning more than 0.5hectares; with trees higher than 5 meters and a canopy cover of more than 40 percent, or trees able to reach these thresholds <i>in situ</i> .
<b>Open Forest (normally degraded forests)</b>	under forestry or no land use, spanning more than 0.5hectares; with trees higher than 5 meters and a canopy cover between 10 and 40 percent, or trees able to reach these thresholds <i>in situ</i> .
<b>Mangrove</b>	Area covered by Mangrove tree species as interpreted from satellite imagery and aerial photographs
<b>Agriculture</b>	Permanent agriculture areas, mostly from plains and valleys. In some cases it is mixed with shifting cultivation
<b>Shifting Cultivation</b>	Shifting Cultivation in the forested areas and mountain areas
<b>Other Wooded lands (Scrub and Grass Land)</b>	Areas mostly covered by grassland and stunted trees, shrub forests, lower than 10% crown density.
<b>Water</b>	Inland water bodies, lakes, reservoirs, large streams and rivers
<b>Others</b>	Other areas (snow, rock, bareland, sandbanks)

### 1.2.3 Original data

FRA Classes	Extent in "000" ha				
	1975	1989	1997	1998	2006
Closed Forests	30322.0	31553.8	25293.9	25516.6	17468.58
Open Forests	10873.6	8131.1	10080.8	9970.5	15542.56
<b>Sub -Total Forests</b>	<b>41195.6</b>	<b>39684.9</b>	<b>35374.7</b>	<b>35487.1</b>	<b>33011.14</b>
Other wooded Land	8876.0	10178.0	11919.3	10547.0	19949.16
Other Land (including water bodies)	17586.8	17792.9	20363.8	21623.8	14697.61
<b>Total Land area</b>	<b>67658.4</b>	<b>67655.8</b>	<b>67657.9</b>	<b>67657.9</b>	<b>67657.9</b>

Remote Sensing and GIS Section of Planning and Statistics Division, Forest Department, under Ministry of Forestry is the organization responsible for processing forest cover data of Myanmar.

The first appraisal was initiated in 1957 using 1:24,000 scale aerial photography and manual interpretation. Second appraisal (1975) was assessed by using 1:1million scale color composite from 80m x 80mx MSS data, third appraisal (1989) was implemented with 1:500,000 scale Landsat TM data (30m x 30m resolution) and manual interpretation. Fourth Appraisal compiled for FRA2000 in 1997 was a combination of various surveys, however, majority consisted digital classification of 30m x 30m Landsat TM data.

FRA2005 and Current FRA2010 data contain Landsat 7 ETM databases, some areas have been checked in the field thoroughly by using 30 meter resolution Landsat images and 4 meter resolution IKONOS images from anti-narcotic surveys.

### **1.3 Analysis and processing of national data**

#### **1.3.1 Calibration**

FAOSTAT figures (as from FRA 2010 guidelines)

Country area: 67 658 Land area: 65 755 Inland water: 1 903

#### **1.3.2 Estimation and forecasting**

Estimation for forest for 1990, 2000, 2005 and 2010 is being done by using change forecast function using 1989, 1998 and 2006.

Estimation for other wooded land has been done using 2006 figures and applying the change rate from the 1989 and 1998 figures to the 2006 to calculate 1990, 2000, 2005 and 2010 figures. This calculation was necessary since the 1989 and 1998 surveys looked much more comparable each other than the one of 2006 which is belief to be the most reliable since it was followed by field checking and it is the most updated dataset.

	<b>1990</b>	<b>2000</b>	<b>2005</b>	<b>2010</b>
Closed forest	30883	23505	18475	13445
Open forest	8335	11364	14846	18329
Total forest	39218	34868	33321	31773
Other Wooded land	19498	19703	19908	20113
Other land	7039	11184	12526	13869
Inland Water bodies	1 903	1 903	1 903	1 903
<b>Total Area of Country</b>	<b>67658</b>	<b>67658</b>	<b>67658</b>	<b>67658</b>

#### **1.3.3 Reclassification into FRA 2010 categories**

This step is not necessary because national and FRA categories match with each other.

## 1.4 Data for Table T1

FRA 2010 categories	Area (1000 hectares)			
	1990	2000	2005	2010
Forest	39218	34868	33321	31773
Other wooded land	19498	19703	19908	20113
Other land	7039	11184	12526	13869
...of which with tree cover				
Inland water bodies	1 903	1 903	1 903	1 903
<b>Total for country</b>	<b>67658</b>	<b>67658</b>	<b>67658</b>	<b>67658</b>

## 1.5 Comments to Table T1

Variable / category	Comments related to data, definitions, etc.	Comments on the reported trend
Forest		
Other wooded land		
Other land		
Other land with tree cover	There is no national information on “other land that has a tree cover”.	
Inland water bodies		

### Other general comments to the table

Remote Sensing and GIS Section of Planning and Statistics Division, Forest Department, under Ministry of Forestry is the organization responsible for processing forest cover data of Myanmar. The first forest resource appraisal in the country was initiated in 1957 using 1:24,000 scale aerial photography and manual interpretation. The second appraisal (1975) was assessed by using 1:1million scale colour composite from 80m x 80mx MSS data. The third appraisal (1989) was implemented with 1:500,000 scale Landsat TM data (30m x 30m resolution) and manual interpretation. The fourth appraisal compiled for FRA2000 in 1997 was a combination of various surveys, however, majority consisted digital classification of 30m x 30m Landsat TM data. The latest appraisal has data from Landsat 7 ETM databases, some of the areas have been checked in the field thoroughly by using 1 meter resolution IKONOS images from anti-narcotic surveys. Four separate survey data are used as baseline data. 67% of the data is from the Information System Development Project for the Management of Tropical Forest. The data for Shan State and Kachin State are only estimation in FRA2000 as these areas are partially covered with 1997 surveys. Now a landcover map for these two states is being developed. Data for Taninthary Division is produced from 1997 (average image year) using manual interpretation of 1:250,000 scale print outs of Landsat 5 TM. The latest data is digitally interpreted data of Landsat7 ETM. Moreover, year 2000 data for Karen State is amended by RS & GIS Section. As all different surveys are controlled and driven by the user needs, so that priority classifications are different. All National Data are grouped into following classification.

### Expected year for completion of ongoing/planned national forest inventory and/or RS survey / mapping

Field inventory	
Remote sensing survey / mapping	



## 2 Table T2 – Forest ownership and management rights

### 2.1 FRA 2010 Categories and definitions

Category	Definition
Public ownership	Forest owned by the State; or administrative units of the public administration; or by institutions or corporations owned by the public administration.
Private ownership	Forest owned by individuals, families, communities, private co-operatives, corporations and other business entities, private religious and educational institutions, pension or investment funds, NGOs, nature conservation associations and other private institutions.
Individuals ( <i>sub-category of Private ownership</i> )	Forest owned by individuals and families.
Private business entities and institutions ( <i>sub-category of Private ownership</i> )	Forest owned by private corporations, co-operatives, companies and other business entities, as well as private non-profit organizations such as NGOs, nature conservation associations, and private religious and educational institutions, etc.
Local communities ( <i>sub-category of Private ownership</i> )	Forest owned by a group of individuals belonging to the same community residing within or in the vicinity of a forest area. The community members are co-owners that share exclusive rights and duties, and benefits contribute to the community development.
Indigenous / tribal communities ( <i>sub-category of Private ownership</i> )	Forest owned by communities of indigenous or tribal people.
Other types of ownership	Other kind of ownership arrangements not covered by the categories above. Also includes areas where ownership is unclear or disputed.
<b>Categories related to the holder of management rights of public forest resources</b>	
Public Administration	The Public Administration (or institutions or corporations owned by the Public Administration) retains management rights and responsibilities within the limits specified by the legislation.
Individuals/households	Forest management rights and responsibilities are transferred from the Public Administration to individuals or households through long-term leases or management agreements.
Private institutions	Forest management rights and responsibilities are transferred from the Public Administration to corporations, other business entities, private co-operatives, private non-profit institutions and associations, etc., through long-term leases or management agreements.
Communities	Forest management rights and responsibilities are transferred from the Public Administration to local communities (including indigenous and tribal communities) through long-term leases or management agreements.
Other form of management rights	Forests for which the transfer of management rights does not belong to any of the categories mentioned above.

