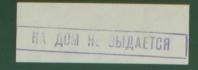
163





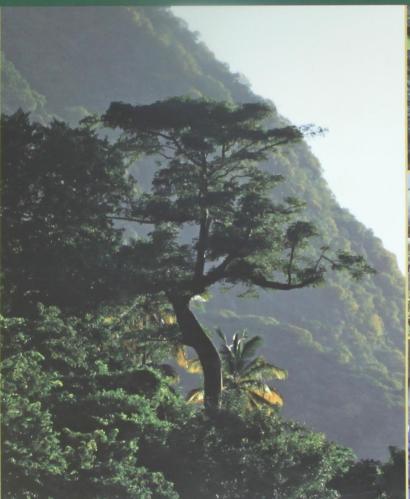


Global Forest Resources Assessment 2010

Main report

H79-4585 163









Global Forest Resources Assessment 2010

FAO FORESTRY PAPER

163

Main report

The designations employed and the presentation of material in this information product do not imply the expression of any opinion whatsoever on the part of the Food and Agriculture Organization of the United Nations (FAO) concerning the legal or development status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. The mention of specific companies or products of manufacturers, whether or not these have been patented, does not imply that these have been endorsed or recommended by FAO in preference to others of a similar nature that are not mentioned.

ISBN 978-92-5-106654-6

All rights reserved. FAO encourages reproduction and dissemination of material in this information product. Non-commercial uses will be authorized free of charge, upon request. Reproduction for resale or other commercial purposes, including educational purposes, may incur fees. Applications for permission to reproduce or disseminate FAO copyright materials, and all queries concerning rights and licences, should be addressed by e-mail to copyright@fao.org or to the Chief, Publishing Policy and Support Branch, Office of Knowledge Exchange, Research and Extension, FAO, Viale delle Terme di Caracalla, 00153 Rome, Italy.

Contents

Acknowledgements Foreword	x
Acronyms and abbreviations	X1 XII
Executive summary	xiii
Chapter 1. Introduction	1
The reporting framework	2
The scope of FRA 2010	3
The process	5
The outputs	8
Chapter 2. Extent of forest resources	9
Overview	9
Key findings	10
Key conclusions	11
Forest area and forest area change	11
Forest characteristics	23
Selected forest types and species groups	27
Growing stock	35
Biomass	41
Carbon stock	44
Chapter 3. Forest biological diversity	
Overview	49
Key findings	50
Key conclusions	51
Area of primary forests	52
Forest area designated for conservation of biological diversity	56
Area of forest in protected areas	59
Tree species composition	62
Chapter 4. Forest health and vitality	65
Overview	65
Key findings	66
Key conclusions	67
Insects and diseases	67
Forest fires	74
Other disturbances	80
Chapter 5. Productive functions of forest resources	85
Overview	85
Key findings	85
Key conclusions	86
Areas designated for productive functions	87
Planted forests	90

Afforestation and reforestation	95
Removals of wood products Removals of non-wood forest produ	100 cts 103
Chapter 6. Protective functions of fo	
Overview	109
Key findings	109
Key conclusions	109
Forest area designated for protective	e purposes 110
Chapter 7. Socio-economic function	
Overview	119
Key findings	119
Key conclusions	121
Ownership and management rights	121
Public expenditure and revenue colle	
Value of wood and non-wood forest	•
Employment	143 services 146
Area of forest designated for social s	
Chapter 8. Legal, policy and institut	
Overview	149
Key findings	149 150
Key conclusions Policy and legal framework	150
Institutional framework	154
Education and research	158
Chapter 9. Progress towards sustain	nable forest management 163
Introduction	163
Status of forest management	163
Progress towards sustainable forest r	management 168
Chapter 10. Conclusions	187
Scope and coverage of FRA 2010	187
The FRA 2010 process	189
Progress towards sustainable forest r	management 191
Next steps	193
Bibliography	195
Annexes	199
Annex 1: Contributors	199
Annex 2: Terms and definitions used	in FRA 2010 209
Annex 3: Global tables	217
Annex 4: FRA 2010 working papers	327
Annex 5: FRA 2010 meetings and wo	rkshops 331
Annex 6: Farlier global assessments	222

