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# Forest Production for Tropical America

Frank H. Wadsworth



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## Contents

<b>Initial Foreword</b>	xv
<b>Final Foreword</b>	xvii
<b>Acknowledgments</b>	xix
<b>Introduction</b>	xxi
<b>Chapter 1. The American Tropics, a Forest Region</b>	1
Climate	1
Solar Radiation	1
Temperature	1
Wind	3
Moisture	4
Regional Climatic Features	6
Physiography	7
Soils	9
Formation	9
Parent Material	13
Drainage	17
Soil Organic Matter	17
Weathering	18
Soil Classifications	20
Oxisols	20
Mountain Soils	20
Inceptisols	20
Ultisols	20
Alfisols	20
Entisols	20
Aridisols	20
Mollisols	20
Fertility of Tropical American Soils	20
Forests	21
Vegetation Genesis	21
Forest Extent and Location	22
Environmental Influences of Forests	24
<b>Chapter 2. The Environment for Forest Production</b>	29
Forest Values	29
Forests and the Human Environment	29
Forests and Water	31
Forests and Soil	32
Forests and Agriculture	32
Forests as a Source of Products	34
Consequences of Overuse	37
Land: Forest Versus Nonforest	38
Forest Versus Agriculture	40
Land-Use Capabilities	43
Land-Use Control	45
Forest Land: Use Allocation	46
Forest-Dependent Cultures	47
Scientific Study	48
Preservation of Biodiversity	48
Soil and Water Conservation	48
Public Enlightenment	49
Public Recreation	49
Commodity Production	49
Integration of Forest Uses	50
Production Policies	51
Forest Protection	53
Selection of Products	54
Production Goals	57
Silviculture	59
Examples of Forestry Diversity	60
<b>Chapter 3. Primary Forests and Their Productivity</b>	63
Forest Structure	64
Forest Density	64
Number and Size of Trees	64
Basal Area	66
Stemwood Volume	67
Biomass	67
Stratification	68
Tree Form	69
Root Systems	69
Stems	70
Branches	70
Tree Crowns	71
Foliage	71
Forest Composition	72
Diversity	72
Heterogeneity	76
Nutrient Cycling	77
Tree Growth	81
Reproduction	87
Environmental Influences	91
Moisture	92
Temperature	93
Light	94
Soils	95
Topography	96

## Contents

Growth-Prediction Experience	96
Other Effects	96
Yields	97
Primary Productivity	97
Useful Wood	98
Variations	99
<b>Chapter 4. Secondary Forests and Their Culture</b>	<b>101</b>
The Nature of the Forests	101
Residual Forests	102
Fallow or Volunteer Forests	105
Recovery Through Succession	105
The Environment for Production	109
General Perceptions	109
Stand Complexities	112
Silviculture	113
Structural Goals	115
Polycyclic (Selection) Practice	118
Diameter Limits	120
Shelterwood	120
Clearcutting	124
Preharvesting Treatments	124
Elimination of Relics	125
Natural Regeneration	126
Refinement Treatments	129
Crop Adequacy	132
Identification of Timber Crops	134
<i>Regeneration Assessment</i>	139
<i>Composition Improvement</i>	141
Liberation	142
<i>Thinnings</i>	146
<i>Arboricides</i>	147
Yields	148
Freshwater Swamp Forests	149
Mangroves	150
Dry Forests	152
Conclusion	153
<b>Chapter 5. Forest Plantations: Policies and Progress</b>	<b>155</b>
The Case for Planting	155
Productivity Advantages of Plantations	156
Land Considerations	158
Timber Supply	159
Site Considerations	162
Plantation Planning	164
Interplanting	164
<i>Gap Planting</i>	165
<i>Underplanting</i>	166
<i>Group Planting</i>	169
Forestation	169
Plantation Composition	169
Evaluating Tree Species	169
Pure Versus Mixed Plantations	170
Yields	172
Native Versus Exotic Species	173
Species Selection	177
Characteristics To Consider	178
Preplanting Site Analysis	181
<i>Variation Within Species</i>	182
<i>Tree Improvement</i>	184
Planting Progress	187
<b>Chapter 6. Tree Propagation and Planting</b>	<b>191</b>
Plantation Planning	191
The Resource Planning Process	191
Forest Plantings	194
Planting Materials	194
Wilding Stock	194
Seed Acquisition	195
Seed Processing	196
Seed Storage	197
Seed Germination Factors	198
Direct Seeding	199
Tree Nurseries	200
Vegetative Propagation	201
Stem and Root Cuttings	202
Air Layering	202
Grafting and Budding	203
Other Tree Propagation Practices	203
Propagating Soil	204
General Nursery Practices	205
Spacing of Stock	205
Transplanting	206
Shade	206
Root Pruning	206
Types of Planting Stock	206
Bareroot Stock	206
Size of Stock	207
Stump Plants and Striplings	207
Containerized Stock	208
Insects and Diseases	210
Planting Techniques	210

Planting Season 211  
 Site Preparation 211  
     *Mechanized Site Preparation* 212  
     *Use of Herbicides* 213  
 Special Site-Preparation Considerations 214  
 Spacing of Planted Trees 215  
 Planting Guidance 219  
 Soil Additives 221

