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Modelling Future Availability of Non-coniferous Veneer Logs and Sawlogs in Tropical Forests

Reino E. Pulkki

Working Paper GFSS/WP/05

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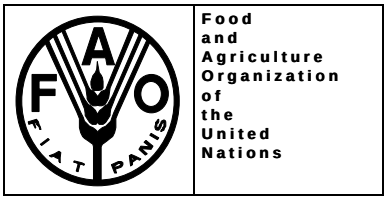

FOREWORD

In late 1995, the FAO Forestry Department initiated the Global Fibre Supply Study (GFSS) with an outlook to the year 2050. The study was recommended by the FAO Advisory Committee on Pulp and Paper (now the Advisory Committee on Paper and Wood Products). The general objective of the study is to contribute reliable data, information, forecasts and analysis of industrial fibre sources in order to promote sustainable forest management.

The GFSS will include a compilation of the latest available inventory data, including recovered and non-wood fibre, focusing primarily on the sources of industrial fibre as raw material for the sawmilling, wood-based panels, and pulp and paper industries. It will also include a projection and analysis of future developments in fibre supply, based on explicit consideration of the major factors affecting supply.

The GFSS is unique among FAO studies in that special emphasis is placed on collection and compilation of fibre volume inventory and growth data for the developing regions - Africa, Asia-Pacific, and Latin America and the Caribbean. The study complements other FAO work, such as the Asia-Pacific Forestry Sector Outlook Study and the upcoming Forest Resources Assessment 2000. FAO is also updating its statistics on forest plantations and developing a method for estimating fibre volumes from non-forest areas in the tropical regions. Available data from these studies will be included in the GFSS.

The major products of the GFSS will include:

- A database accessible on-line through the Internet providing estimates of commercial wood volumes from natural, semi-natural and plantation forests;
- An on-line interactive fibre-supply model incorporating key determinants of supply;
- A statistical and descriptive report on the data and three fibre-supply scenarios which are based on factors deemed to be the most critical;
- A working paper describing in detail the methods for data compilation, gap filling, data validation, forecasting and definitions, survey forms and country list;
- A series of additional working papers on sustainable forest management, improved forest productivity from industrial forest plantations, fibre-supply modelling, recovered and non-wood fibre, and other topics; and
- An issue of *Unasylva*, FAO's quarterly journal on forestry and the forest industry, dedicated to the theme of global fibre supply.

This paper, solicited by the GFSS and prepared by Reino Pulkki describes a means to examine alternative futures for the availability of non-coniferous veneer log and sawlogs from tropical rainforests. We sincerely hope that it contributes productively to the world-wide dialogue on sustainable forest management for fibre and other values.

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This series of working papers have seen the contribution of many silent partners. Our colleagues in the Forestry Department provided much needed advice on several issues. In addition, there have been many outside reviewers from different research institutions and technical cooperation agencies who have provided valuable information. We also want to thank our special assistant Ms Elisa Rubini who guided each report through the many technical hurdles in document preparation, and Ms Liana Micotti for her contribution to the preparation of Working Papers No. 5 and No. 6.

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1. INTRODUCTION

Of special interest in global fibre supply strategies is the availability of non-coniferous (NC) veneer logs and sawlogs from tropical rainforests. This is because there is a general consensus that the best way to manage the tropical forests is through the use of properly planned and executed selection harvesting systems (e.g. through reduced impact logging [RIL]). In general, it is felt that plantations should only be established in areas which have already been deforested or where the forest has been severely degraded [e.g. Jabil 1983, Jonkers and Schmidt 1984, Poore and Sayer 1987, ITTO 1993, Putz and Viana 1996]. Many authors also conclude that there will be no overall global wood fibre shortage in the near future, although some regional shortages will occur, since fast growing plantations can quickly fill gaps in lower quality fibre demand [e.g. FAO 1989b, ITTO 1993, Byron and Perez, 1996, Sayer and Byron 1996, Jaakko Pöyry 1997]. However, the supply of large diameter and high quality logs will be limited. Already it appears that supply restrictions are starting to limit any further expansion in Asia and Oceania, and production has started to fall off (Figure 1). However, production of NC veneer logs and sawlogs has been slowly increasing in Africa, Latin America and the Caribbean.

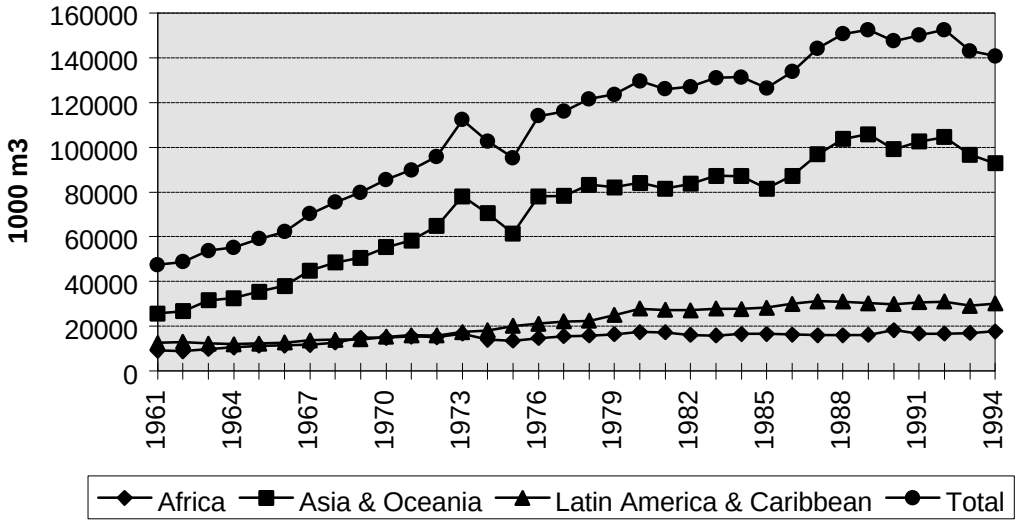

Figure 1. Non-coniferous veneer log and sawlog production from tropical forests (FAOSTAT database)

Econometric models generally show a continuously increasing global consumption of raw forest products [e.g. FAO 1997]. If the price of raw wood is sufficiently high, fast-growing plantations can be established fairly quickly to deal with increases in "low-quality fibre" demand. However, the growth of large-diameter and high-value NC tropical logs takes considerable time and in sustainable selection harvesting there is an ecological limit to the volume available. It must be remembered that plantations are not a panacea in themselves and there is an ecological limit to the fibre available from them also.

In the Forest Resource Assessment 1990 for tropical countries, section 2.2 (Forest harvesting) and Table 5 (state of logging 1990) give estimated areas of natural (previously unlogged) and semi-natural (previously logged) forest, as well as the areas logged [FAO 1993]. For the

Global Fibre Supply Study (GFSS) there was a need to update the data presented in FAO [1993] and to estimate the future supply of NC tropical veneer logs and sawlogs.

The objective of this paper is to review the methodology used to calculate the data presented in Table 5 (state of logging 1990) in FAO [1993], improve the methodology in light of the new data available in the GFSS database and estimate the future availability of NC tropical veneer logs and sawlogs. Based on the review and methodology development, a simple model was constructed to estimate the future availability of high quality NC tropical veneer logs and sawlogs. Two future supply scenarios were run: one assumed status quo with conventional logging and much reduced logging intensities in future harvests; and the other assumed sustainable harvesting operations through RIL. Complementing this paper is a working paper synthesizing the literature on logging impacts and reduced impact logging in tropical rainforests [Pulkki 1997].

2. REVIEW OF THE METHODOLOGY USED TO PRODUCE TABLE 5 IN FAO FORESTRY PAPER 112

2.1 BACKGROUND

The methodology used in the estimation of the data for Table 5 in FAO [1993] was developed by D.P. Dykstra [Dykstra 1995]. Table 5 includes only non-coniferous industrial veneer log and sawlog production from Tropical Closed Broadleaved Forests (TCBF). The regions and list of countries included in Table 5 are presented in Appendix A.

2.2 DETERMINING THE VOLUME LOGGED FROM TCBF

According to Dykstra (pers.comm.) one of the problems with the 1980 Tropical Forest Resources Assessment Project, which was pointed out by J-P. Lanly, was that it assumed all tropical NC sawlogs and veneer logs came from TCBF. Dykstra therefore tried to estimate (based largely on the personal experience of a number of people in the Forestry Department) the fraction of NC veneer log and sawlog production which came from TCBF as opposed to other forests in each country.

To determine the fraction of volume from TCBF, Dykstra simply divided the total area of tropical closed broadleaved forest by the total forest area and applied a factor to adjust the fraction closer to expected values (equation 1). The area of TCBF includes both productive and unproductive areas. The total forest area used in the equation is the total forest area for a country including closed and open forests in both productive and unproductive categories. The same calculated values were used for all years of Dykstra's analysis (i.e. did not change between 5-year periods).

$$\text{Share of volume from TCBF} = \frac{\text{area of TCBF}}{\text{total forest area}} * \text{factor} \qquad [1]$$

The weighting factor for equation 1 varies by region and country (Appendix B). The factor applied to most countries in Africa is 2.0, except for Burundi (1.5), Cameroon (1.431), Congo (1.0), Côte d'Ivoire (1.5), Democratic Republic of Congo (1.7), Equatorial Guinea (1.0), Gabon (1.0), Liberia (1.0), Madagascar (1.3), Mauritius (1.0), Reunion (1.1), Rwanda (1.5), and Sao Tome Principe (1.0). No weighting is applied to the ratio of total forest area as TCBF for Asia (i.e. the factor is 1.0). A factor is only applied to two countries in the Latin America and Caribbean Region: i.e. Haiti (1/4.5=0.22) and Jamaica (1/5=0.20). In cases where multiplying by the factor resulted in greater than 100% of the volume coming from TCBF, 100% was chosen.

2.3 DETERMINING VOLUME LOGGED FROM NATURAL FORESTS

Dykstra states (pers.comm.) that the most important single document that he used was Masson [1982]. This document contains the country-level details for Lanly's [1980] Table 4a, which summarizes growing stock in "unmanaged" ("undisturbed" and "logged") forests and in "managed" forests. This data is also available in the summary tables of the 1980 Tropical Forest Resources Assessment Project [FAO 1981a, FAO 1981b, FAO 1981c].

Dykstra used this data to calculate the base information for the 1976-80 period for all countries in his report. Values of growing stock in each productive closed broadleaved forest class, are used in equation [2] to calculate the percent of volume harvested from natural forests.

$$\text{Share of volume from natural forest} = \frac{\text{growing stock in productive natural CBF}}{\text{total growing stock in productive CBF}} * \text{factor} \qquad [2]$$

In many cases Dykstra made adjustments to the calculated values based mainly on educated guesses; e.g. the calculated value for Indonesia is 75% (74.663%), while the number in his report is 90% (89.596%). He felt that the calculated value was too low, when compared to other reports and thus multiplied the calculated value by a factor of 1.2. Similarly, he multiplied the calculated value for Malaysia by a factor of 1.5 (a later comment of his states this value was too high). In all cases he tried to match the calculated values with other values found in the literature, and all the adjustments were essentially educated guesses. For other countries there was no data available or it did not made sense. In these cases he had to simply enter values. For example, for China an estimate of 10% was entered for volume from natural forest, although in hindsight he states it should only be 1% [Dykstra, pers.comm.]. However, China is not included in Table 5. For the Pacific islands an average value of 65% was entered based on some data he had. The adjustment factors applied to the calculated equation [2] values are presented in Appendix C.

After calculating the base information for 1976-80, Dykstra calculated values of volume logged from natural forest by, in most cases, multiplying the 1976-80 data for each country by 95% to yield the data for 1986-90. This value was chosen based on a rough analysis of trends from a series of World Resources Institute reports. For countries which were known to be harvesting their virgin forests at a fast pace the value was adjusted: e.g. in the case of the Philippines a value of 0.80 instead of 0.95 was used.

The value for the 1981-85 period is simply the average of the 1976-80 and 1986-90 data. For earlier periods he just extrapolated backward assuming a linear trend. The base data used in the calculations for percent of volume from natural forests are presented in Appendix D.

2.4 LOGGING INTENSITY

Dykstra [1995] reviewed the literature on the physical extent of forest harvesting operations in the tropics and impacts of harvesting operations. The logging intensity, in regard to non-coniferous tropical rainforests, refers only to veneer logs and sawlogs extracted, and not to the total volume felled: i.e. unutilized portions of the tree, and residuals severely damaged or destroyed by the logging operations. Values for "average logging intensity" (i.e. solid volume under bark removed per hectare per entry) were determined for each country based on:

- data from several unpublished papers provided by K.D. Singh and J-P. Lanly;
- regional estimates for some countries, based on an average of values in the above papers;
- data for a few individual countries which have been published in various sources.

Logging intensities vary over time and data were available for the periods 1961-1965, 1976-1980 and 1986-1990, only. Data for the other periods were interpolated. The logging intensities used are presented in Appendix E. Table 5 [FAO 1993] has an error in the calculation of the average logging intensity per region. The average should be a weighted average based on volume harvested and not just a simple average.

Dykstra (pers.comm.) comments that the magnitudes of harvesting intensity used for some countries are questionable and need to be checked carefully. However, there is no indication which countries are in question. There is some correspondence in regard to the harvest intensities for West and Central Africa being too high.

Dykstra [1995] used the same logging intensity in both natural and semi-natural forests. Also, Dykstra made the assumption that areas logged previous to 1961 have reverted back to a "natural" situation: i.e. after 30 years the forest returns to a pre-harvesting state. Both of the above assumptions have major impacts on fibre supply outcomes and seem to be unfounded. In the construction of the GFSS database, considerable effort was made in the validation of the current logging intensities by countries and forest types, for both natural and semi-natural forests.

2.5 CALCULATION OF AREAS HARVESTED ANNUALLY

The calculation of the area of forest harvested is simply a manipulation of the values determined above. For example, the area harvested in a particular year from TCBF within a country was determined using equation [3]:

$$\text{TCBF area harvested} = \frac{\text{m}^3 \text{ tropical NCsaw\& veneer log production} * \text{ Eq.[1]}}{\text{Harvesting intensity m}^3\text{ha}^{-1}} \qquad [3]$$

To determine the area of natural forest harvested, the above value was simply multiplied by the calculated percent of volume from natural forests for the country (equation [4]). An example calculation is given in Appendix F. A comparison of data produced with the reconstructed model employing Dykstra's [1995] methodology with the actual original data is also given in Appendix F. With the exception of some rounding errors the reconstructed model gives more or less the same results as in Dykstra's [1995] original data.

Natural TCBF area harvested = TCBF area harvested * Eq.[2]	[4]

The area of semi-natural area harvested was calculated in the same manner, except that the percentage used was volume from previously logged areas. As with logging intensity, the above assumes that similar volumes are removed from unlogged and previously logged forests, which in reality is not the case when using conventional logging practices.

2.6 SUMMARY

The above review of Dykstra's methodology identified the following shortcomings:

1. To determine volume of tropical NC veneer logs and sawlogs from TCBF a ratio is calculated based on the total area of TCBF (including productive and unproductive forest area) and the total forest area (including all forests productive and unproductive). It is felt that only commercially available forests and only tropical broadleaved forests should be considered.
2. To determine the share of volume assigned to TCBF coming from natural forests a ratio is used which is based on growing stock in natural TCBF divided by total growing stock (natural and semi-natural) in TCBF. This is an incorrect ratio since it does not account for the amount of commercial wood actually available in the growing stock. For example, the growing stock in two countries may be the same (e.g. 150 m^3/ha), while in one only 5 m^3/ha is extracted, while in the other 20 m^3/ha may be extracted. Thus the ratio should be based on the volume that is commercially available.
3. The same logging intensity is used in both natural and semi-natural forests. This assumption is incorrect with the conventional logging practised in most tropical forests. In addition there are clear errors in the logging intensities assumed for a number of countries. For the GFSS all the logging intensities were reviewed and values determined for the forest classes considered within each country for both natural and semi-natural forests.
4. Adjustment factors were applied to most countries for both ratios calculated in Dykstra's methodology. These factors were based on educated guesses and thus make the methodology non-repeatable in a new situation. These factors were required due to using the wrong base assumptions above, and to compensate for problems with the input data.

