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The Forest Resources Assessment Programme

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

FAO, at the request of its member countries, regularly monitors the world's forests and their management and uses through the Forest Resources Assessment Programme. This country report forms part of the Global Forest Resources Assessment 2005 (FRA 2005), which is the most comprehensive assessment to date. More than 800 people have been involved, including 172 national correspondents and their colleagues, an Advisory Group, international experts, FAO staff, consultants and volunteers. Information has been collated from 229 countries and territories for three points in time: 1990, 2000 and 2005.

The reporting framework for FRA 2005 is based on the thematic elements of sustainable forest management acknowledged in intergovernmental forest-related fora and includes more than 40 variables related to the extent, condition, uses and values of forest resources. More information on the FRA 2005 process and the results - including all the country reports - is available on the FRA 2005 Web site (www.fao.org/forestry/fra2005).

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The Global Forest Resources Assessment 2005 Country Report Series is designed to document and make available the information forming the basis for the FRA 2005 reports. The Country Reports have been compiled by officially nominated country correspondents in collaboration with FAO staff. Prior to finalisation, these reports were subject to validation by forestry authorities in the respective countries.

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Contents

1	TABLE T1 – EXTENT OF FOREST AND OTHER WOODED LAND	6
1.1	FRA 2005 CATEGORIES AND DEFINITIONS.....	6
1.2	NATIONAL DATA.....	6
1.3	ANALYSIS AND PROCESSING OF NATIONAL DATA.....	7
1.4	RECLASSIFICATION INTO FRA 2005 CLASSES	8
1.5	DATA FOR NATIONAL REPORTING TABLE T1	8
1.6	COMMENTS TO NATIONAL REPORTING TABLE T1	8
2	TABLE T2 – OWNERSHIP OF FOREST AND OTHER WOODED LAND	9
2.1	FRA 2005 CATEGORIES AND DEFINITIONS.....	9
2.2	NATIONAL DATA.....	9
2.3	ANALYSIS AND PROCESSING OF NATIONAL DATA.....	9
2.4	RECLASSIFICATION INTO FRA 2005 CLASSES	9
2.5	DATA FOR NATIONAL REPORTING TABLE T2	9
2.6	COMMENTS TO NATIONAL REPORTING TABLE T2	9
3	TABLE T3 – DESIGNATED FUNCTION OF FOREST AND OTHER WOODED LAND	10
3.1	FRA 2005 CATEGORIES AND DEFINITIONS.....	10
3.2	NATIONAL DATA.....	10
3.3	ANALYSIS AND PROCESSING OF NATIONAL DATA.....	11
3.4	RECLASSIFICATION INTO FRA 2005 CLASSES	11
3.5	DATA FOR NATIONAL REPORTING TABLE T3	11
3.6	COMMENTS TO NATIONAL REPORTING TABLE T3	11
4	TABLE T4 – CHARACTERISTICS OF FOREST AND OTHER WOODED LAND	12
4.1	FRA 2005 CATEGORIES AND DEFINITIONS.....	12
4.2	NATIONAL DATA.....	12
4.3	ANALYSIS AND PROCESSING OF NATIONAL DATA.....	12
4.4	RECLASSIFICATION INTO FRA 2005 CLASSES	13
4.5	DATA FOR NATIONAL REPORTING TABLE T4	13
4.6	COMMENTS TO NATIONAL REPORTING TABLE T4	13
5	TABLE T5 – GROWING STOCK	14
6	TABLE T6 – BIOMASS STOCK.....	14
7	TABLE T7 – CARBON STOCK.....	14
8	TABLE T8 – DISTURBANCES AFFECTING HEALTH AND VITALITY	15
8.1	FRA 2005 CATEGORIES AND DEFINITIONS.....	15
8.2	NATIONAL DATA.....	15
8.3	ANALYSIS AND PROCESSING OF NATIONAL DATA.....	15
8.4	RECLASSIFICATION INTO FRA 2005 CLASSES	15
8.5	DATA FOR NATIONAL REPORTING TABLE T8	15
8.6	COMMENTS TO NATIONAL REPORTING TABLE T8	16
9	TABLE T9 – DIVERSITY OF TREE SPECIES.....	17
9.1	FRA 2005 CATEGORIES AND DEFINITIONS.....	17
9.2	NATIONAL DATA.....	17
9.3	ANALYSIS AND PROCESSING OF NATIONAL DATA.....	18
9.4	RECLASSIFICATION INTO FRA 2005 CLASSES	18
9.5	DATA FOR NATIONAL REPORTING TABLE T9	18
9.6	COMMENTS TO NATIONAL REPORTING TABLE T9	18
10	TABLE T10 – GROWING STOCK COMPOSITION	19
11	TABLE T11 – WOOD REMOVAL	19
12	TABLE T12 – VALUE OF WOOD REMOVAL.....	19