**Chapter 7. Plantation Culture 227**

Site Quality 228  
     Site-Quality Improvement in Plantations 229  
     Site Deterioration in Plantations 230  
 Genetic Relationships 234  
     The Nature of Genetic Variation 235  
     Potential Genetic Gains 237  
     Economic Considerations in Genetic Tree Improvement 238  
     Tree Improvement as an Aspect of Management 238  
     Undertaking Tree Improvement 239  
 Rotation 241  
     Wood Quality 242  
     Growth Prediction 243  
 Plantation Treatment 244  
     Protection 244  
     Vegetation Control 245  
     Cover Crops 247  
     Interplanting 248  
     Soil Cultivation 248  
     Irrigation 250  
     Burning 250  
     Fertilizers 250  
 Thinning 256  
     Effects of Spacing 256  
     Reasons for Thinning 258  
     When to Thin 260  
     How Many Trees to Leave 260  
     Which Trees to Leave 260  
     Economic Considerations 262  
     Effects of Thinning on Wood 263  
     Effects of Thinning on Yields 263  
     Thinning Systems 264  
     Tree Selection 266  
 Pruning 269  
 Coppice 272  
 Bamboo Management 275

Harvesting 275  
 Yields 276  
 Regeneration 276  
 Insects and Diseases 277

**Chapter 8. Agroforestry 279**

Shifting Cultivation 279  
     Custom and Precedent 279  
     Traditional Practices 280  
     The Fallow: Nutrient Conservation 287  
 Ameliorating Shifting-Cultivation Effects 290  
     Improved Local Planning 291  
     Land Use 292  
     Improved Fallows 293  
     Improved Cropping Practices 294  
     Fertilizer Use 295  
 Taungya Systems 295  
 The Development of Agroforestry 298  
     Conceptual Variables 298  
     Possibilities Versus Limitations 299  
     Prospective Benefits of Agroforestry 301  
     Some Drawbacks to Mixed Cropping 302  
     Crop Combinations. 303

**Chapter 9. Forestry Research 307**

History of Tropical Forestry Research 307  
 Regional Research Needs 308  
 Research Components 311  
     Orientation 311  
     Representativeness 313  
     Replication 314  
     Precision 315  
     Interpretation of Results 316  
     Presentation 316  
 Research Focuses 316  
     Forest Classification and Inventories 317  
     Forest Ecosystems 318  
     Tree Life Histories 318  
     Tree Growth 320  
     Silviculture 322  
 Species Adaptability 324  
 Tree Propagation, Artificial Regeneration 328  
 Fertilizer Use 328  
 Growing Space 329  
 Tree Improvement 331  
 Agroforestry 335

## Contents

<b>Chapter 10. Implementation</b>	339
The Forces Behind Implementation	341
The Government's Role	342
The Public's Role	342
Outside Assistance	342
Some Long-Term Goals	344
Strategies	347
Principles for Achieving Success	348
Overcoming Resistance	349
Effective Organization	350
Personal Commitment	350
Some Successes	350
Industrial Production in Brazil	350
Fuelwood in Haiti	350
Multipurpose Trees in Costa Rica	351
Pilot Project in Mexico	351
<b>Appendix A. Regional Weather Features</b>	353
Mexico	353
Central America	353
West Indies	353
South America	353
<b>Appendix B. Climatic Classifications</b>	357
Koeppen's System	357
Thornthwaite's System	357
The Holdridge System	360
Walter's System	361
<b>Appendix C. Past Development of Forests</b>	365
<b>Appendix D. Classifications of Forests</b>	367
Schimper's System	367
Chipp's System	368
Champion's System	369
Burt-Davy's System	369
Beard's System	370
The Holdridge System	372
The Unesco System	372
Regional and Subregional Vegetation Types	374
Mangroves	376
Cerrado Vegetation	376
<b>Appendix E. Chronological Development of Forest Refinement</b>	379
<b>Appendix F. Selecting Tropical Tree Species for Planting</b>	381
<b>Appendix G. Conifers for the Tropics</b>	399
<b>Appendix H. A Chronology of Tropical Forest Planting</b>	401
Southern Asia	401
Africa	401
Southeast Asia and the Pacific	402
Tropical America	402
<b>Appendix I. Examples of Rotation Selection</b>	405
<b>Appendix J. Selected Results of Thinning</b>	411
<b>Appendix K. Publications on Plantation Pests and Diseases</b>	415
<b>Appendix L. Tree Species Appropriate for Agroforestry</b>	417
<b>Appendix M. Silvical Information of Importance</b>	419
<b>Bibliography</b>	421
<b>Index to Bibliography by Country</b>	529
<b>Index to Bibliography by Genus</b>	533
<b>Index to Bibliography by Subject</b>	535
<b>Index</b>	543

