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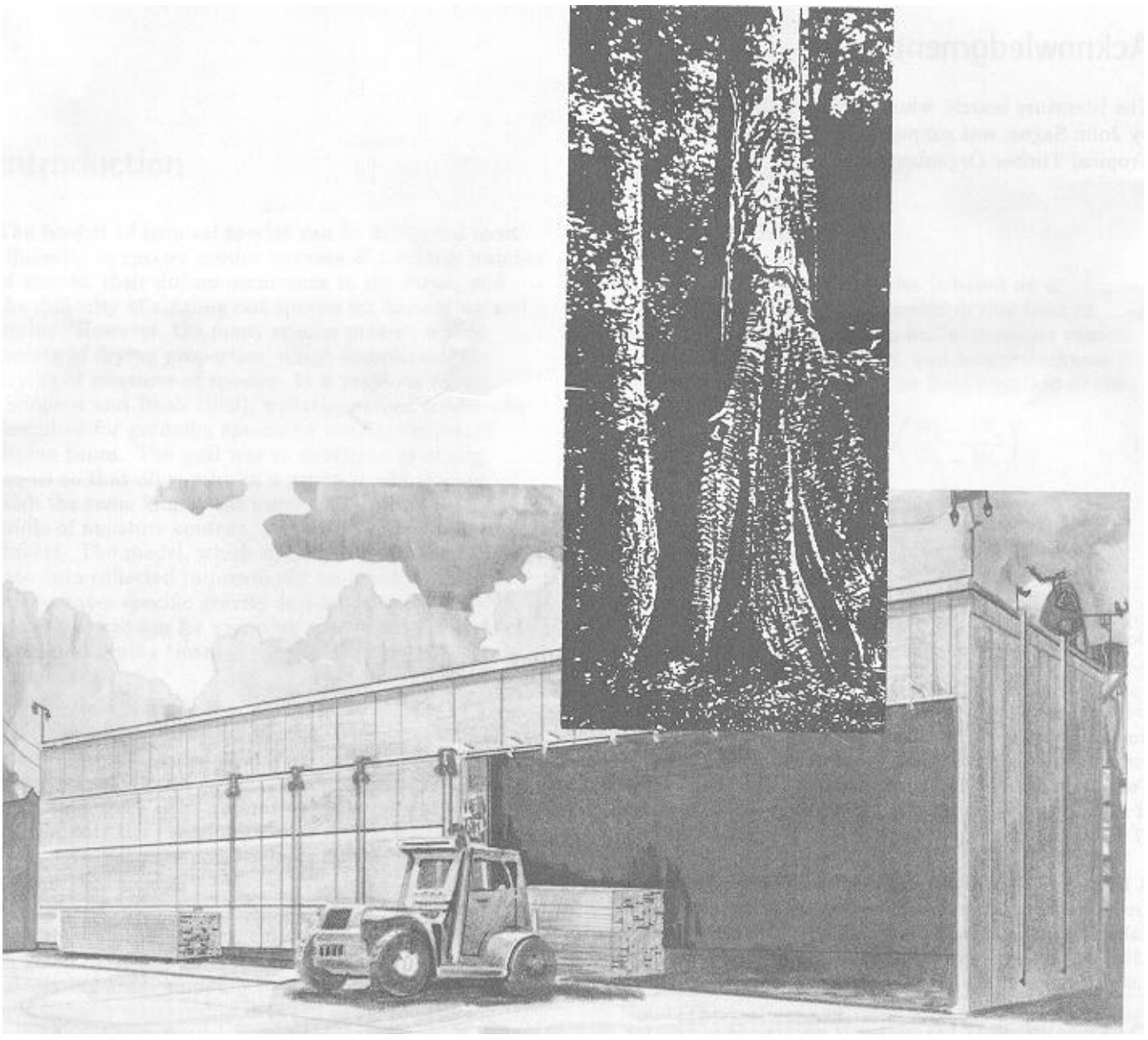
Relative Drying Times of 650 Tropical Woods

Estimation by Green Moisture Content, Specific Gravity, and Green Weight Density

William T. Simpson
John A. Sagoe



Abstract

Many tropical species are underutilized because of their varied and frequently unknown drying properties. When handling a large number of species, harvesting and processing the species individually is impractical, and grouping species by similar drying properties is difficult. This report examines the relationship between green moisture content and specific gravity of tropical species, using data gathered from the world literature. The report shows how these data, converted to green weight density, can be used to estimate drying times and thus to group tropical species by similar estimated drying times.

Keywords: kiln drying, tropical hardwoods, specific gravity, density

Acknowledgment

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Introduction

The lumber of tropical species can be kiln-dried most efficiently in species groups because of the large number of species, their diffuse occurrence in the forest, and the difficulty of singling out species for harvesting and drying. However, the many species present a wide variety of drying properties, which complicates the drying of mixtures of species. In a previous report (Simpson and Baah 1989), a mathematical model was described for grouping species by similar estimated drying times. The goal was to develop a grouping model so that all species in a group would emerge from the same kiln at the same time, within set limits of moisture content, and with minimum drying defects. The model, which utilizes experimental drying rate data collected in previously reported research, incorporates specific gravity and initial moisture content as criteria for grouping species on the basis of estimated drying time.

One limitation of the model is the availability of green moisture content data for species. This information is not always collected in studies on the characteristic properties of species nor is it always easily available to interested users. The general objective of our study was to eliminate the need for green moisture content data when such data are not available for estimating drying time.

