Forestry Department
Food and Agriculture Organization of the United Nations

GLOBAL FOREST RESOURCES ASSESSMENT 2010

COUNTRY REPORT

BHUTAN

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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).

The Global Forest Resources Assessment process is coordinated by the Forestry Department at FAO headquarters in Rome. The contact person for matters related to FRA 2010 is:

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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.

Contents

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

1.2 National data

1.2.1 Data sources

References to sources of information	Quality (H/M/L)	Variable(s)	Year(s)	Additional comments
RGOB, 1995. Land Cover Figures of Bhutan (National figures), Ministry of Agriculture, Royal Government of Bhutan	H	Landuse, Forest types	1989	
RGOB.1999. Japan Forest Technical Association and Department of Forestry Services, Ministry of Agriculture, Royal Government of Bhutan	H	Landuse and forest types	1999	

1.2.2 Classification and definitions

National class	Definition
Mixed conifer	Single species not exceeding 60% percent of the total
Fir	Fir forests. Fir constituting about 80 % of the total.
Blue pine	Blue pine forests. Blue pine constituting about 80 % of the total.
Chir pine	Chir pine forests. Chir pine constituting about 80 % of the total.
Broadleaved + Conifer	Mixture of broadleaf and conifer species of about 80% of the total
Broadleaved forests	Mixture of broadleaved forests of about 80 % of the total.
Conifer plantation	Plantation created of conifer species for productive and protective reasons.
Broadleaved plantation	Plantation created of broadleaf species for productive and protective reasons.
Shrub/Scrub/Grassland/	Forest areas having canopy density more than 5 but less than 10 percent.
Pasture forest areas	Pasture includes areas covered by both natural and improved pastures.
Marshy & water spread	This category includes area covered by rivers, lakes and also marshy area
Other land	Includes snow/glaciers, Rock outcrops, landslides and erosion areas

1.2.3 Original data

National data for 1989

Landuse category	1989(LUSS) (in 1000 ha.)
Forest	
Fir	345.30
Mixed conifer	486.80
Blue pine	128.60
Chir pine	100.90
Conifer + broadleaf	135.80
Broadleaf	1374.90
Plantation	6.40
Scrub	325.80
Pasture	156.40
Horticulture	5.80
Settlement	3.10
Others	598.50
Agriculture	308.80
Water spreads	30.40
Total	4007.50

National Data for 1999

Landuse category	1999(JAFTA) (in 1000 ha.)
Forest	
Fir	506.970
Mixed conifer	495.998
Blue Pine	136.381
Chir pine	279.173
Broadleaf + conifer	313.566
Broadleaf	950.516
Shrub/Grassland	521.46
Agriculture land	172.92
Settlements	1.98
Snow/Glaciers	268.39
Bare land	353.55
Water spread	26.36
Total	**4027.264**

Above data in brief with Scrub/Shrub/Grassland/Pasture shown separately for reclassification.

Broad National Classes	Area in 1000 ha.	
	1989	**1999**
Forests[1]	2,578.70	2,682.61
Scrub/Shrub/Grassland/Pasture	482.2	521.46
Agriculture lands[2]	314.6	172.92
Water spreads	30.4	26.36
Others[3]	601.6	623.92
Total	**4,007.50**	**4,027.27**

Note: [1] Includes plantation and excludes scrub, shrub, grassland and pastures,

[2] Includes Horticulture. [3] Others includes Snow/ glaciers; Bare land; and Settlements.

1.3 Analysis and processing of national data

1.3.1 Calibration

The total area of the country, as per Land Cover figures of Bhutan -1995 (National figures) Ministry of Agriculture, Royal Government of Bhutan is 40,075 square kilometres. The country would like to maintain this figure for reporting. However to comply with FRA guidelines, calibration has been done only for the purpose of FRA. The Scrub/Shrub/Grassland/Pasture has been tabulated separately for simplicity in reclassification and area of water bodies has been matched with FAOSTAT, which is 0. The country prefers to use proportionate method of calibration over the remainder method. This is mainly because the proportionate method maintains the national statistics on percentage of forest cover but indicates higher area where as the remainder method maintains the national statistics on area of the forest cover but reduces the figure of percentage of forest cover. Further that it is the percentage figure that is more important and used more frequently than the area figure.

A. Calibration Factor

Category	**1989**	**1999**
FAOSTAT Area	4,700.00	4,700.00
Proportionate Calibration Factor	1.17280	1.16704

B. Calibrated data

Broad National Classes	**1989**	**1999**
Forests[1]	3024	3131
Scrub/Shrub/Grassland/Pasture	566	609
Agriculture lands[2]	316	202
Water spreads	0	0
Others[3]	794	758
Total	**4700**	**4700**

Note: [1] Includes plantation and excludes scrub, shrub, grassland and pastures.

[2] Horticulture merged with agriculture for 1989. [3] Others includes Snow/glaciers; Bare land and Settlements.

1.3.2 Estimation and forecasting

Area under various broad national classes after estimation and forecasting using linear interpolation and extrapolation techniques is as under

Broad National Classes	**1990**	**2000**	**2005**	**2010**
Forests	3035	3141	3195	3249
Scrub/Shrub/Grassland/Pasture	566	609	611	613
Agriculture lands	318	199	186	173
Water spreads	0	0	0	
Others	781	751	708	665
Total	**4700.00**	**4700.00**	**4700.00**	**4700.00**

1.3.3 Reclassification into FRA 2010 categories

Reclassification (percentage allocation) according to FRA classes

Reclassification	Forest	Other wooded land	Other land with tree cover	Other land	Inland water
Forests	100 %				
Scrub/Shrub/ Grassland & Pasture		100 %			
Agriculture land				100 %	
Water spreads					100 %
Others				100 %	

1.4 Data for Table T1

FRA 2010 categories	Area (1000 hectares)			
	1990	2000	2005	2010
Forest	3 035	3 141	3 195	3 249
Other wooded land	566	609	611	613
Other land	1 099	950	894	838
...of which with tree cover	n.a	n.a	n.a	n.a
Inland water bodies	0	0	0	0
Total for country	**4 700**	**4 700**	**4 700**	**4 700**

1.5 Comments to Table T1

Variable / category	Comments related to data, definitions, etc.	Comments on the reported trend
Forest		The figure for 2010 has been extrapolated from 2000 and 2005 figures.
Other wooded land		
Other land		
Other land with tree cover		
Inland water bodies		

Other general comments to the table

Expected year for completion of ongoing/planned national forest inventory and/or RS survey / mapping	
Field inventory	There is probability of starting National Forest Inventory during the 10th Five Year Plan (2008-2013)
Remote sensing survey / mapping	There is probability of starting National Forest Inventory during the 10th Five Year Plan (2008-2013)

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 *(sub-category of Private ownership)*	Forest owned by individuals and families.
Private business entities and institutions *(sub-category of Private ownership)*	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 *(sub-category of Private ownership)*	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 *(sub-category of Private ownership)*	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.
Categories related to the holder of management rights of public forest resources	
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
RGOB, 1995. Land Cover Figures of Bhutan (National figures), Ministry of Agriculture, Royal Government of Bhutan	H	Landuse, Forest types	1989	
RGOB.1999. Japan Forest Technical Association and Department of Forestry Services, Ministry of Agriculture, Royal Government of Bhutan	H	Landuse and forest types	1999	
Forest and Nature Conservation Act,1995	M	Ownership of the forest land	1995	
Forest and Nature conservation Rules, 2006	M	Ownership of the forest land	2006	
DoF.2005. Information obtained from Social Forestry Division, Department of Forests, Ministry of Agriculture	M	Private Forest	2005	

2.2.2 Classification and definitions

National class	Definition
Reserved Forests	All forest land in the country is a government reserve forests except the forest areas that are removed from the purview of reserved forest or allotted to a person by the Royal Government. Reserved forests also include Community Forests and the Protected Areas. The ownership is with the State.
Private Forests	Any area of private lands that has been registered as private forests pursuant to the rules of Forest and Nature Conservation Rules, 2006 are private forests. The ownership is with the private individuals.

2.2.3 Original data

All forests and other wooded land are owned by the Royal Government of Bhutan.

2.3 Analysis and processing of national data

2.3.1 Calibration

This step is not needed.