## List of Figures

	Page
1-1. Percentage of land at different latitudes in the American Tropics (Baumgartner and Reichel 1975).	2
1-2. Mean surface solar radiation as affected by season and latitude in the Tropics (Gentilli 1968).	3
1-3. Mean daily solar radiation (calories/cm <sup>2</sup> ) received at the Earth's surface in June (Landsberg 1961).	5
1-4. Mean daily solar radiation (calories/cm <sup>2</sup> ) received at the Earth's surface in December (Landsberg 1961).	6
1-5. Land area of tropical America by latitude and mean temperature (Anon. 1975b, 1979b).	7
1-6. The easterly trade winds prevailing throughout the region shape the crown of this sentinel standing on the windward coast of the island of Saint Lucia.	9
1-7. Rainfall contrasts on windward and leeward slopes (Beard 1949).	9
1-8. Surface windflow pattern during the northern solstice; dashed line equals the convergence zone (Garbell 1947).	10
1-9. Surface windflow pattern during the southern solstice; dashed line equals the convergence zone (Garbell 1947).	11
1-10. Wet and dry seasons in the Tropics in relation to latitude (adapted from E. de Martonne, cited by Richards 1952).	12
1-11. Land areas of tropical America by precipitation levels (Anon. 1975h, 1979f).	13
1-12. Mean annual rainfall in the neotropics (Anon. 1975h, 1979f).	14
1-13. Seasonal rainfall patterns in tropical America (Biel 1968).	15
1-14. Percentage of land area of tropical America by latitude and elevation (Anon. 1979b).	16
1-15. Influence of soil acidity and alkalinity on availability of plant nutrients (Lucas and Davies, 1961).	19
1-16. Shaded areas on map indicate portions of tropical America, including savannas, that are naturally without forests.	23
1-17. The hydrological cycle (adapted from Holzman 1941).	27
2-1. The trunks of virtually all chicozapote trees ( <i>Manilkara zapota</i> ) in Mexico and Central America have been tapped repeatedly for their latex as a base for chewing gum.	29
2-2. Mangroves provide a locally accessible, highly productive source of straight poles for construction.	30
2-3. Despite urban sprawl, forests remain a valuable companion in northern Puerto Rico.	30
2-4. Forests have an unexcelled capacity to promote rainwater infiltration into the soil, ameliorating floods, and gradually releasing a constant flow that is free of sediments.	31
2-5. The delayed release of rainwater from forested soils of the uplands maximizes the value of downstream water impoundments that are vital to urban centers.	32
2-6. Montane highway construction and deforestation immediately show the effectiveness of the former forest in preventing sedimentation of this river in Sarawak.	32
2-7. The most productive soils for agriculture were accumulated beneath former forests, and trees on the hills and borders continue to protect the environment for farming.	33
2-8. Old-growth tropical forests are felled and commonly burned rather than harvested because they are remote from markets, and the purpose is not to obtain their wood but rather to use their soil for food production.	33
2-9. Tree crops such as coffee commonly replace forests, and if well managed, may persist for many years.	34
2-10. Tapping latex for rubber remains an important forest industry in tropical America.	34
2-11. Timber from tropical lowlands is largely extracted by rivers as is seen in Panama.	36
2-12. The large trees with attractive, medium-weight woods provide one of the most valuable products of tropical forests, veneer, being made here from a dipterocarp in Sarawak.	36
2-13. The harvest of tropical timber typically is concerned solely with immediate profit, at the expense of any immature trees that might provide future crops.	36
2-14. Schematic sequence for the identification and treatment of lands for trees and forests.	39
2-15. Recently deforested slopes in Sarawak are commonly converted to plantations of black pepper vines, a cash crop.	41
2-16. Extreme overuse of formerly forested slopes produces degraded land such as is seen here in Haiti.	42
2-17. The public forest reserve system of Puerto Rico, representing diverse climates, soils, and ecosystems.	50