## 2.2 National data

### 2.2.1 Data sources

References to sources of information	Quality (H/M/L)	Variable(s)	Year(s)	Additional comments
GOM. 1989. Forest Department, Planning and Statistics Div.	M	Ownership	1985-1989	
GOM. 2001 Statistical Year Book 2001	M	Ownership	1990-1996	
GOM. 2002. Statistical Year Book 2002	M	Ownership	1997-2001	
GOM. 2003. Forest Department, Planning and Statistics Div.	M	Ownership	2002-2003	
GOM. 2004. Forest Department, Planning and Statistics Div.	M	Ownership	2003-2004	
GOM. 2005. Forest Department, Planning and Statistics Div.	M	Ownership	2004-2005	

### 2.2.2 Classification and definitions

National class	Definition
Reserved Forest	means land constituted as "reserved forest" under Forest Law (1992) which is property of Government.
Protected Public Forest	means land constituted as "protected public forest" under Forest Rules (1992) which is property of Government.
Un-classed Forests	Any forest land or waste land or any other land "recorded" in land records as forest land but not notified in government gazette as "reserved" or "protected public forest" under Forest Law (1992) and Forest Rules (1995).

### 2.2.3 Original data

In Myanmar Reserved Forests, Protected Public Forests, and un-classed forests are three major legal classes. A legal notification in the government gazette under Myanmar Forest Act (1992) creates or defines the boundaries of Reserved Forests and Protected Public Forests. All the three categories of forests are owned by the “State”.

All forest area, whether notified as reserved and protected under forest act or not notified and categorised as un-classed forests belong to the “State”. However, there are some forest areas (34000 ha in 2003 and 35000 ha in 2004 and 41000 ha in 2005) that are not under “state ownership”. These are the area brought under community forests owned by the local people with long-term lease permission of the government.

## 2.3 Analysis and processing of national data

### 2.3.1 Reclassification into FRA 2010 categories

All the forests have been considered as publicly owned in 1990 and 2000. In 2005 the 41 000 ha under community forest have been reclassified as private ownership of which by local communities.

## 2.4 Data for Table T2

**Table 2a - Forest ownership**

FRA 2010 Categories	Forest area (1000 hectares)		
	1990	2000	2005
Public ownership	39 218	34 868	33 280
Private ownership	0	0	41
...of which owned by individuals	0	0	0
...of which owned by private business entities and institutions	0	0	0
...of which owned by local communities	0	0	41
...of which owned by indigenous / tribal communities	0	0	0
Other types of ownership	0	0	0
<b>TOTAL</b>	<b>39 218</b>	<b>34 868</b>	<b>33 321</b>

Note: If other types of ownership is reported, please specify details in comment to the table.

Does ownership of trees coincide with ownership of the land on which they are situated?	<input type="checkbox"/>	Yes
	<input type="checkbox"/>	No
If <b>No</b> above, please describe below how the two differ:		
There is no land ownership. All the land are owned by State and individual citizen only have the right use the land. Tree tenure is granted on usufruct basis.		

**Table 2b - Holder of management rights of public forests**

FRA 2010 Categories	Forest area (1000 hectares)		
	1990	2000	2005
Public Administration	n.a.	n.a.	n.a.
Individuals	n.a.	n.a.	n.a.
Private corporations and institutions	n.a.	n.a.	n.a.
Communities	n.a.	n.a.	n.a.
Other	n.a.	n.a.	n.a.
<b>TOTAL</b>	<b>n.a.</b>	<b>n.a.</b>	<b>n.a.</b>

## 2.5 Comments to Table T2

Variable / category	Comments related to data, definitions, etc.	Comments on the reported trend
Public ownership		
Private ownership		
Other types of ownership		
Management rights		

Other general comments to the table

### 3 Table T3 – Forest designation and management

#### 3.1 FRA 2010 Categories and definitions

Term	Definition
Primary designated function	The primary function or management objective assigned to a management unit either by legal prescription, documented decision of the landowner/manager, or evidence provided by documented studies of forest management practices and customary use.
Protected areas	Areas especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means.
<b>Categories of primary designated functions</b>	
Production	Forest area designated primarily for production of wood, fibre, bio-energy and/or non-wood forest products.
Protection of soil and water	Forest area designated primarily for protection of soil and water.
Conservation of biodiversity	Forest area designated primarily for conservation of biological diversity. Includes but is not limited to areas designated for biodiversity conservation within the protected areas.
Social services	Forest area designated primarily for social services.
Multiple use	Forest area designated primarily for more than one purpose and where none of these alone is considered as the predominant designated function.
Other	Forest areas designated primarily for a function other than production, protection, conservation, social services or multiple use.
No / unknown	No or unknown designation.
<b>Special designation and management categories</b>	
Area of permanent forest estate (PFE)	Forest area that is designated to be retained as forest and may not be converted to other land use.
Forest area within protected areas	Forest area within formally established protected areas independently of the purpose for which the protected areas were established.
Forest area under sustainable forest management	To be defined and documented by the country.
Forest area with management plan	Forest area that has a long-term (ten years or more) documented management plan, aiming at defined management goals, which is periodically revised.

#### 3.2 National data

##### 3.2.1 Data sources

References to sources of information	Quality (H/M/L)	Variable(s)	Year(s)	Additional comments
GOM. 2000. Thirty Year Plan for Forestry Sector of Myanmar. Forest Department, Planning and Statistics Div	M	Designation		
GOM. 1995. Forest Working plan (1995-2005). Forest Department, Planning and Statistics Div	M	Designation		
Thirty Years Plans for Forestry Sector of Myanmar (2006-2016)	M	Designation		

### 3.2.2 Classification and definitions

Forest Management Plans (1995-2005) classifies the forest area of the country into 7 categories of management purposes (known as working circle). These categories may be treated as description of the classification based on designation of the forests.

National class	Definition
Non Wood Forest Products working circle	for meeting NWFP products
Production Working Circle	for meeting timber requirements
Plantations Working Circle	for meeting timber requirements through artificial regeneration
Local Supply/Community Forestry W.C	for meeting fuelwood and other minor forest products for local community
Watershed Forests W.C	For meeting conservation of soil and water resources
Mangrove Forests	For utilising, and also conservation of coastal mangrove forests
Protected Areas System W.C	National Parks and Sanctuaries

The following table from old working plans (expired in 1970 but no updated till 1995) provides the description of the designation of the Forests for year 1990.

National class	Definition
Type of Working Circles	Description
1 Teak Selection Working Circle	for meeting teak timber requirements, it includes hardwood supply working circle
2 Teak Eradication Working Circle	for eradication of teak in unfavourable non forest areas (rice fields etc.)
3 Hardwood supply working circle	for meeting hardwood requirements, it is part of teak selection working circle
4 Public Forest Working Circle	for meeting timber needs from public forests (not forest reserved areas)
5 Local Supply Working Circle	for meeting fuelwood and other minor forest products for local community
6 Cutch Working Circle	for special manufacturing of cutch (acacia catechu)
7 Fuelwood Working Circle	for meeting fuelwood products for local community
8 Tidal Forest Working Circle	for meeting mangrove timber, fuelwood and charcoal products
9 Special Working Circles	for meeting special needs

### 3.2.3 Original data

The present data is extracted from Thirty Years Plans for Forestry Sector of Myanmar where 61 FMU (Forest management Units) data has been compiled.

This data is also available only for current working plan period (2006-2016).

#### A. Data for 1990

Working Circle Area of 36 Forest Divisions (expired at 1970 but not updated till 1995)

Type of Working Circles		Area in 000 hectares
1	Teak Selection Working Circle	2854
2	Teak Eradication Working Circle	239
3	Hardwood supply working circle	1178
4	Public Forest Working Circle	290
5	Local Supply Working Circle	101
6	Cutch Working Circle	87
7	Fuelwood Working Circle	50
8	Tidal Forest Working Circle	46
9	Special Working Circles	312
<b>Total</b>		<b>5157</b>

(Note: Teak Selection Working Circle area contains Hardwood supply working circles)

This information has been updated for 1990 as under with information on “Protected Areas System”.