The level of complexity of the methodology with two equations, both with adjustment factors, is not consistent with the level of accuracy of the input data. In addition, the GFSS database contains additional information on available production forest areas, and logging intensities and

cycles, which were not available previously. Therefore, it was concluded that a major revision of Dykstra's [1995] methodology was required.

3. METHODS

3.1 LIMITATIONS

The calculation of harvest area per year is based on the area of tropical broadleaved forests commercially available for NC veneer log and sawlog production, as well as the logging intensities and cycles for each forest class contained within the GFSS database. For simplicity sake it is assumed the current production forest area will remain as production forest, except where official areas for forest conversion have been established: e.g. Malaysia and Indonesia. Also, no account is made for possible deforestation or forest degradation, since it is unknown which forest classes are actually being affected. Forest depletion caused by conventional logging practices is taken into account through reduced logging intensities for semi-natural forests.

In the model no attempt is made to forecast demand increases. The veneer log and sawlog production is held constant, and is the average veneer log and sawlog production for 1990-1995 contained in the FAOSTAT database. Since official database harvest volumes are used there is no account made for possible illegal or otherwise undocumented logging operations. Due to the above limitations the model results can be held as optimistic in nature.

The objective of the model is to provide very general data which can be used as a check to see how current veneer log and sawlog extraction levels relate to the estimated allowable long-run sustained yield (LRSY) harvest level within a country (i.e. optimistic, assuming no deforestation or illegal logging). For example, if a country's current extraction level is well below the estimated "optimistic" LRSY, there may be some possibility to increase removals. However, if it is close to the LRSY there is cause to become concerned and if the current harvest level is higher than the estimated "optimistic" LRSY then a veneer log and sawlog shortage is imminent.

3.2 MODEL DESCRIPTION

The forest area and logging intensity for each forest class are multiplied together to yield a commercial volume theoretically available over the long term. It is important to consider the long term since the area values calculated have no relation to a single year, but to the entire forest area available over the long run.

The ratio of NC sawlogs and veneer logs coming from each forest class is calculated by dividing the commercial volume available in the class by the sum of commercial volume available from all forest classes. The average (1990-1995) veneer log and sawlog production for a country is then multiplied by the ratios to estimate a volume of wood coming from each forest class. The volume coming from each forest class is then divided by the logging intensity to calculate the area with harvesting operations for the year. However, to maintain long-run sustainability, the maximum area harvested in any semi-natural forest cannot exceed the area available divided by the cutting cycle. If this condition is not met in the initial volume

assignment, the model iteratively reduces the volume harvested in each semi-natural forest being over-harvested until the constraint is met.

After the areas logged within a particular year are determined, the natural and semi-natural forest areas are revised to form the basis for the next year's calculation (i.e. area of natural forest harvested deducted from natural forest area and added to semi-natural forest area). Table 1 presents a sample calculation of the first year for Cameroon. Although the example has open and closed forest classes, the breakdown for each country is based on the GFSS database forest classes: i.e. no attempt has been made to force individual country forest classes into standard forest groups.

Table 1. Example NC broadleaved forest area harvested calculation for Cameroon

Sawlog and veneer log production m^3		2 292 333			
Year		1995			
	Natural CBF	Semi-natural CBF	Natural open BF	Semi-natural open BF	Total BF
Available forest ha	6 894 000	4 000 000	0	1 876 000	12 770 000
Logging intensity m^3/ha	7.0	3.5	2.0	0.5	
Logging cycle years		30		50	
Commercial m^3 available	48 258 000	14 000 000	0	938 000	63 196 000
Area available ha		133 333		37 520	
Share of production	0.7882	0.2036	0.0000	0.0082	1.000
m^3 from forest type	1 806 907	466 666	0	18 760	2 292 333
ha of forest harvested	258 130	133 333	0	37 520	428 983
Revised forest area ha	6 635 870	4 258 130	0	1 876 000	12 770 000

As can be seen, the critical values are the average sawlog and veneer log production from the FAOSTAT database, and GFSS database estimates of areas available for wood production, logging intensities and logging cycles by forest classes. All other values are calculated. Therefore, the accuracy of the data is critical when it comes to reliability of the calculated harvest area.

As noted above, it is important to focus on the long term, since the calculated areas harvested have no relation to what may happen during a particular year or short period of years. This is because in some countries with a lot of natural forest, semi-natural forests may be currently bypassed. However, in the long-term all the production forest area will be operated in.

The model continues harvesting until no natural forest area exists or the run has gone for 500 years. The volume harvested once the available production forest is all in semi-natural form represents the sustainable long-run yield, assuming successive logging cycles yield the same volume as the second cycle. This, however, cannot be assured with the conventional uncontrolled and unplanned logging operations typical in tropical broadleaved forests, possible illegal logging, and deforestation.

The FORTRAN programme for the model is contained in Appendix G, while Appendix H contains the GFSS database input data for the countries considered in the analysis. The output

data for each country is written to both a text file and a CSV file which can be imported into EXCEL©. Appendix I contains a detailed explanation of running the programme located on the S_drive of the FAO network.

3.3 MODEL RUNS FOR FUTURE NC TROPICAL VENEER LOG AND SAWLOG AVAILABILITY

Two scenarios were run to estimate the future availability of tropical non-coniferous veneer logs and sawlogs, from natural and semi-natural forests (i.e. plantations not included). The first scenario is based on the GFSS database logging intensities and cycles. This data assumes logging will continue more or less as currently done, and that future logging intensities will be significantly lower due to creaming of the forest, and logging damage to residual trees and the site.

The second scenario assumes that RIL has been implemented. Based on literature on logging impacts and tropical forests silviculture, a conservative logging intensity of 20 m^3/ha on a cycle of 40 years was assumed for closed moist tropical forests in Africa, Latin America and the Caribbean [e.g. Sundberg 1983, Thang 1986, Margules *et al*. 1987, Buenaflor 1989, FAO 1989a, FAO 1989b, Hendrison 1989, Lamprecht 1989, Plonczak 1989, Uhl and Viera 1989, Jonsson and Lindgren 1990, FAO 1991, Kilkki 1992, Silva 1992, d'Oliveira and Braz 1995, Bruenig 1996]. Due to the need to get more canopy open and the more uniform nature of moist dipterocarp forests (MDF) in Asia, a conservative logging intensity of 40 m^3/ha on a 40-year cycle was assumed for them.

4. RESULTS AND DISCUSSION

4.1 GFSS DATABASE LOGGING INTENSITIES AND CYCLES

The summary tables for Africa, Latin America and the Caribbean, and Asia and Oceania (Tables 2, 3 and 4) show that for a number of countries the current official veneer log and sawlog removals are well below the estimated LRSY (i.e. countries for which the allowable harvest level when all forest is semi-natural is greater than 200% of current harvest levels). In some cases the large apparent excess is a result of a low current harvest level. There are also a large number of countries, especially in Africa and Asia, for which the LRSY harvest levels are well below current harvest levels.

On a regional basis (Table 5) it appears there will be a major supply shortage of NC tropical veneer logs and sawlogs in Asia and Oceania, assuming current logging and forest management practices. In Asia and Oceania the estimated LRSY from the model is only 59% of current harvest levels, even with deforestation and illegal logging not accounted for. Africa, mainly due the large forest area available in the Democratic Republic of Congo, seems to have some surplus in LRSY (i.e. LRSY of 30 million m^3, versus a current harvest level of about 17 million m^3). In Latin America and the Caribbean the LRSY and current harvest level is more in balance, with some surplus in LRSY to cover data deficiencies in regard to deforestation and illegal logging. On a global scale it appears there will be a NC tropical veneer log and sawlog shortage since the LRSY is only 91 percent of the current official harvest level.

Table 2. Summary table of initial forest areas available for wood production and LRSY once the available area is semi-natural forest for Africa: assuming GFSS logging intensities and cycles

Region: Africa	Natural	Semi-	Total NC	Average	Year when	Harvest	SNF
	forest	natural	forest area	NC sawlog	available	volume	harvest
Country	available	forest	available	& veneer	natural	when all	volume as
		available		log prod.	forest	semi-natural	percent of
				1990-95	logged	forest	1990-95
	ha	ha	ha	m^3		m^3	average
Angola	0	11780000	11780000	66000	none avail.	751556	1139%
Cameroon	6894000	5876000	12770000	2292333	2030	1289727	56%
Central African Republic	9000000	2355000	11355000	216500	>500 yrs	1099400	508%
Congo, Dem. Republic of	32200000	29459000	61659000	349333	>500 yrs	17373836	4973%
Congo, Republic of	6924000	4400000	11324000	642500	>500 yrs	1350500	210%
Côte d'Ivoire	0	1286000	1286000	2283000	none avail.	476600	21%
Equatorial Guinea	148000	1000000	1148000	219500	>500 yrs	551040	251%
Gabon	2318000	8500000	10818000	1768833	>500 yrs	4327200	245%
Ghana	0	3367000	3367000	1394167	none avail.	442245	32%
Guinea	0	959000	959000	145000	none avail.	66260	46%
Guinea-Bissau	30000	346000	376000	40000	2000	12452	31%
Kenya	0	450000	450000	131000	none avail.	37714	29%
Liberia	200000	2399000	2599000	808833	1997	311880	39%
Madagascar	0	1170000	1170000	317250	none avail.	390000	123%
Malawi	0	1000000	1000000	30667	none avail.	3333	11%
Niger	0	300000	300000	n.a.	none avail.	600	n.a.
Nigeria	0	8399000	8399000	5984000	none avail.	997858	17%
Sierra Leone	0	333000	333000	5067	none avail.	28932	571%
Sudan	0	11380000	11380000	5133	none avail.	35467	691%
Tanzania	1755000	9035000	10790000	147000	2015	65200	44%
Uganda	100000	1344000	1444000	83667	2038	37376	45%
Zambia	0	7300000	7300000	182833	none avail.	115000	63%
Zimbabwe	0	500000	500000	20500	none avail.	3125	15%
Total Africa	59569000	112938000	172507000	17133116		29767301	174%

Table 3. Summary table of initial forest areas available for wood production and LRSY once the available area is semi-natural forest for Latin America and the Caribbean: assuming GFSS logging intensities and cycles

Region: Latin America and the Caribbean Country	Natural forest available	Semi-natural forest available	Total NC forest area available	Average NC sawlog & veneer log prod. 1990-95	Year when available natural forest logged	Harvest volume when all semi-natural forest	SNF harvest volume as percent of 1990-95
	ha	ha	ha	m^3		m^3	average
Belize	0	1215000	1215000	43900	none avail.	303750	692%
Bolivia	11000000	5200000	16200000	412833	>500 yrs	5462500	1323%
Brazil	14000000	54000000	68000000	21897168	2062	19666667	90%
Colombia	1500000	4500000	6000000	1279167	2074	1000000	78%
Costa Rica	0	230000	230000	896000	none avail.	328571	37%
Cuba	0	660000	660000	80000	none avail.	247500	309%
Dominican Rep.	0	715000	715000	3600	none avail.	178750	4965%
Ecuador	708000	2292000	3000000	2683500	2007	1500000	56%
El Salvador	0	0	0	57000	none avail.	0	0%
French Guiana	1150000	1000000	2150000	114833	>500 yrs	161250	140%
Guatemala	0	1683000	1683000	128833	none avail.	673200	523%
Guyana	1000000	5000000	6000000	253000	>500 yrs	1680000	664%
Honduras	0	2269000	2269000	22500	none avail.	907600	4034%
Mexico	0	10150000	10150000	257667	none avail.	2161667	839%
Nicaragua	0	2786000	2786000	90500	none avail.	928667	1026%
Panama	0	850000	850000	50950	none avail.	510000	1001%
Paraguay	650000	850000	1500000	3273833	1999	187500	6%
Peru	4300000	13000000	17300000	1319667	>500 yrs	8650000	655%
Suriname	1100000	1100000	2200000	99000	>500 yrs	366667	370%
Venezuela	6742000	15000000	21742000	858667	>500 yrs	2717750	317%
Total Latin America and Caribbean	42150000	122500000	164650000	33822618		47632039	141%

Table 4. Summary table of initial forest areas available for wood production and LRSY once the available area is semi-natural forest for Asia and Oceania: assuming GFSS logging intensities and cycles

Region: Asia & Oceania	Natural	Semi-	Total NC	Average	Year when	Harvest	SNF
	forest	natural	forest area	NC sawlog	available	volume	harvest
Country	available	forest	available	& veneer	natural	when all	volume as
		available		log prod.	forest	semi-natural	percent of
				1990-95	logged	forest	1990-95
	ha	ha	ha	m^3		m^3	average
Bangladesh	0	0	0	293833	none avail.	0	0%
Bhutan	212000	550000	762000	11083	>500 yrs	476250	4297%
Brunei Darussalam	193000	234000	427000	206000	>500 yrs	427000	207%
Cambodia	1044000	3940000	4984000	181167	>500 yrs	2081286	1149%
Fiji	207000	100000	307000	151167	2095	105257	70%
India	0	19232000	19232000	15812000	none avail.	7692800	49%
Indonesia	37197000	35071000	72268000	33463500	2078	22631829	68%
Laos	495000	2000000	2495000	310167	>500 yrs	935625	302%
Malaysia	2640000	8295000	10935000	38056335	2004	8181817	21%
Myanmar	2872000	16300000	19172000	2135833	>500 yrs	7764000	364%
Papua New Guinea	7500000	1500000	9000000	2767833	2188	2571429	93%
Philippines	0	2010000	2010000	1078167	none avail.	2010000	186%
Solomon Is.	497000	104000	601000	447000	2038	85857	19%
Sri Lanka	0	0	0	44667	none avail.	0	0%
Thailand	0	0	0	167483	none avail.	0	0%
Vanuatu	143000	50000	193000	33800	2156	27571	82%
Vietnam	0	2525000	2525000	2445333	none avail.	2233110	91%
Total Asia & Oceania	53000000	91911000	144911000	97605368		57223831	59%

Table 5. Regional summary table of initial forest areas available for wood production and LRSY once the available area is semi-natural forest: assuming GFSS logging intensities and cycles

	Natural	Semi-natural	Total NC	Average	LRSY	Percent
	forest	forest(SNF)	forest area	90-95 m^3	production,	of 90-95
	available, ha	available, ha	available, ha	production	m^3	production
Africa	59569000	112938000	172507000	17133116	29767301	174%
Asia/Oceania	53000000	91911000	144911000	97605368	57223831	59%
Latin Amer. & Caribbean	42150000	122500000	164650000	33822618	47632039	141%
Total	154719000	327349000	482068000	148561102	134623171	91%

4.2 SUSTAINABLE LOGGING INTENSITIES AND CYCLES WITH RIL IN TROPICAL CLOSED BROADLEAVED FORESTS

With the implementation of RIL and the sustained removal of 20 m^3/ha on a 40-year cycle in tropical closed broadleaved forests in Africa, Latin America and the Caribbean, and 40 m^3/ha on a 40-year cutting cycle in Asian dipterocarp forests, the model results show higher LRSY harvest levels for almost all countries, with the exception of Côte d'Ivoire, Costa Rica, Panama, Malaysia and Vietnam (Tables 5, 6 and 7). With the implementation of RIL and increase in removal of currently underutilized species (i.e. to increase logging intensity in some countries and/or lessen pressure on highly desired species), most countries could have increases in LRSY harvest levels when compared to current official log production values.

On a regional basis (Table 8) the implementation of RIL and "proper" selection cutting results in regional NC tropical veneer log and sawlog surpluses when compared to current official production levels. However, the small surplus (16%) in Asia and Oceania, could quickly become a deficit if deforestation and logged volumes not reported in the official statistics are included.