2.3.2 Estimation and forecasting

This step is not needed.

2.3.3 Reclassification into FRA 2010 categories

National Classes of Ownership	Public Ownership	Private Ownership	Individuals	Local Communities	Indigenous /tribal Ownership	Other types of Ownership
Forest	100%					

Note: Since the forest owned by individuals is very negligible (i.e. <1%), the total forest area has been assumed to be under public ownership.

2.4 Data for Table T2

Table 2a - Forest ownership

FRA 2010 Categories	Forest area (1000 hectares)		
	1990	2000	2005
Public ownership	3 035	3 141	3195
Private ownership	0	0.004	0.056
...of which owned by individuals	0	0.004	0.056
...of which owned by private business entities and institutions	0	0	0
...of which owned by local communities	0	0	0
...of which owned by indigenous / tribal communities	0	0	0
Other types of ownership	0	0	0
TOTAL	**3 035**	**3 141**	**3 195**

Note: The forest owned by individuals is very negligible, which is 4 hectares for 2000 and 56 hectares for 2005.

Does ownership of trees coincide with ownership of the land on which they are situated?	X	Yes
		No
If **No** above, please describe below how the two differ:		
In case of Private Forest, the ownership of trees is with the private individuals, but, in case of Public Forest, the ownership of trees is with the State.		

Table 2b - Holder of management rights of public forests

FRA 2010 Categories	Forest area (1000 hectares)		
	1990	2000	2005
Public Administration	3 035	3 141	3 195
Individuals	0	0	0
Private corporations and institutions	0	0	0
Communities	0	0	0
Other	0	0	0
TOTAL	**3 035**	**3 141**	**3 195**

2.5 Comments to Table T2

Variable / category	Comments related to data, definitions, etc.	Comments on the reported trend
Public ownership	The data reported refers to the forest area owned by the Royal Government.	
Private ownership	The data reported for 2000 is the sum of Private Forests registered only for the year 2000. For 2005, the data includes all the Private Forests registered between the years 2002 to 2005.	
Other types of ownership	The data for "Other types of ownership" is not available.	
Management rights	The management right of public ownership is with the Royal Government and that of private ownership is with the individual.	

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.
Categories of primary designated functions	
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.
Special designation and management categories	
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 sustain-able 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
DOF.2004.Forest Resources Potential Assessment (FRPA) for Bhutan, Department of Forests, Ministry of Agriculture, Royal Government of Bhutan.	H	Production forest, Protection forest, Protected areas	1989	
RGOB.1995.Land Cover Figures for Bhutan (National Figures), Ministry of Agriculture, Royal Government of Bhutan.	H	Area by land use types	1989	
RGOB.1974.National Forest Policy of Bhutan, Department of Forestry, Ministry of Trade,	H	Policy Statements	1974	

Industry and Forests, Royal Government of Bhutan.				
RGOB.1995.Forest and Nature Conservation Act of Bhutan, Ministry of Agriculture, Royal Government of Bhutan.	H	Policy Statements	1995	
DOF.2000.Information obtained from Social Forestry Division, Department of Forests, Ministry of Agriculture	M	Community Forests	2000	

3.2.2 Classification and definitions

National class	Definition
Production Forest	Forests that are managed for meeting timber, wood fuel and NWFP demand in the country
Protection Forest	Forests that are managed for protection of soil, water and biological diversity.
No/unassigned designation	Forests that have not been assigned any designated functions. However, these forests could be assigned for meeting the rural subsidised timber and, for producing saw logs and other industrial timbers. The forest can also be managed for producing NWFP.

3.2.3 Original data

The original data is derived form the Land Cover Figures of Bhutan, 1995 (National Figures), Ministry of Agriculture, Royal Government of Bhutan. On the basis of this data set, functional classification was done as part of Forest Resources Potential Assessment of Bhutan by the Forest Resources Development Division of the Department of Forests.

1. Protection Area (1989)

It is the forest area where timber production is restricted. It includes "Protected Area Network", area above 4000metres above mean sea level, in-operable areas and buffer areas around roads, rivers and scrubs.

2. Production Area (1989)

It is the forest area where timber production is permitted.

Forest Area available for timber production (Production Area)	Area in ha.
Total	**409,564.00**

3. No Functional Designation (1989)

It is the forest area which has not been designated any primary function. However, these forest areas could be brought under timber production.

4. Biodiversity Conservation (1989)

The Protected Area (i.e.1117,170ha) of Bhutan comprises of four national parks, four wildlife sanctuaries and one strict nature reserve. The figure of Protected Area (PA) was revised to

26.3% in 1993. It is assumed that this entire area is designated under "protection area". In 1999, another 9.5% of the land was demarcated as biological corridor linking all nine protected areas.

Distribution of area under different functions

The table below represents distribution of area under different functions in 1989. It totals to 2579(000ha) of forest area.

National Functions	Area in 000 ha
Production	410
Protection	1181
Protected Area	701
No Designation	287
Total	**2579**

3.3 Analysis and processing of national data

3.3.1 Calibration

This step is not necessary.

3.3.2 Estimation and forecasting

The division of forest area under different functions has been estimated using the percentage distribution within the forest area.

National Functions	Forest Area in 000 ha			
	1990	2000	2005	2010
Production	483	500	508	516
Protection	1390	1439	1464	1488
Protected Area	825	854	869	883
No Designation	337	348	354	362
Total	**3035**	**3141**	**3195**	**3249**

3.3.3 Reclassification into FRA 2010 categories

The national data are not exactly in the FRA 2010 classes; therefore reclassification was done as required by FRA 2010.

Reclassification to FRA 2010 categories for "Primary Function".

National Classes	Production	Protection of soil and water	Conservation of biodiversity	No/unknown
Production	100%			
Protection		100%		
Protected Area			100%	
No Designation				100%

Data for Table T3

Table 3a – Primary designated function

FRA 2010 Categories	Forest area (1000 hectares)			
	1990	**2000**	**2005**	**2010**
Production	483	500	508	516
Protection of soil and water	1 390	1 439	1 464	1 488
Conservation of biodiversity	825	854	869	883
Social services	0	0	0	0
Multiple use	0	0	0	0
Other (please specify in comments below the table)	0	0	0	0
No / unknown	337	348	354	362
TOTAL	**3 035**	**3 141**	**3 195**	**3 249**

Table 3b – Special designation and management categories

FRA 2010 Categories	Forest area (1000 hectares)			
	1990	**2000**	**2005**	**2010**
Area of permanent forest estate	1 821	1 885	1 917	1 949
Forest area within protected areas	825	854	869	883
Forest area under sustainable forest management	n.a.	n.a.	3	11
Forest area with management plan	49	184	251	318

3.4 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	The total forest cover has been recorded as PFE, as it is the policy of the Royal Government to maintain 60% of the country's land under forest cover for all times to come.	
Forest area within protected areas	This includes four national parks, four wildlife sanctuaries and one strict nature reserve.	

Forest area under sustainable forest management	This includes all the Community based Forest Management Units or Community Forests in the country that have scientific Forest Management Plans.	
Forest area with management plan	This includes all the Forest Management Units with a long-term documented Forest Management Plans and are revised periodically.	

Other general comments to the table
Forest area under sustainable forest management: No data was available for 1990 and 2000. The data compiled for 2005 is the total Community Forest registered in the country for the year 2001 to 2005; and for 2010, it is the sum of all the approved Community Forests from 2006 till 2008.