This report presents data collected from the literature on green moisture content and green weight density (for calculating green shipping weight of tropical species), establishes a relationship between green moisture content and specific gravity, and presents an estimated drying time index for the species listed.

Mathematical Model

Estimation of Drying Time

The method for grouping species is based on a mathematical model that estimates drying time in relationship to specific gravity, initial moisture content, temperature, relative humidity, and board thickness (Simpson and Baah 1989).[1] The final equation of the model is

$$t = \frac{-L^{1.52} b_{T1}}{b_s b_{T2}} \ln\left(\frac{W_a - W_e}{W_0 - W_e}\right) \qquad (1)$$

where

t is time (days),

L board thickness (mm),

b_s empirical specific gravity coefficient ($mm^{1.52}$/day),

b_{T1} empirical temperature coefficient for $T_1 = 49°C$,

b_{T2} empirical temperature coefficient for $T_2 = 38°C$ to $82°C$,

W_a average moisture content of board (percent) at time t,

W_e equilibrium moisture content (EMC) in kiln (percent), and

W_0 initial moisture content of board (percent).

Determination of the coefficients was described in Tschernitz and Simpson (1977). In that experiment,

[1] Note: The vertical axis units for b_s in Figure 1 of the Simpson and Baah report are incorrect. These units are $inch^{1.52}$ (136.6 $mm^{1.52}$)/day.

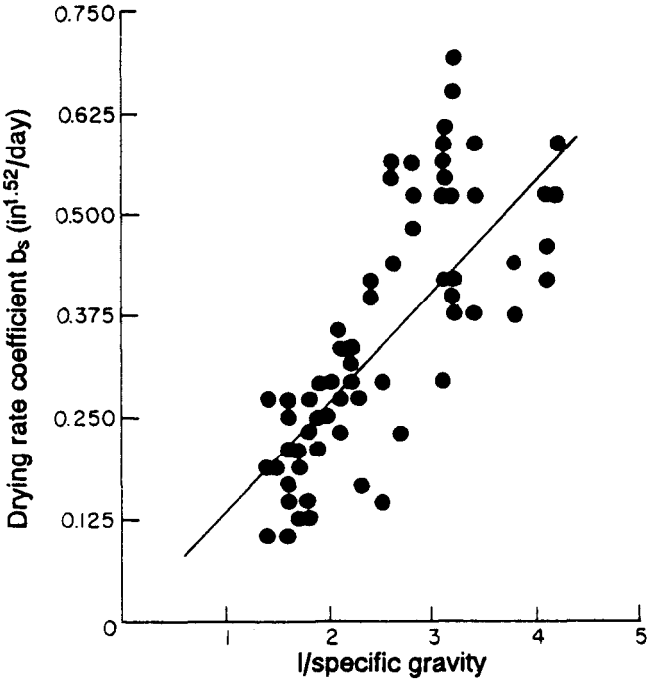

Figure 1—Correlation of drying rate coefficient b_s to specific gravity at 49°C.

T_1 = 40°C. The coefficient b_s was determined for 43 Philippine species at T_1, and it was related to specific gravity as shown in Figure 1. Regression analysis resulted in the following relationship between b_s and specific gravity G_b:

$$b_s = 1.42 + \frac{18.2}{G_b} \qquad (2)$$

The ratio of b_{T1} to b_{T2} adjusts b_s for temperatures other than 49°C. The relationship between these coefficients, temperature, and humidity is as follows (Simpson and Tschernitz 1980):

$$b_T = 0.0575 + 0.00142p \qquad (3)$$

where p is the vapor pressure of water in millimeters mercury (1 mmHg = 133 Pa) within the temperature range of 38°C to 82°C, and

$$p = \exp\left(20.41 - \frac{5,132}{T + 273}\right) \qquad (4)$$

where T is temperature in degrees Celsius.

Combining Equations (3) and (4), b_{T1} and b_{T2} are calculated by

$$b = 0.0575 + 0.00142 \exp\left(20.41 - \frac{5,132}{T + 273}\right) \qquad (5)$$

The grouping method is based on determining combinations of specific gravity and green moisture content that result in similar drying times. For example, Equation (1) predicts that 11 days are required to dry 29-mm-thick lumber from green to 30 percent moisture content at 38°C and 14 percent EMC when green moisture content is 120 percent and specific gravity is 0.472. However, drying time is also 11 days when green moisture content is 60 percent and specific gravity is 0.870. Thus, the two species with these properties could be grouped together for drying. In practical use, combinations of species with drying times that fall within an interval of perhaps 2 days might be grouped together, dried by a kiln schedule suitable for all species in the group, and then equalized after drying to reduce variability in final moisture content.

Equation (1) can be applied to a multiple-step drying schedule by making the final moisture content (W_a) of each step the initial moisture content (W_0) of the next step.

Estimation of Green Moisture Content

If W_0 is not known, Equation (1) cannot be used to estimate drying time. Samad and Wallin (1966) developed, tested, and confirmed a relationship between specific gravity and green moisture content. If specific gravity is known, green moisture content can be estimated and Equation (1) used to estimate drying time. The relationship between specific gravity and green moisture content is expressed as

$$M_g = \frac{1 - 0.65G_b}{G_b} 100(1 - \exp(AG_b + BG_b^2)) \qquad (6)$$

where

M_g is green moisture content (percent) (W_0 in Equation (l)),

G_b is specific gravity, and

A and B are regression coefficients.

The first term in Equation (6), (1 - $0.65G_b/G_b$)100, is the maximum moisture content possible for any specific gravity, assuming a specific gravity of 1.54 for wood substance (Brown and others 1952, Kollman and Cote 1968).