## Contents

### List of Tables

	Page
1-1. Equatorial (inner) and outer tropical land areas	3
1-2. Daily insolation losses at the Earth's surface for June and December by type of loss and latitude	4
1-3. Mean temperature relative to altitude and latitude (°C)	8
1-4. Mean temperature change with elevation at different locations in the Western Hemisphere	8
1-5. Topography of tropical South America	16
1-6. Tropical forest formations by zones (thousand km <sup>2</sup> )	24
1-7. Annual tropical deforestation, 1981-90	25
1-8. Natural forest cover in the Tropics, 1990	26
2-1. Production and export of wood products in tropical America, 1982-92	35
2-2. Food production in tropical America, 1972-81	40
2-3. Land capabilities in Central America	44
2-4. Prospective land use in Puerto Rico	45
2-5. Vegetation influences on erosion and infiltration in tropical forests in Cuba	49
2-6. Indicative wood consumption in tropical America, 1992	51
2-7. Nontimber products derived from forests in India	54
2-8. Effects of moisture content on the heat value of wood	56
3-1. Extent of undisturbed tropical forests in 1980	64
3-2. Structural contrasts between moist and dry forests	65
3-3. Number of trees per hectare in selected tropical forests	65
3-4. Trees 10 cm in d.b.h. and larger by altitude in Venezuela	66
3-5. Distribution of tree sizes in Amazon forests (no. of trees per ha)	66
3-6. Approximate pantropical stand table for high forests	66
3-7. Tree strata and phytomass, Manaus, Brazil	69
3-8. Percentage of phytomass by tree components for two tree species in India	70
3-9. No. of tree species >25 cm in d.b.h. per unit of terra firme forest in the Amazon	73
3-10. Percentage of all trees >25 cm in d.b.h. by family in the planalto Amazon forest	74
3-11. Biomass and principal nutrients in an undisturbed moist forest at Kabo, Suriname	78
3-12. Nutrient changes in rainwater at La Selva, Costa Rica	79
3-13. Nutrient content of litter in forests of three tropical countries (kg/ha)	80
3-14. Nutrient cycling in a Ghanaian rain forest (kg/ha/yr)	80
3-15. Nutrient losses in a primary forest ecosystem in Papua New Guinea (kg/ha)	81
3-16. Light effect on mean annual 4-year d.b.h. growth of dipterocarps in Sarawak (cm/yr)	83
3-17. Energy allocation in a Thai rain forest	84
3-18. Mean relative humidity in a terra firme forest near Belem, Brazil, by month, time of day, and height above ground (%)	93
3-19. Mean temperature variation in a terra firme forest in Brazil by month, time of day, and height above ground (°C)	94
3-20. Soil temperatures near Belem, Brazil, by month, depth, and type of land (°C)	95
3-21. Relationship of climate and net primary productivity	97
4-1. Potentially productive secondary tropical forests, 1980	103
4-2. Annual change in potentially productive secondary tropical forest area, 1975-80	104
4-3. Biomass growth allocation in a secondary tropical forest in Panama (t/ha/yr)	107
4-4. Precipitation interception in a 14-year-old secondary forest in Guatemala	107
4-5. Restoration of soil porosity in a secondary forest in Nigeria	108
4-6. Management status of closed tropical forests in 1980	109
4-7. Pantropical stand for primary moist forests	116
4-8. Growth acceleration after logging in Sabah (cm)	118

<b>List of Tables (contd.)</b>	<b>Page</b>
4-9. Shelterwood crop production in Dahomey (Benin) and Nigeria	122
4-10. Number of trees corresponding to full stocking in Ugandan forests	133
4-11. Merchantable height by d.b.h. of 1,600 trees of 15 species from moist forests in Puerto Rico	136
4-12. Stand composition improvement from forest refining in a moist secondary forest in Puerto Rico	143
4-13. Spacing guide for liberation of crop trees in Puerto Rico	145
4-14. Response of dipterocarps to liberation in Sarawak (cm)	145
4-15. Postlogging changes in a Nigerian stand of 16 economically valuable species liberated by climber cutting and poisoning in the middle of the upper canopy	146
4-16. <i>Virola surinamensis</i> response during 18 months following liberation in Guyana (cm/yr)	147
5-1. Plantation timber as a substitute for natural forest timber in the Tropics	156
5-2. Petroleum equivalent of 7-year <i>Eucalyptus</i> yields in Africa	157
5-3. Productivity of tropical plantations	158
5-4. Minimum tropical plantation size to support wood-using industries	159
5-5. Mean annual increment superiority of good over mediocre tropical planting sites for various species	159
5-6. Land converted to tropical timber plantations	160
5-7. End products of tropical forest plantations and percentage of forest land area devoted to production of each	161
5-8. Soil characteristics of neem ( <i>Azadirachta indica</i> ) plantations compared with nonforested land in northwest Nigeria	162
5-9. Rainfall disposition by plantations of <i>Pinus roxburghii</i> and <i>Tectona grandis</i> in India	163
5-10. Effects of different tropical tree plantations on soil nutrient reserves over a period of 18 years	170
5-11. Overyielding of <i>Eucalyptus</i> planted with leguminous trees in Hawaii	173
5-12. Timber production and property requirements by end use	179
5-13. Species composition of tropical timber plantations	181
5-14. Tropical tree species adaptation by life zones in central and northern South America	182
5-15. Site effects on <i>Pinus caribaea</i> productivity in Queensland, Australia	182
5-16. Forest plantations in the Tropics, 1990 (thousand ha)	188
5-17. Plantation establishment in tropical America, 1985 (thousand ha)	189
5-18. Planted areas in tropical America by species, 1980 (thousand ha)	189
5-19. Planting rate relative to major deforestation in tropical America, 1980-90 (thousand ha)	189
6-1. Land capability classes for Brazil	193
6-2. Land-use areas in tropical Brazil	193
6-3. Effects on viability of immersing <i>Ochroma lagopus</i> seeds in boiling water	198
6-4. Seed germination periods for tree species in Zambia	198
6-5. Effects of spacing on survival and yields of <i>Gmelina arborea</i> in India	205
6-6. Teak, <i>Tectona grandis</i> , stump diameter versus survival and early height growth in India	208
6-7. Spacing effects on <i>Pinus elliottii</i> in Queensland, Australia	216
6-8. Spacing effects at 4 years on <i>Leucaena leucocephala</i> biomass yields in plantations in Taiwan	217
6-9. Spacing effects on tree volume at 30 months for <i>Sesbania sesban</i> in India	217
6-10. Spacing effects on tree yields at 8 years for <i>Eucalyptus saligna</i> in Sao Paulo	219
6-11. Spacing effects and tree growth at 5 years for <i>Eucalyptus saligna</i> in Hawaii	219
6-12. Influence of spacing on growth of <i>Pinus taeda</i> in Hawaii	220
6-13. Spacing and yield at 15 years for <i>Pinus taeda</i> in the Southeastern United States	220
6-14. Nitrogen application and weeding benefits to <i>Leucaena leucocephala</i> in Papua New Guinea	223
6-15. Foliar nutrient variation in the leaves of a single <i>Gmelina arborea</i> tree	224
7-1. Sequence of industrial plantation decisions and operations	227
7-2. Usable cellulose volume of <i>Pinus elliottii</i> in Parana, Brazil (m <sup>3</sup> )	229