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 outside 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).
Characteristics categories	
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.
Special categories	
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
DOF.2003.Vision and Strategy for the Nature Conservation Division, Department of Forests, Ministry of Agriculture, Royal Government of Bhutan.	H	Area of Protected areas	2003	
MOA.1995.Land Cover Figures of Bhutan -1995 (National Figures), Ministry of Agriculture, Royal Government of Bhutan.	H	Area by land uses	1989	
DOF.2002.Forestry in Bhutan (Facts and Figures)-2002, Department of Forests.	M	Area of FMUs	2002	
DOF.2004.Forest Resources Potential Assessment (FRPA) for Bhutan, Department of Forests, Royal Government of Bhutan.	M	Areas	1989	
DOF.2007.Information obtained from Plantation Section, Social Forestry Division, Department of Forests, Ministry of Agriculture.	M	Plantation Area	2007	
DOF.2008.Information obtained from Forest Resources Development Division, Department of Forests, Ministry of Agriculture.	M	FMU Area	2008	

4.2.2 Classification and definitions

National class	Definition
Protected Areas	A little more than half of the forest area in the Protected Areas have been categorised as Primary Forest. In this forest no human interference has taken place. In the other areas some human activities have taken place like collection of timber, firewood and non-wood forest products for *bonafide* consumption by the local people. This area has been categorised as Other naturally regenerated forest.
Forest covered by management plan	This refers to those forest areas that have approved management plans and are under intensive management. The forests are harvested under approved silvicultural system and are put under natural regeneration. However, if the natural regeneration fails even after three years then artificial regeneration are carried out.
Forest areas that are not covered by management plans	This refers to those forest areas that have no approved management plans. Removal on the selection system is done for supplying the timber and firewood for the local people for their *bonafide* consumption. The area is generally left for natural regeneration.
Plantation	All plantations created for producing timber and other non-wood forest products are put under this category.

Primary Forests
Fifty percent of forests in the Protected Areas are assumed as Primary Forests. Since in the Protected Areas like National Parks and Wildlife Sanctuaries there is very little human interference and the ecological processes are not disturbed. The above assumption creates a problem that the figure of area of primary forest increases with increase in area designated as "PA" where as in reality the area of primary forest cannot increase in such duration as 10 or 15 or 20 years (1990 to 2000, 2005 and 2010). Therefore, the area of forests under "PA" in 1990 has been assumed as area of primary forests in 1990, 2000, 2005 and 2010. The forest area under "PA" in 2000, 2005 and 2010, which is over and above that in 1990 has been treated as "Other naturally regenerated forests"

Other naturally regenerated forests
This includes all forest areas that are covered by some type of approved forest management plan and which are under intensive management. These areas are harvested under approved silvicultural system and are expected to regenerate naturally. The artificial or assisted natural regeneration is carried out in cases where the natural regeneration has failed in reforestation of harvested areas. It also includes all forest areas that have no approved management plans. The selection system is used to supply timber and firewood to the local people for their *bona fide* consumption. The area is generally left for natural regeneration. In addition, it includes the forest area under "PA" in 2000, 2005 and 2010, which is over and above the "PA" in 1990.

Plantation
All plantations established either under afforestation or reforestation schemes are put under this category. The main objective of most of these plantations is to provide timber and other non-wood forest products.

4.2.3 Original data

National Categories	Forest Area (000 ha)	
	1989	**1999**
Forest with management plan	35.00	170.00
Plantation	0.71	1.55

4.3 Analysis and processing of national data

4.3.1 Calibration

This step is not necessary.

4.3.2 Estimation and forecasting

The national figures, after estimation and forecasting are given in the table below.

Variable	Forest Area (000 ha)			
	1990	**2000**	**2005**	**2010**
Forest with management plan	49	184	251	318
Plantation	1	2	2	3
Protected Area	825	854	869	883
Protection Area	1390	1439	1464	1488
Forest without management plan	770	662	609	557
Total	**3035**	**3141**	**3195**	**3249**

Further, as indicated earlier the primary forest area has been assumed to remain constant since 1990. Any area under "PA" network in 2000, 2005 and 2010 that exceeds the figure for 1990 has been transferred to the category of "Other naturally regenerated forests"

4.3.3 Reclassification into FRA 2010 categories

National Class	Percentage of a national class into FRA classes			
	Primary forest	Other naturally regenerated forest	Planted forests of native species	Planted forests of introduced species
	%	%	%	%
Forest with management plan		100%		
Plantation			100%	
Protected Area	50%	50%		
Protection Area		100%		
Forest without management plan		100%		

4.4 Data for Table T4

Table 4a

FRA 2010 Categories	Forest area (1000 hectares)			
	1990	**2000**	**2005**	**2010**
Primary forest	413	413	413	413
Other naturally regenerated forest	2 621	2 726	2 780	2 833
...of which of introduced species	n.a.	n.a.	n.a.	n.a.
Planted forest	1	2	2	3
...of which of introduced species	n.a.	n.a.	n.a.	n.a.
TOTAL	**3 035**	**3 141**	**3 195**	**3 249**

Table 4b

FRA 2010 Categories	Area (1000 hectares)			
	1990	2000	2005	2010
Rubber plantations (Forest)	0	0	0	0
Mangroves (Forest and OWL)	0	0	0	0
Bamboo (Forest and OWL)	n.a.	n.a.	n.a.	n.a.

4.5 Comments to Table T4

Variable / category	Comments related to data, definitions, etc.	Comments on the reported trend
Primary forest	This includes 50% of the Protected Area and, is assumed to remain same for 1990, 2000, 2005 and 2010.	
Other naturally regenerating forest	This includes all the forest area in the country that has approved management plans, forest areas without management plans, protection area and 50% of Protected Area.	
Planted forest		
Rubber plantations	This data is not available.	
Mangroves	This data is not available.	
Bamboo	This data is not available.	

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
DOF.2002.Records of forest plantation of Bhutan, Department of Forests, Ministry of Agriculture, Royal Government of Bhutan.	M	Plantation Area	2002	
DOF.2007.Information obtained from Plantation Section, Social Forestry Division, Department of Forests, Ministry of Agriculture.	M	Plantation Area	2007	
DOF.2007.Progress Reports obtained from the Divisional Forest Officers, Department of Forests, Ministry of Agriculture.	M	Plantation Area	2007	
NRDCL.2007. Information obtained from Natural Resources Development Corporation Limited, Druk Holding and Investment, Thimphu	M	Plantation Area	2007	

5.2.2 Classification and definitions

National class	Definition
Normal Plantation	This includes those forest areas that do not have any vegetation cover, either through planting or seeding. All the plantations established by Territorial Divisions and Dzongkhag Forestry Sectors are put under this category.
Plantation of harvested areas	This includes those forest areas that are harvested and are re-planted, either through planting or seeding. All the plantations established by NRDCL, BBPL and BCCL are put under this category.

5.2.3 Original data

Categories	Plantation during 1988-1992 (ha)	Average per year (ha)	Plantation during 1998-2002 (ha)	Average per year (ha)	Plantation during 2003-2007 (ha)	Average per year (ha)
Normal Plantation	3439.10	687.82	1233.46	246.69	1980.23	396.05
Plantation of harvested areas	1005.90	201.18	666.19	133.24	304.09	60.82
Total	**4445.00**	**889.00**	**1899.65**	**379.93**	**2284.32**	**456.87**

5.3 Analysis and processing of national data

5.3.1 Calibration

This step is not required.

5.3.2 Estimation and forecasting

This step is not required.

5.3.3 Reclassification into FRA 2010 categories

National Class	Percentage of national class into FRA classes	
	Afforestation	Reforestation
Normal Plantation	100%	
Plantation of harvested areas		100%

5.4 Data for Table T5

FRA 2010 Categories	Annual forest establishment (hectares/year)			...of which of introduced species [1] (hectares/year)		
	1990	2000	2005	1990	2000	2005
Afforestation	687.82	246.69	396.05	n.a.	n.a	n.a
Reforestation	201.18	133.24	60.82	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

5.5 Comments to Table T5

Variable / category	Comments related to data, definitions, etc.	Comments on the reported trend
Afforestation	Data reported is the average of 5 years period (i.e. 1988-1992, 1998-2002 and 2003-2007).	
Reforestation	Data reported is the average of 5 years period (i.e. 1988-1992, 1998-2002 and 2003-2007).	
Natural expansion of forest	This data is not available.	