Green Moisture Content Data in Literature

The regression coefficients A and B must be determined to use Equation (6) to estimate green moisture content. Samad and Wallin (1966) found these coefficients to be -1.57 and -3.09, respectively, for Bangladesh species. However, these results were based on only 14 species. Therefore, to expand the data base, we examined other literature in which green moisture content and specific gravity were both reported. We found 15 references that reported both properties and

a total of 729 data entries (approximately 650 species). Tropical Asia, Africa, and Latin America were all represented. In some cases species were repeated, but in these cases the repeated data constituted independent data sets.

The results of the literature search are listed in Appendix A alphabetically by scientific name. Common name, geographical region, and literature source are also given. Both the basic specific gravity (ovendry weight/green volume) and specific gravity at 12 percent moisture content (ovendry weight/volume at 12 percent moisture content) are listed, as well as shrinkage data. Green weight density is also listed.

Several references did not provide data on green moisture content or either basic specific gravity or specific gravity at 12 percent moisture content; these values were estimated (see Appendix B). The equations used to calculate green weight density are also presented in Appendix B.

Green Moisture Content and Specific Gravity

The green moisture content-basic specific gravity data in Appendix A were fitted by regression analysis to Equation (6). The values of the regression coefficients A and B are –4.79 and 4.13, respectively. The raw data, regression curve, and maximum moisture content curve are shown in Figure 2. Green moisture content ranged from >200 percent at $G_b \leq 0.3$ to ≤30 percent at G_b 2 1.0. Most data were clustered between green moisture content of 50 to 100 percent and G_b of 0.4 to 0.8.

One problem was lack of information on the experimental methods used to collect data on green moisture content. The references did not describe how green moisture content specimens were handled from the time they were cut until the green weight was determined. Freshly cut green specimens can easily lose moisture, resulting in calculation errors in moisture content if the specimens are not either weighed immediately after cutting or wrapped in vapor-resistant wrapping until weighed. Therefore, in general we might expect some reported green moisture content values to be lower than the true values. Figure 2 suggests this because many data points fall well below the maximum moisture content curve.

Drying Time Index

The species listed in Appendix A can be categorized by a drying time index that reflects their relative drying time and thus gives a first approximation for grouping. The base for the index is somewhat arbitrary; we chose the base as the drying time of 29-mm-thick lumber at $G_b = 0.500$. The average green moisture content of the data in Appendix A is 97.5 percent at this specific gravity. The drying time index is thus defined as the ratio of the drying time estimated by Equation (1) at any G_b - W_0 combination to the drying time at the 0.500-97.5-percent combination. The index is also slightly dependent on kiln schedule because drying temperature and EMC have a nonlinear effect on drying time. Therefore, we chose a simple conservative schedule that could be applied safely to many species (Table 1). To illustrate the sensitivity of drying time index to drying time, a change in drying time index of 0.065 is equivalent to a change in drying time of 1 day at the drying conditions listed in Table 1. If we were to choose a drying time of 2 days as an interval for grouping, then our grouping criterion would be drying time index ±0.065.

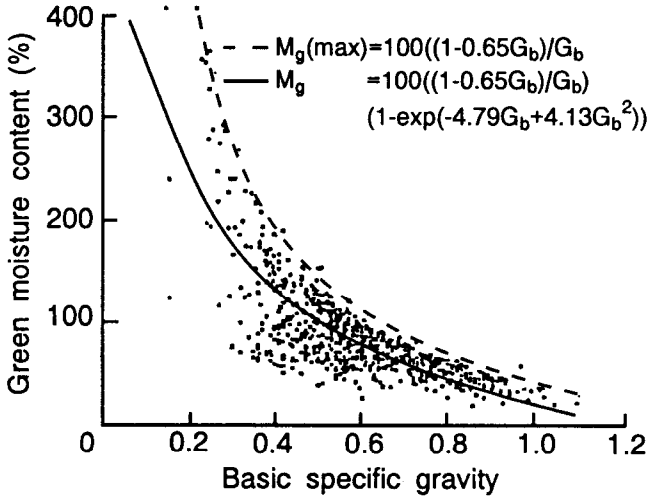

Figure 2—Relationship between basic specific gravity (G_b) and green moisture content (M_g) of tropical hardwoods. Figure shows actual data points, regression curve (solid line), and maximum moisture content curve (broken line).

Table 1—Kiln schedule for calculating drying time index

Moisture content (percent)	Dry bulb temperature (°C)	Relative humidity (percent)	Equilibrium moisture content (percent)
Green–25	40	70	12.2
25–20	50	50	8.1
20–15	60	40	6.3
15–10	70	30	4.6

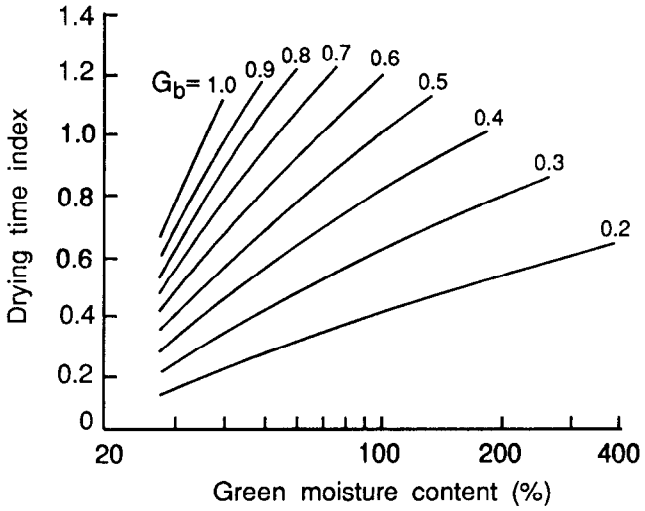

Figure 3—Dependence of drying time index on green moisture content and basic specific gravity of tropical hardwoods.