Type of Working Circles	Area in 000 hectares
Teak Selection Working Circle	2854
Teak Eradication Working Circle	239
Hardwood supply working circle	1178
Public Forest Working Circle	290
Local Supply Working Circle	101
Cutch Working Circle	87
Fuelwood Working Circle	50
Tidal Forest Working Circle	46
Special Working Circles	312
Protected Areas Systems Area	720
Total Under management plans	5877
Forest area not under management plans	33625

## B. Data for 2000 and 2005 and 2010

Working Circle Area of 61 Forest Management Units (1995-2005)

Type of Working Circles		Area in 000 hectares (2000)
1	Non Wood Forest Products W.C	5182
2	Production Working Circle	12017
3	Plantations Working Circle	651
4	Local Supply/ Community Forestry W.C	6749
5	Watershed Forests W.C	1499
6	Mangrove W.C	76
7	Protected Areas System W.C	964

The above data updated with data of Protected Area System for 2000 and actual area under plantations in 2000.

Type of Working Circles	Area in 000 hectares (2000)
-------------------------	--------------------------------

Non Wood Forest Products W.C	5182
Production Working Circle	12017
Plantations Working Circle	696
Local Supply/ Community Forestry W.C	6749
Watershed Forests W.C	1499
Mangrove W.C	76
Protected Areas System WC	1220
Total Area under management plans	27439
Forest area not under management plan	7683

Similarly information updated for 2005 with the help of Protection Area System for 2004 and plantation area in 2005 (planned).

Type of Working Circles	Area in 000 hectares (2005)
Non Wood Forest Products W.C	5182
Production Working Circle	12017
Plantations Working Circle	849
Local Supply/ Community Forestry W.C	6749
Watershed Forests W.C	1499
Mangrove W.C	76
Protected Areas System WC	4901
Total Area under management plans	31273
Forest area not under management plan	2936

Year 2010	Working Circle	000 hectares
1	Non Wood Forest Products W.C	942
2	Production Working Circle	11075
3	Plantations Working Circle	545
4	Local Supply/ Community Forestry W.C	7071
5	Watershed Forests W.C	1352
6	Mangrove W.C	50
7	Protected Areas System W.C*	2081
8	Forest area not included in WCs	8772

\* Updated with actual PAS area on working plan

### 3.3 Analysis and processing of national data

#### 3.3.1 Estimation and forecasting

For 1990, 2000, 2005 and 2010 figures for Protection, production and conservation forest have been taken from previous tables. The rest of the forest area has been considered as multiple forest to make the total match with table 1.

#### 3.3.2 Reclassification into FRA 2010 categories

For 1990



National Category	Percentage of a National Class into a FRA 2005 classes					
	Prod F/OWL	Prot F/OWL	Conservation of Biodiversity	Social function	Multiple function	Unknown function
<b>Forests</b>						
Teak Selection WC	100					
Teak Eradication WC	100					
Hardwood supply WC	100					
Public Forest WC					100	
Local Supply WC	100					
Cutch Working Circle					100	
Fuelwood Working Circle	100					
Tidal Forest Working Circle					100	
Special Working Circles		100				
Protected Areas Systems WC			100			
Forest area not under management plans					100	

### For 2000 2005 and 2010

National Category	Percentage of a National Class into a FRA 2005 classes -Primary Function					
	Production	Protection	CBD	Social	Multiple	Unknown
<b>Forest</b>						
Non Wood Forest Product WC	100					
Production Working Circle	100					
Plantations Working Circle	100					
Local Supply/ Community Forestry W.C	100					
Watershed Forests W.C		100				
Mangrove W.C					100	
Protected Areas System W.C			100			
Forest area not under management plans					100	

### 3.4 Data for Table T3

Table 3a – Primary designated function

FRA 2010 Categories	Forest area (1000 hectares)			
	1990	2000	2005	2010
Production	4 422	24 644	24 797	19 633
Protection of soil and water	312	1 499	1 499	1 352
Conservation of biodiversity	720	1 220	4 901	2 081
Social services	0	0	0	0
Multiple use	33 764	7 505	2 124	8 707
Other (please specify in comments below the table)	0	0	0	0
No / unknown	0	0	0	0
<b>TOTAL</b>	<b>39 218</b>	<b>34 868</b>	<b>33 321</b>	<b>31 773</b>

**Table 3b – Special designation and management categories**

FRA 2010 Categories	Forest area (1000 hectares)			
	1990	2000	2005	2010
Area of permanent forest estate	n.a.	n.a.	n.a.	n.a.
Forest area within protected areas	720	1220	4 901	2 081
Forest area under sustainable forest management	n.a.	n.a.	n.a.	n.a.
Forest area with management plan	5877	27439	31273	31273

### 3.5 Comments to Table T3

Variable / category	Comments related to data, definitions, etc.	Comments on the reported trend
Production		
Protection of soil and water		
Conservation of biodiversity		
Social services		
Multiple use		
Other		
No / unknown designation		
Area of permanent forest estate	ITTO gives a figure of PFE 13710 (000) ha (International Tropical Timber Organization (ITTO). 2005. Status of tropical forest management 2005)	
Forest area within protected areas		
Forest area under sustainable forest management		
Forest area with management plan		

**Other general comments to the table**

Forest Management Plans of Myanmar Forest Department classifies the forest area of the country into 7 categories for management purposes (known as working circles). Some other wooded lands may be included in these working circle areas. Working circle can also overlap (NWFP with production working circle) each other. The following data is extracted from Thirty Years Plans for Forestry Sector of Myanmar where 61 FMU (Forest management Units) data has been compiled. This data is also available only for current working plan period (1995-2005). The old working plans that expired in 1970but not updated till 1995 provide similar classification for 1990.

## 4 Table T4 – Forest characteristics

### 4.1 FRA 2010 Categories and definitions

Term / category	Definition
Naturally regenerated forest	Forest predominantly composed of trees established through natural regeneration.
Introduced species	A species, subspecies or lower taxon, occurring <u>outside</u> its natural range (past or present) and dispersal potential (i.e. outside the range it occupies naturally or could occupy without direct or indirect introduction or care by humans).
<b>Characteristics categories</b>	
Primary forest	Naturally regenerated forest of native species, where there are no clearly visible indications of human activities and the ecological processes are not significantly disturbed.
Other naturally regenerated forest	Naturally regenerated forest where there are clearly visible indications of human activities.
Other naturally regenerated forest of introduced species (sub-category)	Other naturally regenerated forest where the trees are predominantly of introduced species.
Planted forest	Forest predominantly composed of trees established through planting and/or deliberate seeding.
Planted forest of introduced species (sub-category)	Planted forest, where the planted/seeded trees are predominantly of introduced species.
<b>Special categories</b>	
Rubber plantations	Forest area with rubber tree plantations.
Mangroves	Area of forest and other wooded land with mangrove vegetation.
Bamboo	Area of forest and other wooded land with predominant bamboo vegetation.

### 4.2 National data

#### 4.2.1 Data sources

References to sources of information	Quality (H/M/L)	Variable(s)	Year(s)	Additional comments
GOM. 2004. Plantation database (unpublished). Forest Department, Planning and Statistics Div	M	Plantation area	Till 2004	
FAO.2007. Mangroves of Asia, working paper 137		Mangroves		Secondary source
FAO.2007. World Bamboo resources, FRA 2005 thematic study working paper 126		Bamboo		Secondary source

#### 4.2.2 Classification and definitions

National class	Definition
	No relevant national classification and definitions are available for this table.

### 4.2.3 Original data

Following table presents forest area under plantation from plantation database of Forest Department. The figures for 1990, 2000, 2003 data are actual figures and that for 2005 data is based on target set for 2005 by the Forest Department.

Year	Forest Area under Plantations (000 hectares)
1990	394
2000	696
2003	788
2005	849

Following table is plantation database of Forest Department. 1990, 2000, 2003, 2005-2009 data are actual figures and 2010 data is the figure of target set for 2010 by the Forest Department.

Year	000 hectares
<b>2006</b>	<b>857.208</b>
<b>2007</b>	<b>892.640</b>
<b>2008</b>	<b>924.855</b>
<b>2009</b>	<b>957.471</b>
<b>2010</b>	<b>988.533</b>

There are no national figures on primary forest. WCMC reports a total protected areas of 3.192 million hectares and it is assumed that this area can be a quite reliable proxy to estimate primary forest.

The difference between total forest as from table 1 and the planted forest and primary forest has been considered as other naturally regenerated forest.