<b>List of Tables (contd.)</b>	<b>Page</b>
7-3. Usable cellulose volume of <i>Pinus taeda</i> in Parana, Brazil (m <sup>3</sup> )	229
7-4. Teak ( <i>Tectona grandis</i> ) yields by site quality in Java	230
7-5. Site effects on productivity of <i>Eucalyptus globulus</i> in Madras, India	231
7-6. Site effects on productivity of 8-year-old <i>Eucalyptus globulus</i> in El Salvador	231
7-7. <i>Pinus caribaea</i> performance at age 30 in Suriname by site class	232
7-8. Site effects on <i>Pinus caribaea</i> in Queensland, Australia	232
7-9. Aboveground biomass in a 40-year-old <i>Pinus radiata</i> plantation in South Africa	233
7-10. Comparative productivity of first and second rotations of 14-year-old <i>Pinus patula</i> in Swaziland	233
7-11. Nutrient levels in 6-year-old <i>Gmelina</i> plantations in Nigeria and Brazil	234
7-12. Nutrient levels in 6-year-old <i>Pinus caribaea</i> plantations in Suriname and Brazil	235
7-13. Twisting in teak progeny as related to seed source in India	236
7-14. Hybrid vigor in <i>Pinus caribaea</i> and <i>P. elliottii</i> in Australia	238
7-15. Selection gains with <i>Cupressus lusitanica</i> in Kenya	238
7-16. <i>Pinus taeda</i> pollen production as related to tree spacing in 13- to 16-year-old seed orchards in Australia	241
7-17. The effect of tree spacing on cone production of <i>Pinus elliottii</i> and <i>Araucaria cunninghamii</i> in Australia	242
7-18. Area and growth of irrigated plantations in India in 1944	250
7-19. Nutrient return through litter in a <i>Eucalyptus</i> hybrid plantation in India	251
7-20. Nutrient flux in a <i>Pinus radiata</i> plantation on a 35-year rotation in New Zealand	253
7-21. Net nutrient demands of <i>Pinus radiata</i> in New Zealand	253
7-22. Return of nutrients through litterfall from a 10-year-old teak ( <i>Tectona grandis</i> ) plantation and from natural forests in west Africa	254
7-23. Nutrient content of five <i>Eucalyptus globulus</i> trees grown in Italy	255
7-24. Spacing requirements in meters for free growth of three tropical tree species by d.b.h.	257
7-25. Spacing of <i>Eucalyptus camaldulensis</i> and resultant tree quality in Israel	257
7-26. Eucalyptus stocking limit derived from crown-diameter-to-d.b.h. ratio	257
7-27. Effects of spacing on unthinned, 12-year-old <i>Pinus caribaea</i> in Puerto Rico	258
7-28. Fifteen-year thinning regimes for tropical tree species based on the relations between crown diameter and d.b.h.	261
7-29. Size differentiation for unthinned <i>Anthocephalus chinensis</i> in Sabah (d.b.h. in cm)	262
7-30. Diameter growth relative to tree size for <i>Swietenia macrophylla</i> and <i>Tarrietia utilis</i> in Ivory Coast	262
7-31. Stocking levels adapted from Hart's spacing factor	266
7-32. Thinning regimes according to height growth	266
7-33. Thinning regime according to 33-percent tree removal (no./ha)	266
7-34. Provisional S% thinning for <i>Pinus caribaea</i> in Suriname	267
7-35. Site effects on limiting basal-area growth of <i>Pinus elliottii</i> in Queensland, Australia	267
7-36. Thinning schedules for <i>Pinus caribaea</i> in South Africa	269
7-37. Growth responses to pruning of 7-1/2-year-old <i>Pinus patula</i> in Malawi	272
7-38. Pruning schedule for <i>Pinus elliottii</i> and <i>P. patula</i> in South Africa	272
7-39. Wood production potentials of <i>Eucalyptus</i> spp. in Brazil	273
7-40. Thinning effects on a <i>Eucalyptus saligna</i> coppice in Kenya	274
7-41. Postthinning recovery of <i>Dendrocalamus strictus</i>	275
7-42. <i>Eucalyptus</i> plantation yields in Sao Paulo, Brazil	277
7-43. Typical plantation yields of tropical species by Holdridge's life zones	277
8-1. Past shifting cultivation regimes in what was formerly Zaire	282
8-2. Comparative yields from shifting cultivation in what was formerly Zaire (t/ha)	283
8-3. Burning effects on soil properties in Amazonia	287
8-4. Runoff and sediment losses with clearing of forests in Mindanao, Philippines	287
8-5. Dry-weight biomass accumulation in forest fallows in Yangambi, in what was formerly Zaire (t/ha)	288
8-6. The chemical composition of forest fallows in Yangambi, in what was formerly Zaire (kg/ha)	289