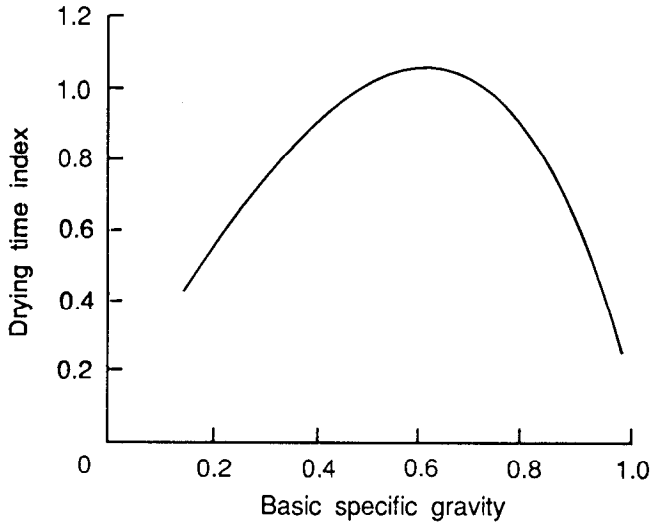

Figure 4—Dependence of drying time index on basic specific gravity of tropical hardwoods, assuming the Equation (2) relationship between basic specific gravity and green moisture content.

The drying time index for each species is included in Appendix A and illustrated in Figures 3 and 4. Figure 3 shows the relationship between drying time index and green moisture content at several levels of basic specific gravity. However, if green moisture content is not known, Figure 3 cannot be used to determine drying time index. In that case, the drying time index-basic specific gravity relationship shown in Figure 4 applies.

The drying time index can also be empirically related to green weight density (Fig. 5). The relationship shown suggests that green weight density alone might offer a good basis for a grouping system. Basic

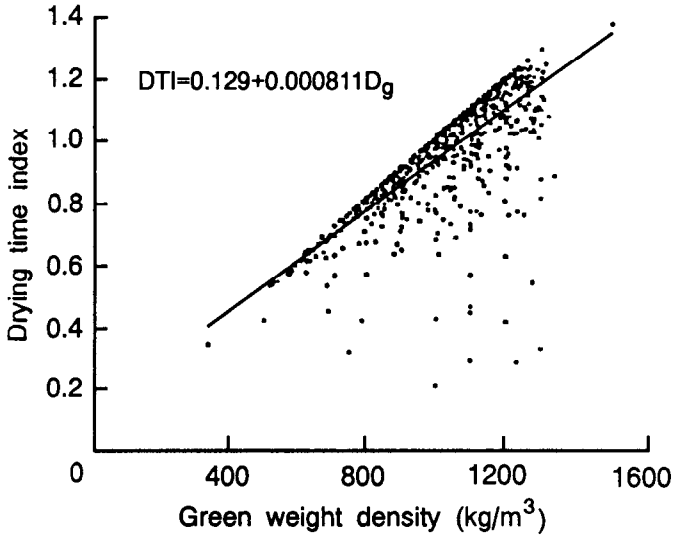

Figure 5—Dependence of drying time index (DTI) on green weight density (D_g). Correlation coefficient is 0.756.

specific gravity and initial moisture content both require an oven to determine ovendry weights. Green weight density requires only calipers (for measuring dimensions) and a balance, and eliminates the need for an oven and the time required for determining ovendry weight. Green weight density is thus easier to determine and could offer a more practical grouping system than do specific gravity and green moisture content. The sensitivity of drying time to green weight density is the equivalency of 1 day of drying to 80 kg/m^3 green weight density. A 2-day drying time interval for grouping could then be stated in terms of green weight density ±80 kg/m^3.

Concluding Remarks

Data on green moisture content of tropical hardwoods have been reported in the literature, but the data are in many different sources, not all of which are easily accessible to potential users. This report brings together some of these data and uses this expanded data base to confirm a previously developed relationship between basic specific gravity and green moisture content. This relationship makes possible a first approximation at grouping tropical hardwoods by similar estimated drying times given only basic specific gravity or green weight density.

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Appendix A. Drying Properties of Tropical Hardwoods

The table in Appendix A lists tropical hardwoods by scientific name, common name, and geographical region. Drying properties include green moisture content, basic specific gravity, specific gravity at 12 percent moisture content, volumetric shrinkage, tangential shrinkage, radial shrinkage, and green weight. The drying time index is also listed for each species.