The FAO study on Mangroves reports the following figures for mangroves for 1972:

Mangroves area ha	1972
Area ha	571 071

Original source 1972:

**Hthay, U. T. and U.S. Han.** 1984. Mangrove forests of Burma. *In: proceedings of the Asian Symposium on Mangrove Environment Research and Management, Kuala Lumpur, August 25-29, 1980.* p. 82-85 Edited by E. Soepadmo, A.N. Rao and D.J. MacIntosh. 1984

Other data on mangrove comes from the following sources:

Sr. No.	State /Division	Year	Hectares	Source
1	Rakhine State	1996	157992	Japan Forest Technical Association (JAFTA) Data
2	Ayeyarwady Division	2003	90387	Japan International Cooperation Agency (JICA)
3	Tanintharyi Division	2000	237866	Technical paper, FD FAO
	<b>Total</b>		<b>486 245</b>	

Source - Forest Department (2004): FRA 2005

#### EXTENT OF MANGROVE FOREST at 2005 and 2007

Sr. No.	State /Division	Year	Hectares	Source
1	Rakhine State	2005	178158	Coastal, 2005 landsat TM classification
2	Ayeyarwady Division	2005	83393	Coastal and delta, 2005 landsat TM classification
3	Tanintharyi Division	2007	176380	Coastal, 2007 landsat 7 ETM+ and other sources
	<b>Total</b>		<b>437 931</b>	

Source - Forest Department (2009): Preparation for FRA 2010 by digital classification using 2007 Landsat 7 ETM+ scenes combined with other Landsat 5 scenes and Aster scenes.

UNEP-WCMC database on protected areas gives a total of 3.192 million hectares of protected areas in IUCN categories I – IV. It could be used as a proxy to estimate the area of primary forest.

### 4.3 Analysis and processing of national data

#### 4.3.1 Estimation and forecasting

Figures from 1996, 2003 and 2000 have been used for 2000 and figures from 2005 and 2007 for 2005. For 2010 due to lack of updated figures same figure as 2005 has been used. For 1990 linear interpolation for 1990 and 2000 figures has been used.

#### 4.3.2 Reclassification into FRA 2010 categories

Forest area under plantation has been considered as planted forest.

### 4.4 Data for Table T4

Table 4a

FRA 2010 Categories	Forest area (1000 hectares)			
	1990	2000	2005	2010
Primary forest	3192	3192	3192	3192
Other naturally regenerated forest	35633	30980	29280	27593
...of which of introduced species				
Planted forest	394	696	849	988
...of which of introduced species				
<b>TOTAL</b>	39218	34868	33321	31773

**Table 4b**

FRA 2010 Categories	Area (1000 hectares)			
	1990	2000	2005	2010
Rubber plantations (Forest)	n.a.	n.a.	n.a.	n.a.
Mangroves (Forest and OWL)	517	486	438	438
Bamboo (Forest and OWL)	963	895	859	859

**4.5 Comments to Table T4**

Variable / category	Comments related to data, definitions, etc.	Comments on the reported trend
Primary forest		
Other naturally regenerating forest		
Planted forest	The forest department raises four types of forest plantation (commercial, industrial, village supply and watershed Plantation). The first three types are for the purpose of production and the last (watershed plantation) type is for the protection purpose.	
Rubber plantations		
Mangroves		
Bamboo		

Other general comments to the table

## 5 Table T5 – Forest establishment and reforestation

### 5.1 FRA 2010 Categories and definitions

Term	Definition
Afforestation	Establishment of forest through planting and/or deliberate seeding on land that, until then, was not classified as forest.
Reforestation	Re-establishment of forest through planting and/or deliberate seeding on land classified as forest.
Natural expansion of forest	Expansion of forests through natural succession on land that, until then, was under another land use (e.g. forest succession on land previously used for agriculture).

### 5.2 National data

#### 5.2.1 Data sources

References to sources of information	Quality (H/M/L)	Variable(s)	Year(s)	Additional comments
Source: Planning & Statistics Division, Forest Department		Forest plantations	up to 2007	

#### 5.2.2 Classification and definitions

National class	Definition
Not available	

#### 5.2.3 Original data

Year	Type of Plantation				Total
	Commercial	Village Supply	Industrial	Watershed	
1	2	3	4	5	6
1896-1941	38262	8907	0	0	<b>47169</b>
1948-1962	1230	692	0	0	<b>1922</b>
1963	444	297	0	0	<b>741</b>
1964	808	790	35	0	<b>1633</b>
1965	1749	944	23	0	<b>2716</b>
1966	1651	796	6	0	<b>2453</b>
1967	2557	876	45	0	<b>3478</b>
1968	3035	711	40	0	<b>3786</b>
1969	2112	716	51	0	<b>2879</b>
1970	1930	1234	45	0	<b>3209</b>



1971	1634	1103	35	0	<b>2772</b>
1972	1053	2055	42	0	<b>3150</b>
1973	1506	1185	32	0	<b>2723</b>
1974	921	1612	33	0	<b>2566</b>
1975	1180	1870	24	0	<b>3074</b>
1976	1510	1591	24	0	<b>3125</b>
1977	2047	1534	40	0	<b>3621</b>
1978	2251	2033	20	0	<b>4304</b>
1979	3208	3252	210	61	<b>6731</b>
1980	8405	4409	228	453	<b>13495</b>
1981	11493	3654	283	1817	<b>17247</b>
1982	14666	3491	526	3553	<b>22236</b>
1983	16304	6235	769	4304	<b>27612</b>
1984	18517	6907	1433	3960	<b>30817</b>
1985	18627	10711	2776	4228	<b>36342</b>
1986	18918	7968	3446	2615	<b>32947</b>
1987	17323	6730	5540	2716	<b>32309</b>
1988	16382	5799	4958	2777	<b>29916</b>
1989	13812	1303	2448	1165	<b>18728</b>
1990	18313	6006	4573	1807	<b>30699</b>
1991	18255	7268	3905	1607	<b>31035</b>
1992	17335	7892	4128	2232	<b>31587</b>
1993	13406	11198	3244	3164	<b>31012</b>
1994	6309	12742	890	2641	<b>22582</b>
1995	11791	13470	2750	4089	<b>32100</b>
1996	13409	13729	2226	3399	<b>32763</b>
1997	13871	6803	2246	7264	<b>30184</b>
1998	16780	5981	2084	3905	<b>28750</b>
1999	17265	5247	1093	7111	<b>30716</b>
2000	16848	4335	2086	7451	<b>30720</b>
2001	15571	4543	3703	6941	<b>30758</b>
2002	15358	4695	3513	7831	<b>31397</b>
2003	15344	4413	3319	7366	<b>30442</b>
2004	16279	3656	3905	8134	<b>31974</b>
2005	17085	4219	2995	8903	<b>33202</b>
2006	17094	2600	1922	6712	<b>28328</b>
2007	12889	2125	1926	6961	<b>23901</b>
<b>Total</b>	<b>496737</b>	<b>210327</b>	<b>73620</b>	<b>125167</b>	<b>905 851</b>

### 5.3 Analysis and processing of national data

#### 5.3.1 Calibration

### 5.3.2 Estimation and forecasting

The average of the 5 years period 1988-1992, 1998-2002 and 2003-2007 have been used to estimate annual forest respectively for 1990, 2000 and 2005.

### 5.3.3 Reclassification into FRA 2010 categories

The annual planting has been considered as belonging to the reforestation categories since no breakdown between afforestation and reforestation plantings was possible.

## 5.4 Data for Table T5

FRA 2010 Categories	Annual forest establishment (hectares/year)			...of which of introduced species <sup>1)</sup> (hectares/year)		
	1990	2000	2005	1990	2000	2005
Afforestation	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Reforestation	28393	30468	29569	n.a.	n.a.	n.a.
...of which on areas previously planted	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Natural expansion of forest	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

Note: The figures for the reporting years refer to the averages for the 5-year periods 1988-1992, 1998-2002 and 2003-2007 respectively.

## 5.5 Comments to Table T5

Variable / category	Comments related to data, definitions, etc.	Comments on the reported trend
Afforestation		
Reforestation	Figures for reforestation may include also some afforestation activities, since no separated figures were available.	
Natural expansion of forest		

Other general comments to the table

## 6 Table T6 – Growing stock

### 6.1 FRA 2010 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.
Growing stock of commercial species	Growing stock (see def. above) of commercial species.