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
DOF.1989.Report on Pre-investment Survey of Forest Resources in Southern Bhutan, Department of Forests, Royal Government of Bhutan (Part I)	H	Growing stock per stratum	1989	
DOF.1989.Report on Pre-investment Survey of Forest Resources in Central and Eastern Bhutan, Department of Forests, Royal Government of Bhutan, Volume I	H	Growing stock per stratum	1989	
DOF.1989.Report on Pre-investment Survey of Forest Resources in North Western Bhutan, Department of Forests, Royal Government of Bhutan	H	Growing stock per stratum	1989	

6.2.2 Classification and definitions

National class	Definition
Growing stock	Volume of all trees above 10cm dbh measured at breast height (i.e. 1.30 meters above the ground)
Commercial growing stock	Assumed 40 percent of the total growing stock

6.2.3 Original data

The following data is from various survey reports (DOF, 1989)

Forest Types	Area (000 ha)	Volume (000 m^3)	Vol./ha
Chir pine	100.90	8466	83.90
Blue pine	128.60	5607	43.60
Fir & Spruce	345.30	92635	268.27
Mixed conifers	486.80	40276	82.74
Conifers mixed with broadleaf	135.80	71764	528.45
Hardwood	1374.90	310229	225.64
Total	**2578.70**	**528977**	205.13

Note: An area of 6.4 (000 ha) has been added to Hardwoods to match the forest area figures in 1989 (Table 1)

6.3 Analysis and processing of national data

6.3.1 Calibration

This step is not necessary.

6.3.2 Estimation and forecasting

A. growing stock in 1999

Applying the per hectare growing stock for 1989 (species wise) to the corresponding area in 1999 (Table 1) result in the following table.

Forest Types	**Area (000 ha)**	**Volume (m^3/ha)**	**Total Volume (000 m^3)**
Chir pine	279.17	83.90	23422.36
Blue pine	136.38	43.60	5946.17
Fir & Spruce	506.97	268.27	136004.84
Mixed conifers	495.99	82.74	41038.21
Conifers mixed with broadleaf	313.58	528.45	165711.35
Hardwood	950.52	225.64	214475.33
Total	**2682.61**		**586598.26**

B. Estimating growing stock for 1990, 2000, 2005 and 2010.

Method of linear interpolation and extrapolation has been used to develop the estimates.

Growing stock	**1990**	**2000**	**2005**	**2010**
	Volume in million m^3			
	535	592	621	650

The commercial growing stock is being assumed as 40 percent of the total growing stock.

6.3.3 Reclassification into FRA 2010 categories

Reclassification (percentage allocation) into FRA 2010 classes.

Forest Types	**Coniferous**	**Broadleaved**
Chir pine	100%	
Blue pine	100%	
Fir & Spruce	100%	
Mixed conifers	100%	
Conifers mixed with broadleaf	50%	50%
Hardwood		100%

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	535	592	621	650	n.a.	n.a.	n.a.	n.a.
... of which coniferous	194	300	353	406	n.a.	n.a.	n.a.	n.a.
... of which broadleaved	341	292	268	244	n.a.	n.a.	n.a.	n.a.
Growing stock of commercial species	214	237	248	260	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
1st	*Abies densa*	Fir	110	122	128
2nd	*Quercus* spp.	Oak	95	105	110
3rd	*Tsuga brunoniana*	Hemlock	32	36	37
4th	*Rhododendron* spp.	Rhododendron	20	22	23
5th	*Machilus spp.*	Kawla	18	19	20
6th	*Acer* spp.	Maple	16	17	18
7th	*Betula* spp.	Birch	14	16	17
8th	*Picea spinulosa*	Spruce	13	14	15
9th	*Michelia* spp.	Champ	9	10	11
10th	*Pinus roxburghii*	Chir pine	10	10	10
Remaining			198	221	232
TOTAL			**535**	**592**	**621**

Table 6c – Specification of threshold values

Item	Value	Complementary information
Minimum diameter (cm) at breast height[1] of trees included in growing stock (X)	5	
Minimum diameter (cm) at the top end of stem for calculation of growing stock (Y)	5	
Minimum diameter (cm) of branches included in growing stock (W)		
Volume refers to "above ground" (AG) or "above stump" (AS)	AG	

[1] 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.

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		
Growing stock composition		

Other general comments to the table
In the case of Growing stock of 10 most common species, the year 1989 has been used as the reference year for defining the species list and the order of the species. The Growing stock is in decreasing order i.e.1st is the species with the highest growing stock.

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
Brown, Sandra. 1997. Estimating Biomass Change in Tropical Forests. A Primer. FAO Forestry Paper No. 134	H	Biomass Expansion Factor	All years	
Brown, S.L. and P.E. Schroeder. 1999. Spatial Patterns of Aboveground production and Mortality of Woody Biomass for Eastern U.S. Forests. Ecological Applications, 9(3) 1999, Ecological Society of America	H	Biomass Expansion Factor	All years	
GPG.2003.Good Practise Guidance for Land-use, Land-use Change and Forestry. IPCC.	H	Basic Densities Root: Shoot Ratio Dead to Live Ratio	All	

7.2.2 Classification and definitions

National class	Definition
Growing stock	Volume of all trees above 10cm dbh measured at breast height (i.e. 1.30 meters from ground level).

7.2.3 Original data

Pre-Investment Survey of Forest Resources (PISFR) is the most important data source for the total growing stock and the growing stock per hectare. PISFR was carried out in 1989 and, since then no National Forest Inventory has been carried out in the country.

The national data for biomass stock is not available. Therefore, the biomass has been estimated based on growing stock in the Table 6 and using following factors, mainly from GPG (2003).

A. Basic Density

Species	Basic Density tonnes/m^3
Chir pine	0.39
Blue pine	0.30
Fir and Spruce	0.40
Mixed Conifer	0.41
Conifer mixed with broadleaf	0.45
Hardwood	0.49

The weighted basic density for 1989 is 0.459 and for 1999 is 0.446, which is computed using the above densities and relative species composition in 1989 and 1999.

B. Biomass Expansion Factor

There are no national estimates for Biomass Expansion Factor (BEF). The following table presents estimates of BEF using the formula (BEF = EXP (3.213-0.506*LN (Stem biomass per hectare) for broadleaved species (Sandra Brown, 1997) and using the formula (BEF = exp {1.771-0.339*LN (Stem biomass per hectare) for conifers (Brown and Schroeder, 1999). The latter formula is for USA but is one of the few formula that are available for conifers that mainly cover pine and spruce species, which are the main constituent of the growing stock in Bhutan.

BEF	1990	2000	2005	2010
Broadleaved Species	2.69	2.64	2.60	2.56
Coniferous Species	1.33	1.31	1.29	1.27
Weighted BEF	1.87	1.84	1.82	1.80

The table represents weighted average BEF, which is computed by using the broad proportion (60:40) of the volume of the coniferous and broadleaved species in the growing stock.

C. Root to Shoot ratio

Following the broad proportion (60:40) of the volume of the coniferous and broadleaved species in the growing stock in 1989 and 1999, a weighted average (0.372) Root to Shoot ratio has been calculated using the default values for conifers (0.46) and broadleaved (0.24) forests in GPG (2003).

7.3 Analysis and processing of national data

7.3.1 Calibration

This step is not necessary.

7.3.2 Estimation and forecasting

A. Weighted basic density

It has been assumed that the weighted basic density for 1989 hold good for 1990 and that of1999 for 2000, 2005 and 2010.

B. Above Ground Biomass

Category	Unit	1990	2000	2005	2010
Growing stock	million m^3	535	592	621	650
Basic density	tonnes/m^3	0.459	0.446	0.446	0.446
BEF		1.87	1.84	1.82	1.80
Above Ground Biomass	**million tonnes**	**459**	**486**	**503**	**522**

C. Below Ground Biomass

A weighted root to shoot ratio of 0.372 have been used.

Category	Unit	1990	2000	2005	2010
Above ground biomass	million tonnes	459	486	503	522
Root Shoot ratio		0.372	0.372	0.372	0.372
Below Ground Biomass	**million tonnes**	**171**	**181**	**187**	**194**

7.3.3 Reclassification into FRA 2010 categories

This step is not necessary.

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	459	486	503	522	n.a.	n.a.	n.a.	n.a.
Below-ground biomass	171	181	187	194	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.
TOTAL	**630**	**667**	**690**	**716**	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
The figure for 2010 has been extrapolated from 2000 and 2005 figures.

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
IPCC.2006.Guidelines for National Greenhouse Gas Inventories Volume 4.	H	Carbon fraction Default values for litter Default values for soil organic C stocks	All	

8.2.2 Classification and definitions

No national definition on forest carbon stock is available.

8.2.3 Original data

A. Conversion factor Biomass to Carbon

The forest carbon stock has been estimated based on the biomass data from Table T6 and using the default conversion factor (0.47) as provided in the IPCC Guidelines for National Greenhouse Gas Inventories Volume 4 (2006).