Table 6. Summary table for Africa of initial forest areas available for wood production and LRSY once the available area is semi-natural forest: assuming RIL and a logging intensity of 20 m^3/ha on a 40-year cycle in tropical closed broadleaved forests

Region: Africa	Natural	Semi-	Total NC	Average	Year when	Harvest	SNF
	forest	natural	forest area	NC sawlog	available	volume	harvest
Country	available	forest	available	& veneer	natural	when all	volume as
		available		log prod.	forest	semi-natural	percent of
				1990-95	logged	forest	1990-95
	ha	ha	ha	m^3		m^3	average
Angola	0	11780000	11780000	66000	none avail.	1279333	1938%
Cameroon	6894000	5876000	12770000	2292333	>500 years	5465760	238%
Central African Rep.	9000000	2355000	11355000	216500	>500 years	1837500	849%
Congo, Dem. Republic of	32200000	29459000	61659000	349333	>500 years	27129836	7766%
Congo, Republic of	6924000	4700000	11624000	642500	>500 years	4622000	719%
Côte d'Ivoire	0	1286000	1286000	2283000	none avail.	398000	17%
Equatorial Guinea	148000	1000000	1148000	219500	>500 years	574000	262%
Gabon	2318000	8500000	10818000	1768833	>500 years	5409000	306%
Ghana	0	3367000	3367000	1394167	none avail.	587120	42%
Guinea	0	959000	959000	145000	none avail.	237237	164%
Guinea-Bissau	30000	346000	376000	40000	>500 years	75452	189%
Kenya	0	450000	450000	131000	none avail.	127000	97%
Liberia	200000	2399000	2599000	808833	>500 years	1299500	161%
Madagascar	0	1170000	1170000	317250	none avail.	585000	184%
Malawi	0	1000000	1000000	30667	none avail.	3333	11%
Niger	0	300000	300000	n.a	none avail.	600	n.a.
Nigeria	0	8399000	8399000	5984000	none avail.	997858	17%
Sierra Leone	0	333000	333000	5067	none avail.	50932	1005%
Sudan	0	11380000	11380000	5133	none avail.	35467	691%
Tanzania	1755000	9035000	10790000	147000	>500 years	187000	127%
Uganda	100000	1344000	1444000	83667	2035	55376	66%
Zambia	0	7300000	7300000	182833	none avail.	552500	302%
Zimbabwe	0	500000	500000	20500	none avail.	3125	15%
Total Africa	59569000	113238000	172807000	17133116		51512929	301%

Table 7. Summary table for Latin America and the Caribbean of initial forest areas available for wood production and LRSY once the available area is semi-natural forest: assuming RIL and a logging intensity of 20 m^3/ha on a 40-year cycle in tropical closed broadleaved forests

Region: Latin America and the Caribbean	Natural forest	Semi-natural forest	Total NC forest area	Average NC sawlog & veneer log prod. 1990-95	Year when available natural forest logged	Harvest volume when all semi-natural forest	SNF harvest volume as percent of 1990-95
Country	available	available	available				average
	ha	ha	ha	m^3		m^3	
Belize	0	1215000	1215000	43900	none avail.	607500	1384%
Bolivia	11000000	5200000	16200000	412833	>500 years	8100000	1962%
Brazil	14000000	54000000	68000000	21897168	>500 years	34000000	155%
Colombia	1500000	4500000	6000000	1279167	>500 years	3000000	235%
Costa Rica	0	230000	230000	896000	none avail.	115000	13%
Cuba	0	660000	660000	80000	none avail.	330000	413%
Dominican Rep.	0	715000	715000	3600	none avail.	357500	9931%
Ecuador	708000	2292000	3000000	2683500	2005	1500000	56%
El Salvador	0	0	0	57000	none avail.	10107	18%
French Guiana	1150000	1000000	2150000	114833	>500 years	1075000	936%
Guatemala	0	1683000	1683000	128833	none avail.	841500	653%
Guyana	1000000	5000000	6000000	253000	>500 years	3000000	1186%
Honduras	0	2269000	2269000	22500	none avail.	1134500	5042%
Mexico	0	10150000	10150000	257667	none avail.	3365000	1306%
Nicaragua	0	2786000	2786000	90500	none avail.	1393000	1539%
Panama	0	850000	850000	50950	none avail.	425000	834%
Paraguay	650000	850000	1500000	3273833	1999	750000	23%
Peru	4300000	13000000	17300000	1319667	>500 years	8650000	655%
Suriname	1100000	1100000	2200000	99000	>500 years	1100000	1111%
Venezuela	6742000	15000000	21742000	858667	>500 years	10871000	1266%
Total Latin America & Caribbean	42150000	122500000	164650000	33822618		80625107	238%

Table 8: Summary table for Asia and Oceania of initial forest areas available for wood production and LRSY once the available area is semi-natural forest: assuming RIL and a logging intensity of 40 m^3/ha on a 40-year cycle in moist dipterocarp forests

Region: Asia & Oceania	Natural	Semi-	Total NC	Average	Year when	Harvest	SNF
	forest	natural	forest area	NC sawlog	available	volume	harvest
Country	available	forest	available	& veneer	natural	when all	volume as
		available		log prod.	forest	semi-natural	percent of
				1990-95	logged	forest	1990-95
	ha	ha	ha	m^3		m^3	average
Bangladesh	0	0	0	293833	none avail.	0	0%
Bhutan	212000	550000	762000	11083	>500 years	762000	6875%
Brunei Darussalam	193000	234000	427000	206000	>500 years	427000	207%
Cambodia	1044000	3940000	4984000	181167	>500 years	3408000	1881%
Fiji	207000	100000	307000	151167	>500 years	307000	203%
India	0	19232000	19232000	15812000	none avail.	19232000	122%
Indonesia	37197000	35071000	72268000	33463500	>500 years	46813000	140%
Laos	495000	2000000	2495000	310167	>500 years	2495000	804%
Malaysia	2640000	8295000	10935000	38056335	2002	7793500	20%
Myanmar	2872000	16300000	19172000	2135833	>500 years	19172000	898%
Papua New Guinea	7500000	1500000	9000000	2767833	>500 years	9000000	325%
Philippines	0	2010000	2010000	1078167	none avail.	2010000	186%
Solomon Is.	497000	104000	601000	447000	>500 years	601000	134%
Sri Lanka	0	0	0	44667	none avail.	0	0%
Thailand	0	0	0	167483	none avail.	0	0%
Vanuatu	143000	50000	193000	33800	>500 years	193000	571%
Vietnam	0	2525000	2525000	2445333	none avail.	1401000	57%
Total Asia & Oceania	53000000	91911000	144911000	97605368		113614500	116%

Table 9: Regional summary table of initial forest areas available for wood production and LRSY once the available area is semi-natural forest: assuming RIL, 40-year logging cycle, and logging intensities of 20 m^3/ha in tropical closed broadleaved forests of Africa, Latin America and the Caribbean, and 40 m^3/ha in moist dipterocarp forests of Asia

	Natural	Semi-natural	Total NC	Average	LRSY	Percent
	forest	forest(SNF)	forest area	90-95 m^3	production	of 90-95
	available, ha	available, ha	available, ha	production	m^3	production
Africa	59569000	113238000	172807000	17133116	51512929	301%
Asia & Oceania	53000000	91911000	144911000	97605368	113614500	116%
Latin America & Caribbean	42150000	122500000	164650000	33822618	80625107	238%
Total	154719000	327649000	482368000	148561102	245752536	165%

5. CONCLUSIONS

The results presented in Tables 2 to 9 only indicate broad trends due to the limited accuracy of the input data, and omission of deforestation, log production not reported in official country statistics and illegal logging. However, it is quite clear that the implementation of RIL and increase in use of lesser known and utilized species can have a major impact on future NC veneer log and sawlog availability. However, even with the implementation of RIL there are a number of countries which will still face major log shortages in the near future. Continuing current selective logging practices, with excessive damage to residuals and the site, will result in log shortages in most countries and a general world-wide shortage of NC veneer logs and sawlogs within the very near future.

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APPENDIX A: REGION AND COUNTRY LIST FOR TABLE 5A,B,C - STATE OF LOGGING 1990 (FAO 1993)

AFRICA	ASIA	LATIN AMERICAN AND THE CARIBBEAN
WEST SAHELIAN AFRICA	SOUTH ASIA	CENTRAL AMERICA
Burkina Faso	Bangladesh	Costa Rica
Chad	Bhutan	Guatemala
Gambia	India	Honduras
Guinea-Bissau	Sri Lanka	Mexico
Mali	CONTINENTAL S.E. ASIA	Nicaragua
Mauritania	Cambodia	Panama
Niger	Laos	CARIBBEAN
Senegal	Myanmar	Belize
EAST SAHELIAN AFRICA	Thailand	Cuba
Ethiopia	Vietnam	Dominican Rep.
Kenya	INSULAR S.E. ASIA	French Guyana
Somalia	Brunei	Guadeloupe
Sudan	Indonesia	Guyana
Uganda	Malaysia	Haiti
WEST AFRICA	Philippines	Jamaica
Benin	PACIFIC	Martinique
Côte d'Ivoire	Papua New Guinea	Suriname
Ghana		Trinidad & Tobago
Guinea		TROPICAL S. AMERICA
Liberia		Bolivia
Nigeria		Brazil
Sierra Leone		Columbia
Togo		Ecuador
CENTRAL AFRICA		Paraguay
Cameroon		Peru
Central African Rep.		Venezuela
Congo		
Dem. Republic of Congo		
Equatorial Guinea		
Gabon		
TROPICAL S. AFRICA		
Angola		
Burundi		
Malawi		
Mozambique		
Rwanda		
Tanzania		
Zambia		
Zimbabwe		
INSULAR AFRICA		
Madagascar		

APPENDIX B: WEIGHTING FACTORS FOR EQ.[1] AND DYKSTRA DEFAULT RATIOS OF VOLUME FROM TCBF

AFRICA	Factor	Ratio
Angola	2.000	0.108
Benin	2.000	0.024
Burkina Faso	2.000	0.114
Burundi	1.500	0.375
Cameroon	1.431	1.000
Central African Republic	2.000	0.200
Chad	2.000	0.074
Congo	1.001	1.000
Côte d'Ivoire	1.500	0.667
Dem. Republic of Congo	1.681	1.000
Equatorial Guinea	1.000	1.000
Ethiopia	2.000	0.202
Gabon	1.005	1.000
Gambia	2.000	0.602
Ghana	2.000	0.392
Guinea	2.000	0.385
Guinea-Bissau	2.000	0.627
Kenya	2.000	0.543
Liberia	1.023	1.000
Madagascar	1.307	1.000
Malawi	2.000	0.085
Mali	2.000	0.138
Mauritania	2.000	0.105
Mauritius	1.000	0.214
Mozambique	2.000	0.121
Niger	2.000	0.078
Nigeria	2.000	0.798
Reunion	1.098	1.000
Rwanda	1.500	0.585
Sao Tome Principe	1.000	1.000
Senegal	2.000	0.040
Sierra Leone	2.000	0.718
Somalia	2.000	0.327
Sudan	2.000	0.027
Tanzania	2.000	0.068
Togo	2.000	0.359
Uganda	2.000	0.247
Zambia	2.000	0.204
Zimbabwe	2.000	0.020

ASIA	Factor	Ratio
Bangladesh	1.000	0.879
Bhutan	1.000	0.694
Brunei Darussalam	1.000	1.000
China	est.	0.018
Fiji	est.	0.953
India	0.767	0.056
Indonesia	1.200	0.956
Cambodia	1.000	0.565
Laos	0.975	0.554
Malaysia	1.500	0.999
Myanmar	1.400	0.976
New Caledonia	est.	0.687
Papua New Guinea	0.979	0.883
Philippines	1.200	0.950
Samoa	est.	0.986
Solomon Islands	est.	0.986
Sri Lanka	1.000	0.937
Thailand	0.467	0.515
Vanuatu	est.	1.000
Vietnam	0.476	0.717

TROPICAL AMERICA	Factor	Ratio
Belize	est.	0.867
Bolivia	1.000	0.659
Brazil	1.000	0.687
Colombia	1.000	0.896
Costa Rica	est.	0.909
Cuba	1.000	0.779
Dominican Republic	1.000	0.699
Ecuador	1.000	0.963
French Guiana	1.000	1.000
Guadeloupe	est.	0.957
Guatemala	1.000	0.831
Guyana	1.056	0.988
Haiti	est.	0.163
Honduras	0.772	0.464
Jamaica	1.000	0.168
Martinique	est.	0.741
Mexico	1.000	0.143
Nicaragua	1.000	0.927
Panama	1.000	0.999
Paraguay	1.000	0.206
Peru	1.000	0.980
Suriname	1.000	0.988
Trinidad & Tobago	est.	0.929
Venezuela	1.000	0.938

APPENDIX C: WEIGHTING FACTORS FOR EQ. [2] - % OF VOLUME FROM NATURAL FORESTS

AFRICA	Factor
Angola	est.
Benin	2.000
Burkina Faso	1.000
Burundi	est.
Cameroon	2.200
Central African Republic	1.066
Chad	0.850
Congo	1.121
Côte d'Ivoire	5.001
Dem. Republic of Congo	0.994
Equatorial Guinea	1.123
Ethiopia	1.091
Gabon	1.700
Gambia	1.000
Ghana	est.
Guinea	1.124
Guinea-Bissau	1.093
Kenya	1.500
Liberia	1.300
Madagascar	1.000
Malawi	1.000
Mali	1.000
Mauritania	est.
Mauritius	est.
Mozambique	2.000
Niger	1.000
Nigeria	2.000
Reunion	est.
Rwanda	est.
Sao Tome Principe	est.
Senegal	0.056
Sierra Leone	1.000
Somalia	1.000
Sudan	1.000
Tanzania	2.500
Togo	2.000
Uganda	3.000
Zambia	2.000
Zimbabwe	est.

ASIA	Factor
Bangladesh	0.838
Bhutan	1.000
Brunei Darussalam	1.000
China	est.
Fiji	1.000
India	1.000
Indonesia	1.000
Kampuchea	1.000
Laos	1.000
Malaysia	1.000
Myanmar	1.000
New Caledonia	1.000
Papua New Guinea	1.000
Philippines	1.000
Samoa	1.000
Solomon Islands	1.000
Sri Lanka	1.000
Thailand	1.000
Vanuatu	1.000
Vietnam	1.000

TROPICAL AMERICA	Factor
Belize	1.000
Bolivia	1.000
Brazil	1.000
Colombia	1.000
Costa Rica	1.000
Cuba	1.000
Dominican Republic	1.000
Ecuador	1.000
French Guiana	1.000
Guadeloupe	1.000
Guatemala	1.000
Guyana	1.000
Haiti	0.222
Honduras	1.000
Jamaica	0.200
Martinique	1.000
Mexico	1.000
Nicaragua	1.000
Panama	1.000
Paraguay	1.000
Peru	1.000
Suriname	1.000
Trinidad & Tobago	1.000
Venezuela	1.000

APPENDIX D: DYKSTRA DEFAULT VALUES FOR FRACTION OF TROPICAL HARDWOOD VENEER LOGS AND SAWLOGS FROM NATURAL FOREST

AFRICA	61-65	66-70	71-75	76-80	81-85	86-90
Angola	0.000	0.053	0.051	0.050	0.049	0.048
Benin	0.634	0.620	0.605	0.590	0.575	0.561
Burkina Faso	0.000	0.000	0.000	0.000	0.000	0.000
Burundi	0.054	0.053	0.051	0.050	0.049	0.048
Cameroon	0.998	0.975	0.952	0.928	0.905	0.882
Central African Republic	1.000	0.990	0.980	0.967	0.943	0.919
Chad	0.914	0.893	0.871	0.850	0.829	0.808
Congo	0.995	0.972	0.949	0.926	0.903	0.880
Côte d'Ivoire	0.379	0.370	0.361	0.352	0.344	0.335
Dem. Republic of Congo	1.000	0.990	0.990	0.990	0.965	0.941
Equatorial Guinea	0.985	0.962	0.939	0.916	0.893	0.870
Ethiopia	1.000	0.990	0.980	0.958	0.934	0.910
Gabon	1.000	0.990	0.980	0.964	0.940	0.916
Gambia	0.000	0.000	0.000	0.000	0.000	0.000
Ghana	0.215	0.210	0.205	0.200	0.195	0.190
Guinea	0.973	0.951	0.928	0.905	0.883	0.860
Guinea-Bissau	1.000	0.986	0.962	0.939	0.915	0.892
Kenya	0.961	0.939	0.917	0.894	0.872	0.850
Liberia	0.978	0.956	0.933	0.910	0.887	0.865
Madagascar	0.341	0.333	0.326	0.318	0.310	0.302
Malawi	0.000	0.000	0.000	0.000	0.000	0.000
Mali	0.000	0.000	0.000	0.000	0.000	0.000
Mauritania	0.000	0.000	0.000	0.000	0.000	0.000
Mauritius	0.108	0.105	0.103	0.100	0.098	0.095
Mozambique	0.448	0.438	0.427	0.417	0.406	0.396
Niger	0.000	0.000	0.000	0.000	0.000	0.000
Nigeria	0.341	0.333	0.325	0.317	0.309	0.301
Reunion	0.000	0.000	0.000	0.000	0.000	0.000
Rwanda	0.054	0.053	0.051	0.050	0.049	0.048
Sao Tome Principe	0.000	0.000	0.000	0.000	0.000	0.000
Senegal	0.060	0.058	0.057	0.056	0.054	0.053
Sierra Leone	0.000	0.000	0.000	0.000	0.000	0.000
Somalia	0.000	0.000	0.000	0.000	0.000	0.000
Sudan	0.000	0.000	0.000	0.000	0.000	0.000
Tanzania	0.858	0.838	0.818	0.798	0.778	0.758
Togo	0.529	0.517	0.504	0.492	0.480	0.468
Uganda	0.675	0.659	0.644	0.628	0.612	0.597
Zambia	0.378	0.369	0.360	0.351	0.343	0.334
Zimbabwe	0.151	0.147	0.144	0.140	0.137	0.133