,

Tables

1.1	FRA 2010 reporting tables and links to the thematic elements of sustainable	1
1.2	forest management Key statistics for regions and subregions used in FRA 2010	4 6
1.2	key statistics for regions and subregions used in FRA 2010	O
2.1	Distribution of forests by region and subregion, 2010	13
2.2	High forest cover countries, 2010	14
2.3	Forest cover by region and subregion, 2010	15
2.4	Annual change in forest area by region and subregion, 1990–2010	18
2.5	Ten countries with largest annual net loss of forest area, 1990–2010	21
2.6	Ten countries with largest annual net gain in forest area, 1990–2010	21
2.7	Comparison of forest area estimates in FRA 2010 and FRA 2005	22
2.8	Trends in area of mangroves by region and subregion, 1990–2010	30
2.9	Trends in area of bamboo by country and region, 1990–2010	31
2.10	Trends in area of rubber plantations by country and region, 1990–2010	33
2.11	Growing stock by region and subregion, 2010	35
2.12	Growing stock of commercial species by region and subregion, 2010	37
2.13	Trends in growing stock in forest by region and subregion, 1990–2010	38
2.14	Trends in growing stock composition by region and subregion, 1990–2010	39
2.15	Trends in growing stock of commercial species by region and subregion, 1990–2010	40
2.16	Trends in growing stock in other wooded land by region and subregion, 1990–2010	40
2.17	Biomass and dead wood stock by region and subregion, 2010	42
2.18	Biomass conversion and expansion factor, root–shoot ratio and dead–live ratio by region and subregion, 2010	42
2.19	Trends in total biomass in forests by region and subregion, 1990–2010	43
2.20	Trends in dead wood stocks by region and subregion, 1990–2010	44
2.21	Carbon stock in forest by region and subregion, 2010	45
2.22	Trends in carbon stocks in forest biomass by region and subregion, 1990–2010	46
2.23	Trends in carbon stocks in dead wood and litter combined, by region and subregion, 1990–2010	47
2.24	Trends in carbon stocks in forest soil by region and subregion, 1990-2010	48
2.25	Trends in total carbon stocks in forests, 1990–2010	48
3.1	Area of primary forest by region and subregion, 2010	53
3.2	Ten countries with the highest percentage of primary forest, 2010	54
3.3	Trends in area of primary forest by region and subregion, 1990–2010	55
3.4	Area of forest designated for conservation of biodiversity by region and subregion, 2010	57
3.5	Trends in area of forest designated for conservation of biodiversity by region and subregion, 1990–2010	58
3.6	Area of forest in protected areas by region and subregion, 2010	60
3.7	Trends in area of forest in protected areas by region and subregion, 1990–2010	61
3.8	Growing stock of the ten most common species as a percentage of total growing stock by region and subregion, 2005	63
4.1	Average area of forest annually affected by insects by region and subregion, 2005	70
	<u>-</u> ∞	