B. Carbon in forest litter

The default factor of 22 tonnes C per ha for conifer and 13 tonnes C per ha for broadleaf (Guidelines for National Greenhouse Gas Inventories, IPCC, 2006) has been assumed to estimate carbon content of forest litter.

C. Soil Carbon

The forest soil classification has not been done in Bhutan according to the classes mentioned in Guidelines for National Greenhouse Gas Inventories, IPCC, 2006. For that reason, based on expert knowledge, it has been assumed that HAC Soils span about 50% of forest area, LAC Soils about 30% of forest area and Sandy Soils about 20% of forest area.

Forest	Area (000 hectares)			
	1990	**2000**	**2005**	**2010**
HAC Soils	1518	1571	1598	1624
LAC Soils	911	942	959	975
Sandy Soils	606	628	638	650
Total	**3035**	**3141**	**3195**	**3249**

8.3 Analysis and processing of national data

8.3.1 Calibration

This step is not necessary.

8.3.2 Estimation and forecasting

A. Carbon in Living biomass and Dead wood biomass

FRA 2010 Categories	Carbon (Million metric tonnes)							
	Forest				Other wooded land			
	1990	**2000**	**2005**	**2010**	**1990**	**2000**	**2005**	**2010**
Carbon in above ground biomass	216	228	236	245	n.a.	n.a.	n.a.	n.a.
Carbon in below ground biomass	80	85	88	91	n.a.	n.a.	n.a.	n.a.
Sub-total: Carbon in living biomass	**296**	**313**	**324**	**336**	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.

B. Carbon in Litter

Category	**1990**	**2000**	**2005**	**2010**
Forest area (000 ha)	3035	3141	3195	3249
Conifer	1093	1602	1821	2014
broadleaf	1942	1539	1374	1235
Default factor (tonnes C/ha)				
Conifer	22	22	22	22
Broadleaf	13	13	13	13
Carbon (million tonnes)				
Conifer	24	35	40	44
Broadleaf	25	20	18	16
Total (million tonnes)	**49**	**55**	**58**	**60**

C. Carbon in Forest Soil

Following the IPCC Guidelines for National Greenhouse Gas Inventories Volume 4 (2006), it has been assumed that the per hectare carbon content of HAC, LAC and Sandy forest soils is 88, 63 and 34 tonnes respectively.

Forest	Carbon in million tonnes			
	1990	**2000**	**2005**	**2010**
HAC Soils	134	138	141	143
LAC Soils	57	59	60	61
Sandy Soils	21	21	22	22
Total	**212**	**218**	**223**	**226**

8.3.3 Reclassification into FRA 2010 categories

This step is not necessary.

8.4 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	216	228	236	245	n.a.	n.a.	n.a.	n.a.
Carbon in below-ground biomass	80	85	88	91	n.a.	n.a.	n.a.	n.a.
Sub-total: Living biomass	**296**	**313**	**324**	**336**	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	49	55	58	60	n.a.	n.a.	n.a.	n.a.
Sub-total: Dead wood and litter	**49**	**55**	**58**	**60**	n.a.	n.a.	n.a.	n.a.
Soil carbon	**212**	**218**	**223**	**226**	n.a.	n.a.	n.a.	n.a.
TOTAL	**557**	**586**	**605**	**622**	n.a.	n.a.	n.a.	n.a.

Soil depth (cm) used for soil carbon estimates	30 cm

8.5 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
DoF.2008. Information obtained from Fire Section, Social Forestry Division, Department of Forests, Ministry of Agriculture.	M	Area affected by fire	1992 -2008	

9.2.2 Classification and definitions

National class	Definition
Forest fire	Wild fire that are either unplanned or uncontrolled which burns the forest and destroys the flora and fauna.

9.2.3 Original data

Forest affected by fire

Year	1992-1993	1993-1994	1994-1995	1995-1996	1996-1997	1997-1998	1998-1999	1999-2000
Area affected (in ha)	29,182.37	2,240.78	19,627.72	10,812.10	9,853.32	6,487.28	13,535.95	13,455.33
No. of fires	84	36	56	62	48	72	112	104

Year	2000-2001	2001-2002	2002-2003	2003-2004	2004-2005	2005-2006	2006-2007	2007-2008
Area affected (in ha)	9,325.68	5,857.66	2,170.39	1,084.48	3,186.20	7,832.27	22,512.29	2,566.89
No. of fires	81	64	46	40	67	37	47	10

9.3 Analysis and processing of national data

9.3.1 Calibration

This step is not necessary.

9.3.2 Estimation and forecasting

This step is not necessary.

9.3.3 Reclassification into FRA 2010 categories

Reclassification of national data on forest fire is not necessary. The information is more or less, as per the FRA 2010 format. Data before 1992 is not available. The data for 2000 is an average of 1998 – 2002 (six months of 1998 and six months of 2002, which is only four years). The data for 2005 is an average of 2003 – 2007 (six months of 2003 and six months of 2007, which is also four years).

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	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
... of which on forest	n.a.	n.a.	8.43	72	6.92	38
... of which on other wooded land	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
... of which on other land	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

Table 9b

FRA 2010 category	Proportion of forest area affected by fire (%)		
	1990	2000	2005
Wildfire	n.a.	100	100
Planned fire	n.a.	0	0

Note: There is no data available for "planned fire". So the data recorded has been assumed to be for "Wild fire" only.

9.5 Comments to Table T9

Variable / category	Comments related to data, definitions, etc.	Comments on the reported trend
Area affected by fire	No data has been collected separately for "forest", "other wooded land" and "other land". Therefore, the data has been assumed to be for forest only.	
Number of fires		
Wildfire / planned fire		

Other general comments to the table

10 Table T10 – Other disturbances affecting forest health and vitality

10.1 FRA 2010 Categories and definitions

Term	Definition
Disturbance	Damage caused by any factor (biotic or abiotic) that adversely affects the vigour and productivity of the forest and which is not a direct result of human activities.
Invasive species	Species that are non-native to a particular ecosystem and whose introduction and spread cause, or are likely to cause, socio-cultural, economic or environmental harm or harm to human health.
Category	**Definition**
Disturbance by insects	Disturbance caused by insect pests.
Disturbance by diseases	Disturbance caused by diseases attributable to pathogens, such as bacteria, fungi, phytoplasma or virus.
Disturbance by other biotic agents	Disturbance caused by biotic agents other than insects or diseases, such as wildlife browsing, grazing, physical damage by animals, etc.
Disturbance caused by abiotic factors	Disturbances caused by abiotic factors, such as air pollution, snow, storm, drought, etc.

10.2 National data

10.2.1 Data sources

References to sources of information	Quality (H/M/L)	Variable(s)	Year(s)	Additional comments
CoRRB.2007.Information collected from Renewable Natural Resources Research Centre, RNR-RC Yusipang, Thimphu, Ministry of Agriculture.	M	Area affected by insects, diseases, biotic agents and abiotic factors	1988-2007	
CoRRB.2007.Information collected from Renewable Natural Resources Research Centre, RNR-RC Bajo, Wangdue, Ministry of Agriculture.	M	Area affected by insects, diseases, biotic agents and abiotic factors	1988-2007	
CoRRB.2007.Information collected from Renewable Natural Resources Research Centre, RNR-RC Jakar, Bumthang, Ministry of Agriculture.	M	Area affected by insects, diseases, biotic agents and abiotic factors	1988-2007	
CoRRB.2007.Information collected from Renewable Natural Resources Research Centre, RNR-RC Wengkhar, Monggar, Ministry of Agriculture.	M	Area affected by insects, diseases, biotic agents and abiotic factors	1988-2007	

10.2.2 Classification and definitions

National class	Definition
Disturbances by insects	Disturbances caused by insects that are detrimental to forest health.
Disturbances by diseases	Disturbances caused by diseases attributable to pathogens, such as bacteria, fungi, phytoplasma or virus.
Disturbances by biotic agents	Disturbances caused by biotic agents such as wildlife browsing, livestock grazing especially domestic cattle, physical damage by animals, etc.
Disturbances by abiotic factors	Disturbances caused by abiotic factors such as drought, wind, storm, snow, etc.