Appendix A. Drying properties of tropical hardwoods[a]

Scientific name	Common name	Region[b]	Ref.	M_g (%)	G_b	G_{12}	S_v (%)	S_t (%)	S_r (%)	DTI	W_g (kg/m^3)
Acacia confusa	Ayangili	AS	11	63.9	0.747	0.850				1.185	1,224
Adina microcephala	Matumi/haldu/kwao	AS	18	49.0	0.751	0.817	13.5	7.4	4.5	0.999	1,119
Afzelia quanzensis	Pod mahogany	AF	18	57.0	0.580	0.601	5.7	3.6	2.3	0.868	911
Agathis philippinensis	Almaciga	AS	11	95.4	0.410	0.439				0.817	801
Agathis spp.	Kauri	AS	18	128.0	0.412	0.433	8.1	5.4	3.6	0.926	939
Aglaia diffusa	Malasaging	AS	11	74.8	0.699	0.788				1.214	1,222
Aglaia iloilo	Ilo-ilo	AS	11	108.2	0.527	0.576				1.099	1,097
Aglaia llanosiana	Bayanti	AS	11	43.0	0.892	1.043				1.057	1,276
Alangium longiflorum	Malatapai	AS	11	88.3	0.648	0.724				1.225	1,220
Alangium meyeri	Putian	AS	11	88.0	0.631	0.703				1.193	1,186
Albizia adianthifolia	Flat crown/impepe	AF	18	75.0	0.469	0.497	9.3	5.6	2.3	0.830	821
Albizia caribaea	Carabali	LA	19	78.3	0.660	0.700	9.5	6.5	4.2	1.177	1,177
Albizia falcata	Moluccan sau	AS	11	192.2	0.250	0.261				0.655	731
Albizia ferruginea/angolensis	Iatandza	AF	3	86.3	0.510	0.600	9.2	4.9	2.9	0.964	950
Albizia lebbek	Langil	AS	11	87.1	0.658	0.737				1.235	1,231
Albizia lebbek	Koroi	AS	1	90.0	0.620					1.185	1,178
Albizia procera	Akleng-parang	AS	11	97.5	0.591	0.654				1.174	1,167
Albizia versicolor	Nongo	AF	18	120.0	0.482	0.505	7.6	3.5	2.2	1.052	1,060
Aleurites moluccana	Lumbang	AS	11	314.9	0.246	0.256				0.745	1,021
Aleurites trisperma	Bagilumbang	AS	11	138.3	0.427	0.459				0.987	1,018
Alphitonia philippinensis	Tulo	AS	11	139.3	0.395	0.422				0.918	945
Alphonsea arborea	Bolon	AS	11	64.3	0.691	0.778				1.105	1,135
Alseodaphne longipes	Babulo	AS	11	103.6	0.486	0.528				0.998	989
Alstonia boonei	Alstonia	AF	9	123.0	0.330					0.735	736
Alstonia macrophylla	Batino	AS	11	100.0	0.605	0.671				1.213	1,210
Alstonia scholaris	Dita	AS	11	137.3	0.360	0.382				0.834	854
Amburana cearensis/acreanea	Cerejeira	LA	5	50.3	0.566	0.590	6.9	4.5	2.4	0.779	850
Amoora aherniana	Kato	AS	11	103.7	0.584	0.645				1.192	1,190
Amoora macrocarpa	Katong-lakihan	AS	11	98.8	0.545	0.599				1.092	1,083
Amphimas spp.	Lati	AF	3	53.2	0.620	0.800	16.5	10.7	6.4	0.884	950
Anacardium excelsum	Espave	LA	17	155.0	0.380	0.400	8.3	5.1	2.6	0.918	969
Anacardium spp.	Caracoli	LA	5	62.1	0.524	0.555	9.2	5.7	3.5	0.831	850
Anacardium excelsum	Espave	LA	19	109.0	0.410	0.432	8.4	5.2	2.8	0.865	857

Appendix A. Drying properties of tropical hardwoods[a]–Continued

Scientific name	Common name	Region[b]	Ref.	M_g (%)	G_b	G_{12}	S_v (%)	S_t (%)	S_r (%)	DTI	W_g (kg/m^3)
Andira spp.	Andira	LA	5	48.6	0.807	0.870	12.0	7.3	4.7	1.063	1,200
Andira spp.	Barbosquillo	LA	17	76.0	0.640	0.692	12.5	9.8	4.6	1.125	1,126
Aniba canelilla	Preciosa	LA	2	41.3	0.920	1.070	13.6	8.2	6.4	1.049	1,300
Aniba riparia (Ocotea spp.*)*	Brazilian louro	LA	19	54.6	0.620	0.669	12.1	7.0	4.6	0.900	959
Anisoptera aurea	Dagang	AS	11	113.7	0.532	0.583				1.132	1,137
Anisoptera brunnea	Afu	AS	11	106.6	0.540	0.592				1.118	1,116
Anisoptera thurifera	Palosapis	AS	11	108.5	0.532	0.582				1.110	1,109
Anthocephalus cadamba	Kadam	AS	1	99.0	0.530					1.064	1,055
Anthocephalus chinensis	Kaaloan bangkal	AS	11	173.2	0.332	0.351				0.836	907
Anthocephalus chinensis	Laran	AS	9	138.0	0.380					0.881	904
Antidesma pleuricum	Bignai-kalabau	AS	11	94.0	0.593	0.656				1.159	1,150
Apeiba aspera	Cortezo	LA	17	115.0	0.270	0.285	8.7	5.5	2.7	0.589	581
Aphanamixis cumingiana	Salakin	AS	11	86.2	0.581	0.641				1.092	1,082
Aphanamixis perrottetiana	Kangko	AS	11	110.3	0.511	0.557				1.076	1,075
Apuleia molaris	Muira-juba	LA	19	55.0	0.760	0.821	12.3	6.8	4.6	1.097	1,178
Artocarpus blancoi	Antipolo	AS	11	135.7	0.422	0.454				0.969	995
Artocarpus chaplasha	Chapalish	AS	1	130.0	0.400					0.905	920
Artocarpus ovata	Anubing	AS	11	127.3	0.470	0.509				1.050	1,068
Aspidosperma cruentum	Mylady	LA	19	57.2	0.710	0.777	14.3	8.7	5.2	1.055	1,116
Aspidosperma desmanthum	—	LA	21	58.2	0.720	0.795	15.8	9.7	6.6	1.081	1,139
Aspidosperma duckei	—	LA	21	74.6	0.660	0.708	11.4	7.4	3.8	1.148	1,152
Aspidosperma megalocarpon	—	LA	21	40.4	0.750	0.845	18.8	9.7	6.8	0.848	1,053
Aspidosperma spp.	Araracanga	LA	5	16.9	0.855	0.950	16.6	10.2	6.4	0.211	1,000
Astronium gracile	Muiracatiara/guarita	LA	2	56.2	0.730	0.830	11.9	8.0	5.3	1.071	1,140
Astronium graveolens	Goncalo alves	LA	5	34.2	0.820	0.880	11.4	7.3	4.1	0.770	1,100
Astronium graveolens	Goncalo alves	LA	19	46.2	0.840	0.894	1	7.6	4.0	1.061	1,228
Astronium lecointei	—	LA	21	41.1	0.690	0.746	12.6	8.4	4.4	0.796	974
Astronium lecointei	Muiracatiara	LA	2	50.6	0.790	0.900	11.9	7.6	4.6	1.073	1,190
Astronium ulei	Muiracatiara	LA	2	49.3	0.710	0.810	12.2	8.1	4.3	0.952	1,060
Autranella congolensis	Mukulungu	AF	9	42.0	0.720					0.846	1,022
Bagassa guianensis	Tatajuba	LA	19	58.0	0.680	0.724	10.2	6.6	5.2	1.022	1,074
Bagassa guianensis/tiliaefolia	Tatajuba	LA	5	46.2	0.753	0.795	8.9	5.2	3.7	0.957	1,100
Baikiaea minor	Nkobakoba/nkoma	AF	18	58.0	0.671	0.717	10.7	6.5	3.7	1.009	1,060
Baikiaea plurijuga	Rhodesian teak	AF	18	45.0	0.752	0.789	7.8	4.5	3.0	0.935	1,090
Beilschmiedia spp.	Aquacatillo	LA	17	69.5	0.540	0.588	13.5	9.1	4.6	0.912	915