13	TABLE T13 – NON-WOOD FOREST PRODUCT REMOVAL.....	19
14	TABLE T14 – VALUE OF NON-WOOD FOREST PRODUCT REMOVAL	19
15	TABLE T15 – EMPLOYMENT IN FORESTRY.....	20
15.1	FRA 2005 CATEGORIES AND DEFINITIONS.....	20
15.2	NATIONAL DATA	20
15.3	ANALYSIS AND PROCESSING OF NATIONAL DATA.....	20
15.4	RECLASSIFICATION INTO FRA 2005 CLASSES	21
15.5	DATA FOR NATIONAL REPORTING TABLE T15	21
15.6	COMMENTS TO NATIONAL REPORTING TABLE T15	21

1 Table T1 – Extent of Forest and Other wooded land

1.1 FRA 2005 Categories and definitions

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

1.2 National data

1.2.1 Data sources

References to sources of information	Quality (H/M/L)	Variable(s)	Year(s)	Additional comments
Chan, L. and Corlett, R. T. 1997. Biodiversity in the nature reserves of Singapore, Proceedings of the Nature Reserves Survey Seminar, Singapore December 1997. Singapore Gardens Bulletin 49 (II). National Parks Board, Singapore Botanic Gardens, Cluny Road.	H	Extent and National Definitions	1990	
Corlett, R.T., 1997. The vegetation in the Nature Reserves of Singapore. The Garden Bulletin of Singapore Vol. 49 (2) : pp : 147-160.	M	Extent	1997	Mentions that no change has taken place since 1990

1.2.2 Classification and definitions

National class	Definition
Dryland Primary Forest	It is simplest and most informative to refer this forest as primary forest, i.e., forest which has never been completely cleared.
Mangrove Forest	Tidal forest on the mud flats at the mouth of streams and along the shore of shallow bays. Marsh and tidal waste The stated figure for marsh and tidal waste is excluding the 500 ha stated to be mangrove.
Primary Freshwater Swamp Forest	This swamp system is extremely complex. Swamp forest occurs in low-lying areas where the water table is close to the soil surface.
Secondary Forests	Secondary re-growth filled up logged forest areas and gradually colonised land that was originally cleared and used for cultivation.
Other	Water bodies (gazetted reserves) and Shrubland etc. The figure is derived as a difference (The total land area- Dryland Primary Forest- Primary Freshwater Swamp Forest- Secondary Forests, Mangrove forests- Built up areas, Farm holding areas, Marsh and tidal wash, Others).

Built up areas	Not defined
Farm holding areas	Not defined
Marsh and tidal waste	Not defined
Others	Inland waters, public gardens, open spaces, cemeteries, non built up areas in military establishments and unused land.

(Source: Chan, L. and Corlett, R. T. 1997)

1.2.3 Original data

National class	Extent in ha in 1990
Dryland Primary Forest	192
Primary Freshwater Swamp Forest	87
Mangrove Forest	500
Secondary Forests	1560
Other	1,021
Built up areas	32220
Farm holding areas	1080
Marsh and tidal waste	1050
Others	27070
Total	64780

(Source: Chan, L. and Richard, T. 1997)

1.3 Analysis and processing of national data

1.3.1 Calibration

The total area of the country in national statistics is 65 (000 ha) and it varies with UN STAT figure of 68 (000 ha), therefore calibration was done by adjusting the area under “other land”.