10.2.3 Original data

Year	1988-1992	1998-2002	2003-2007
Area affected by insects (in ha)	1150.0	410.5	500.0
Area affected diseases (in ha)	n.a.	10.0	35.0
Area affected biotic agents (in ha)	n.a.	n.a.	n.a.
Area affected abiotic factors (in ha)	n.a.	1405.0	25.0
Total area affected by disturbances (in ha)	1150.0	1825.5	560.0

10.3 Analysis and processing of national data

10.3.1 Calibration

This step is not necessary.

10.3.2 Estimation and forecasting

This step is not necessary.

10.3.3 Reclassification into FRA 2010 categories

This step is not necessary.

10.4 Data for Table T10

Table 10a – Disturbances

FRA 2010 category	Affected forest area (1000 hectares)		
	1990	2000	2005
Disturbance by insects	0.230	0.082	0.100
Disturbance by diseases	n.a.	0.002	0.007
Disturbance by other biotic agents	n.a.	n.a.	n.a.
Disturbance caused by abiotic factors	n.a.	0.281	0.005
Total area affected by disturbances	**0.230**	**0.365**	**0.112**

Notes: 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.

Table 10b – Major outbreaks of insects and diseases affecting forest health and vitality

Description / name	Tree species or genera affected (scientific name)	Year(s) of latest outbreak	Area affected (1000 hectares)	If cyclic, approx. cycle (years)
Ips Schmutzenhoferi	*Picea Spinulosa*	2000-2002	0.30	n.a.
Ips Schmutzenhoferi	*Picea Spinulosa, Pinus Wallichiana*	1988-1992	1.15	n.a.
Zeuzera multistrigatya	*Cryptomeria japonica*	2001	0.01	n.a.
Armillaria Mellea	*Picea Spinulosa*	2002	0.01	n.a.
Lambdina Spp.	*Pinus Roxburghii*	2005-2006	0.10	n.a.
Abraxus Spp.	*Abies Densa*	2006	0.30	n.a.
Arceuthobium minutissimum	*Pinus Wallichiana*	n.a.	n.a.	n.a.
Arceuthobium pini	*Picea Spinulosa*	n.a.	n.a.	n.a.
Lambdina Spp.	*Pinus Roxburghii, Quercus lanata*	2006	n.a.	n.a.
Lebeda nobilis	*Pinus Roxburghii*	1986,1990	0.10	4-5 years

Note: Area affected refers to the total area affected during the outbreak.

Table 10c – Area of forest affected by woody invasive species

Scientific name of woody invasive species	Forest area affected 2005 (1000 hectares)
Lantana Camara	n.a.
Mimosa Diplotricha	n.a.
Solanum Mauritianum	n.a.
Melastoma Candidum	n.a.
Leucaena Leucocephala	n.a.
Total forest area affected by woody invasive species	

Note: The total forest area affected by woody invasive species is not necessary the sum of the values above, as these may be overlapping.

10.5 Comments to Table T10

Variable / category	Comments related to data, definitions, etc.	Comments on the reported trend
Disturbance by insects	The data reported for 1990 is the sum of forest area affected by insects from 1988-1992. For 2000, the data compiled is from 2000-2002, and for 2005 the data compiled is from 2005-2006.	
Disturbance by diseases	No data is available for 1990. For 2000, the data reported is only for the year 2002. For 2005, the data reported is for the year 2003-2005.	
Disturbance by other biotic agents	No data is available for 1990, 2000 and 2005.	
Disturbance caused by abiotic factors	No data is available for 1990. For 2000, the data reported is for the year 1999 and 2001. For 2005, the data reported is for the year 2003 and 2005.	
Major outbreaks		
Invasive species	So far only the woody invasive species have been identified in the country. There is no record of the area affected by woody invasive species.	

Other general comments to the table

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
DOF.1992.Terminal Report for 6th Five Year Plan, Department of Forests (1987-1992)	M	Quantity and value of wood removal	1987 to 1992	
DOF.2006.Progress Reports obtained from the Divisional Forest Officers, Department of Forests	M	Quantity and value of wood removal	2006	
NRDCL.2006. Information obtained from Natural Resources Development Corporation Limited, Druk Holding and Investment, Thimphu	M	Quantity and value of wood removal	2006	

11.2.2 Classification and definitions

National class	Definition
Commercial supply	Royalty is paid at market value for the supplies such as trees, logs, poles and posts that are available for commercial use. The consumers buy the materials in open auction.
Rural supply	Royalty is paid at a subsidized rate for the supplies such as trees, logs, poles and posts that are supplied to the rural villagers for their *bonafide* use
Royalty free supply	No royalty is charged on supplies made on "*royalty free supply*"

11.2.3 Original data

Wood Removal

The quantity of timber supplied for 1990 is the average of supplies made during 1987 to 1992.

Sl. No	Particulars	Unit	Supply during 1987-1992[1]	Conversion factor[2]	Total volume supplied (m^3)	Average per year (m^3)	Value (Nu.)	Value/m^3 (Nu.)
1	Trees	Nos	510,519.00	1.300	663,674.70	132,734.94	135,790,000.00	1174.65
2	Poles/posts	Nos	472,628.00	0.067	31,666.07	6,333.21	5,900,000.00	
3	Log form	cft	5,470,732.00	35.310	154,934.35	30,986.87	58,000,000.00	
	subtotal					170,055.02	199,690,000.00	
4	Wood fuel	m^3	715,268.00		715,268.00	143,053.60	1,890,000.00	13.22
	Total				**1,565,543.12**	**313,108.62**	**201,580,000.00**	

Note:

[1] July 1987 to December 1987 = 6 months. January 1988 to December 1991 = 4 years. January 1992 to June 1992 = 6 months

[2] Conversion factor used for converting "number of trees" to m^3 is 1.300. Conversion factor used for converting "number of poles" to m^3 is 0.067.

Since the information is not available for the years 1998-2002, the figure for 2000 is the actual supply made for the year 2000 only. This is not an average figure.

Sl. No	Particulars	Unit	Supply during 2000	Conversion factor[1]	Total volume supplied (m^3)	Value (Nu.)	Value/m^3 (Nu.)
1	Trees	Nos	85,090.00	1.300	110,617.00	113,162,988.06	1296.32
2	Poles/posts	Nos	285,974.50	0.067	19,160.29	17,849,670.39	
3	Log form	m^3	65,055.99	35.310	65,055.99	121,769,233.87	
4	Wood fuel	m^3	94,611.00		94,611.00	1,249,984.55	13.16
	Total				**289,444.28**	**254,031,876.87**	

[1] Conversion factor used for converting "number of trees" to m^3 is 1.300. Conversion factor used for converting "number of poles" to m^3 is 0.067.

The quantity of timber supplied for 2005 is the average of supplies made during 2002 to 2006.

Sl. No	Particulars	Unit	Supply during 2002-2006[1]	Conversion factor[2]	Total volume supplied (m^3)	Average per year (m^3)	Value (Nu.)	Value/m^3 (Nu.)
1	Tree	Nos	86251.00	1.300	112125.50	28031.38	2678352.00	961.3
2	Shinglep	Nos	11194.00	0.067	22388.00	5597.00	146720.00	
3	Cham	Nos	320056.00	1.100	278237.30	69559.33	2090027.50	
4	Tsim	Nos	155478.00	0.067	10417.03	2604.26	511706.50	
5	Dangchung	Nos	167388.00	0.067	11215.00	2803.75	1469210.00	
6	Fencing post	Nos	130337.00	0.035	4561.80	1140.45	216793.00	
7	Flag post	Nos	162357.00	0.047	7630.78	1907.69	215025.00	
8	Log form	cft	14521907.12	35.310	411268.98	102817.25	199983766.74	
9	Sawn form	cft	183073.44	35.310	5188.33	1297.08	328381.53	
	Subtotal					215758.19	207639982.30	
10	Wood fuel	m^3	373577.58		373577.58	93394.39	990992.55	10.66
	Total				**1,236,610.30**	**309,152.58**	**208,630,974.82**	

Note:
[1] July 2002 to December 2002 = 6 months. January 2003 to December 2005 = 3 years. January 2006 to June 2006 = 6 months
[2] Conversion factor used for converting "number of trees" to m^3 is 1.300. Conversion factor used for converting "number of Shinglep" to m^3 is 2.000. Conversion factor used for converting "number of Cham" to m^3 is 1.100. Conversion factor used for converting "number of Tsim" to m^3 is 0.067. Conversion factor used for converting "number of Dangchung" to m^3 is 0.067. Conversion factor used for converting "number of Fencing post" to m^3 is 0.035. Conversion factor used for converting "number of Flag post" to m^3 is 0.047.