Appendix A. Drying properties of tropical hardwoods[a]–Continued

Scientific name	Common name	Region[b]	Ref.	M_g (%)	G_b	G_{12}	S_v (%)	S_t (%)	S_r (%)	DTI	W_g (kg/m^3)
Berlinia confusa	Berlinia	AF	9	75.0	0.570					1.001	998
Bertholletia excelsa	Brazil Nut	LA	19	69.9	0.590	0.633	11.2	3.9	5.9	0.996	1,002
Bischofia javanica	Tuad	AS	11	124.3	0.525	0.574				1.157	1,178
Bischofia javanica	Bishopwood	AS	18	94.0	0.521	0.568	13.7	7.9	3.1	1.023	1,011
Bischofia javanica	Bhadi	AS	1	84.0	0.600					1.112	1,104
Bombacopsis quinata	Cedro espino	LA	19	116.7	0.450	0.479	10.1	6.1	3.5	0.973	975
Bombacopsis quinata	Saqui-saqui	LA	5	59.1	0.566	0.600	9.5	5.8	3.7	0.868	900
Bombacopsis sessilis	Bongo macho	LA	17	133.0	0.420	0.462	15.1	1	4.8	0.957	979
Bombax malabarica	Simul	AS	1	126.0	0.340					0.764	768
Bombycidendron vidalianum	Vidal lanutan	AS	11	93.7	0.532	0.582				1.043	1,030
Bowdichia nitida	Sucupira	LA	2	43.5	0.850	0.990	14.7	9.0	6.0	1.020	1,220
Bowdichia nitida	Sucupira preta	LA	5	41.3	0.849	0.915	12.0	7.1	4.9	0.973	1,200
Brachylaena discolor	Bosvaalbos	AF	18	56.0	0.667	0.732	14.7	9.3	4.7	0.981	1,041
Brachylaena hutchinsii	Muhuhu	AF	9	31.0	0.770					0.635	1,009
Brachystegia spiciformis	Brachystegia	AF	18	54.0	0.656	0.699	10.3	5.8	4.1	0.942	1,010
Brosimum alicastrum	Janita	LA	2	66.2	0.740	0.880	16.0	9.4	5.6	1.199	1,230
Brosimum rubescens	Satine	LA	5	17.8	1.044	1.110	9.9	5.8	4.1	0.285	1,230
Brosimum spp.	Sande	LA	5	43.4	0.628	0.685	14.0	8.2	5.8	0.765	900
Buchenavia capitata	Yellow sanders	LA	19	65.1	0.590	0.626	9.6	5.7	2.8	0.957	974
Bumelia spp.	Nisperillo	LA	17	51.0	0.730	0.810	16.5	11.2	5.9	1.002	1,102
Burkea africana	Macarati	AF	18	65.0	0.659	0.696	8.7	5.3	3.5	1.063	1,087
Byrsonima coriacea	Serrette	LA	9	78.0	0.570					1.021	1,015
Calophyllum blancoi	Bitanghol	AS	11	117.2	0.510	0.556				1.100	1,108
Calophyllum brasiliense	Santa Maria	LA	5	63.2	0.582	0.630	12.7	7.7	5.0	0.929	950
Calophyllum brasiliense	Santa Maria	LA	21	62.0	0.520	0.561	12.3	7.1	4.8	0.824	842
Calophyllum brasiliense	Santa Maria	LA	9	62.0	0.540					0.855	875
Calophyllum brasiliense	Maria	LA	17	62.0	0.470	0.511	13.4	8.7	5.3	0.748	761
Calophyllum inophyllum	Bitaog	AS	11	77.0	0.572	0.630				1.018	1,012
Calycophyllum spruceanum	Pau mulato	LA	5	42.9	0.770	0.830	12.1	8.2	3.9	0.918	1,100
Campnosperma panamensis	Nisperillo	LA	17	97.0	0.420	0.460	14.5	9.2	5.4	0.843	827
Cananga odorata	Ilang-ilang	AS	11	225.3	0.291	0.305				0.798	947
Canarium asperum	Pagsahingin	AS	11	79.8	0.601	0.666				1.086	1,081
Canarium calophyllum	Pagsahingin-bulog	AS	11	109.3	0.500	0.544				1.049	1,047
Canarium hirsutum	Dulit	AS	11	163.6	0.397	0.424				0.976	1,046
Canarium luzonicum	Piling-liitan	AS	11	98.7	0.489	0.531				0.984	972