ASIA & OCEANIA	61-65	66-70	71-75	76-80	81-85	86-90
Bangladesh	0.079	0.078	0.076	0.074	0.072	0.070
Bhutan	0.881	0.861	0.840	0.820	0.799	0.779
Brunei Darussalam	1.000	0.990	0.980	0.970	0.946	0.922
China	0.108	0.105	0.103	0.100	0.098	0.095
Fiji	0.699	0.683	0.666	0.650	0.634	0.618
India	0.203	0.198	0.194	0.189	0.184	0.180
Indonesia	0.963	0.941	0.918	0.896	0.874	0.851
Kampuchea	0.981	0.958	0.935	0.912	0.889	0.867
Laos	1.000	0.990	0.980	0.975	0.951	0.927
Malaysia	0.947	0.925	0.903	0.881	0.859	0.837
Myanmar	1.000	0.983	0.959	0.936	0.912	0.889
New Caledonia	0.699	0.683	0.666	0.650	0.634	0.618
Papua New Guinea	1.000	0.990	0.980	0.971	0.947	0.922
Philippines	0.936	0.864	0.792	0.720	0.648	0.576
Samoa	0.699	0.683	0.666	0.650	0.634	0.618
Solomon Islands	0.699	0.683	0.666	0.650	0.634	0.618
Sri Lanka	0.037	0.036	0.035	0.034	0.034	0.033
Thailand	0.502	0.490	0.478	0.467	0.455	0.443
Vanuatu	0.699	0.683	0.666	0.650	0.634	0.618
Vietnam	0.508	0.496	0.484	0.472	0.460	0.448

TROPICAL AMERICA	61-65	66-70	71-75	76-80	81-85	86-90
Belize	0.050	0.050	0.050	0.050	0.050	0.050
Bolivia	0.823	0.799	0.774	0.749	0.725	0.700
Brazil	1.000	0.990	0.978	0.959	0.939	0.920
Colombia	1.000	0.990	0.980	0.984	0.952	0.920
Costa Rica	0.582	0.513	0.445	0.377	0.308	0.240
Cuba	0.130	0.120	0.110	0.100	0.090	0.080
Dominican Republic	0.718	0.695	0.671	0.647	0.624	0.600
Ecuador	1.000	0.990	0.990	0.993	0.972	0.950
French Guiana	1.000	0.990	0.980	0.982	0.961	0.940
Guadeloupe	0.725	0.700	0.675	0.650	0.625	0.600
Guatemala	0.611	0.585	0.558	0.532	0.506	0.480
Guyana	1.000	0.990	0.975	0.950	0.925	0.900
Haiti	0.225	0.200	0.175	0.150	0.125	0.100
Honduras	0.301	0.277	0.252	0.228	0.204	0.180
Jamaica	1.000	0.990	0.980	0.963	0.931	0.900
Martinique	0.725	0.700	0.675	0.650	0.625	0.600
Mexico	1.000	0.990	0.980	0.981	0.951	0.920
Nicaragua	1.000	0.990	0.980	0.966	0.938	0.910
Panama	0.938	0.886	0.835	0.783	0.732	0.680
Paraguay	0.310	0.284	0.258	0.232	0.206	0.180
Peru	0.989	0.957	0.925	0.894	0.862	0.830
Suriname	1.000	0.990	0.980	0.971	0.945	0.920
Trinidad & Tobago	0.065	0.060	0.055	0.050	0.045	0.040
Venezuela	0.503	0.478	0.454	0.429	0.405	0.380

APPENDIX E: AVERAGE LOGGING INTENSITIES BY COUNTRIES (m3/ha/entry)

AFRICA	61-65	66-70	71-75	76-80	81-85	86-90
Angola	15	15	15	15	15	15
Benin	4	4	4	4	4	4
Burkina Faso	5	5	5	5	5	5
Burundi	30	30	30	30	30	30
Cameroon	6	6	6	6	6	6
Central African Rep.	15	15	15	15	15	15
Chad	5	5	5	5	5	5
Congo	8	8	8	8	8	8
Côte d'Ivoire	25	25	25	25	25	25
Dem. Republic of Congo	15	15	15	15	15	15
Equatorial Guinea	25	25	25	25	25	25
Ethiopia	30	30	30	30	30	30
Gabon	10	10	10	10	10	10
Gambia	18	18	18	18	18	18
Ghana	24	24	24	24	24	24
Guinea	7	7	7	7	7	7
Guinea-Bissau	5	5	5	5	5	5
Kenya	27	27	27	27	27	27
Liberia	8	8	8	8	8	8
Madagascar	24	24	24	24	24	24
Malawi	15	15	15	15	15	15
Mali	5	5	5	5	5	5
Mauritania	5	5	5	5	5	5
Mauritius	30	30	30	30	30	30
Mozambique	10	10	10	10	10	10
Niger	12	12	12	12	12	12
Nigeria	35	35	35	35	35	35
Reunion	4	4	4	4	4	4
Rwanda	30	30	30	30	30	30
Sao Tome Principe	30	30	30	30	30	30
Senegal	20	20	20	20	20	20
Sierra Leone	13	13	13	13	13	13
Somalia	12	12	12	12	12	12
Sudan	18	18	18	18	18	18
Tanzania	5	5	5	5	5	5
Togo	10	10	10	10	10	10
Uganda	27	27	27	27	27	27
Zambia	5	5	5	5	5	5
Zimbabwe	12	12	12	12	12	12

ASIA	61-65	66-70	71-75	76-80	81-85	86-90
Bangladesh	30	30	30	30	30	30
Bhutan	76	76	76	76	76	76
Brunei Darussalam	58	64	69	75	75	75
Cambodia	20	20	20	20	20	20
China	31	29	27	25	25	25
Fiji	20	20	20	20	20	20
India	25	23	22	20	20	20
Indonesia	24	23	21	20	20	20
Laos	12	12	12	12	12	12
Malaysia	80	78	77	75	75	75
Myanmar	12	12	13	13	14	14
New Caledonia	15	15	15	15	15	15
Papua New Guinea	27	28	29	30	31	32
Philippines	90	90	90	90	85	80
Samoa	24	24	24	24	24	24
Solomon Islands	12	12	12	12	12	12
Sri Lanka	40	47	53	60	50	40
Thailand	28	27	26	25	24	23
Vanuatu	40	40	40	40	40	40
Vietnam	30	30	30	30	30	30

TROPICAL AMERICA	61-65	66-70	71-75	76-80	81-85	86-90
Belize	10	10	10	10	10	10
Bolivia	5	8	10	12	12	13
Brazil	5	5	5	6	6	7
Columbia	8	12	14	16	16	16
Costa Rica	22	22	22	25	22	22
Cuba	15	15	15	15	15	15
Dominican Republic	10	10	10	10	10	10
Ecuador	15	15	15	15	15	15
French Guiana	16	16	16	16	16	16
Guadeloupe	10	10	10	10	10	10
Guatemala	5	6	8	10	10	10
Guyana	15	15	18	20	20	20
Haiti	15	15	15	15	15	15
Honduras	10	10	10	10	10	10
Jamaica	12	12	12	14	14	14
Martinique	10	10	10	10	10	10
Mexico	12	12	13	13	14	15
Nicaragua	10	10	10	10	10	10
Panama	24	26	26	30	30	30
Paraguay	8	8	8	10	10	11
Peru	12	12	12	12	12	12
Suriname	15	15	15	15	15	16
Trinidad & Tobago	15	15	15	15	15	15
Venezuela	11	11	11	11	11	11

APPENDIX F: CHECK CALCULATION COMPARING RECONSTRUCTED MODEL RESULTS TO ORIGINAL (DYKSTRA) VALUES OF TCBF AREA HARVESTED

Country	Nigeria
Period	1976-80
Sawlog and Veneer log production (m^3)	3,399,200
Factor for share of m^3 from TCBF	2.000
Factor for share of m^3 from natural forest	2.000

	Area (ha)	Average growing stock (m^3/ha)	Total growing stock (mill.m^3)	Logging intensity (m^3/ha)
Productive TCBF - natural	380000	205	77.9	
Productive TCBF - semi-natural	2590000	160	414.4	
Productive TCBF - intensively managed	0			
Productive TCBF - total	2970000		492.3	
Non-productive TCBF - physical	2980000			
Non-productive TCBF - legal	0			
Total non-productive TCBF	2980000			
Total TCBF area	5950000			35
Total forest area	14913000			

RESULTS	Model calculated	Original (Dykstra)
Share of volume from TCBF	0.798	0.798
Volume from TCBF (m^3)	2712430.8	
Share from natural forest	0.316	0.317
Share from semi-natural and managed	0.684	
Natural forest harvested (ha)	24526.1	24573.0
Semi-natural & managed forest harvested (ha)	52971.9	52925.0
Total TCBF area harvested (ha)	77498.0	77498.0