11.3 Analysis and processing of national data

11.3.1 Calibration

This step is not necessary.

11.3.2 Estimation and forecasting

This step is not necessary.

11.3.3 Reclassification into FRA 2010 categories

National Classes	Percentage of national class belonging to FRA Class	
	Industrial roundwood	Wood fuel (fuel wood)
Tree	100%	
Shinglep	100%	
Cham	100%	
Tsim	100%	
Dangchung	100%	
Fencing post	100%	
Flag post	100%	
Log form	100%	
Sawn form	100%	

Wood fuel		100%

11.4 Data for Table T11

FRA 2010 Category	Industrial round wood removals			Wood fuel removals		
	1990	2000	2005	1990	2000	2005
Total volume (1000 m^3 o.b.)	170	195	216	143	95	93
... of which from forest	170	195	216	143	95	93
Unit value (local currency / m^3 o.b.)	1174.65	1296.32	961.30	13.22	13.16	10.66
Total value (1000 local currency)	199,690.5	252,782.4	207,640.8	1,890.5	1,250.2	991.38

Note: The product of Total Volume (1000 m^3 o.b.) and Unit Value (local currency / m^3 o.b.) will not result in the exact figure of Total Value (1000 local currency) due to rounding-off.

	1990	2000	2005
Name of local currency	Ngultrum	Ngultrum	Ngultrum

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	Industrial roundwood removals have increased over the years	This is due to urbanization and infrastructure development in the country.
Total volume of woodfuel removals	Woodfuel removals have decreased over the years.	It is because people have switched over to the use of electricity and gas as a source of energy for cooking and space heating.
Unit value		
Total value		

Other general comments to the table
Industrial round wood removals includes Trees, Shinglep, Cham, Tsim, Dangchung, Fencing post, Flag post, Log form and Sawn form. The total removal includes rural supply, urban supply/auction by NRDCL, supply made to Government institutions, supply to Dzong and Lhakhang on subsidy, supply to Dzong and Lhakhang on commercial royalty and supply made on kidu or free of royalty and, similarly for Woodfuel removals.

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

12.1 FRA 2010 Categories and definitions

Term	Definition
Non-wood forest product (NWFP)	Goods derived from forests that are tangible and physical objects of biological origin other than wood.
Value of NWFP removals	For the purpose of this table, value is defined as the market value at the site of collection or forest border.

NWFP categories

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

12.2 National data

12.2.1 Data sources

References to sources of information	Quality (H/M/L)	Variable(s)	Year(s)	Additional comments
RGOB.2000.Renewable Natural Resources Statistics,2000,volume I, Ministry of Agriculture, Royal Government of Bhutan	H	Quantity and value of removal	2000	
DOF.1992.Terminal Report for 6th Five Year Plan, Department of Forest (1987-1992)	M	Quantity and value of removal	1987 to 1992	
DOF.2003.Progress Report of the Department of Forests (1999-2003),Department of Forests	M	Quantity and value of removal	1999 to 2003	
DOF.2004.Records from Bhutan Museum of Natural History, Department of Forests, ministry of Agriculture	M	Quantity and value of removal	2004	
DOF. 2005. Forest Information Management System, Department of Forests, Ministry of Agriculture	M	Quantity and value of removal	2004 to 2005	

12.2.2 Classification and definitions

National class	Definition
NWFP – Plant Products/ Raw Material	Currently it includes Mushroom billet, Lemon grass oil, Resin, Daphne, Cordycep, Leaf mould, Bamboo, Stone, Sand, Stone chips, Top soil and Wood chips.
NWFP – Animal Products	Currently it includes skin, hides, antlers, trophy, birds' parts, like skin, skin body parts, honey, wax, and edible animal parts, etc.

12.2.3 Original data

Non Wood Forest Products on commercial rate									
		1990		2000		2004-2005		2005-2006	
Forest Produce	Unit	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Bamboo	Nos.	n.a.	n.a.	n.a.	n.a.	324372	168,673.44	464883	246387.99
Stone	T/L	n.a.	n.a.	n.a.	n.a.	46038	1,841,520.00	41955	1678200
Sand	T/L	n.a.	n.a.	n.a.	n.a.	47137	1,885,480.00	45730	1829200
Sand chips	T/L	n.a.	n.a.	n.a.	n.a.	28481.5	1,139,260.00	n.a.	0
Top soil	T/L	n.a.	n.a.	n.a.	n.a.	350	14,000.00	380	15200
Wood Chips	T/L	n.a.	n.a.	n.a.	n.a.	206	103,000.00	289	144500
Lemon grass oil	Kg	5,117.84	n.a.	102,117.00	n.a.	6330	25,320.00	3596	14384
Mushroom billet	Nos.	n.a.	n.a.	n.a.	n.a.	5700	5,700.00	12774	12774
Resin	Kg	239,811.00	997,613.76	111,611.70	464,304.67	7391.5	29,566.00	41135	164540
Cordycep	Kg	n.a.	n.a.	n.a.	n.a.	153	3,442,500.00	80.96	1821600
Daphne	Kg	n.a.	n.a.	1,3157.40	8,157.58	900	540.00	9400	5640
Leaf mould	T/L	n.a.	n.a.	n.a.	n.a.	141	8,460.00	575.5	34530
Skin	No.	n.a.	n.a.	423	n.a.	n.a.	n.a.	n.a.	n.a.
Trophy	No.	n.a.	n.a.	293	n.a.	n.a.	n.a.	n.a.	n.a.
Skull	No.	n.a.	n.a.	87	n.a.	n.a.	n.a.	n.a.	n.a.
Skeleton	No.	n.a.	n.a.	80	n.a.	n.a.	n.a.	n.a.	n.a.

12.3 Analysis and processing of national data

12.3.1 Calibration

This step is not necessary.

12.3.2 Estimation and forecasting

The figure available is for the financial year 2004-2005 (i.e. July 2004 to June 2005) and 2005-2006 (i.e. July 2005 to June 2006). Therefore, the figure for 2005 is taken as an average of 2004-2005 and 2005-2006 figures.

12.3.3 Reclassification into FRA 2010 categories

National Class	Percentage of national class that falls in FRA class of NWFP					
	1	**3**	**5**	**7**	**8**	**10**
Bamboo			100			
Stone						
Sand						
Sand Chips						
Top Soil			100			
Wood Chips						
Lemon grass oil		100				
Mushroom billet	100					
Resin				100		
Cordycep		100				
Daphne					100	
Leaf mould					100	
Skin						100
Trophy						100
Skull						100
Skeleton						100

Note: the number in column represent following NWFP

ID#	Name of NWFP category
1	Food
3	Raw material for medicine and aromatic products
5	Raw material for utensils, handicrafts & construction
7	Exudates
8	Other plant Products
10	Hides, skins and trophies

12.4 Data for Table T12

Rank	**Name of product**	**Key species**	**Unit**	**NWFP removals 2005**		**NWFP category**
				Quantity	**Value (1000 local currency)**	
1st	Cordycep		Kg	116.98	2632.050	**3**
2nd	Bamboo		Nos.	394627.5	207.530	**5**
3rd	Resin		Kg	24263.25	97.053	**7**
4th	Lemon grass oil		Kg	4963	19.852	**3**
5th	Top soil		T/L	365	14.600	**5**
6th	Mushroom billet		Nos.	9237	9.237	**1**
7th	Leaf mould		T/L	358.25	21.495	**8**
8th	Daphne		Kg	5150	3.090	**8**
9th						
10th						
All other plant products						
All other animal products		n.a.	n.a.	n.a.	n.a.	**n.a.**
TOTAL					3004. 907	

	2005
Name of local currency	Ngultrum

12.5 Comments to Table T12

Variable / category	Comments related to data, definitions, etc.
10 most important products	
Other plant products	
Other animal products	
Value by product	
Total value	

Other general comments to the 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 wage or salary in cash or in kind.
Self-employment	Persons who during a specified reference period performed some work for profit or family gain 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
DoF.2005. Administration and Finance Division, Department of Forests, Ministry of Agriculture	M	Information on personnel	1969 to 2005	
NRDCL.2005.Administration and Finance Division, Natural Resources Development Corporation Limited, Druk Holding and Investment	M	Information on personnel	1995 to 2005	

13.2.2 Classification and definitions

National class	Definition
Regular employees of the Department of Forests and Natural Resources Development Corporation Limited	All the regular employees of the Department of Forests and Natural Resources Development Corporation Limited has been categorised as regular employees.
People engaged in logging, firewood collection, medicinal plants collection, collection of fodder from forests, maintenance of forest road, nursery and plantation activities by the Department of Forests and Natural Resources Development Corporation Limited	Wage employees involved in the forestry activities like logging, firewood collection, medicinal plants collection, collection of fodder from forests, maintenance of forest road, nursery and plantation activities are categorised as wage-workers.