### 6.2 National data

#### 6.2.1 Data sources

References to sources of information	Quality (H/M/L)	Variable(s)	Year(s)	Additional comments
Inventory Section, Planning and Statistics Division, Forest Department, Ministry of Forestry		Growing stock		Ministry of Forestry is responsible for the assessment of forest growing stock data in Myanmar.
		Growing stock composition		The records of the Planning and Statistics Division of Forest Department, which has been conducting NFI (National Forest Inventory) since 1982.

#### 6.2.2 Classification and definitions

The following table describes national classification of growing stock and commercial growing stock used.

National class	Definition
<b>Growing Stock</b>	The sum-total of all trees, by number or volume or biomass, growing within a particular area of interest. [Myanmar Forest Department measures all living trees over 20cm diameter at breast height (1.3m) in a sampling survey. Volume equations are constructed in the manner of forest inventory surveys during 1980s and used to calculate tree volume. For Volume equation, sample trees are measured from 30cm above ground to the crown point is taken as length and calculated. Branches etc. are not measured. This means growing stock given is the commercial (marketable part as timber) above stump.]
<b>Commercial growing stock</b> (meaning growing stock of commercial tree species)	Growing stock of tree species and groups prescribed by the Forest Department and Myanma Timber Enterprise are commercial. Teak is in its own class, others are Group 1, 2, 3, 4, 5 and others. Group 1 includes hard woods such as <i>Xylia xylocarpa</i> , Paduak ( <i>Pterocarpus macroparus</i> ). Durability and values are highest in Group 1 and decrease follow with the group number.

### 6.2.3 Original data

Sr.	State/	Inventory	Inventory	Volume	Forest Cover Area		Total
	Division	Covered	Volume	per hactare	Closed	Open	Volume
		ha	cu m <sup>3</sup>	cu m <sup>3</sup>	(, 000) ha	(, 000) ha	cu m <sup>3</sup>
1	Kachin	285,950	12,456,794	44	4,819.2	1,306.5	266,853
2	Kayah	460,640	15,173,532	33	130.4	306.1	14,380
3	Karen	460,640	15,173,532	33	1,151.4	892.4	67,322
4	Chin	889,550	27,040,496	30	1,472.0	857.1	70,800
5	Sagaing	802,270	36,547,706	46	3,230.8	1,818.7	230,035
6	Tannintharyi	120,400	7,877,689	65	2,480.2	930.5	223,156
7	Bago	712,610	35,545,961	50	380.6	726.2	55,207
8	Magway	789,780	30,503,688	39	546.2	159.3	27,250
9	Mandalay	703,550	17,795,022	25	124.5	788.3	23,088
10	Mon	120,400	7,877,689	65	226.8	268.1	32,380
11	Rakhine	399,980	16,038,123	40	831.4	1,645.4	99,312
12	Yangon	56,190	1,958,288	35	15.6	92.0	3,753
13	Shan	866,970	43,069,905	50	1,939.8	5,470.9	368,153
14	Ayeyarwady	146,980	7,205,968	49	120.0	281.2	19,670
		6,815,910	274,264,393		17,468.9	15,542.9	1,501,360

Kayah and Kayin inventory volume data is estimated from Southern Shan State Inventory data. Mon inventory volume data is estimated from Tanintharyi Inventory data.

Common name	Scientific name	Growing stock
Kayin	<i>Dipterocarpus spp.</i>	147,306
In	<i>Dipterocarpus tuberculatus</i>	99,938
Kyun	<i>Tectona grandis</i>	90,918
Thabye	<i>Eugenia spp.</i>	82,985
Ingyin	<i>Pentacme siamensis</i>	76,711
Taukkyan	<i>Terminalia tomentosa</i>	50,424
Pyinkado	<i>Xylia dolabriformis</i>	47,550
Thitya	<i>Shorea oblongifolia</i>	41,861
Gangaw	<i>Mesua ferrea</i>	34,526
Taung-thayet	<i>Swintonia floribunda</i>	29,165
Sub Total		701,385
	<i>remaining species</i>	799,975
<b>Total</b>		<b>1501360</b>

### 6.3 Analysis and processing of national data

#### 6.3.1 Estimation and forecasting

The growing stock per ha of 45m<sup>3</sup>/ha as coming from the previous table has been applied to the total forest area from T1.

For the commercial growing stock the ratio commercial/total of 27.85% as calculated from previous forest inventories has been applied to the total growing stock.

For the growing stock composition, same percentage as presented in the previous table has been applied to the total growing stock previously calculated.

#### 6.4 Data for Table T6

**Table 6a – Growing stock**

FRA 2010 category	Volume (million cubic meters over bark)							
	Forest				Other wooded land			
	1990	2000	2005	2010	1990	2000	2005	2010
Total growing stock	1765	1569	1499	1430	n.a.	n.a.	n.a.	n.a.
... of which coniferous	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
... of which broadleaved	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Growing stock of commercial species	491	437	418	398	n.a.	n.a.	n.a.	n.a.

**Table 6b – Growing stock of the 10 most common species**

FRA 2010 category / Species name			Growing stock in forest (million cubic meters)		
Rank	Scientific name	Common name	1990	2000	2005
1 <sup>st</sup>	<i>Dipterocarpus spp.</i>	Kanyin	173	154	147
2 <sup>nd</sup>	<i>Dipterocarpus tuberculatus</i>	In	117	104	100
3 <sup>rd</sup>	<i>Tectona grandis</i>	Kyun	107	95	91
4 <sup>th</sup>	<i>Eugenia spp.</i>	Thabye	98	87	83
5 <sup>th</sup>	<i>Pentacme siamensis</i>	Ingyin	90	80	77
6 <sup>th</sup>	<i>Terminalia tomentosa</i>	Taukkyan	59	53	50
7 <sup>th</sup>	<i>Xylia dolabriformis</i>	Pyinkado	56	50	47
8 <sup>th</sup>	<i>Shorea oblongifolia</i>	Thitya	49	44	42
9 <sup>th</sup>	<i>Mesua ferrea</i>	Gangaw	41	36	34
10 <sup>th</sup>	<i>Swintonia floribunda</i>	Taung-thayet	34	30	29
Remaining	Rest of spp.	Rest of spp.	941	836	799
<b>Total</b>	<b>TOTAL</b>	<b>TOTAL</b>	1765	1569	1499

Note: Rank refers to the order of importance in terms of growing stock, i.e. 1<sup>st</sup> is the species with the highest growing stock. Year 2000 is the reference year for defining the species list and the order of the species.

**Table 6c – Specification of threshold values**

Item	Value	Complementary information
Minimum diameter (cm) at breast height <sup>1</sup> of trees included in growing stock (X)	20 cm	
Minimum diameter (cm) at the top end of stem for calculation of growing stock (Y)	10 cm	
Minimum diameter (cm) of branches included in growing stock (W)	n.a.	
Volume refers to “above ground” (AG) or “above stump” (AS)	AS	

## 6.5 Comments to Table T6

Variable / category	Comments related to data, definitions, etc.	Comments on the reported trend
Total growing stock		
Growing stock of broadleaved / coniferous		
Growing stock of commercial species		

Other general comments to the table
<p>The working Plan Division of Forest Department has been implementing all kinds of forest surveys since 1850. Up to 1980s Forest Department has relied on cent percent surveys of teak and hardwoods from enumeration process during teak girdling operation and Selection Marking operation of Hardwood for felling. Modern sampling techniques have been given priority over convention methods since 1990. With the aid of remote sensing, GIS and computer databases, national forest inventory is being carried out each year with prescribed planning of 5 years intervals.</p> <p>During sampling survey (inventory) all living trees over 20cm diameter at breast height (1.3m) are measured in a sampling survey. For Volume equation, sample trees are measured from 30cm above ground to the crown point and it is taken as stem length and volume is calculated. The branches etc. are not measured and their volume is not included in the growing stock. This means growing stock given is the marketable part (as timber) above the stump.</p> <p>The valuable species composition has comparatively decreased within 10 years.</p>

<sup>1</sup> Diameter at breast height (DBH) refers to diameter over bark measured at a height of 1.30 m above ground level or 30 cm above buttresses if these are higher than 1 m.

## 7 Table T7 – Biomass stock

### 7.1 FRA 2010 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 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	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.