APPENDIX G: FORTRAN PROGRAMME FOR NC TROPICAL VENEER LOG AND SAWLOG SUPPLY ANALYSIS

```
      PROGRAMME MAIN
      CHARACTER FNAME*12,FOUT*12,FCSV*12
      REAL*8 INTENS(35),WEIGHT(35),COMVOL(35),SHARE(35),CLASM3(35),
     2CYCLE(35),ALOWHA(35),FINLM3(35),AREA(35),LOGHA(35),REVISE(35),
     3FINLHA(35)
      REAL*4 RES1(501,35),RES2(501,35),RES3(501,35)
      INTEGER ICNTRY
      COMMON /GROUPA/RES1
      COMMON /GROUPB/RES2
      COMMON /GROUPC/RES3
      COMMON /GROUPD/INTENS,WEIGHT,COMVOL,SHARE,CLASM3,CYCLE,ALOWHA,FINL
     2M3,AREA,LOGHA,REVISE,FINLHA
      COMMON /GROUPE/FNAME,FOUT,FCSV
      OPEN(9,FILE='TROP_NC.LST')
      READ(9,1)ICNTRY
 1    FORMAT(11X,I3)
      DO 2 I=1,ICNTRY
      READ(9,3)FNAME,FOUT,FCSV
 3    FORMAT(A12,/,A12,/,A12)
      CALL OUT
      CALL CSV
 2    CONTINUE
      CLOSE(9)
      STOP
      END

      SUBROUTINE OUT
C -
C - For determining development of tropical closed broadleaved forests
C - make sure the first two forest classes correspond to TCBF.  Class 1
C - is the natural forest and Class 2 is the semi-natural forest
C-  WEIGHT is 0.0 or 1.0 depending on if the forest class is in use
C -
      CHARACTER FNAME*12,CONTRY*25,CLASS(35)*25,FOUT*12,FCSV*12
      INTEGER*4 YEAR,ICLASS,JUMP(35),IRUN,YRTRCK(501)
      REAL*8 DEFOR,INTENS(35),WEIGHT(35),COMVOL(35),SHARE(35),SUMWGT,
     2CLASM3(35),CYCLE(35),ALOWHA(35),FINLM3(35),AREA(35),LOGHA(35),
     3REVISE(35),FINLHA(35),TOTLOG,TOTARE,PROD,XVOL,TOTM3,PERCNT
      REAL*4 RES1(501,35),RES2(501,35),RES3(501,35)
      COMMON /GROUPA/RES1
      COMMON /GROUPB/RES2
      COMMON /GROUPC/RES3
      COMMON /GROUPD/INTENS,WEIGHT,COMVOL,SHARE,CLASM3,CYCLE,ALOWHA,FINL
     2M3,AREA,LOGHA,REVISE,FINLHA
      COMMON /GROUPE/FNAME,FOUT,FCSV
C --
      OPEN(7,FILE=FNAME)
      OPEN(8,FILE=FOUT)
 3    CONTINUE
      READ(7,4)CONTRY,YEAR,PROD,DEFOR,ICLASS
 4    FORMAT(17X,A25,/,17X,I4,/,17X,F10.0,/,17X,F4.1,/,17X,I2,///)
      WRITE(8,5)CONTRY,YEAR,PROD,DEFOR,ICLASS
 5    FORMAT(' COUNTRY           = ',A25,/,
     3' STARTING YEAR     = ',I4,/,
     4' LOG PRODUCTION m3 = ',F10.0,/,
     5' DEFORESTATION %/a = ',F4.1,/,
     6' FOREST CLASSES    = ',I2,//,
     7' FOREST CLASS',16X,' AREA,ha INTEN WGHT CYCL')
C --
```

```
      DO 6 I=1,ICLASS
      READ(7,7)CLASS(I),AREA(I),INTENS(I),WEIGHT(I),CYCLE(I)
 7    FORMAT(A25,1X,F10.0,2X,F5.1,2X,F4.1,2X,F4.1)
 6    CONTINUE
C --
      DO 8 I=1,ICLASS
      WRITE(8,9)CLASS(I),AREA(I),INTENS(I),WEIGHT(I),CYCLE(I)
 9    FORMAT(1X,A25,1X,F10.0,1X,F5.1,1X,F4.1,1X,F4.1)
 8    CONTINUE
C --
      IRUN=0
 10   CONTINUE
      IRUN=IRUN+1
      IF(IRUN.GT.500)THEN
      WRITE(8,887)
 887  FORMAT(/,' RUN GOES MORE THAN 500 YEARS WITH NATURAL/CONVERSION FO
     2REST',/,' FOREST AREAS AT THAT TIME ARE:')
      DO 886 I=1,ICLASS
      WRITE(8,885)CLASS(I),AREA(I)
 885  FORMAT(1X,A25,1X,F10.0,' ha')
 886  CONTINUE
      GOTO 888
      ENDIF
      DO 11 I=1,ICLASS
      IF(CYCLE(I).NE.0.0)THEN
      ALOWHA(I)=AREA(I)/CYCLE(I)
      ELSE
      ALOWHA(I)=0.0
      ENDIF
      COMVOL(I)=AREA(I)*INTENS(I)
      JUMP(I)=1
 11   CONTINUE
 997  CONTINUE
      SUMWGT=0.0
      DO 40 I=1,ICLASS
      IF(JUMP(I).EQ.0)GOTO 40
      SUMWGT=SUMWGT+COMVOL(I)*WEIGHT(I)
 40   CONTINUE
      IF(SUMWGT.EQ.0.0)GOTO 998
      IFLAG=0
      DO 12 I=1,ICLASS
      IF(JUMP(I).EQ.0)GOTO 12
      SHARE(I)=COMVOL(I)*WEIGHT(I)/SUMWGT
      XVOL=PROD
      DO 41 J=1,ICLASS
      IF(JUMP(J).EQ.1)GOTO 41
      XVOL=XVOL-CLASM3(J)
 41   CONTINUE
      CLASM3(I)=XVOL*SHARE(I)
      IF(INTENS(I).NE.0.0)THEN
        LOGHA(I)=CLASM3(I)/INTENS(I)
        ELSE
        LOGHA(I)=0.0
        ENDIF
      IF(LOGHA(I).GT.ALOWHA(I))THEN
        LOGHA(I)=ALOWHA(I)
        CLASM3(I)=LOGHA(I)*INTENS(I)
        JUMP(I)=0
        IFLAG=1
      ENDIF
 12   CONTINUE
      IF(IFLAG.EQ.1)GOTO 997
C --
```

```
 998  CONTINUE
      TOTM3=0.0
      TOTLOG=0.0
      DO 42 I=1,ICLASS
      TOTM3=TOTM3+CLASM3(I)
      TOTLOG=TOTLOG+LOGHA(I)
 42   CONTINUE
      DO 21 I=1,ICLASS,2
      K=I+1
      REVISE(I)=AREA(I)-LOGHA(I)
      REVISE(K)=AREA(K)+LOGHA(I)
 21   CONTINUE
C --
      YRTRCK(IRUN)=YEAR
      DO 31 I=1,ICLASS
      RES1(IRUN,I)=AREA(I)
      RES2(IRUN,I)=LOGHA(I)
      RES3(IRUN,I)=CLASM3(I)
 31   CONTINUE
C --
      TOTARE=0
      DO 18 I=1,ICLASS
      AREA(I)=REVISE(I)
      TOTARE=TOTARE+AREA(I)
 18   CONTINUE
C --
C     IF(TOTM3.NE.PROD)GOTO 999
      YEAR=YEAR+1
      ISTOP=1
      DO 25 I=1,ICLASS,2
      IF(LOGHA(I).GT.0.0)ISTOP=0
 25   CONTINUE
      IF(ISTOP.EQ.1)GOTO 999
      ISTOP=1
      DO 26 I=1,ICLASS,2
      IF(AREA(I).GT.0.0)ISTOP=0
 26   CONTINUE
      IF(ISTOP.EQ.0)GOTO 10
C --
 999  CONTINUE
C --
      IF(IRUN.LE.50)ISKIP=1
      IF(IRUN.GT.50.AND.IRUN.LE.100)ISKIP=2
      IF(IRUN.GT.100.AND.IRUN.LE.200)ISKIP=5
      IF(IRUN.GT.200.AND.IRUN.LE.300)ISKIP=10
      IF(IRUN.GT.300.AND.IRUN.LE.400)ISKIP=20
      IF(IRUN.GT.400)ISKIP=25
      DO 32 I=1,ICLASS,2
      K=I+1
      IF(WEIGHT(I).EQ.0.0.AND.WEIGHT(K).EQ.0.0)GOTO 32
      WRITE(8,29)CLASS(I),CLASS(K)
 29   FORMAT(//,' FOREST AREA AND HARVEST DEVELOPMENT IN CLASSES',/,
     21X,A25,' AND',1X,A25,/,
     21X,70('-'),/,1X,'YEAR',10X,'NATURAL FOREST',17X,
     3'SEMI-NATURAL FOREST',/,1X,4('-'),2(1X,32('-')),/,4X,
     42(3X,'AVAILABLE',4X,'LOGGED',5X,'LOGGED'),/,2X,2(9X,'ha',9X,'ha',
     59X,'m3'),/,1X,4('-'),6(1X,10('-')))
      DO 33 J=1,IRUN,ISKIP
      WRITE(8,27)YRTRCK(J),RES1(J,I),RES2(J,I),RES3(J,I),
     2RES1(J,K),RES2(J,K),RES3(J,K)
 27   FORMAT(1X,I4,6(1X,F10.0))
 33   CONTINUE
      WRITE(8,34)
```

```
 34   FORMAT(1X,70('-'))
 32   CONTINUE
C --
      TOTLOG=0.0
      TOTM3=0.0
      DO 100 I=1,ICLASS
      IF(CYCLE(I).NE.0.0)THEN
      FINLHA(I)=AREA(I)/CYCLE(I)
      ELSE
      FINLHA(I)=0.0
      ENDIF
      FINLM3(I)=FINLHA(I)*INTENS(I)*WEIGHT(I)
      TOTLOG=TOTLOG+FINLHA(I)
      TOTM3=TOTM3+FINLM3(I)
 100  CONTINUE
      WRITE(8,101)YRTRCK(IRUN)
 101  FORMAT(//,' HARVEST AREAS AND VOLUMES WHEN ALL SEMI-NATURAL FOREST
     2 IN',I5)
C --
      GOTO 889
 888  CONTINUE
      TOTM3=0.0
      TOTLOG=0.0
      DO 880 I=1,ICLASS,2
      K=I+1
      FINLHA(I)=0.0
      IF(CYCLE(K).NE.0.0)THEN
        FINLHA(K)=(AREA(I)+AREA(K))/CYCLE(K)
        ELSE
        FINLHA(K)=0.0
      ENDIF
      FINLM3(I)=0.0
      FINLM3(K)=FINLHA(K)*INTENS(K)*WEIGHT(K)
      TOTM3=TOTM3+FINLM3(K)
      TOTLOG=TOTLOG+FINLHA(K)
 880  CONTINUE
      WRITE(8,879)
 879  FORMAT(/,' HARVEST AREAS AND VOLUMES WHEN ALL NATURAL FOREST')
 889  CONTINUE
C --
      DO 103 I=1,ICLASS
      WRITE(8,102)CLASS(I),FINLHA(I),FINLM3(I)
 102  FORMAT(1X,A25,'=',F10.0,' ha',2X,F10.0,' m3')
 103  CONTINUE
      PERCNT=TOTM3/PROD*100.0
      WRITE(8,104)TOTLOG,TOTM3,PERCNT
 104  FORMAT(' TOTAL',20X,'=',F10.0,' ha',2X,F10.0,' m3',//,
     2' FINAL HARVEST LEVEL IS ',F5.0,'% OF ORIGINAL')
      CLOSE(7)
      CLOSE(8)
      RETURN
      END

      SUBROUTINE CSV
C -
C - For determining development of tropical closed broadleaved forests
C - make sure the first two forest classes correspond to TCBF.  Class 1
C - is the natural forest and Class 2 is the semi-natural forest
C -
C - WEIGHT is 0.0 or 1.0 depending if the forest class is taken into use
C -
      CHARACTER FNAME*12,CONTRY*25,CLASS(35)*25,FOUT*12,FCSV*12
      INTEGER*4 YEAR,ICLASS,JUMP(35),IRUN,YRTRCK(501)
```

```
      REAL*8 DEFOR,INTENS(35),WEIGHT(35),COMVOL(35),SHARE(35),SUMWGT,
     2CLASM3(35),CYCLE(35),ALOWHA(35),FINLM3(35),AREA(35),LOGHA(35),
     3REVISE(35),FINLHA(35),TOTLOG,TOTARE,PROD,XVOL,TOTM3,PERCNT
      REAL*4 RES1(501,35),RES2(501,35),RES3(501,35)
      COMMON /GROUPA/RES1
      COMMON /GROUPB/RES2
      COMMON /GROUPC/RES3
      COMMON /GROUPD/INTENS,WEIGHT,COMVOL,SHARE,CLASM3,CYCLE,ALOWHA,FINL
     2M3,AREA,LOGHA,REVISE,FINLHA
      COMMON /GROUPE/FNAME,FOUT,FCSV
C --
      OPEN(7,FILE=FNAME)
      OPEN(8,FILE=FCSV)
 3    CONTINUE
      READ(7,4)CONTRY,YEAR,PROD,DEFOR,ICLASS
 4    FORMAT(17X,A25,/,17X,I4,/,17X,F10.0,/,17X,F4.1,/,17X,I2,///)
      WRITE(8,5)CONTRY,YEAR,PROD,DEFOR,ICLASS
 5    FORMAT('COUNTRY =,',A25,/,
     3'STARTING YEAR=,',I4,/,
     4'LOG PRODUCTION m3 =,',F10.0,/,
     5'DEFORESTATION %/a =,',F4.1,/,
     6'FOREST CLASSES =,',I2,//,
     7'FOREST CLASS,AREA ha,INTEN,WGHT,CYCL')
C --
      DO 6 I=1,ICLASS
      READ(7,7)CLASS(I),AREA(I),INTENS(I),WEIGHT(I),CYCLE(I)
 7    FORMAT(A25,1X,F10.0,2X,F5.1,2X,F4.1,2X,F4.1)
 6    CONTINUE
C --
      DO 8 I=1,ICLASS
      WRITE(8,9)CLASS(I),AREA(I),INTENS(I),WEIGHT(I),CYCLE(I)
 9    FORMAT(A25,',',F10.0,',',F5.1,',',F4.1,',',F4.1)
 8    CONTINUE
C --
      IRUN=0
 10   CONTINUE
      IRUN=IRUN+1
      IF(IRUN.GT.500)THEN
      WRITE(8,887)
 887  FORMAT(/,'RUN GOES MORE THAN 500 YEARS WITH NATURAL/CONVERSION FOR
     2EST',/,'FOREST AREAS AT THAT TIME ARE:')
      DO 886 I=1,ICLASS
      WRITE(8,885)CLASS(I),AREA(I)
 885  FORMAT(A25,',',F10.0,',ha')
 886  CONTINUE
      GOTO 888
      ENDIF
      DO 11 I=1,ICLASS
      IF(CYCLE(I).NE.0.0)THEN
      ALOWHA(I)=AREA(I)/CYCLE(I)
      ELSE
      ALOWHA(I)=0.0
      ENDIF
      COMVOL(I)=AREA(I)*INTENS(I)
      JUMP(I)=1
 11   CONTINUE
 997  CONTINUE
      SUMWGT=0.0
      DO 40 I=1,ICLASS
      IF(JUMP(I).EQ.0)GOTO 40
      SUMWGT=SUMWGT+COMVOL(I)*WEIGHT(I)
 40   CONTINUE
      IF(SUMWGT.EQ.0.0)GOTO 998
```

```
      IFLAG=0
      DO 12 I=1,ICLASS
      IF(JUMP(I).EQ.0)GOTO 12
      SHARE(I)=COMVOL(I)*WEIGHT(I)/SUMWGT
      XVOL=PROD
      DO 41 J=1,ICLASS
      IF(JUMP(J).EQ.1)GOTO 41
      XVOL=XVOL-CLASM3(J)
 41   CONTINUE
      CLASM3(I)=XVOL*SHARE(I)
      IF(INTENS(I).NE.0.0)THEN
        LOGHA(I)=CLASM3(I)/INTENS(I)
        ELSE
        LOGHA(I)=0.0
        ENDIF
      IF(LOGHA(I).GT.ALOWHA(I))THEN
        LOGHA(I)=ALOWHA(I)
        CLASM3(I)=LOGHA(I)*INTENS(I)
        JUMP(I)=0
        IFLAG=1
      ENDIF
 12   CONTINUE
      IF(IFLAG.EQ.1)GOTO 997
C --
 998  CONTINUE
      TOTM3=0.0
      TOTLOG=0.0
      DO 42 I=1,ICLASS
      TOTM3=TOTM3+CLASM3(I)
      TOTLOG=TOTLOG+LOGHA(I)
 42   CONTINUE
      DO 21 I=1,ICLASS,2
      K=I+1
      REVISE(I)=AREA(I)-LOGHA(I)
      REVISE(K)=AREA(K)+LOGHA(I)
 21   CONTINUE
C --
      YRTRCK(IRUN)=YEAR
      DO 31 I=1,ICLASS
      RES1(IRUN,I)=AREA(I)
      RES2(IRUN,I)=LOGHA(I)
      RES3(IRUN,I)=CLASM3(I)
 31   CONTINUE
C --
      TOTARE=0
      DO 18 I=1,ICLASS
      AREA(I)=REVISE(I)
      TOTARE=TOTARE+AREA(I)
 18   CONTINUE
C --
C     IF(TOTM3.NE.PROD)GOTO 999
      YEAR=YEAR+1
      ISTOP=1
      DO 25 I=1,ICLASS,2
      IF(LOGHA(I).GT.0.0)ISTOP=0
 25   CONTINUE
      IF(ISTOP.EQ.1)GOTO 999
      ISTOP=1
      DO 26 I=1,ICLASS,2
      IF(AREA(I).GT.0.0)ISTOP=0
 26   CONTINUE
      IF(ISTOP.EQ.0)GOTO 10
C --
```

```
 999  CONTINUE
C --
      IF(IRUN.LE.50)ISKIP=1
      IF(IRUN.GT.50.AND.IRUN.LE.100)ISKIP=2
      IF(IRUN.GT.100.AND.IRUN.LE.200)ISKIP=5
      IF(IRUN.GT.200.AND.IRUN.LE.300)ISKIP=10
      IF(IRUN.GT.300.AND.IRUN.LE.400)ISKIP=20
      IF(IRUN.GT.400)ISKIP=25
      DO 32 I=1,ICLASS,2
      K=I+1
      IF(WEIGHT(I).EQ.0.0.AND.WEIGHT(K).EQ.0.0)GOTO 32
      WRITE(8,29)CLASS(I),CLASS(K)
 29   FORMAT(//,'FOREST AREA AND HARVEST DEVELOPMENT IN CLASSES',/,
     2A25,' AND',1X,A25,/,
     2'YEAR,','NATURAL FOREST,,,','SEMI-NATURAL FOREST',/,
     42(',AVAILABLE,LOGGED,LOGGED'),/,2(',ha,ha,m3'),/)
      DO 33 J=1,IRUN,ISKIP
      WRITE(8,27)YRTRCK(J),RES1(J,I),RES2(J,I),RES3(J,I),
     2RES1(J,K),RES2(J,K),RES3(J,K)
 27   FORMAT(I4,',',6(F10.0,','))
 33   CONTINUE
 32   CONTINUE
C --
      TOTLOG=0.0
      TOTM3=0.0
      DO 100 I=1,ICLASS
      IF(CYCLE(I).NE.0.0)THEN
      FINLHA(I)=AREA(I)/CYCLE(I)
      ELSE
      FINLHA(I)=0.0
      ENDIF
      FINLM3(I)=FINLHA(I)*INTENS(I)*WEIGHT(I)
      TOTLOG=TOTLOG+FINLHA(I)
      TOTM3=TOTM3+FINLM3(I)
 100  CONTINUE
      WRITE(8,101)YRTRCK(IRUN)
 101  FORMAT(//,'HARVEST AREAS AND VOLUMES WHEN ALL SEMI-NATURAL FOREST
     2 IN,',I5)
C --
      GOTO 889
 888  CONTINUE
      TOTM3=0.0
      TOTLOG=0.0
      DO 880 I=1,ICLASS,2
      K=I+1
      FINLHA(I)=0.0
      IF(CYCLE(K).NE.0.0)THEN
        FINLHA(K)=(AREA(I)+AREA(K))/CYCLE(K)
        ELSE
        FINLHA(K)=0.0
      ENDIF
      FINLM3(I)=0.0
      FINLM3(K)=FINLHA(K)*INTENS(K)*WEIGHT(K)
      TOTM3=TOTM3+FINLM3(K)
      TOTLOG=TOTLOG+FINLHA(K)
 880  CONTINUE
      WRITE(8,879)
 879  FORMAT(/,'HARVEST AREAS AND VOLUMES WHEN ALL NATURAL FOREST')
 889  CONTINUE
C --
      DO 103 I=1,ICLASS
      WRITE(8,102)CLASS(I),FINLHA(I),FINLM3(I)
 102  FORMAT(A25,'=,',F10.0,',ha,',F10.0,',m3')
```

```
103  CONTINUE
     PERCNT=TOTM3/PROD*100.0
     WRITE(8,104)TOTLOG,TOTM3,PERCNT
104  FORMAT('TOTAL =,',F10.0,',ha,',F10.0,',m3',//,
    2'FINAL HARVEST LEVEL IS,',F5.0,',% OF ORIGINAL')
     CLOSE(7)
     CLOSE(8)
     RETURN
     END
```

APPENDIX H: MODEL INPUT DATA FOR THE 60 COUNTRIES IN THE ANALYSIS

COUNTRY : ANGOLA
YEAR : 1995
LOG PRODUCTION: 000066000.
DEFORESTA %/YR: -1.0
FOREST CLASSES: 04

CLASS	HECTARES	INTEN	WGHT	CYCL
NAT CLOSED	000000000.	000.0	01.0	01.0
S-N CLOSED	001900000.	010.0	01.0	45.0
NAT OPEN	000000000.	000.0	01.0	01.0
S-N OPEN	009880000.	002.0	01.0	60.0