13.2.3 Original data

The table given below provides information on number of workers under the Department of Forests.

National category of employment	1990	2000	2005
	Number of persons		
Regular employees of the Department of Forests			
Engaged in logging	n.a.	2	
Firewood collection	n.a.	5	
Medicinal plant collection	4	6	
Collection of fodder from forests	11	2	
Maintenance of forest road	n.a.	n.a.	
Employed in nursery	n.a.	2	32 (add more later)
Employed in plantation works	231	2684	820(add more later)

The table given below provides information on number of workers under Natural Resources Development Corporation Limited.

National category of employment	1990	2000	2005
	Number of persons		
Regular employees of NRDCL	n.a.	187	229
Engaged in logging	97	154	135
Firewood collection	n.a.	39	45
Medicinal plant collection	n.a.	n.a.	n.a.
Collection of fodder from forests	n.a.	n.a.	n.a.
Maintenance of forest road	n.a.	n.a.	75
Employed in nursery	3	4	7
Employed in plantation works	127	70	3926

The table given below provides information on the total number of workers under the Department of Forests and Natural Resources Development Corporation Limited, who are employed in primary production of goods derived from forests.

National category of employment	1990	2000	2005
	Number of persons		
Regular employees	n.a.	187	229
Engaged in logging	97	156	135
Firewood collection	n.a.	44	45
Medicinal plant collection	4	6	n.a.
Collection of fodder from forests	11	2	n.a.
Maintenance of forest road	n.a.	n.a.	75
Employed in nursery	3	6	39
Employed in plantation works	358	2754	4746

13.3 Data for Table T13

FRA 2010 Category	Employment (1000 years FTE)		
	1990	2000	2005
Employment in primary production of goods	0.5	3.2	5.2
...of which paid employment	n.a.	n.a.	n.a.
...of which self-employment	n.a.	n.a.	n.a.
Employment in management of protected areas	n.a.	n.a.	n.a.

13.4 Comments to Table T13

Variable / category	Comments related to data, definitions, etc.	Comments on the reported trend
Employment in primary production of goods	The reported figures are the number of employees in primary production of goods derived from forests under the Department of Forests and Natural Resources Development Corporation Limited. The figures are underestimated due to a lack of some data.	
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)			
Forest policy statement with national scope		X	Yes
			No
If Yes above, provide:	Year of endorsement	1974	
	Reference to document	National Forest Policy	
National forest programme (nfp)		X	Yes
			No
If Yes above, provide:	Name of nfp in country	10th Five Year Plan	
	Starting year	2008 - 2013	
	Current status		In formulation
		X	In implementation
			Under revision
			Process temporarily suspended
	Reference to document or web site	10th Five Year Plan	
Law (Act or Code) on forest with national scope		X	Yes, specific forest law exists
			Yes, but rules on forests are incorporated in other (broader) legislation
			No, forest issues are not regulated by national legislation
If Yes above, provide:	Year of enactment	1995	
	Year of latest amendment	No revision of Act	
	Reference to document	Forest and Nature Conservation Act of Bhutan	

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.		
Sub-national forest policy statements		Yes
	X	No
If Yes above, indicate the number of regions/states/provinces with forest policy statements		
Sub-national Laws (Acts or Codes) on forest		Yes
	X	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)	
Law (Act or Code) on forest with national scope	
Sub-national forest policy statements	
Sub-national Laws (Acts or Codes) on forest	

Other general comments to the table

15 Table 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	Minister, Ministry of Agriculture, Royal Government of Bhutan.	
Level of subordination of Head of Forestry within the Ministry		1st level subordination to Minister
	X	2nd level subordination to Minister
		3rd level subordination to Minister
		4th or lower level subordination to Minister
Other public forest agencies at national level	Natural Resources Development Corporation Limited (NRDCL)	
Institution(s) responsible for forest law enforcement	Department of Forests	

Table 15b – Human resources

FRA 2010 Category	Human resources within public forest institutions					
	2000		2005		2008	
	Number	%Female	Number	%Female	Number	%Female
Total staff	794	9	1195	13	1255	13
...of which with university degree or equivalent	32	3	42	14	54	17

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	The Head of Forest Department reports to Secretary, Ministry of Agriculture, who in turn reports to the Minister, Ministry of Agriculture.	
Other public forest agencies at national level		
Institution(s) responsible for forest law enforcement		
Human resources within public forest institutions	The human resource data compiled for the year 2000, 2005 and 2008 includes forestry personnel from the year 1969 to 2000, 1969 to 2005 and 1969 to 2008 respectively.	

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 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
DoF.2008. Administration and Finance Division, Department of Forests, Ministry of Agriculture	M	Information on personnel	1969 to 2008	
Administration and Finance Division, Council for Renewable Natural Resources Research of Bhutan (CoRRB), Ministry of Agriculture	M	Information on personnel	1970 to 2007	

16.2.2 Original data

	Graduation of students in forest-related education					
	2000		2005		2008	
	Total Number	Female Number	Total Number	Female Number	Total Number	Female Number
Master's degree (MSc)	**31**	**1**	**2**	**1**	**5**	**1**
Bachelor's degree (BSc)	**1**	**0**	**8**	**4**	**7**	**2**
certificate / diploma	**762**	**70**	**391**	**83**	**48**	**0**

	Professionals working in publicly funded forest research centres					
	2000		2005		2008	
	Total Number	Female Number	Total Number	Female Number	Total Number	Female Number
Doctor's degree (PhD)	**2**	**0**	**0**	**0**	**0**	**0**
Master's degree (MSc)	**28**	**2**	**0**	**0**	**0**	**0**
Bachelor's degree (BSc)	**6**	**0**	**10**	**1**	**3**	**1**

16.3 Analysis and processing of national data

16.3.1 Estimation and forecasting

This step is not required.

16.4 Data for Table T16

FRA 2010 Category	Graduation [1] of students in forest-related education					
	2000		2005		2008	
	Number	%Female	Number	%Female	Number	%Female
Master's degree (MSc) or equivalent	31	3	2	50	5	25
Bachelor's degree (BSc) or equivalent	1	0	8	50	7	29
Forest technician certificate / diploma	762	9	391	21	48	0
FRA 2010 Category	**Professionals working in publicly funded forest research centres [2]**					
	2000		2005		2008	
	Number	%Female	Number	%Female	Number	%Female
Doctor's degree (PhD)	2	0	0	0	0	0
Master's degree (MSc) or equivalent	28	7	0	0	0	0
Bachelor's degree (BSc) or equivalent	6	0	10	10	3	33

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	The data compiled for the year 2000, 2005 and 2008 includes information on forestry personnel from the year 1969 to 2000, 2001 to 2005 and 2006 to 2008 respectively.	
Professionals working in public forest research centres	The data compiled for the year 2000, 2005 and 2008 includes information on public forest research personnel from the year 1970 to 2000, 2001 to 2005 and 2006 to 2008 respectively.	

Other general comments to the table
The names of the education institutions are College of Natural Resources (CNR), Bhutan Forestry Institute (BFI) and Ugyen Wangchuck Environmental and Forestry Institute (UWEFI). Forest research centre includes Renewable Natural Resources Research Centre (RNR-RC) Yusipang, RNR-RC Bajo, RNR-RC Jakar and RNR-RC Wengkhar.

17 Table T17 – Public revenue collection and expenditure

No data available.