<b>List of Tables (contd.)</b>	<b>Page</b>
8-7. Four-year nutrient storage of an <i>Acioa barteri</i> fallow in west Africa (kg/ha)	293
8-8. Soil effects of cropping in Mindanao, Philippines	294
8-9. Yields of <i>Eucalyptus</i> and corn from a taungya system in Brazil	298
8-10. Shade effects of <i>Terminalia ivorensis</i> on cacao yields in Ghana	303
8-11. <i>Leucaena leucocephala</i> wood and forage production in India	304
9-1. Values of "Students' t" (95-percent probability level) for various numbers of replicates in research studies	314
9-2. Approximate number of observations required for a specified precision in experiments based on coefficients of variation	315
9-3. Probable error from ground sampling in forest inventories (%)	317
9-4. Differences for significance (expressed as a percentage of the mean) that will be obtained in experiments for given precision and number of replications (%)	325
9-5. Prescribed thinning schedule for the design in figure 9-2 (yr).	330
9-6. Pros and cons of tree provenance test designs in forestry research	336
A-1. Representative climatic means in tropical America	355
B-1. Heat index values for monthly mean temperatures between 10 °C and 30 °C	358
B-2. Land area in life zones in Central America (thousand km <sup>2</sup> )	361
D-1. Life zones within the Tropics	373
D-2. Drought influence on forest types	374
D-3. Regions of tropical South America according to type of vegetation	374
D-4. Stand characteristics of cerrado forests	377
H-1. Teak ( <i>Tectona grandis</i> ) introduction and early planting in Africa	401
I-1. Relation of age to growth and mean annual increment (MAI) for teak ( <i>Tectona grandis</i> ) in Trinidad	405
I-2. Mean annual increment (MAI) of <i>Pinus caribaea hondurensis</i> in Trinidad as related to age and site quality	405
I-3. Age/volume trends in <i>Araucaria angustifolia</i> plantations of 1,000 trees per hectare in Brazil (m <sup>3</sup> /ha/yr)	405
I-4. Wood production potential of <i>Araucaria angustifolia</i> in Brazil	406
I-5. Age/yield trends with <i>Cunninghamia lanceolata</i> plantations of 1,000 trees per hectare in Brazil (m <sup>3</sup> /ha/yr)	406
I-6. Wood production potential of <i>Cunninghamia lanceolata</i> in Brazil	407
I-7. Age/volume trends with <i>Cryptomeria japonica</i> plantations with 1,000 trees per hectare in Brazil (m <sup>3</sup> /ha/yr)	407
I-8. Wood production potential of <i>Cryptomeria japonica</i> in Brazil	408
I-9. Age/increment relations for <i>Cupressus lusitanica</i> in Colombia	408
I-10. Age/increment trends for <i>Eucalyptus saligna</i> in Transvaal, South Africa (m <sup>3</sup> /ha)	408
I-11. Basal-area growth of old <i>Eucalyptus globulus</i> in India	408
I-12. Fuelwood production of <i>Eucalyptus</i> in Brazil	409
I-13. Age/volume trends in <i>Eucalyptus</i> plantations of 1,000 trees per hectare in Brazil	409
I-14. Age/increment relations for <i>Eucalyptus deglupta</i> in Papua New Guinea	409
I-15. Age/increment relations for <i>Gmelina arborea</i> in the Philippines	409
I-16. Age/increment relations for <i>Anthocephalus chinensis</i> in India	410
I-17. Age/increment relations of <i>Casuarina equisetifolia</i> in India	410
I-18. Relation of age to tree volume for <i>Pinus elliottii</i> in Argentina	410

## Contents

<b>List of Tables (contd.)</b>		Page
J-1.	Effects of various intensities of thinning on an 8-year-old teak ( <i>Tectona grandis</i> ) plantation in Nigeria	412
J-2.	Thinning effects on volume growth of <i>Pinus elliottii</i> in the Southern United States	412
J-3.	Diameter growth of largest trees after thinning of <i>Pinus elliottii</i> in the Southern United States	412
J-4.	Effects of thinning on an <i>Araucaria angustifolia</i> plantation in Misiones, Argentina, treated at age 4 and measured at age 11	413
J-5.	Tree dimensions of open-grown teak ( <i>Tectona grandis</i> ) in Thailand	413
J-6.	Teak ( <i>Tectona grandis</i> ) thinning schedule in Nigeria for site quality I based on crop height	413
J-7.	Thinning schedules for three species in Kenya	414
J-8.	Thinning schedules for <i>Pinus patula</i> and <i>P. radiata</i> in Kenya	414

## Initial Foreword

Loss of tropical forests today ranks at or near the top of the forestry agenda in almost every region of the world. The Western Hemisphere contains more than half the world's moist tropical forests, mainly in the Amazon Basin but also in neighboring regions of South and Central America. Thus, it is timely to introduce the first comprehensive book on tropical forests and forestry in the New World.