COUNTRY : BANGLADESH
YEAR : 1995
LOG PRODUCTION: 000293833.
DEFORESTA %/YR: -0.8
FOREST CLASSES: 06

CLASS	HECTARES	INTEN	WGHT	CYCL
NAT BROADLEAVED	000000000.	030.0	01.0	1.0
S-N BROADLEAVED	000000000.	015.0	01.0	20.0
NAT MOIST DECIDUOUS	000000000.	000.0	01.0	1.0
S-N MOIST DECIDUOUS	000000000.	000.0	01.0	20.0
NAT MANGROVE	000000000.	030.0	01.0	1.0
S-N MAGROVE	000000000.	020.0	01.0	10.0

COUNTRY : BELIZE
YEAR : 1995
LOG PRODUCTION: 000043900.
DEFORESTA %/YR: -0.3
FOREST CLASSES: 02

CLASS	HECTARES	INTEN	WGHT	CYCL
NAT TOTAL	000000000.	000.0	01.0	01.0
S-N TOTAL	001215000.	010.0	01.0	40.0

COUNTRY : BHUTAN
YEAR : 1995
LOG PRODUCTION: 000011083.
DEFORESTA %/YR: -0.3
FOREST CLASSES: 02

CLASS	HECTARES	INTEN	WGHT	CYCL
NAT BROADLEAVED	000212000.	075.0	01.0	1.0
S-N BROADLEAVED	000550000.	025.0	01.0	40.0

COUNTRY : BOLIVIA
YEAR : 1995
LOG PRODUCTION: 000412833.
DEFORESTA %/YR: -1.2
FOREST CLASSES: 08

CLASS	HECTARES	INTEN	WGHT	CYCL
NAT AMAZONICA	008500000.	015.0	01.0	1.0
S-N AMAZONICA	003000000.	015.0	01.0	40.0
NAT CHIQUITANA	002000000.	010.0	01.0	1.0
S-N CHIQUITANA	001500000.	010.0	01.0	50.0
NAT YUNGAS	000100000.	020.0	01.0	1.0
S-N YUNGAS	000300000.	015.0	01.0	40.0
NAT PERICHAQUENA	000400000.	020.0	01.0	01.0
S-N PERICHAQUENA	000400000.	015.0	01.0	40.0

COUNTRY : BRAZIL
YEAR : 1995
LOG PRODUCTION: 021897168.
DEFORESTA %/YR: -0.5
FOREST CLASSES: 10

CLASS	HECTARES	INTEN	WGHT	CYCL
NAT NORTH	010000000.	025.0	01.0	01.0
S-N NORTH	040000000.	010.0	01.0	30.0
NAT CENTRAL-WEST	004000000.	010.0	01.0	01.0
S-N CENTRAL-WEST	006000000.	005.0	01.0	30.0
NAT SOUTH-EAST	000000000.	010.0	01.0	01.0
S-N SOUTH-EAST	001000000.	005.0	01.0	30.0
NAT SOUTH	000000000.	010.0	01.0	01.0
S-N SOUTH	002000000.	005.0	01.0	30.0
NAT NORTH-EAST	000000000.	010.0	01.0	01.0
S-N NORTH-EAST	005000000.	005.0	01.0	30.0

COUNTRY : BRUNEI DARUSSALAM
YEAR : 1995
LOG PRODUCTION: 000206000.
DEFORESTA %/YR: -0.6
FOREST CLASSES: 02

CLASS	HECTARES	INTEN	WGHT	CYCL
NAT TOTAL	000193000.	060.0	01.0	01.0
S-N TOTAL	000234000.	045.0	01.0	45.0

COUNTRY : CAMBODIA
YEAR : 1995
LOG PRODUCTION: 000181167.
DEFORESTA %/YR: -1.6
FOREST CLASSES: 06

CLASS	HECTARES	INTEN	WGHT	CYCL
NAT EVERGREEN	000282000.	030.0	01.0	01.0
S-N EVERGREEN	001550000.	020.0	01.0	35.0
NAT DECIDUOUS	000215000.	015.0	01.0	01.0
S-N DECIDUOUS	002000000.	010.0	01.0	35.0
NAT MIXED	000547000.	020.0	01.0	01.0
S-N MIXED	000390000.	015.0	01.0	35.0

```
COUNTRY       :  CAMEROON
YEAR          :  1995
LOG PRODUCTION:  002292333.
DEFORESTA %/YR:  -0.6
FOREST CLASSES:  04
CLASS                      HECTARES   INTEN  WGHT  CYCL
------------------------- ----------  -----  ----  ----
NAT CBF                   006894000.  007.0  01.0   1.0
S-N CBF                   004000000.  003.5  01.0  30.0
NAT OPEN BF               000000000.  002.0  01.0   1.0
S-N OPEN BF               001876000.  000.5  01.0  50.0

COUNTRY       :  CEN. AFRICAN REPUBLIC
YEAR          :  1995
LOG PRODUCTION:  000216500.
DEFORESTA %/YR:  -0.4
FOREST CLASSES:  04
CLASS                      HECTARES   INTEN  WGHT  CYCL
------------------------- ----------  -----  ----  ----
NAT CLOSED                001000000.  015.0  01.0  01.0
S-N CLOSED                002355000.  007.0  01.0  25.0
NAT OPEN                  008000000.  002.0  01.0  01.0
S-N OPEN                  000000000.  001.0  01.0  50.0

COUNTRY       :  COLOMBIA
YEAR          :  1995
LOG PRODUCTION:  001279167.
DEFORESTA %/YR:  -0.5
FOREST CLASSES:  02
CLASS                      HECTARES   INTEN  WGHT  CYCL
------------------------- ----------  -----  ----  ----
NAT TOTAL                 001500000.  025.0  01.0  01.0
S-N TOTAL                 004500000.  005.0  01.0  30.0

COUNTRY       :  COSTA RICA
YEAR          :  1995
LOG PRODUCTION:  000896000.
DEFORESTA %/YR:  -3.0
FOREST CLASSES:  02
**** Give data for natural condition forest then semi-natural forest *****
CLASS                      HECTARES   INTEN  WGHT  CYCL
------------------------- ----------  -----  ----  ----
NAT TOTAL                 000000000.  000.0  01.0  01.0
S-N TOTAL                 000230000.  050.0  01.0  35.0

COUNTRY       :  COTE DIVOIRE
YEAR          :  1995
LOG PRODUCTION:  002283000.
DEFORESTA %/YR:  -0.6
FOREST CLASSES:  04
CLASS                      HECTARES   INTEN  WGHT  CYCL
------------------------- ----------  -----  ----  ----
NAT FORET DENSE           000000000.  000.0  01.0  01.0
S-N FORET DENSE           000786000.  015.0  01.0  25.0
NAT FORET SAVANE          000000000.  000.0  01.0  01.0
S-N FORET SAVANE          000500000.  000.5  01.0  50.0

COUNTRY       :  CUBA
YEAR          :  1995
LOG PRODUCTION:  000080000.
DEFORESTA %/YR:  -1.2
FOREST CLASSES:  02
CLASS                      HECTARES   INTEN  WGHT  CYCL
```

```
------------------------- ----------  -----  ----  ----
NAT TOTAL                 000000000.  000.0  01.0  01.0
S-N TOTAL                 000660000.  015.0  01.0  40.0

COUNTRY       :  DEMOCRATIC REP. OF CONGO
YEAR          :  1995
LOG PRODUCTION:  000349333.
DEFORESTA %/YR:  -0.7
FOREST CLASSES:  04
CLASS                      HECTARES   INTEN  WGHT  CYCL
------------------------- ----------  -----  ----  ----
NAT FORET DENSE           032200000.  015.0  01.0  01.0
S-N FORET DENSE           022000000.  008.0  01.0  25.0
NAT FORET OUVERTE         000000000.  002.0  01.0  01.0
S-N FORET OUVERTE         007459000.  000.2  01.0  50.0

COUNTRY       :  DOMINICAN REPUBLIC
YEAR          :  1995
LOG PRODUCTION:  000003600.
DEFORESTA %/YR:  -1.6
FOREST CLASSES:  02
CLASS                      HECTARES   INTEN  WGHT  CYCL
------------------------- ----------  -----  ----  ----
NAT TOTAL                 000000000.  000.0  01.0  01.0
S-N TOTAL                 000715000.  010.0  01.0  40.0

COUNTRY       :  ECUADOR
YEAR          :  1995
LOG PRODUCTION:  002683500.
DEFORESTA %/YR:  -1.6
FOREST CLASSES:  06
CLASS                      HECTARES   INTEN  WGHT  CYCL
------------------------- ----------  -----  ----  ----
NAT ORIENTE               000708000.  025.0  01.0  01.0
S-N ORIENTE               002000000.  015.0  01.0  30.0
NAT SIERRA                000000000.  015.0  01.0  01.0
S-N SIERRA                000000000.  015.0  01.0  30.0
NAT COSTA                 000000000.  026.0  01.0  01.0
S-N COSTA                 000292000.  015.0  01.0  30.0

COUNTRY       :  EL SALVADOR
YEAR          :  1995
LOG PRODUCTION:  000057000.
DEFORESTA %/YR:  -3.3
FOREST CLASSES:  02
CLASS                      HECTARES   INTEN  WGHT  CYCL
------------------------- ----------  -----  ----  ----
NAT TOTAL                 000000000.  000.0  01.0  01.0
S-N TOTAL                 000000000.  005.0  01.0  35.0
```

```
COUNTRY       :  EQUATORIAL GUINEA
YEAR          :  1995
LOG PRODUCTION:  000219500.
DEFORESTA %/YR:  -0.5
FOREST CLASSES:  02
CLASS                      HECTARES   INTEN  WGHT  CYCL
------------------------- ----------  -----  ----  ----
NAT TOTAL                 000148000.  025.0  01.0  01.0
S-N TOTAL                 001000000.  012.0  01.0  25.0

COUNTRY       :  FIJI
YEAR          :  1995
LOG PRODUCTION:  000151167.
DEFORESTA %/YR:  -0.4
FOREST CLASSES:  02
CLASS                      HECTARES   INTEN  WGHT  CYCL
------------------------- ----------  -----  ----  ----
NAT TOTAL                 000207000.  040.0  01.0  01.0
S-N TOTAL                 000100000.  012.0  01.0  35.0

COUNTRY       :  FRENCH GUIANA
YEAR          :  1995
LOG PRODUCTION:  000114833.
DEFORESTA %/YR:  -0.0
FOREST CLASSES:  02
CLASS                      HECTARES   INTEN  WGHT  CYCL
------------------------- ----------  -----  ----  ----
NAT TOTAL                 001150000.  007.0  01.0  01.0
S-N TOTAL                 001000000.  003.0  01.0  40.0

COUNTRY       :  GABON
YEAR          :  1995
LOG PRODUCTION:  001768833.
DEFORESTA %/YR:  -0.5
FOREST CLASSES:  04
CLASS                      HECTARES   INTEN  WGHT  CYCL
------------------------- ----------  -----  ----  ----
NAT FORET DENSE           002318000.  025.0  01.0  01.0
S-N FORET DENSE           008500000.  012.0  01.0  30.0
NAT FORET SAVANE          000000000.  000.0  00.0  00.0
S-N FORET SAVANE          000000000.  000.0  00.0  00.0

COUNTRY       :  GHANA
YEAR          :  1995
LOG PRODUCTION:  001394167.
DEFORESTA %/YR:  -1.3
FOREST CLASSES:  06
CLASS                      HECTARES   INTEN  WGHT  CYCL
------------------------- ----------  -----  ----  ----
NAT TOT.HIGH FOREST RESER 000000000.  000.0  01.0  01.0
S-N TOT.HIGH FOREST RESER 001159000.  015.0  01.0  40.0
NAT TOT.SAVAN.FOR.RESERVE 000000000.  000.0  01.0  01.0
S-N TOT.SAVAN.FOR.RESERVE 000052000.  000.5  01.0  60.0
NAT TOT.SAVAN.FOR.UNRESER 000000000.  000.0  01.0  01.0
S-N TOT.SAVAN.FOR.UNRESER 002156000.  000.2  01.0  60.0
```

```
COUNTRY       :  GUATEMALA
YEAR          :  1995
LOG PRODUCTION:  000128833.
DEFORESTA %/YR:  -2.0
FOREST CLASSES:  02
CLASS                      HECTARES   INTEN  WGHT  CYCL
------------------------- ----------  -----  ----  ----
NAT TOTAL                 000000000.  030.0  01.0  01.0
S-N TOTAL                 001683000.  010.0  01.0  25.0

COUNTRY       :  GUINEA
YEAR          :  1995
LOG PRODUCTION:  000145000.
DEFORESTA %/YR:  -1.1
FOREST CLASSES:  04
CLASS                      HECTARES   INTEN  WGHT  CYCL
------------------------- ----------  -----  ----  ----
NAT CLOSED                000000000.  007.0  01.0  01.0
S-N CLOSED                000459000.  003.5  01.0  25.0
NAT OPEN                  000000000.  000.5  01.0  01.0
S-N OPEN                  000500000.  000.2  01.0  50.0

COUNTRY       :  GUINEA-BISSAU
YEAR          :  1995
LOG PRODUCTION:  000040000.
DEFORESTA %/YR:  -0.4
FOREST CLASSES:  08
CLASS                      HECTARES   INTEN  WGHT  CYCL
------------------------- ----------  -----  ----  ----
NAT FORET DENSE           000030000.  005.0  01.0  01.0
S-N FORET DENSE           000120000.  002.0  01.0  25.0
NAT FORET CLAIRE          000000000.  000.0  00.0  00.0
S-N FORET CLAIRE          000000000.  000.0  00.0  00.0
NAT FORET SAVANE          000000000.  001.0  01.0  01.0
S-N FORET SAVANE          000226000.  000.1  01.0  50.0
NAT AUTRE                 000000000.  000.0  00.0  00.0
S-N AUTRE                 000000000.  000.0  00.0  00.0

COUNTRY       :  GUYANA
YEAR          :  1995
LOG PRODUCTION:  000253000.
DEFORESTA %/YR:  -0.0
FOREST CLASSES:  02
CLASS                      HECTARES   INTEN  WGHT  CYCL
------------------------- ----------  -----  ----  ----
NAT TOTAL                 001000000.  015.0  01.0  01.0
S-N TOTAL                 005000000.  007.0  01.0  25.0

COUNTRY       :  HONDURAS
YEAR          :  1995
LOG PRODUCTION:  000022500.
DEFORESTA %/YR:  -2.3
FOREST CLASSES:  02
CLASS                      HECTARES   INTEN  WGHT  CYCL
------------------------- ----------  -----  ----  ----
NAT TOTAL                 000000000.  030.0  01.0  01.0
S-N TOTAL                 002269000.  010.0  01.0  25.0
```

```
COUNTRY       :  INDIA
YEAR          :  1995
LOG PRODUCTION:  015812000.
DEFORESTA %/YR:  -0.0
FOREST CLASSES:  10
CLASS                       HECTARES   INTEN  WGHT  CYCL
------------------------- ----------  -----  ----  ----
NAT DENSE BROADLEAVED     000000000.  035.0  01.0  01.0
S-N DENSE BROADLEAVED     019232000.  020.0  01.0  50.0
NAT OPEN BROADLEAVED      000000000.  000.0  01.0  01.0
S-N OPEN BROADLEAVED      000000000.  000.0  01.0  00.0
NAT MANGROVE              000073000.  005.0  00.0  01.0
S-N MANGROVE              000230000.  003.0  00.0  20.0
NAT CONIFEROUS            000000000.  045.0  00.0  01.0
S-N CONIFEROUS            001200000.  030.0  00.0  50.0
NAT BAMBOO                000100000.  000.0  00.0  01.0
S-N BAMBOO                001100000.  000.0  00.0  00.0

COUNTRY       :  INDONESIA
YEAR          :  1995
LOG PRODUCTION:  033463500.
DEFORESTA %/YR:  -1.0
FOREST CLASSES:  20
CLASS                       HECTARES   INTEN  WGHT  CYCL
------------------------- ----------  -----  ----  ----
NAT LOWLAND PERMANENT     019512000.  035.0  01.0  01.0
S-N LOWLAND PERMANENT     016111000.  018.0  01.0  35.0
NAT LOWLAND CONVERSION    008211000.  040.0  01.0  01.0
NAT LOWLAND CONVERTED             0.    0.0  01.0  00.0
S-N LOWLAND CONVERSION    006712000.  020.0  01.0  01.0
S-N LOWLAND CONVERTED             0.    0.0  01.0  00.0
NAT SWAMP PERMANENT       003832000.  025.0  01.0  01.0
S-N SWAMP PERMANENT       003458000.  010.0  01.0  35.0
NAT SWAMP CONVERSION      003542000.  020.0  01.0  01.0
NAT SWAMP CONVERTED               0.    0.0  01.0  00.0
S-N SWAMP CONVERSION      003090000.  008.0  01.0  01.0
S-N SWAMP CONVERTED               0.    0.0  01.0  00.0
NAT MANGROVE PERMANENT    000365000.  010.0  00.0  01.0
S-N MANGROVE PERMANENT    000604000.  000.0  00.0  25.0
NAT MANGROVE CONVERSION   000625000.  030.0  00.0  01.0
S-N MANGROVE CONVERSION   000304000.  015.0  00.0  00.0
NAT HIGHLAND, >1000 m     000000000.  000.0  00.0  00.0
S-N HIGHLAND, >1000 m     000000000.  000.0  00.0  00.0
NAT OTHER LAND WITH FOR   002100000.  035.0  01.0  01.0
S-N OTHER LAND WITH FOR   005700000.  010.0  01.0  35.0

COUNTRY       :  KENYA
YEAR          :  1995
LOG PRODUCTION:  000131000.
DEFORESTA %/YR:  -0.3
FOREST CLASSES:  04
CLASS                       HECTARES   INTEN  WGHT  CYCL
------------------------- ----------  -----  ----  ----
NAT CLOSED                000000000.  000.0  01.0  01.0
S-N CLOSED                000250000.  005.0  01.0  35.0
NAT OPEN                  000000000.  000.0  01.0  01.0
S-N OPEN                  000200000.  000.5  01.0  50.0
```

```
COUNTRY       :  LAOS
YEAR          :  1995
LOG PRODUCTION:  000310167.
DEFORESTA %/YR:  -1.2
FOREST CLASSES:  02
CLASS                      HECTARES   INTEN  WGHT  CYCL
------------------------- ----------  -----  ----  ----
NAT TOTAL                 000495000.  020.0  01.0  01.0
S-N TOTAL                 002000000.  015.0  01.0  40.0

COUNTRY       :  LIBERIA
YEAR          :  1995
LOG PRODUCTION:  000808833.
DEFORESTA %/YR:  -0.6
FOREST CLASSES:  02
CLASS                      HECTARES   INTEN  WGHT  CYCL
------------------------- ----------  -----  ----  ----
NAT TOTAL                 000200000.  007.5  01.0  01.0
S-N TOTAL                 002399000.  003.0  01.0  25.0

COUNTRY       :  MADAGASCAR
YEAR          :  1995
LOG PRODUCTION:  000317250.
DEFORESTA %/YR:  -0.8
FOREST CLASSES:  04
CLASS                      HECTARES   INTEN  WGHT  CYCL
------------------------- ----------  -----  ----  ----
NAT DRY                   000000000.  000.0  00.0  01.0
S-N DRY                   000000000.  000.0  00.0  00.0
NAT HUMID                 000000000.  024.0  01.0  01.0
S-N HUMID                 001170000.  010.0  01.0  30.0

COUNTRY       :  MALAWI
YEAR          :  1995
LOG PRODUCTION:  000030667.
DEFORESTA %/YR:  -1.6
FOREST CLASSES:  04
CLASS                      HECTARES   INTEN  WGHT  CYCL
------------------------- ----------  -----  ----  ----
NAT OPEN                  000000000.  000.0  01.0  01.0
S-N OPEN                  001000000.  000.2  01.0  60.0
NAT CLOSED                000000000.  000.0  00.0  01.0
S-N CLOSED                000000000.  000.0  00.0  00.0

COUNTRY       :  MALAYSIA
YEAR          :  1995
LOG PRODUCTION:  038056335.
DEFORESTA %/YR:  -2.4
FOREST CLASSES:  30
CLASS                      HECTARES   INTEN  WGHT  CYCL
------------------------- ----------  -----  ----  ----
NAT PEN-MDF DRY           000685000.  050.0  01.0  01.0
S-N PEN-MDF DRY           001791000.  040.0  01.0  45.0
NAT PEN-MDF CONVERSION    000042000.  070.0  01.0  01.0
NAT PEN-MDF CONVERTED             0.    0.0  01.0  00.0
S-N PEN-MDF CONVERSION    000700000.  040.0  01.0  01.0
S-N PEN-MDF CONVERTED             0.    0.0  01.0  00.0
NAT SAB-COMMERCIAL GOOD   000000000.  000.0  01.0  01.0
S-N SAB-COMMERCIAL GOOD   000100000.  050.0  01.0  60.0
NAT SAB-COMMERCIAL AVER   000000000.  000.0  01.0  01.0
S-N SAB-COMMERCIAL AVER   000261000.  029.0  01.0  60.0
NAT SAB-COMMERCIAL POOR   000000000.  000.0  01.0  01.0
S-N SAB-COMMERCIAL POOR   000533000.  020.0  01.0  60.0
```