Appendix A. Drying properties of tropical hardwoods[a]–Continued

Scientific name	Common name	Region[b]	Ref.	M_g (%)	G_b	G_{12}	S_v (%)	S_t (%)	S_r (%)	DTI	W_g (kg/m^3)
Canarium schweinfurthil	Canarium	AF	9	94.0	0.400					0.793	776
Canarium vrieseanum	Gisau	AS	11	96.1	0.562	0.618				1.111	1,102
Canthium monstrosum	Tadiang-anuang	AS	11	138.6	0.422	0.453				0.977	1,007
Carapa guianensis/procera	Andiroba	LA	5	53.3	0.620	0.670	12.5	7.7	4.8	0.885	950
Carapa guianensis/procera	Andiroba	LA	19	65.0	0.540	0.582	12.1	8.0	3.9	0.879	891
Carapa slateri/guianensis	Bateo	LA	17	63.0	0.560	0.614	14.6	9.2	5.7	0.893	913
Cariniana brasiliensis/integrifolia	Jequitiba	LA	5	34.3	0.596	0.635	10.3	5.3	5.0	0.571	800
Cariniana pyriformis	Abarco	LA	5	42.1	0.634	0.680	11.4	6.6	4.8	0.751	900
Caryocar spp.	Piquia	LA	5	51.7	0.738	0.810	14.8	9.7	5.1	1.022	1,120
Caryocar villosum	Piquia	LA	19	61.3	0.720	0.781	13.0	8.0	5.0	1.117	1,161
Cassia fistula	Cana-fistula	AS	11	75.0	0.709	0.801				1.232	1,241
Cassia javanica	Antsoan	AS	11	79.4	0.685	0.771				1.227	1,229
Cassia scleroxylon	Muirapixuna	LA	2	32.7	1.010	1.140	11.5	8.2	3.6	0.883	1,340
Cassia spectabilis	Antsoan-dilau	AS	11	134.8	0.484	0.525				1.103	1,136
Cassia spp.	Canafistula	LA	17	90.0	0.590	0.637	12.2	7.6	4.7	1.130	1,121
Cassipourea gerrardii	Bastard onionwood	AF	18	89.0	0.529	0.572	12.6	7.2	2.6	1.013	1,000
Cassipourea malosana	Pillarwood	AF	9	65.0	0.590					0.956	974
Casuarina equisetifolia	Agoho	AS	11	54.5	0.841	0.974				1.199	1,299
Catostemma spp.	—	LA	21	62.2	0.600	0.670	17.5	11.1	5.2	0.947	973
Cavanillesia plantanifolia	Quipo	LA	17	556.0	0.120	0.123	4.2	3.4	1.7	0.422	787
Cedrelinga catenaeformis	Tornillo	LA	5	85.1	0.486	0.520	10.8	7.0	3.8	0.914	900
Ceiba pentandra	Kapok	AS	11	344.6	0.226	0.235				0.702	1,005
Ceiba pentandra	Bango	LA	17	195.0	0.240	0.250	6.9	3.9	2.5	0.632	708
Ceiba pentandra	Sumauma	LA	5	164.8	0.302	0.320	9.3	6.3	3.0	0.750	800
Celtis africana	Camdeboo stinkwood	AF	18	58.0	0.627	0.680	12.9	7.9	4.4	0.946	991
Celtis luzonica	Magabuyo	AS	11	131.0	0.488	0.531				1.101	1,127
Celtis spp.	Diania/ohia	AF	3	46.8	0.630	0.740	12.4	7.9	4.4	0.816	925
Celtis spp.	African celtis	AF	9	59.0	0.640					0.975	1,018
Centrolobium spp.	Arariba	LA	5	42.1	0.809	0.850	8.0	5.6	2.4	0.946	1,150
Centrolobium yavizanum	Amarillo guayaquil	LA	17	35.0	0.650	0.690	9.7	6.4	3.6	0.636	878
Chickrassia tabularis	Chickrassi	AS	1	90.0	0.580	00				1.112	1,102
Chisocheton cumingianus	Balukamag	AS	11	116.9	0.520	0.568				1.120	1,128
Chisocheton pentandrus	Katong-matsin	AS	11	127.2	0.518	0.565				1.153	1,177
Chlorophora excelsa	Iroko	AF	9	92.0	0.540					1.049	1,037
Chlorophora tinctoria	Mora amarilla	LA	19	64.7	0.710	0.745	7.8	5.4	3.4	1.138	1,169