National Categories	Extent of Forests in ha
	1990
Dryland Primary Forest	192
Primary Freshwater Swamp Forest	87
Mangrove Forest	500
Secondary Forests	1560
All Other land Categories	64661
... of which ... with tree cover	NIL
Inland water bodies	1000
Total for country	68000

1.3.2 Estimation and forecasting

Based on Corlett (1997) it has been assumed that there is no change in forest resources since 1990 and the same assumption has been applied for forecasting figures for 2005.

National Categories	Extent in ha		
	1990	2000	2005
Dryland Primary Forest	192	192	192
Primary Freshwater Swamp Forest	87	87	87
Mangrove Forest	500	500	500
Secondary Forests	1560	1560	1560
All Other land Categories	64661	64661	64661
... of which ... with tree cover	NIL	NIL	NIL
Inland water bodies	1	1	1
Total for country	68000	68000	68000

1.4 Reclassification into FRA 2005 classes

National Categories (Land)	FRA 2005 classes (%)	
	Forest	Other Land
Dryland Primary Forest	100	
Primary Freshwater Swamp Forest	100	
Mangrove Forest	100	
Secondary Forests	100	
All Other land Categories		100

1.5 Data for National reporting table T1

Following figures are after reclassification and rounding to nearest 1000.

FRA 2005 Categories	Area (1000 hectares)		
	1990	2000	2005
Forest	2.3	2.3	2.3
Other wooded land	0.0	0.0	0.0
Other land	64.7	64.7	64.7
...of which with tree cover	0	0	0
Inland water bodies	1.0	1.0	1.0
TOTAL	68	68	68

1.6 Comments to National reporting table T1

Based on Corlett (1997), it has been assumed that no changes have occurred since 1990 and that changes are likely to be small increases. The country is relatively rich in trees outside forests (FRA 2000 validation document).

2 Table T2 – Ownership of Forest and Other wooded land

2.1 FRA 2005 Categories and definitions

Category	Definition
Private ownership	Land owned by individuals, families, private co-operatives, corporations, industries, religious and educational institutions, pension or investment funds, and other private institutions.
Public ownership	Land owned by the State (national, state and regional governments) or government-owned institutions or corporations or other public bodies including cities, municipalities, villages and communes.
Other ownership	Land that is not classified either as “Public ownership” or as “Private ownership”.

2.2 National data

No definitions are available. All forests are publicly owned.

2.3 Analysis and processing of national data

2.3.1 Calibration

Area has been calibrated in Table 1

2.4 Reclassification into FRA 2005 classes

Not needed

2.5 Data for National reporting table T2

FRA 2005 Categories	Area (1000 hectares)			
	Forest		Other wooded land	
	1990	2000	1990	2000
Private ownership	0	0	0	0
Public ownership	2	2	0	0
Other ownership	0	0	0	0
TOTAL	2	2	0	0

2.6 Comments to National reporting table T2

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

3.1 FRA 2005 Categories and definitions

Types of designation

Category	Definition
Primary function	A designated function is considered to be primary when it is significantly more important than other functions. This includes areas that are legally or voluntarily set aside for specific purposes.
Total area with function	Total area where a specific function has been designated, regardless whether it is primary or not.

Designation categories

Category / Designated function	Definition
Production	Forest / Other wooded land designated for production and extraction of forest goods, including both wood and non-wood forest products.
Protection of soil and water	Forest / Other wooded land designated for protection of soil and water.
Conservation of biodiversity	Forest / Other wooded land designated for conservation of biological diversity.
Social services	Forest / Other wooded land designated for the provision of social services.
Multiple purpose	Forest / Other wooded land designated to any combination of: production of goods, protection of soil and water, conservation of biodiversity and provision of social services and where none of these alone can be considered as being significantly more important than the others.
No or unknown function	Forest / Other wooded land for which a specific function has not been designated or where designated function is unknown.

3.2 National data

3.2.1 Data sources

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

3.2.2 Classification and definitions

National class	Definition

3.2.3 Original data

All forest area is managed mainly for conservation of biodiversity with recognition that they also serve the social function and conserve soil and water.