This is an exhaustively researched book, one that is likely to influence the tone and content of tropical forestry in the New World for years to come. While the emphasis is on the American Tropics, the author has reviewed forestry practices in all the world's tropical regions.

The breadth of the book is immense. Beginning with a characterization of forests in tropical America, the author reviews the socioeconomic values of the forests, their biology and silviculture, and management of secondary forests and plantations. He concludes by discussing agroforestry, future research needs, and the goals for implementation of improved forestry practices by both governments and the public.

*Robert E. Buckman*  
Deputy Chief for Research (Ret.)  
U.S. Department of Agriculture  
Forest Service

June 30, 1986

*(Dr. Buckman instigated and inspired this book and wrote this foreword before his retirement from the Forest Service.)*

For me, two highlights deserve special mention. The first is the sensitivity with which the author treats the interrelationship between environmental and developmental concerns in tropical forests. And the second is the emphasis he places on the silviculture and management of secondary forests, an area of his personal research and one that shows high promise in forested regions that are beginning to recover from the first generation of exploitation.

This book summarizes what we know about tropical forestry. Its impact will be greatly enhanced with publication of a low-cost edition in Spanish, widely available to students, professional foresters, and interested citizens in Latin America.

A few heartfelt words about the author. I have known Frank Wadsworth personally for about half his professional career. Everyone knows him as a warm human being, scientifically and professionally at the top of his field, and a most articulate spokesman for tropical forests everywhere. I can think of no more fitting climax to a lifetime of work in this field than the publication of this book.

## Final Foreword

The current generation of tropical forest managers faces serious challenges, now and into the future. The tropical forest resource itself is threatened and the socioeconomic complexities are pervasive and diverse. Global trends in the tropics include increasing rates of deforestation and land degradation. Populations and standards of living are increasing, as are the demands for wood, biological diversity, and other associated services and uses. While some users of the resource expect forest exploitation to continue, others expect absolute preservation or one of the countless intermediate alternatives. To deal with these and associated problems, managers will need to understand the dynamics of the forest systems and the importance of dealing with the human dimension in resource trade-offs. Research, training, and technology transfer will certainly be part of the process if we want to leave the tropical forests improved for the next generation.

Professionals of the 21st century will benefit from the research and experience of Dr. Frank H. Wadsworth, who is a pioneer of tropical forest management. When Dr. Wadsworth arrived in Puerto Rico over 50 years ago, he found a deforested island, badly in need of rehabilitation before it could provide quality environments for its inhabitants. Since that time Dr. Wadsworth has not only conducted research and practiced management in the tropical forests of the Caribbean islands, but also has traveled the whole tropical world and participated in the development of tropical forestry institutions all over Latin America. He has personally trained hundreds of Latin American foresters in the classroom and in the field.

*Robert Lewis*  
Deputy Chief for Research  
USDA Forest Service  
Washington, DC

May 30, 1997

In this book, Dr. Wadsworth brings together a lifetime of practical experience and combines it with a comprehensive review of the literature about tropical forest management. He calls attention to the work of many other pioneers whose fundamental contributions are forgotten by those interested only in the most recent literature. It is a practical book that focuses on the ecological relationships of tropical forests. Beyond the scientific literature, the book contains knowledge accumulated from real experience by the inquisitive and creative Dr. Wadsworth—the one who had the foresight to establish long-term tree growth plots soon after he arrived in Puerto Rico in 1942.

There can be no better tool for the training of a new cadre of tropical foresters than this accumulated wisdom by the person who, decades ahead of others, dealt with the trends described above, and who can claim success in the rehabilitation of degraded forest lands in the Caribbean islands. This book was initially supported by Dr. Robert Buckman, former Deputy Chief for Research of the USDA Forest Service, who saw the value of synthesizing and sharing this important information. This book arrives at a time when the world is in need of identifying the proper balance between the need to use forests and the requirement to preserve them for generations to come. Thank you, Dr. Wadsworth, for blazing a clear path for all of us to follow as we continue, as we must, to seek a balance between people's needs and resource use.

*Ariel E. Lugo*  
Director, International Institute of Tropical Forestry  
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Rio Piedras, PR

## Acknowledgments

This book is the product of several years of effort by a host of workers. The scope was defined by *Forestry Abstracts* from which came a foundation of literature references. These led to a concentrated review of forestry literature from the Tropics of the Eastern Hemisphere at the unsurpassed library of the Oxford Forestry Institute in England. Through expert assistance, it was possible to peruse some 2,000 references and obtain copies of many for subsequent study. One result was that virtually all significant material found and included in the bibliography herein is now to be found in the library of the International Institute of Tropical Forestry in Rio Piedras, Puerto Rico. In the search, procurement, retrieval, and referencing of this large fund of information, the author's primary debt is to the librarians of the institute, JoAnne Feheley and Gisela Reyes, whose indefatigable efforts to find and obtain needed information, usually on the basis of incomplete descriptions, have been, in my view, nothing less than heroic.