NAT SAB-COMM.VERY POOR	000000000.	000.0	01.0	01.0
S-N SAB-COMM.VERY POOR	000600000.	005.0	01.0	60.0
NAT SAB-MANGROVE	000050000.	000.0	00.0	01.0
S-N SAB-MANGROVE	000150000.	015.0	00.0	30.0
NAT SAB-CONVERSION	000000000.	000.0	01.0	01.0
NAT SAB-CONVERTED	0.	000.0	01.0	00.0
S-N SAB-CONVERSION	000110000.	030.0	01.0	01.0
S-N SAB-CONVERTED	0.	0.0	01.0	00.0
NAT SAR-MDF	001690000.	070.0	01.0	01.0
S-N SAR-MDF	002000000.	035.0	01.0	25.0
NAT SAR-SWAMP FOREST	000050000.	060.0	01.0	01.0
S-N SAR-SWAMP FOREST	000800000.	020.0	01.0	45.0
NAT SAR-MANGROVE	000070000.	030.0	00.0	01.0
S-N SAR-MAGROVE	000050000.	025.0	00.0	25.0
NAT SAR-CONV.STATELAND	000173000.	080.0	01.0	01.0
NAT SAR-CONVERTED STATE	0.	0.0	01.0	00.0
S-N SAR-CONV.STATELAND	001400000.	040.0	01.0	01.0
S-N SAR-CONVERTED STATE	0.	0.0	01.0	00.0

COUNTRY : MEXICO
YEAR : 1995
LOG PRODUCTION: 000257667.
DEFORESTA %/YR: -0.9
FOREST CLASSES: 18

CLASS	HECTARES	INTEN	WGHT	CYCL
NAT B.CONIFERAS CERRADAS	000000000.	000.0	00.0	01.0
S-N B.CONIFERAS CERRADAS	003800000.	030.0	00.0	40.0
NAT B.CONIF.Y LATIF.CERRA	000000000.	000.0	00.0	01.0
S-N B.CONIF.Y LATIF.CERRA	003000000.	010.0	00.5	50.0
NAT B.LATIF.CERRADAS	000000000.	000.0	00.0	01.0
S-N B.LATIF.CERRADAS	000800000.	005.0	01.0	60.0
NAT B.CONIF.ABIERTAS	000000000.	000.0	00.0	01.0
S-N B.CONIF.ABIERTAS	001400000.	005.0	00.0	50.0
NAT B.CONIF.Y LATIF.ABIER	000000000.	000.0	00.0	01.0
S-N B.CONIF.Y LATIF.ABIER	002300000.	005.0	00.5	50.0
NAT B.LATIF.ABIERTAS	000000000.	000.0	00.0	01.0
S-N B.LATIF.ABIERTAS	001000000.	002.0	01.0	60.0
NAT S.ALTA Y MEDIA CERRAD	000000000.	000.0	00.0	01.0
S-N S.ALTA Y MEDIA CERRAD	004700000.	013.0	01.0	45.0
NAT SELVAS BAJAS CERRADAS	000000000.	000.0	00.0	01.0
S-N SELVAS BAJAS CERRADAS	001000000.	013.0	01.0	45.0
NAT S.LATA Y MEDIA ABIERT	000000000.	000.0	00.0	01.0
S-N S.LATA Y MEDIA ABIERT	000000000.	008.0	01.0	55.0

```
COUNTRY       :  MYANMAR
YEAR          :  1995
LOG PRODUCTION:  002135833.
DEFORESTA %/YR:  -1.4
FOREST CLASSES:  10
CLASS                      HECTARES   INTEN  WGHT  CYCL
------------------------- ----------  -----  ----  ----
NAT RAINFOREST           002432000.  020.0  01.0  01.0
S-N RAINFOREST           008500000.  010.0  01.0  30.0
NAT MONSOON               000440000.  020.0  01.0  01.0
S-N MONSOON               007800000.  015.0  01.0  30.0
NAT MANGROVE              000020000.  015.0  00.0  01.0
S-N MANGROVE              000330000.  010.0  00.0  20.0
NAT BAMBOO                000400000.  000.0  00.0  01.0
S-N BAMBOO                000450000.  000.0  00.0  10.0
NAT CONIFER               000010000.  030.0  00.0  01.0
S-N CONIFER               000060000.  020.0  00.0  30.0

COUNTRY       :  NICARAGUA
YEAR          :  1995
LOG PRODUCTION:  000090500.
DEFORESTA %/YR:  -2.5
FOREST CLASSES:  02
CLASS                      HECTARES   INTEN  WGHT  CYCL
------------------------- ----------  -----  ----  ----
NAT TOTAL                 000000000.  030.0  01.0  01.0
S-N TOTAL                 002786000.  010.0  01.0  30.0

COUNTRY       :  NIGER
YEAR          :  1995
LOG PRODUCTION:  000000000.
DEFORESTA %/YR:  -0.0
FOREST CLASSES:  02
CLASS                      HECTARES   INTEN  WGHT  CYCL
------------------------- ----------  -----  ----  ----
NAT TOTAL                 000000000.  000.0  01.0  01.0
S-N TOTAL                 000300000.  000.1  01.0  50.0

COUNTRY       :  NIGERIA
YEAR          :  1995
LOG PRODUCTION:  005984000.
DEFORESTA %/YR:  -0.9
FOREST CLASSES:  04
CLASS                      HECTARES   INTEN  WGHT  CYCL
------------------------- ----------  -----  ----  ----
NAT TOTAL CLOSED          000000000.  035.0  01.0  01.0
S-N TOTAL CLOSED          001970000.  015.0  01.0  30.0
NAT TOTAL OPEN            000000000.  000.5  01.0  01.0
S-N TOTAL OPEN            006429000.  000.1  01.0  50.0

COUNTRY       :  PANAMA
YEAR          :  1995
LOG PRODUCTION:  000050950.
DEFORESTA %/YR:  -2.1
FOREST CLASSES:  02
CLASS                      HECTARES   INTEN  WGHT  CYCL
------------------------- ----------  -----  ----  ----
NAT TOTAL                 000000000.  030.0  01.0  01.0
S-N TOTAL                 000850000.  015.0  01.0  25.0

COUNTRY       :  PAPUA NEW GUINEA
YEAR          :  1995
LOG PRODUCTION:  002767833.
```

DEFORESTA %/YR: -0.4
FOREST CLASSES: 02

CLASS	HECTARES	INTEN	WGHT	CYCL
NAT TOTAL	007500000.	030.0	01.0	01.0
S-N TOTAL	001500000.	010.0	01.0	35.0

COUNTRY : PARAGUAY
YEAR : 1995
LOG PRODUCTION: 003273833.
DEFORESTA %/YR: -2.6
FOREST CLASSES: 02

CLASS	HECTARES	INTEN	WGHT	CYCL
NAT TOTAL	000650000.	020.0	01.0	01.0
S-N TOTAL	000850000.	005.0	01.0	40.0

COUNTRY : PERU
YEAR : 1995
LOG PRODUCTION: 001319667.
DEFORESTA %/YR: -0.3
FOREST CLASSES: 06

CLASS	HECTARES	INTEN	WGHT	CYCL
NAT COSTA	000000000.	000.0	00.0	00.0
S-N COSTA	000000000.	000.0	00.0	00.0
NAT SIERRA	000000000.	000.0	00.0	00.0
S-N SIERRA	000000000.	000.0	00.0	00.0
NAT SELVA	004300000.	015.0	01.0	01.0
S-N SELVA	013000000.	015.0	01.0	30.0

COUNTRY : PHILIPPINES
YEAR : 1995
LOG PRODUCTION: 001078167.
DEFORESTA %/YR: -3.5
FOREST CLASSES: 12

CLASS	HECTARES	INTEN	WGHT	CYCL
NAT DIPTEROCARP	000000000.	090.0	01.0	01.0
S-N DIPTEROCARP	002010000.	035.0	01.0	35.0
NAT PINE CLOSED	000000000.	000.0	00.0	01.0
S-N PINE CLOSED	000116000.	040.0	00.0	50.0
NAT PINE OPEN	000000000.	000.0	00.0	01.0
S-N PINE OPEN	000076000.	025.0	00.0	50.0
NAT MOSSY	000000000.	000.0	00.0	01.0
S-N MOSSY	000000000.	000.0	00.0	00.0
NAT MANGROVE	000000000.	000.0	00.0	01.0
S-N MANGROVE	000000000.	000.0	00.0	00.0
NAT SUB-MARGINAL	000000000.	000.0	00.0	01.0
S-N SUB-MARGINAL	000000000.	000.0	00.0	00.0