3.3 Analysis and processing of national data

3.3.1 Calibration

Not needed

3.3.2 Estimation and forecasting

Not needed

3.4 Reclassification into FRA 2005 classes

Not needed

3.5 Data for National reporting table T3

FRA 2005 Categories / Designated function	Area (1000 hectares)					
	Primary function			Total area with function		
	1990	2000	2005	1990	2000	2005
Forest						
Production						
Protection of soil and water				2	2	2
Conservation of biodiversity	2	2	2	2	2	2
Social services				2	2	2
Multiple purpose						
No or unknown function						
Total - Forest	2	2	2			
Other wooded land						
Production						
Protection of soil and water						
Conservation of biodiversity						
Social services						
Multiple purpose						
No or unknown function						
Total – Other wooded land	0	0	0			

3.6 Comments to National reporting table T3

4 Table T4 – Characteristics of Forest and Other wooded land

4.1 FRA 2005 Categories and definitions

Category	Definition
Primary	Forest / Other wooded land of native species, where there are no clearly visible indications of human activities and the ecological processes are not significantly disturbed.
Modified natural	Forest / Other wooded land of naturally regenerated native species where there are clearly visible indications of human activities.
Semi-natural	Forest / Other wooded land of native species, established through planting, seeding or assisted natural regeneration.
Productive plantation	Forest / Other wooded land of introduced species, and in some cases native species, established through planting or seeding mainly for production of wood or non wood goods.
Protective plantation	Forest / Other wooded land of native or introduced species, established through planting or seeding mainly for provision of services.

4.2 National data

4.2.1 Data sources

References to sources of information	Quality (H/M/L)	Variable(s)	Year(s)	Additional comments
Corlett, R.T., 1997. The vegetation in the Nature Reserves of Singapore. The Garden Bulletin of Singapore Vol. 49 (2) : pp : 147-160.	M	Extent	1997	

4.2.2 Classification and definitions

Detailed information not available.

4.2.3 Original data

Corlett (1997) considers all the forest areas as primary nature.

4.3 Analysis and processing of national data

4.3.1 Calibration

Not needed

4.3.2 Estimation and forecasting

Not needed

4.4 Reclassification into FRA 2005 classes

Not needed

4.5 Data for National reporting table T4

All forest areas are managed for conservation and therefore assumed to be primary in nature.

FRA 2005 Categories	Area (1000 hectares)					
	Forest			Other wooded land		
	1990	2000	2005	1990	2000	2005
Primary	2	2	2			
Modified natural	0	0	0			
Semi-natural	0	0	0			
Productive plantation	0	0	0			
Protective plantation	0	0	0			
TOTAL	2	2	2	0	0	0

4.6 Comments to National reporting table T4

5 Table T5 – Growing stock

No data is available.

6 Table T6 – Biomass stock

No data is available.

7 Table T7 – Carbon stock

No data is available.

8 Table T8 – Disturbances affecting health and vitality

8.1 FRA 2005 Categories and definitions

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

8.2 National data

8.2.1 Original data

There are no reports on damage to forests by fire, insects or diseases.

FRA-2005 Categories	Average annual area affected (1000 hectares)			
	Forests		Other wooded land	
	1990	2000	1990	2000
Disturbance by fire	0	0	0	0
Disturbance by insects	0	0	0	0
Disturbance by diseases	0	0	0	0
Other disturbance	0	0	0	0

8.3 Analysis and processing of national data

8.3.1 Estimation and forecasting

Not needed

8.4 Reclassification into FRA 2005 classes

Not needed

8.5 Data for National reporting table T8

FRA-2005 Categories	Average annual area affected (1000 hectares)			
	Forests		Other wooded land	
	1990	2000	1990	2000
Disturbance by fire	0	0	0	0
Disturbance by insects	0	0	0	0
Disturbance by diseases	0	0	0	0
Other disturbance	0	0	0	0

8.6 Comments to National reporting table T8

There are no reports on damage to forests by fire, insects or diseases.

9 Table T9 – Diversity of tree species

9.1 FRA 2005 Categories and definitions

Category	Definition
Number of native tree species	The total number of native tree species that have been identified within the country.
Number of critically endangered tree species	The number of native tree species that are classified as “Critically endangered” in the IUCN red list.
Number of endangered tree species	The number of native tree species that are classified as “Endangered” in the IUCN red list.
Number of vulnerable tree species	The number of native tree species that are classified as “Vulnerable” in the IUCN red list.