Chapter 4 was reviewed by Dr. Peter Murphy of Michigan State University and Dr. T.C. Whitmore, ecologist of Cambridge University. Chapter 5 was reviewed by John Wyatt-Smith, retired forester with long experience in Malaysia and Africa; Dr. John J. Ewel, Director of the Institute of Pacific Islands Forestry in Hawaii; and the late Ian Hutchinson, formerly of the Department of Renewable Natural Resources, Centro Agronómico Técnico de Investigación y Enseñanza, Turrialba, Costa Rica. The entire manuscript was reviewed by Dr. Charles Larson, retired dean of the College of Environmental Sciences and Forestry, State University of New York at Syracuse, and the late Dr. Steven Preston, former Dean of the School of Natural Resources, University of Michigan.

These reviewers offered advice and suggestions on concepts and policies as well as technical detail. A deep debt of gratitude is owed to these individuals for poring over a long manuscript and promptly responding; however, deficiencies in the final product are entirely the author's responsibility.

Editorial review of the entire manuscript was contracted to Mary Elaine Lora, Susan Branham, and Robert Wray, retired USDA Forest Service editor. The author acknowledges a special debt to each, not only for improved clarity of the text but also for suggestions on organization.

From within the Forest Service, assistance without which the manuscript would never have been finished was provided in the form of reviews by editors under the supervision of Carol Lowe and the corresponding, seemingly endless revisions requiring monotonous retyping, initially without benefit of a word processor. Fortunately, thereafter it was possible to index both the bibliography and the text as a whole by the use of a computer. A final, detailed, technical and format review was an extremely welcome contribution from J.L. Whitmore of the Forest Management Research Staff, USDA Forest Service, Washington, DC.

The author acknowledges a more basic debt of gratitude to the Forest Service itself, through which the acquisition and interpretation of the information presented were made possible during a professional career that included opportunities to attain some personal familiarity with the Tropics and the fascinating forests and forestry of the region.

## Introduction

This book is intended as a reference for those who are to make tropical American forests productive: the students in the forestry schools of the region. There has been a serious lack of a general reference as to what is already known about forest production that might be applicable within the American Tropics. The present book, which is to be translated, is intended to reduce that deficiency.

This book focuses on the potentialities of the forests. An imbalance between forest productivity and human demands is now so widespread it affects all living species on Earth. Yet past attempts to manage and culture these forests suggest that their sustainable productivity and resulting utility could be far above anything yet reported.

This book is concerned primarily with wood production. Without the direct economic returns possible therefrom, the other, less tangible benefits that accrue from forests are in jeopardy in the face of developmental pressures driven by more attractive direct financial incentives. Nevertheless, multiple benefits from forests are inseparable, so the goal should be to make forests productive for all purposes. Forest production, then, as here defined refers to *all* the values of forests, including those primarily esthetic.

The text emphasizes two vital relations. One is that forestry is ecological. Forest managers must be oriented to accept ecological information fundamental to goals and practices. A rift between the two disciplines that exists elsewhere must not intensify in tropical America. Forest production is forestry, not ecology, but intimacy between the two disciplines is mutually vital. The second relation emphasized in the book is that in productive forest management the animal component is as crucial as the plants. The value of animals to forest ecosystems goes far beyond their physical attraction.

Personal convictions that surface in the text include the following:

- Social acceptance is fundamental to the success of forest production, but so is technical excellence.
- Single-use forests do not exist, and optimum forest-use integration maximizes none.
- Economic production is prerequisite to conservation of forests.

- Sustainability, the primary goal of forestry, is no more difficult technically in the Tropics than elsewhere.
- Tropical forest production is better served by quality human resources than by mere financial expenditure.
- User-oriented tropical forestry research must not be subordinated by that which is purely scientist oriented.

As a reference source for students, this book differs from the multitude of books appearing on tropical forests. Emphasis is more on what has been experienced than on what is new. Applicability is as important as clean-shoe esoterica. Citations go to first published sources rather than more recent restatements. The culmination of literature citations prior to 1980 is not due to omission of recent substantive sources.

Much of the apparently applicable tropical forestry experience is little known in tropical America. Many fundamentals came to light long before the present generation of forest managers. Moreover, nearly all the early findings appeared in the Eastern Hemisphere. Widely distributed journals then were few. What was published was not in languages vernacular in most of tropical America.

The text cites forestry experience from sources so distant as to appear outwardly superfluous. There is also a mixture of experimental data and interpreted observations unsupported by today's rigid scientific standards. Some of this mixture is conflicting and appears questionable. The author neither offers apologies for such inconsistencies nor presents subjective conclusions therefrom. The book is no definitive manual of practices but rather only suggests what might work if tested. The intent is to arouse in alert students curiosity to dig deeper and confirm or correct on the basis of local findings. For upon such curiosity and a capacity to enlighten the local social context that dictates the level of management hangs the fate of our tropical forests and of the Tropics itself!

A geographical note: The information reported herein appeared over nearly a century from throughout the world. During this period the names of many source countries changed. To provide consistency and maximum contemporary utility, the names of countries have all been updated to the present.