COUNTRY : REPUBLIC OF CONGO
YEAR : 1995
LOG PRODUCTION: 000642500.
DEFORESTA %/YR: -0.2
FOREST CLASSES: 06

CLASS	HECTARES	INTEN	WGHT	CYCL
NAT KOUILOU-MAYOMBE	000000000.	006.0	01.0	01.0
S-N KOUILOU-MAYOMBE	000400000.	004.0	01.0	40.0
NAT CHAILLU	000700000.	006.0	01.0	01.0
S-N CHAILLU	001500000.	004.0	01.0	40.0
NAT NORD	006224000.	008.0	01.0	01.0

```
S-N NORD                  002500000.  005.0  01.0  40.0

COUNTRY       :  SIERRA LEONE
YEAR          :  1995
LOG PRODUCTION:  000005067.
DEFORESTA %/YR:  -3.0
FOREST CLASSES:  04
CLASS                      HECTARES   INTEN  WGHT  CYCL
------------------------- ----------  -----  ----  ----
NAT CLOSED BROADLEAVED    000000000.  000.0  01.0  01.0
S-N CLOSED BROADLEAVED    000100000.  007.0  01.0  25.0
NAT OPEN BROADLEAVED      000000000.  002.0  01.0  01.0
S-N OPEN BROADLEAVED      000233000.  000.2  01.0  50.0

COUNTRY       :  SALOMON ISLANDS
YEAR          :  1995
LOG PRODUCTION:  000447000.
DEFORESTA %/YR:  -0.2
FOREST CLASSES:  02
CLASS                      HECTARES   INTEN  WGHT  CYCL
------------------------- ----------  -----  ----  ----
NAT TOTAL                 000497000.  035.0  01.0  01.0
S-N TOTAL                 000104000.  005.0  01.0  35.0

COUNTRY       :  SRI LANKA
YEAR          :  1995
LOG PRODUCTION:  000044667.
DEFORESTA %/YR:  -1.1
FOREST CLASSES:  02
CLASS                      HECTARES   INTEN  WGHT  CYCL
------------------------- ----------  -----  ----  ----
NAT TOTAL FOREST          000000000.  000.0  01.0  01.0
S-N TOTAL FOREST          000000000.  010.0  01.0  30.0

COUNTRY       :  SUDAN
YEAR          :  1995
LOG PRODUCTION:  000005133.
DEFORESTA %/YR:  -0.8
FOREST CLASSES:  04
CLASS                      HECTARES   INTEN  WGHT  CYCL
------------------------- ----------  -----  ----  ----
NAT FOREST ESTATE         000000000.  000.0  01.0  01.0
S-N FOREST ESTATE         001980000.  000.5  01.0  50.0
NAT OTHER WOODLANDS       000000000.  000.0  01.0  01.0
S-N OTHER WOODLANDS       009400000.  000.1  01.0  60.0
```

```
COUNTRY       :  SURINAME
YEAR          :  1995
LOG PRODUCTION:  000099000.
DEFORESTA %/YR:  -0.1
FOREST CLASSES:  02
CLASS                      HECTARES   INTEN  WGHT  CYCL
------------------------- ----------  -----  ----  ----
NAT TOTAL                 001100000.  020.0  01.0  01.0
S-N TOTAL                 001100000.  005.0  01.0  30.0

COUNTRY       :  TANZANIA
YEAR          :  1995
LOG PRODUCTION:  000147000.
DEFORESTA %/YR:  -1.0
FOREST CLASSES:  04
CLASS                      HECTARES   INTEN  WGHT  CYCL
------------------------- ----------  -----  ----  ----
NAT CLOSED                000000000.  005.0  01.0  01.0
S-N CLOSED                000290000.  002.0  01.0  25.0
NAT OPEN                  001755000.  001.0  01.0  01.0
S-N OPEN                  008745000.  000.2  01.0  50.0

COUNTRY       :  THAILAND
YEAR          :  1995
LOG PRODUCTION:  000167483.
DEFORESTA %/YR:  -2.6
FOREST CLASSES:  02
CLASS                      HECTARES   INTEN  WGHT  CYCL
------------------------- ----------  -----  ----  ----
NAT TOTAL FOREST          000000000.  000.0  01.0  01.0
S-N TOTAL FOREST          000000000.  015.0  01.0  30.0

COUNTRY       :  UGANDA
YEAR          :  1995
LOG PRODUCTION:  000083667.
DEFORESTA %/YR:  -0.9
FOREST CLASSES:  04
CLASS                      HECTARES   INTEN  WGHT  CYCL
------------------------- ----------  -----  ----  ----
NAT THF RESERVED          000100000.  027.0  01.0  01.0
S-N THF RESERVED          000000000.  008.0  01.0  25.0
NAT SAVANNAH WOODLAND     000000000.  002.0  01.0  01.0
S-N SAVANNAH WOODLAND     001344000.  000.2  01.0  50.0

COUNTRY       :  VANUATU
YEAR          :  1995
LOG PRODUCTION:  000033800.
DEFORESTA %/YR:  -0.8
FOREST CLASSES:  02
CLASS                      HECTARES   INTEN  WGHT  CYCL
------------------------- ----------  -----  ----  ----
NAT TOTAL                 000143000.  020.0  01.0  01.0
S-N TOTAL                 000050000.  005.0  01.0  35.0

COUNTRY       :  VENEZUELA
YEAR          :  1995
LOG PRODUCTION:  000858667.
DEFORESTA %/YR:  -1.1
FOREST CLASSES:  02
CLASS                      HECTARES   INTEN  WGHT  CYCL
------------------------- ----------  -----  ----  ----
NAT TOTAL                 006742000.  020.0  01.0  01.0
S-N TOTAL                 015000000.  005.0  01.0  40.0
```

```
COUNTRY       :  VIET NAM
YEAR          :  1995
LOG PRODUCTION:  002445333.
DEFORESTA %/YR:  -1.4
FOREST CLASSES:  18
CLASS                      HECTARES   INTEN  WGHT  CYCL
------------------------- ----------  -----  ----  ----
NAT CONIFEROUS            000000000.  000.0  00.0  01.0
S-N CONIFEROUS            000047000.  030.0  00.0  40.0
NAT MANGROVES             000000000.  000.0  00.0  00.0
S-N MANGROVES             000000000.  000.0  00.0  00.0
NAT BAMBOO                000000000.  000.0  00.0  00.0
S-N BAMBOO                000480000.  000.0  00.0  00.0
NAT MIXED                 000000000.  000.0  01.0  01.0
S-N MIXED                 000326000.  020.0  01.0  22.0
NAT BROADLEAVED RICH      000000000.  000.0  01.0  01.0
S-N BROADLEAVED RICH      000384000.  035.0  01.0  22.0
NAT BROADLEAVED MEDIUM    000000000.  000.0  01.0  01.0
S-N BROADLEAVED MEDIUM    000949000.  025.0  01.0  22.0
NAT BROADLEAVED POOR      000000000.  000.0  00.0  00.0
S-N BROADLEAVED POOR      000000000.  000.0  00.0  00.0
NAT BROADLEAVED YOUNG     000000000.  000.0  00.0  00.0
S-N BROADLEAVED YOUNG     000000000.  000.0  00.0  00.0
NAT PROTECTION FOREST     000000000.  000.0  01.0  01.0
S-N PROTECTION FOREST     000866000.  010.0  01.0  35.0

COUNTRY       :  ZAMBIA
YEAR          :  1995
LOG PRODUCTION:  000182833.
DEFORESTA %/YR:  -0.8
FOREST CLASSES:  04
CLASS                      HECTARES   INTEN  WGHT  CYCL
------------------------- ----------  -----  ----  ----
NAT DENSE FOREST          000000000.  000.0  01.0  01.0
S-N DENSE FOREST          001000000.  002.5  01.0  40.0
NAT WOODLAND              000000000.  000.0  01.0  01.0
S-N WOODLAND              006300000.  000.5  01.0  60.0

COUNTRY       :  ZIMBABWE
YEAR          :  1995
LOG PRODUCTION:  000020500.
DEFORESTA %/YR:  -0.6
FOREST CLASSES:  04
CLASS                      HECTARES   INTEN  WGHT  CYCL
------------------------- ----------  -----  ----  ----
NAT WOODLANDS             000000000.  000.0  01.0  01.0
S-N WOODLANDS             000500000.  000.5  01.0  80.0
NAT RAINFOREST            000000000.  000.0  00.0  01.0
S-N RAINFOREST            000000000.  000.0  00.0  00.0
```

APPENDIX I: INSTRUCTIONS FOR RUNNING TROPICAL LOGGING PROGRAMME

The programme, input data files and output "OUT" and "CSV" files are located in two directories on S_drive. The "OUT" files are text files which can be viewed, edited and output using any editor. The "CSV" files can be imported into EXCEL©. The directory containing the input data assuming GFSS logging intensities and cycles is S:\GFSS\HARV_RUN. The directory containing the input data assuming RIL and sustainable harvesting intensities of 20 m3/ha on a 40-year cycle in tropical closed broadleaved forests in Africa, Latin America and the Caribbean, and 40 m3/ha on a 40-year cycle in moist dipterocarp forests of Asia is S:\GFSS\HARV_RUN\20_40_40.

To update the input data files use the Microsoft© text editor. The input data files generally contain the first eight letters of the country or a combination of the first two or three letters if the name contains multiple words: e.g. names of files containing input data for some countries are CENAFREP.DAT (Central African Republic), INDONESI.DAT (Indonesia) and MEXICO.DAT (Mexico). To edit the file type enter EDIT file_name.dat. The data format must be kept the same when updated since the programme reads in the data as formatted text; i.e. keep the rows and columns exactly the same. The INSERT button can be used with the editor so that you can just over-write the numbers when updating. Any changes need to be done to the country input data files in both directories.

The name of the logging programme is LOG_TROP.EXE. To run the programme enter LOG_TROP. The programme first reads a data file (TROP_NC.LST) containing the number of countries, and the input and output data file names for each country: i.e. three file names per country. If additional countries are to be added or some subtracted, this file (in both directories) must be edited: i.e. change the number of countries and add or subtract the input and output data file names for the country in question. The programme automatically "logs" the natural and semi-natural forests areas for each country until all forest is semi-natural or the run has gone for 500 years. A text file (country_name.OUT) and an EXCEL© importable file (country_name.CSV) are generated for each country. With each data updating the programme must be run in both directories, as outlined above. LOG_TROP.EXE is contained in both directories, so all that is required is to get into the appropriate directory and enter the programme name.

A hard copy of individual text files can be obtained by PRINT country_name.OUT or by using the print function in the text editor. When using the PRINT command, you must specify the printing device as LPT1 the first time run. The font must be courier, otherwise the format of the output will be mixed up. A batch printing file is also contained in both directories (PRNT_OUT.BAT). This file can be used to print out the output text files for all countries. To run the batch file enter PRNT_OUT and specify the printing device as LPT1. The file prints out 10 countries and then pauses. You need to wait for about a minute before hitting the space bar at each pause, otherwise the printing queue overflows and the data for all countries will not be printed. If countries are added or deleted, the batch printing files in both directories need to be updated accordingly.

APPENDIX J: SAMPLE MODEL OUTPUT FOR CAMEROON

```
COUNTRY           = CAMEROON
STARTING YEAR     = 1995
LOG PRODUCTION m3 =   2292333.
DEFORESTATION %/a = -0.6
FOREST CLASSES    =  4
FOREST CLASS                 AREA,ha INTEN WGHT CYCL
NAT CBF                     6894000.   7.0  1.0  1.0
S-N CBF                     4000000.   3.5  1.0 30.0
NAT OPEN BF                       0.   2.0  1.0  1.0
S-N OPEN BF                 1876000.   0.5  1.0 50.0
FOREST AREA AND HARVEST DEVELOPMENT IN CLASSES
NAT CBF                   AND S-N CBF
```

YEAR	NATURAL FOREST			SEMI-NATURAL FOREST		
	AVAILABLE ha	LOGGED ha	LOGGED m3	AVAILABLE ha	LOGGED ha	LOGGED m3
1995	6894000.	258129.	1806906.	4000000.	133333.	466667.
1996	6635870.	253827.	1776791.	4258129.	141938.	496782.
1997	6382043.	249597.	1747178.	4511957.	150399.	526395.
1998	6132446.	245437.	1718058.	4761553.	158718.	555515.
1999	5887009.	241346.	1689424.	5006990.	166900.	584149.
2000	5645663.	237324.	1661267.	5248337.	174945.	612306.
2001	5408339.	233368.	1633579.	5485660.	182855.	639994.
2002	5174971.	229479.	1606353.	5719029.	190634.	667220.
2003	4945492.	225654.	1579580.	5948508.	198284.	693993.
2004	4719837.	221893.	1553254.	6174162.	205805.	720319.
2005	4497944.	218195.	1527366.	6396056.	213202.	746206.
2006	4279749.	214559.	1501910.	6614251.	220475.	771663.
2007	4065190.	210983.	1476878.	6828810.	227627.	796694.
2008	3854207.	207466.	1452264.	7039792.	234660.	821309.
2009	3646741.	204008.	1428059.	7247258.	241575.	845513.
2010	3442733.	200608.	1404258.	7451267.	248376.	869314.
2011	3242124.	197265.	1380854.	7651875.	255063.	892719.
2012	3044859.	193977.	1357840.	7849140.	261638.	915733.
2013	2850882.	190744.	1335209.	8043117.	268104.	938364.
2014	2660138.	187565.	1312956.	8233862.	274462.	960617.
2015	2472573.	184439.	1291073.	8421427.	280714.	982500.
2016	2288134.	181365.	1269555.	8605866.	286862.	1004018.
2017	2106769.	178342.	1248396.	8787231.	292908.	1025177.
2018	1928427.	175370.	1227589.	8965573.	298852.	1045984.
2019	1753057.	172447.	1207130.	9140943.	304698.	1066443.
2020	1580610.	169573.	1187011.	9313390.	310446.	1086562.
2021	1411037.	166747.	1167227.	9482963.	316099.	1106346.
2022	1244290.	163968.	1147773.	9649710.	321657.	1125799.
2023	1080322.	161235.	1128644.	9813678.	327123.	1144929.
2024	919087.	158548.	1109833.	9974912.	332497.	1163740.
2025	760540.	155905.	1091336.	10133460.	337782.	1182237.
2026	604635.	153307.	1073147.	10289365.	342979.	1200426.
2027	451328.	150752.	1055261.	10442672.	348089.	1218312.
2028	300576.	148239.	1037674.	10593424.	353114.	1235899.
2029	152337.	145768.	1020379.	10741663.	358055.	1253194.
2030	6569.	6569.	45983.	10887431.	362914.	1270200.

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FOREST AREA AND HARVEST DEVELOPMENT IN CLASSES
NAT OPEN BF               AND S-N OPEN BF
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YEAR	NATURAL FOREST			SEMI-NATURAL FOREST		
	AVAILABLE	LOGGED	LOGGED	AVAILABLE	LOGGED	LOGGED

	ha	ha	m3	ha	ha	m3
1995	0.	0.	0.	1876000.	37520.	18760.
1996	0.	0.	0.	1876000.	37520.	18760.
1997	0.	0.	0.	1876000.	37520.	18760.
1998	0.	0.	0.	1876000.	37520.	18760.
1999	0.	0.	0.	1876000.	37520.	18760.
2000	0.	0.	0.	1876000.	37520.	18760.
2001	0.	0.	0.	1876000.	37520.	18760.
2002	0.	0.	0.	1876000.	37520.	18760.
2003	0.	0.	0.	1876000.	37520.	18760.
2004	0.	0.	0.	1876000.	37520.	18760.
2005	0.	0.	0.	1876000.	37520.	18760.
2006	0.	0.	0.	1876000.	37520.	18760.
2007	0.	0.	0.	1876000.	37520.	18760.
2008	0.	0.	0.	1876000.	37520.	18760.
2009	0.	0.	0.	1876000.	37520.	18760.
2010	0.	0.	0.	1876000.	37520.	18760.
2011	0.	0.	0.	1876000.	37520.	18760.
2012	0.	0.	0.	1876000.	37520.	18760.
2013	0.	0.	0.	1876000.	37520.	18760.
2014	0.	0.	0.	1876000.	37520.	18760.
2015	0.	0.	0.	1876000.	37520.	18760.
2016	0.	0.	0.	1876000.	37520.	18760.
2017	0.	0.	0.	1876000.	37520.	18760.
2018	0.	0.	0.	1876000.	37520.	18760.
2019	0.	0.	0.	1876000.	37520.	18760.
2020	0.	0.	0.	1876000.	37520.	18760.
2021	0.	0.	0.	1876000.	37520.	18760.
2022	0.	0.	0.	1876000.	37520.	18760.
2023	0.	0.	0.	1876000.	37520.	18760.
2024	0.	0.	0.	1876000.	37520.	18760.
2025	0.	0.	0.	1876000.	37520.	18760.
2026	0.	0.	0.	1876000.	37520.	18760.
2027	0.	0.	0.	1876000.	37520.	18760.
2028	0.	0.	0.	1876000.	37520.	18760.
2029	0.	0.	0.	1876000.	37520.	18760.
2030	0.	0.	0.	1876000.	37520.	18760.

HARVEST AREAS AND VOLUMES WHEN ALL SEMI-NATURAL FOREST IN 2030

NAT CBF	=	0. ha	0. m3
S-N CBF	=	363133. ha	1270967. m3
NAT OPEN BF	=	0. ha	0. m3
S-N OPEN BF	=	37520. ha	18760. m3
TOTAL	=	400653. ha	1289727. m3

FINAL HARVEST LEVEL IS 56.% OF ORIGINAL

GLOBAL FIBRE SUPPLY STUDY
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The Global Fibre Supply Study (GFSS) of the FAO Forestry Department operates under the guidance of an Advisory Committee on Paper and Wood Products. The GFSS has produced the above-mentioned publications. To obtain a copy free of charge, please contact:

Forest Products Division
Forestry Department
Food and Agriculture Organization of the United Nations
Viale delle Terme di Caracalla
00100 Rome
Italy

e-mail: global-fibre-supply@fao.org
WWW: http://www.fao.org

Non-coniferous veneer and sawlogs supply from tropical rainforests will be limited in the future. This paper first reviews an old methodology used to calculate the availability of these logs and then proposes an improved methodology. The improvement was made feasible given the new data now available in the Global Fibre Supply Study. A model was constructed to estimate the future availability of high- quality non-coniferous tropical logs. Two future supply scenarios were developed, one assumed *status quo* with conventional logging and much reduced logging intensities in future harvests; and the other assumed sustainable harvesting operations through reduced impact logging. Complementing this paper is a working paper synthesizing the literature on logging impacts and reduced impact logging in tropical rainforests (Working Paper No. 6).