9.2 National data

9.2.1 Data sources

References to sources of information	Quality (H/M/L)	Variable(s)	Year(s)	Additional comments
Keng, H. 1990. The Concise Flora of Singapore. Vol. 1. Singapore University Press. Singapore	H	Native Species	1990	Includes tree and non-tree species.
IUCN, 2004. The 2004 IUCN Red List of Threatened Species. IUCN- The World Conservation Union. (www.redlist.org)	H	Threatened Species	2004	Includes tree and non-tree species.

9.2.2 Classification and definitions

Same as FRA 2005 and IUCN Classes. (www.redlist.org)

9.2.3 Original data

The global IUCN list omits a number of Singapore species.

FRA 2005 Categories	Number of species 2000
Native tree species	2013 ¹
Critically endangered tree species	11 ²
Endangered tree species	11 ²
Vulnerable tree species	27 ²

(Note 1. Numbers have not been calculated separately for trees and therefore includes tree and non-tree species. Source: 1. Native species - **Keng, H. 1990.** 2. IUCN Red Book 2004.

9.3 Analysis and processing of national data

9.3.1 Estimation and forecasting

Not needed

9.4 Reclassification into FRA 2005 classes

Not needed

9.5 Data for National reporting table T9

FRA 2005 Categories	Number of species (year 2000)
Native tree species	2013 ¹
Critically endangered tree species	11 ²
Endangered tree species	11 ²
Vulnerable tree species	27 ²

(Note 1. Numbers have not been calculated separately for trees and therefore includes tree and non-tree species. Source: 1. Native species - **Keng, H. 1990**. 2. IUCN Red Book 2004.)

9.6 Comments to National reporting table T9

These numbers have not been calculated separately for trees, shrubs, herbs, etc. Furthermore, the global IUCN list omits a number of Singapore species. IUCN list mentions Singapore for a number of species that have not actually, or not definitely been recorded here. The list also omits some species which have been recorded in Singapore and which Singapore would consider deserve listing.

10 Table T10 – Growing stock composition

No data is available for this table

11 Table T11 – Wood removal

Singapore's policy is not to exploit timber and non-timber products from forest areas, therefore there is no data for this table.

12 Table T12 – Value of wood removal

Singapore's policy is not to exploit timber and non-timber products from forest areas, therefore there is no data for this table.

13 Table T13 – Non-wood forest product removal

Singapore's policy is not to exploit timber and non-timber products from forest areas, therefore there is no data for this table.

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

Singapore's policy is not to exploit timber and non-timber products from forest areas, therefore there is no data for this table.

15 Table T15 – Employment in forestry

15.1 FRA 2005 Categories and definitions

Category	Definition
Primary production of goods	Employment in activities related to primary production of goods, like industrial roundwood, woodfuel and non-wood forest products.
Provision of services	Employment in activities directly related to services from forests and woodlands.
Unspecified forestry activities	Employment in unspecified forestry activities.

15.2 National data

15.2.1 Data sources

No published information is available.

15.2.2 Classification and definitions

National class	Definition
Provision of services through Conservation Division	The total staff strength of Conservation Division of National Parks Board.
Provision of services through Parks and Reserves	Number of staff within those sections of Conservation Division who are based directly in parks and reserves.

15.2.3 Original data

Category	Employment (1000 person-years)	
	1990	2000
Primary production of goods	NIL	NIL
Provision of services through Conservation Division	0.09	0.090
Unspecified forestry activities	NIL	NIL
TOTAL	0.90	0.90

(Note 1. Total number of staff (90) in the Conservation Division, National Parks Board subsumes the number of staff (23), who are based directly in the parks and reserves.)

15.3 Analysis and processing of national data

15.3.1 Estimation and forecasting

Same figures have been assumed for 1990 and 2000

15.4 Reclassification into FRA 2005 classes

National Category	FRA 2005 Category (%)		
	Primary Production	Provision of Services	Unspecified forestry activities
Provision of services		100	

15.5 Data for National reporting table T15

FRA 2005 Categories	Employment (1000 person-years)	
	1990	2000
Primary production of goods	0	0
Provision of services	0.09	0.09
Unspecified forestry activities	0	0
TOTAL	0.09	0.09

15.6 Comments to National reporting table T15