### 7.2 National data

#### 7.2.1 Data sources

References to sources of information	Quality (H/M/L)	Variable(s)	Year(s)	Additional comments
FAO. 2008. Guidelines for Country Reporting to FRA 2005. Global Forest Resources Assessment 2010				Biomass conversion and expansion factor (BCEF) and root-shoot ratio from Appendix 5 FRA guidelines

#### 7.2.2 Classification and definitions

National class	Definition
Not available	

#### 7.2.3 Original data

There is no data on biomass. This table uses data from Table 6.

### 7.3 Analysis and processing of national data

#### 7.3.1 Estimation and forecasting

##### Above ground biomass:

Following recommendations from FRA guidelines the following assumptions and calculations have been made:

From appendix 5, table 5.4 pag 6 of the FRA guidelines and considering a humid tropical ecological zone and a growing stock is in the range 41-60m<sup>3</sup>/ha the biomass conversion and expansion factor (BCEF) of 2.05 has been applied to the growing stock:

Below ground biomass :

From appendix 5, table 5.3 pag 5 of the FRA guidelines, considering an above ground biomass<125t/ha and tropical forest biome (no estimates available for the subtropical mountain system), the root-shoot ratio of 0.20 has been chosen.

	1990	2000	2005	2010
Growing stock (million m <sup>3</sup> )	1765	1569	1499	1430
BCEF	2.05	2.05	2.05	2.05
Aboveground biomass (million tonnes)	3618	3217	3074	2931
Root-shoot ratio	0.20	0.20	0.20	0.20
Belowground biomass	724	643	615	586

#### 7.4 Data for Table T7

FRA 2010 category	Biomass (million metric tonnes oven-dry weight)							
	Forest				Other wooded land			
	1990	2000	2005	2010	1990	2000	2005	2010
Above-ground biomass	3618	3217	3074	2931	n.a.	n.a.	n.a.	n.a.
Below-ground biomass	724	643	615	586	n.a.	n.a.	n.a.	n.a.
Dead wood	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
<b>TOTAL</b>	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

#### 7.5 Comments to Table T7

Variable / category	Comments related to data, definitions, etc.	Comments on the reported trend
Above-ground biomass		
Below-ground biomass		
Dead wood		

Other general comments to the table



## 8 Table T8 – Carbon stock

### 8.1 FRA 2010 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 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	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 the minimum diameter for dead wood (e.g. 10 cm), lying dead in various states of decomposition above the mineral or organic soil.
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.

### 8.2 National data

#### 8.2.1 Data sources

References to sources of information	Quality (H/M/L)	Variable(s)	Year(s)	Additional comments
FAO. 2008. Guidelines for Country Reporting to FRA 2005. Global Forest Resources Assessment 2010				Carbon conversion factor of 0.47

#### 8.2.2 Classification and definitions

National class	Definition
Not available	

#### 8.2.3 Original data

No original data on carbon were available, so the carbon conversion factor of 0.47 recommended in the FRA guidelines has been applied to the biomass as coming from table 7. The GPG default factor of 2.1 tonnes/ ha is adopted for evergreen, mixed, deciduous and bamboo forest areas.

### 8.3 Data for Table T8

FRA 2010 Category	Carbon (Million metric tonnes)							
	Forest				Other wooded land			
	1990	2000	2005	2010	1990	2000	2005	2010
Carbon in above-ground biomass	1700	1512	1445	1378	n.a.	n.a.	n.a.	n.a.
Carbon in below-ground biomass	340	302	289	276	n.a.	n.a.	n.a.	n.a.
<b>Sub-total: Living biomass</b>	2040	1814	1734	1653	n.a.	n.a.	n.a.	n.a.
Carbon in dead wood	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Carbon in litter	82	73	70	67	n.a.	n.a.	n.a.	n.a.
<b>Sub-total: Dead wood and litter</b>	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Soil carbon	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
<b>TOTAL</b>	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

Soil depth (cm) used for soil carbon estimates	
--	--

### 8.4 Comments to Table T8

Variable / category	Comments related to data, definitions, etc.	Comments on the reported trend
Carbon in above-ground biomass		
Carbon in below-ground biomass		
Carbon in dead wood		
Carbon in litter		
Soil carbon		

Other general comments to the table

## 9 Table T9 – Forest fires

### 9.1 FRA 2010 Categories and definitions

Category	Definition
Number of fires	Average number of vegetation fires per year in the country.
Area affected by fire	Average area affected by vegetation fires per year in the country.
Vegetation fire (supplementary term)	Any vegetation fire regardless of ignition source, damage or benefit.
Wildfire	Any unplanned and/or uncontrolled vegetation fire.
Planned fire	A vegetation fire regardless of ignition source that burns according to management objectives and requires limited or no suppression action.

### 9.2 National data

#### 9.2.1 Data sources

References to sources of information	Quality (H/M/L)	Variable(s)	Year(s)	Additional comments
Satellite images	H			

#### 9.2.2 Classification and definitions

Category	Definition
Not available	

#### 9.2.3 Original data

Year	All Affected Area	Within reserved forest (Ha.)
Y 1990	4,248,247.55	76,442.81
Y 2000	2,452,839.79	63,844.42
Y 2005	1,091,083.90	217,756.23
Y 2008	1,001,663.92	178,755.03
Y 2010	434,687.07	206,059.85

### 9.3 Analysis and processing of national data

#### 9.3.1 Calibration

#### 9.3.2 Estimation and forecasting

#### 9.3.3 Reclassification into FRA 2010 categories

## 9.4 Data for Table T9

**Table 9a**

FRA 2010 category	Annual average for 5-year period					
	1990		2000		2005	
	1000 hectares	number of fires	1000 hectares	number of fires	1000 hectares	number of fires
Total land area affected by fire	4248	n.a.	2453	n.a.	1091	n.a.
... of which on forest	76	n.a.	64	n.a.	218	n.a.
... of which on other wooded land						
... of which on other land						

**Table 9b**

FRA 2010 category	Proportion of forest area affected by fire (%)		
	1990	2000	2005
Wildfire			
Planned fire			

## 9.5 Comments to Table T9

Variable / category	Comments related to data, definitions, etc.	Comments on the reported trend
Area affected by fire		
Number of fires		
Wildfire / planned fire		

## **10 Table T10 – Other disturbances affecting forest health and vitality**

No data available.

## 11 Table T11 – Wood removals and value of removals

### 11.1 FRA 2010 Categories and definitions

Category	Definition
Industrial roundwood removals	The wood removed (volume of roundwood over bark) for production of goods and services other than energy production (woodfuel).
Woodfuel removals	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
GOM. 2003. Annual Reports (1992-93 to 2003-04) of Myanmar Timber Enterprise. Myanmar.	M	Wood Removal	1990 to 2003	
GOM. 2004. Departmental Database of Planning and Statistics Division. Forest Department. Myanmar.	M	Wood fuel Removal	1990 to 2003	

#### 11.2.2 Classification and definitions

National class	Definition
Not available	

#### 11.2.3 Original data

Main Source for round wood removal data is extracted from annual report (1992-93 to 2003-04) of Myanmar Timber Enterprise. Woodfuel removal data is compiled from the departmental data base of planning and Statistics Forest Department Division. No data exists for other land with trees.

Round Wood Removal	1990-91	1991-02	1992-93	1993-94	1994-95	1995-96	1996-97	1997-98	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04
Industrial Round Wood	3.57	3.44	3.18	3.19	2.62	2.65	2.81	3.18	3.28	3.35	3.57	3.94	3.88	3.88
Fuelwood	32.27	32.22	32.38	32.40	32.48	31.46	31.96	31.14	31.75	33.14	33.49	34.20	34.94	35.66
Total	35.84	35.66	35.56	35.59	35.10	34.10	34.78	34.31	35.03	36.49	37.06	38.13	38.81	39.55

For value of removals no documented source is available. The value of wood and fuelwood is calculated based on annual prevailing prices.

The data of wood removal is prevailing prices in Myanmar currency (Kyats).

(Kyats in Million)

	1990-91	1991-02	1992-93	1993-94	1994-95	1995-96	1996-97	1997-98	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04
Industrial Round Wood	29710	40800	56331	68802	78545	94818	122178	177951	236805	278956	318215	493070	720766	855575
Fuelwood	8952	10152	11587	13176	14991	16493	19045	21076	24416	28961	33240	38551	44760	51901
Total	38662	50952	67918	81978	93536	111311	141223	199027	261221	307917	351455	531621	765526	907476

### 11.3 Analysis and processing of national data

#### 11.3.1 Calibration

#### 11.3.2 Estimation and forecasting

This average for 1990 has been calculated using three years data 1990 to 1993. The average for 2000 has been calculated using five year data from 1998 to 2002. The figure for 2005 has been calculated by averaging last two years data (2002 and 2003).