4.2	Average area of forest annually affected by diseases by region and subregion, 2005	70
4.3	Trends in area of forest annually affected by insects by region and	
4.3	subregion, 1990–2005	73
4.4	Trends in area of forest annually affected by diseases by region, 1990–2005	73
4.5	Ten most prevalent insect pests reported	74
4.6	Most prevalent pathogens reported	74
4.7	Average area of forest annually affected by fire by region and	
٦.,	subregion, 2005	75
4.8	Trends in area of forest annually affected by fire by region and	
	subregion, 1990–2005	77
4.9	Most prevalent woody invasive species reported	82
5.1	Area of forest designated for production by region and subregion,	0.0
	2010	88
5.2	Trends in area of forest designated for production by region and subregion, 1990–2010	89
5.3	Area of planted forests by region and subregion, 2010	91
5.4	Use of introduced species in planted forests by region and subregion, 2010	92
5.5	Trends in area of planted forests by region and subregion, 1990–2010	94
5.6	Country reporting on afforestation and reforestation by region, 2005	95
5.7	Afforestation and reforestation by region and subregion, 2005	96
5.8	Use of introduced species in afforestation and reforestation, 2005	97
5.9	Trends in afforestation and reforestation by region and subregion, 2000–2005	99
5.10	Wood removals by region and subregion, 2005	101
5.11	Trends in wood removals by region and subregion, 1990–2005	102
6.1	Area of forest designated for protection of soil and water, 2010	111
6.2	Ten countries with the highest proportion of forest area designated	
	for protection of soil and water, 2010	114
6.3	Trends in area of forest designated for protection of soil and water by region and subregion, 1990–2010	115
7.1	Forest ownership by region, 2005	122
7.2	Forest revenue collection by region, 2005	128
7.3	Public expenditure on forestry by region, 2005	129
7.4	Sources and uses of public expenditure on forestry by region, 2005	131
7.5	Trends in forest revenue collection by region, 2000–2005	134
7.6	Trends in public expenditure on forestry by region, 2000–2005	135
7.7	Number of countries reporting value of wood removals by region, 2005	137
7.8	Total value of wood and NWFP removals by region, 2005	138
7.9	Value of NWFP removals by category and region, 2005	140
7.10		141
7.11		141
	Number of people employed in forestry by region, 2005	145
	Trends in number of people employed in forestry by region,	
7 1/1	1990–2005 Area of forest designated for social socials as is a set of the social social social socials as is a set of the social socia	145
/. I *	Area of forest designated for social services by region and subregion, 2010	147

O. I	Number of countries with a national forest policy, NFP and national	
	forest law by region and subregion, 2008	152
8.2	First level of subordination of the head of forestry to minister	156
8.3	Human resource levels per unit of forest area 2008 and changes between 2000 and 2008	156
9.1	Area of permanent forest estate by region and subregion, 2010	164
9.2	Trends in area of permanent forest estate by region and subregion, 1990–2010	165
9.3	Area of forest with a management plan by region and subregion, 2010	166
9.4	Trends in area of forest with a management plan by region and subregion, 1990–2010	166
9.5	Progress towards sustainable forest management at the global level, 1990–2010	171
9.6	Progress towards sustainable forest management in Africa, 1990–2010	173
9.7	Progress towards sustainable forest management in Asia, 1990–2010	175
9.8	Progress towards sustainable forest management in Europe, 1990–2010	177
9.9	Progress towards sustainable forest management in North and Central America, 1990–2010	179
9.10	Progress towards sustainable forest management in Oceania, 1990–2010	181
9.11	Progress towards sustainable forest management in South America, 1990–2010	183
9.12	Progress towards sustainable forest management by subregion, 1990–2010	184
Figu	res	
1.1	Regional and subregional breakdown used in FRA 2010	6
1.2	FRA 2010 timeline	7
2.1	The world's forests	12
2.2	Ten countries with the largest forest area, 2010	13
2.3	Forest area as a percentage of total land area by country, 2010	14
2.4	Forest change dynamics	17
2.5	Annual change in forest area by region, 1990–2010	18
2.6	Annual change in forest area, 2005–2010	20
2.7	The systematic sampling grid	24
2.8	Example of steps used in processing Landsat data to classified land cover map and resulting land cover change, 1990–2000	25
2.9	Forest characteristics by region and subregion, 2010	26
2.10	Trends in forest characteristics by region and subregion, 1990–2010	28
2.11	Area of mangroves by country, 2010	29
2.12	Area of bamboo by country, 2010	32
2.13	Area of rubber plantations by country, 2010	34
2.14	Growing stock per hectare by country, 2010	36
2.15	Growing stock composition by subregion, 2010	36
2.16	Growing stock of commercial species by region, 2010	37
3.1	Ten countries with the largest area of primary forest, 2010	53
3.2	Primary forest as a percentage of total forest area by country, 2010	54