For removals value the reporting figures for 1990, 2000 and 2005 have been developed as under,

- For 1990- Taking three year average (1990 to 1992) since data for 1988 and 1999 is not available.
- For 2000 - Taking five year averages of data from 1998 to 2002.
- For 2005 – Taking two year average (2002 and 2003) since data for 2004 is not available.

#### 11.3.3 Reclassification into FRA 2010 categories

### 11.4 Data for Table T11

FRA 2010 Category	Industrial roundwood removals			Woodfuel removals		
	1990	2000	2005	1990	2000	2005
Total volume (1000 m <sup>3</sup> o.b.)	3397	3604	3880	35687	37104	39180
... of which from forest						
Unit value (local currency / m <sup>3</sup> o.b.)	124464	113641	203137	287	9785	21350
Total value (1000 local currency)	422803333	409562400	788170500	10230333	363053500	836501000

Note: The figures for the reporting years refer to the averages of annually affected areas for the 5-year periods 1988-1992, 1998-2002 and 2003-2007 respectively.

	1990	2000	2005
Name of local currency	Kyats	Kyats	Kyats

### 11.5 Comments to Table T11

Variable / category	Comments related to data, definitions, etc.	Comments on the reported trend
Total volume of industrial roundwood removals		
Total volume of woodfuel removals		
Unit value		
Total value		

Other general comments to the table



## **12 Table T12 – Non-wood forest products removals and value of removals**

No data are available for this reporting table.

## 13 Table T13 – Employment

### 13.1 FRA 2010 Categories and definitions

Category	Definition
Full-time equivalents (FTE)	A measurement equal to one person working full-time during a specified reference period.
Employment	Includes all persons in paid employment or self-employment.
Paid employment	Persons who during a specified reference period performed some work for <u>wage or salary</u> in cash or in kind.
Self-employment	Persons who during a specified reference period performed some work for <u>profit or family gain</u> in cash or in kind (e.g. employers, own-account workers, members of producers' cooperatives, contributing family workers).

### 13.2 National data

#### 13.2.1 Data sources

References to sources of information	Quality (H/M/L)	Variable(s)	Year(s)	Additional comments
				The forestry activities within the forest area is controlled by the Forest Department and data relating to the forest operations is available, however employees concerning with wood fuel removal and NWFP removal are not available and recorded.

#### 13.2.2 Original data

##### A. Forest Department

Employee involvement for 1990 and , 2000

Number of employees	1990	2000
Field Staff	8985	8622
Labour	79252	71855
<b>Total</b>	<b>88237</b>	<b>80477</b>

##### B Myanmar Timber Enterprise

Operation	1990	2000
Loggers	8000	7253
Skidders	8144	7384
Mechanical Operator	6352	5759
<b>Total</b>	<b>22496</b>	<b>20396</b>

### 13.3 Analysis and processing of national data

#### 13.3.1 Reclassification into FRA 2010 categories

Except for field staff of forest department all other employment is allocated to production. The regular staff is apportioned between production and services based on the ratio of the area under protected area system and the rest from Table 3.

Variable	1990	2000
Percent of Forest Area under PAS	2	3
Percent of the rest of Forest Area	98	97

#### 13.4 Data for Table T13

FRA Category	Full Time Employment (1000 person-years)		
	1990	2000	2005
<b>Employment in primary production of goods</b>			
... of which paid employment	110.6	100.6	n.a.
... of which self-employment			
<b>Employment in management of protected areas</b>	0.2	0.3	n.a.

#### 13.5 Comments to Table T13

Variable / category	Comments related to data, definitions, etc.	Comments on the reported trend
Employment in primary production of goods		
Paid employment / self-employment		
Employment in management of protected areas		

Other general comments to the table

## 14 Table T14 – Policy and legal framework

### 14.1 FRA 2010 Categories and definitions

Term	Definition
Forest policy	A set of orientations and principles of actions adopted by public authorities in harmony with national socio-economic and environmental policies in a given country to guide future decisions in relation to the management, use and conservation of forest and tree resources for the benefit of society.
Forest policy statement	A document that describes the objectives, priorities and means for implementation of the forest policy.
National forest programme (nfp)	A generic expression that refers to a wide range of approaches towards forest policy formulation, planning and implementation at national and sub-national levels. The national forest programme provides a framework and guidance for country-driven forest sector development with participation of all stakeholders and in consistence with policies of other sectors and international policies.
Law (Act or Code) on forest	A set of rules enacted by the legislative authority of a country regulating the access, management, conservation and use of forest resources.

### 14.2 Data for Table T14

Indicate the existence of the following (2008)			
<b>Forest policy statement with national scope</b>	<input checked="" type="checkbox"/>	Yes	
	<input type="checkbox"/>	No	
If Yes above, provide:	Year of endorsement		
	Reference to document		
<b>National forest programme (nfp)</b>	<input checked="" type="checkbox"/>	Yes	
	<input type="checkbox"/>	No	
If Yes above, provide:	Name of nfp in country	National Forest Programme (30 yrs plan)	
	Starting year	2001-2002	
	Current status	<input type="checkbox"/>	In formulation
		<input checked="" type="checkbox"/>	In implementation
		<input type="checkbox"/>	Under revision
Reference to document or web site	the Forest Law, 1992 <a href="http://www.nfp-facility.org/media/14331/0/40/">http://www.nfp-facility.org/media/14331/0/40/</a>		
<b>Law (Act or Code) on forest with national scope</b>	<input checked="" type="checkbox"/>	Yes, specific forest law exists	
	<input type="checkbox"/>	Yes, but rules on forests are incorporated in other (broader) legislation	
	<input type="checkbox"/>	No, forest issues are not regulated by national legislation	
If Yes above, provide:	Year of enactment	1902	
	Year of latest amendment	1992	
	Reference to document	Burma Forest act 1902 <a href="http://faolex.fao.org/docs/texts/mya3290.doc">http://faolex.fao.org/docs/texts/mya3290.doc</a>	

In case the responsibility for forest policy- and/or forest law-making is decentralized, please indicate the existence of the following and explain in the comments below the table how the responsibility for forest policy- and law-making is organized in your country.	
<b>Sub-national forest policy statements</b>	Yes
	No
If Yes above, indicate the number of regions/states/provinces with forest policy statements	
<b>Sub-national Laws (Acts or Codes) on forest</b>	Yes
	No
If Yes above, indicate the number of regions/states/provinces with Laws on forests	

### 14.3 Comments to Table T14

Variable / category	Comments related to data, definitions, etc.
Forest policy statement with national scope	
National forest programme (nfp)	Need evaluation and revision in accordance with current situation and trend.
Law (Act or Code) on forest with national scope	Necessary amendment should be made periodically to cope with the changes in practice.
Sub-national forest policy statements	
Sub-national Laws (Acts or Codes) on forest	

Other general comments to the table

## 15 hTable T15 – Institutional framework

### 15.1 FRA 2010 Categories and definitions

Term	Definition
Minister responsible for forest policy-making	Minister holding the main responsibility for forest issues and the formulation of the forest policy.
Head of Forestry	The Head of Forestry is the Government Officer responsible for implementing the mandate of the public administration related to forests.
Level of subordination	Number of administrative levels between the Head of Forestry and the Minister.
University degree	Qualification provided by University after a minimum of 3 years of post secondary education.

### 15.2 Data for Table T15

Table 15a – Institutions

FRA 2010 Category	2008	
Minister responsible for forest policy formulation : please provide full title	Ministry of Forestry	
Level of subordination of Head of Forestry within the Ministry	X	1 <sup>st</sup> level subordination to Minister
		2 <sup>nd</sup> level subordination to Minister
		3 <sup>rd</sup> level subordination to Minister
		4 <sup>th</sup> or lower level subordination to Minister
Other public forest agencies at national level		
Institution(s) responsible for forest law enforcement		

Table 15b – Human resources

FRA 2010 Category	Human resources within public forest institutions					
	2000		2005		2008	
	Number	%Female	Number	%Female	Number	%Female
Total staff	na	na	na	na	64,858	na
...of which with university degree or equivalent	na	na	na	na	na	na

Notes:

1. Includes human resources within public forest institutions at sub-national level
2. Excludes people employed in State-owned enterprises, education and research, as well as temporary / seasonal workers.