3.3	Proportion of forest area designated for conservation of biodiversity by country, 2010	58
3.4	Trends in area of forest designated for conservation of biodiversity by	59
	region, 1990–2010	61
3.5	Percentage of forest area in protected areas by region, 2010 Growing stock of the ten most common species as a percentage	0.
3.6	of total growing stock by country, 2005	63
4.1	Average area of forest annually affected by insects by country, 2005	71
4.2	Average area of forest annually affected by diseases by country, 2005	71
4.3	Average area of forest annually affected by fire by country, 2005	76
4.4	Number of fires and burnt area in the EU-Mediterranean region	78
4.5	Number of fires and total burnt area in the non-Mediterranean region	78
4.6	Average forest fire density and average burned forest fraction in Europe, 1998–2007	79
5.1	Proportion of forest area designated for production by country, 2010	88
5.2	Area of planted forest by country, 2010	92
5.3	Ten countries with greatest annual increase in planted forest area, 1990–2010	94
5.4	Ten countries with largest area of afforestation, 2005	98
5.5	Ten countries with largest area of reforestation, 2005	98
5.6	Ten countries with largest volume of wood removals in percent, 2005	102
5.7	Information availability – NWFP removals, 2005	105
6.1	Proportion of forest area designated for protection of soil and water by subregion, 2010	111
6.2	Ten countries with the largest area of forest designated for protection of soil and water, 2010	114
6.3	Trends in area of forest designated for protection of soil and water by subregion, 1990–2010	116
7.1	Forest ownership by subregion, 2005	123
7.2	Private forest ownership by type of forest owner and subregion, 2005	123
7.3	Management of public forests by subregion, 2005	124
7.4	Trends in public and private ownership of forests by region, 1990–2005	125
7.5	Trends in management of public forests by region, 1990–2005	126
7.6	Forest revenue collection by country, 2005	129
7.7	Public expenditure on forestry by country, 2005	130
7.8	Distribution of forest revenue collection at the global level, 2005	132
7.9	Distribution of public expenditure on forestry at the global level, 2005	132
7.10	Net revenue collection and public expenditure on forestry, 2005	133
7.11	Value of industrial roundwood removals, 2005	139
7.12	Countries with high values of NWFP removals, 2005	141
7.13	Trend in forest area designated for social services by region, 1990–2010	148
8.1	Percentage of forest area covered by national forest programmes	
0.2	by region and subregion, 2008	151
8.2 8.3	Date of engagement of forest policy statement	152
	Date of enactment of forest legislation	154
8.4	Ministry with main responsibility for forest policy, 2008	155

8.5 8.6	Percentage of female staff in public forest institutions by region, 2008 Graduation of students in forest-related education, 2008	158 159
8.7 8.8	Ratio of university graduates to population and forest area, 2008 Percentage of female graduates in forest-related education, 2008	160 161
8.9	Number of Ph.D. researchers in public forest research institutions per million hectares of forest, 2008	161
9.1	Designated functions of the world's forests, 2010	163
9.2 9.3	Trends in area of forest with a management plan by region, 1990–2010 Variation in proportion of forest area under sustainable forest	167
	management by subregion, 2010	168
10.1	Information availability for the 17 reporting tables in FRA 2010, in relation to global forest area	189
Boxe	s	
1.1	The Global Objectives on Forests	4
2.1	Special study on trees outside forests	16
2.2	Deforestation and net change in forest area	17
2.3	The global forest remote sensing survey – better global data on changes in forest extent	24
3.1	Reporting on the State of the World's Forest Genetic Resources	51
4.1	Climate change and forest pests	68
4.2	Trends in forest fires in Europe	78
6.1	Arid zone forests: preventing and combating desertification	112
6.2	Generating momentum on forests and water in Europe	117
7.1	FRA 2010 special study on forestry, poverty and livelihoods	120
7.2	Problems and issues with the estimation of employment levels in forestry	144
8.1	International conventions and agreements related to forests	153
10.1	FAO's support to national forest monitoring and assessment	190
10.2	Special study on Small Island Developing States	191