### 15.3 Comments to Table T15

Variable / category	Comments related to data, definitions, etc.	Comments on the reported trend
Minister responsible for forest policy formulation		
Level of subordination of Head of Forestry within the Ministry		
Other public forest agencies at national level		
Institution(s) responsible for forest law enforcement		
Human resources within public forest institutions		

Other general comments to the table

## 16 Table T16 – Education and research

### 16.1 FRA 2010 Categories and definitions

Term	Definition
Forest-related education	Post-secondary education programme with focus on forests and related subjects.
Doctor's degree (PhD)	University (or equivalent) education with a total duration of about 8 years.
Master's degree (MSc) or equivalent	University (or equivalent) education with a total duration of about five years.
Bachelor's degree (BSc) or equivalent	University (or equivalent) education with a duration of about three years.
Technician certificate or diploma	Qualification issued from a technical education institution consisting of 1 to 3 years post secondary education.
Publicly funded forest research centers	Research centers primarily implementing research programmes on forest matters. Funding is mainly public or channelled through public institutions.

### 16.2 National data

#### 16.2.1 Data sources

References to sources of information	Quality (H/M/L)	Variable(s)	Year(s)	Additional comments
Forestry department				

#### 16.2.2 Original data

##### List of Graduated Students from Institute of Forestry (from year 2000 to 2008), Myanmar

Sr.	Year	Month	male	female	total	remark
1	2000	September	40	-	40	
2	2001	September	37	12	49	
3	2002	July	42	13	55	
4	2002	September	33	13	46	
5	2004	March	33	3	36	
6	2005	March	37	5	42	
7	2005	September	30	4	34	
8	2006	March	34	6	40	
9	2006	September	25	4	29	
10	2007	March	15	2	17	
11	2007	September	17	4	21	
12	2008	September	22	1	23	
		<b>Total</b>	<b>365</b>	<b>67</b>	<b>432</b>	

### 16.3 Analysis and processing of national data

#### 16.3.1 Estimation and forecasting



**16.4 Data for Table T16**

FRA 2010 Category	Graduation <sup>1)</sup> of students in forest-related education					
	2000		2005		2008	
	Number	% Female	Number	% Female	Number	% Female
Master's degree (MSc) or equivalent	40	0	76	12	23	4
Bachelor's degree (BSc) or equivalent	na	na	na	na	na	na
Forest technician certificate / diploma	na	na	na	na	na	na
FRA 2010 Category	Professionals working in publicly funded forest research centres <sup>2)</sup>					
	2000		2005		2008	
	Number	% Female	Number	% Female	Number	% Female
Doctor's degree (PhD)	na	na	na	na	na	na
Master's degree (MSc) or equivalent	na	na	na	na	na	na
Bachelor's degree (BSc) or equivalent	na	na	na	na	na	na

Notes:

1. Graduation refers to the number of students that have successfully completed a Bachelor's or higher degree or achieved a certificate or diploma as forest technician.
2. Covers degrees in all sciences, not only forestry.

**16.5 Comments to Table T16**

Variable / category	Comments related to data, definitions, etc.	Comments on the reported trend
Graduation of students in forest-related education		
Professionals working in public forest research centres		

**Other general comments to the table**

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## Table T17 – Public revenue collection and expenditure

### 17.1 FRA 2010 Categories and definitions

Category	Definition
Forest revenue	All government revenue collected from the domestic production and trade of forest products and services. For this purpose, forest products include: roundwood; sawnwood; wood-based panels; pulp and paper; and non-wood forest products. As far as possible, this should include revenue collected by all levels of government (i.e. central, regional/provincial and municipal level), but it should exclude the income of publicly owned business entities.
Public expenditure	All government expenditure on forest related activities (further defined below).
Operational expenditure (sub-category to Public expenditure)	All government expenditure on public institutions solely engaged in the forest sector. Where the forest administration is part of a larger public agency (e.g. department or ministry), this should only include the forest sector component of the agency's total expenditure. As far as possible, this should also include other institutions (e.g. in research, training and marketing) solely engaged in the forest sector, but it should exclude the expenditure of publicly owned business entities.
Transfer payments (sub-category to Public expenditure)	All government expenditure on direct financial incentives paid to non-government and private-sector institutions, enterprises communities or individuals operating in the forest sector to implement forest related activities.
Domestic funding	Public expenditure funded from domestic public financial resources, including: retained forest revenue; forest-related funds; and allocations from the national budget (i.e. from non-forest sector public revenue sources).
External funding	Public expenditure funded from grants and loans from donors, non-governmental organisations, international lending agencies and international organisations, where such funds are channelled through national public institutions.

### 17.2 National data

#### 17.2.1 Data sources

References to sources of information	Quality (H/M/L)	Variable(s)	Year(s)	Additional comments
Budget Division, Forest Department		Income, expenditure		

#### 17.2.2 Classification and definitions

National class	Definition
Not available	

**17.2.3 Original data**

Kyats in thousand

Year	Expenditure			Income					
	Current	Capital	Total	Revenue				Current Receive	Total Income
				Teak	Hardwood	Other	Total		
1998-99	457723.7	388236.6	845960.3	193078.9	268787.7	232197.7	694064.3	388148.2	1082212.5
1999-00	574509.9	641858.9	1216368.8	320199.0	303653.7	254737.4	878590.1	429174.3	1307764.4
2000-01	1310003.2	618232.1	1928235.3	409320.5	348293.0	288361.3	1045974.8	539030.8	1585005.6
2001-02	1433139.5	724858.1	2157997.6	377893.6	414332.0	321710.0	1113935.6	276616.1	1390551.7
2002-03	1496168.9	839253.3	2335422.2	454227.7	308874.7	616017.9	1379120.3	199199.0	1578319.3
2003-04	1834505.9	1102691.6	2937197.5	491539.1	475189.3	891225.7	1857954.1	225398.5	2083352.6
2004-05	2663158.6	1264233.1	3927391.7	546766.5	540001.0	845110.0	1931877.5	557551.1	2489428.6
2005-06	3262894.8	1373369.6	4636264.4	601717.5	730770.1	938807.7	2271295.3	689912.6	2961207.9
2006-07	6678468.2	1723824.6	8402292.8	717994.0	457525.8	3107797.9	4283317.7	908250.7	5191568.4
2007-08	8811935.5	2688281.1	11500216.6	925033.0	739684.5	3981031.2	5645748.7	381031.2	7095577.8

Source: Budget Division, Forest Department

**17.3 Analysis and processing of national data****17.3.1 Calibration****17.3.2 Estimation and forecasting**

Revenues and expenditures are calculated as an average of the two periods 1999-2000 and 2000-2001 for 2000 and for the 2004-2005 2005-2006 for 2005.

Local currency is Kyats.

**17.3.3 Reclassification into FRA 2010 categories****17.4 Data for Table T17****Table 17a - Forest revenues**

FRA 2010 Categories	Revenues (1000 local currency)	
	2000	2005
Forest revenue	962 283	2 101 586

**Table 17b - Public expenditure in forest sector by funding source**

FRA 2010 Categories	Domestic funding (1000 local currency)		External funding (1000 local currency)		Total (1000 local currency)	
	2000	2005	2000	2005	2000	2005
Operational expenditure						
Transfer payments						
<b>Total public expenditure</b>					2 043 116	4 281 828
If transfer payments are made for forest management and conservation, indicate for what specific objective(s) - Please tick all that apply.	<input type="checkbox"/>	Reforestation				
	<input type="checkbox"/>	Afforestation				
	<input type="checkbox"/>	Forest inventory and/or planning				
	<input type="checkbox"/>	Conservation of forest biodiversity				
	<input type="checkbox"/>	Protection of soil and water				
	<input type="checkbox"/>	Forest stand improvement				
	<input type="checkbox"/>	Establishment or maintenance of protected areas				
	<input type="checkbox"/>	Other, specify below				

**17.5 Comments to Table T17**

Variable / category	Comments related to data, definitions, etc.	Comments on the reported trend
Forest revenue		
Operational expenditure		
Transfer payments		

Other general comments to the table