Appendix A. Drying properties of tropical hardwoods[a]–Continued

Scientific name	Common name	Region[b]	Ref.	M_g (%)	G_b	G_{12}	S_v (%)	S_t (%)	S_r (%)	DTI	W_g (kg/m^3)
Chlorophora tinctoria	Moral	LA	5	32.5	0.830	0.880	9.4	6.1	3.3	0.729	1,100
Chloroxylon swietenia	Satinwood	AS	11	45.6	0.758	0.865				0.953	1,104
Chrysophyllum spp.	Platano	LA	17	76.0	0.525	0.577	15.1	9.5	5.2	0.931	924
Cinnamomum camphora	Camphor wood	AS	18	77.0	0.435	0.462	9.7	7.6	4.7	0.782	770
Citrus grandis	Lukban	AS	11	96.7	0.592	0.655				1.171	1,164
Clarisia racemosa	Guariuba	LA	5	53.8	0.650	0.690	9.6	6.5	3.1	0.932	1,000
Clarisia racemosa	Guariuba	LA	2	93.3	0.600	0.660	1	6.2	3.1	1.168	1,160
Cleidion spiciflorum	Santiki	AS	11	139.9	0.495	0.538				1.143	1,188
Cleistocalyx operculatus	Malaruhat	AS	11	76.8	0.664	0.744				1.172	1,174
Colona serratifolia	Anilau	AS	11	134.9	0.389	0.415				0.894	914
Combretodendron quadrialatum	Toog	AS	11	99.2	0.570	0.628				1.142	1,135
Copaifera aromatica	Cabimo blanco	LA	17	56.0	0.620	0.667	11.7	7.4	4.1	0.915	967
Copaifera reticulata	—	LA	21	51.9	0.640	0.701	14.6	9.2	4.4	0.895	972
Copaifera spp.	Copaiba	LA	5	56.3	0.608	0.650	13.1	6.8	4.1	0.901	950
Cordia alliodora	Laurel blanco	LA	19	104.4	0.440	0.466	9.2	7.1	3.4	0.910	899
Cordia caffra	Oudehout	AF	18	65.0	0.661	0.721	13.9	8.0	5.7	1.066	1,091
Cordia collococca	Candelera	LA	19	87.4	0.470	0.511	13.3	9.2	4.8	0.896	881
Cordia goeldiana	Freijo	LA	5	53.3	0.555	0.590	1	6.1	3.9	0.796	850
Cordia goeldiana	Freijo	LA	20	53.4	0.520	0.559	11.5	7.6	4.8	0.749	798
Cordia millenil	Cordia	AF	9	61.0	0.360					0.572	580
Cordia spp.	Laurel	LA	17	87.0	0.360	0.389	12.3	9.2	3.1	0.691	673
Cordia trichotoma	—	LA	21	37.5	0.500	0.534	10.7	6.6	4.9	0.534	688
Cornus disciflora	Mato hombre	LA	17	78.0	0.550	0.602	14.5	8.9	5.0	0.987	979
Coumarouna oleifera	Almendro	LA	17	52.0	0.790	0.854	12.4	8.3	5.9	1.095	1,201
Coumarouna oleifera/odorata	Almendro	LA	19	46.7	0.890	0.959	12.0	7.6	5.0	1.129	1,306
Couratari oblongifolia	Tauari	LA	2	126.0	0.500	0.560	10.9	6.6	4.2	1.110	1,130
Couratari panamensis	Congolo-garapelo	LA	17	72.0	0.490	0.514	7.7	3.6	1.9	0.847	843
Couratari pulchra	Tauary	LA	19	68.8	0.500	0.536	11.3	7.3	4.1	0.843	844
Couratari spp.	Tauari	LA	5	55.9	0.577	0.620	11.5	7.0	4.5	0.853	900
Croton sylvaticus	Croton	AF	18	77.0	0.508	0.544	11.0	6.7	2.9	0.908	899
Cryptocarya liebertiana	Wild quince	AS	18	97.0	0.497	0.538	12.6	7.0	3.4	0.992	979
Cubilia cubili	Kubili	AS	11	116.6	0.486	0.528				1.048	1,053
Cullenia ceylanica	Kataboda	AS	9	39.0	0.510					0.567	709
Cupania spp.	Cacho de chivo	LA	17	59.0	0.550	0.602	14.5	8.9	5.4	0.844	875
Cylicodiscus gabunensis	Okan	AF	9	52.0	0.790					1.095	1,201

Appendix A. Drying properties of tropical hardwoods[a]–Continued

Scientific name	Common name	Region[b]	Ref.	M_g (%)	G_b	G_{12}	S_v (%)	S_t (%)	S_r (%)	DTI	W_g (kg/m^3)
Cynometra alexandri	Muhimbi	AF	9	46.0	0.740					0.938	1,080
Cynometra ramiflora	Balitbitan	AS	11	75.2	0.697	0.786				1.214	1,221
Dacryodes spp.	Gommier	LA	5	60.0	0.562	0.610	13.0	7.9	5.1	0.870	900
Dehassia triandra	Margapali	AS	11	71.4	0.643	0.718				1.094	1,102
Dendropanax arborea	Nagua blance	LA	17	78.0	0.410	0.447	13.8	8.3	5.1	0.743	730
Dialium guianense	Hauso	LA	17	39.0	0.930	1.000	11.7	8.5	4.9	1.003	1,293
Dialium guianense	Jutai-pororoca	LA	2	44.3	0.880	1.020	14.5	8.9	5.1	1.070	1,270
Dialyanthera spp.	Cuangara, virola	LA	17	81.0	0.410	0.414	12.0	9.4	4.2	0.757	742
Dicorynia guianensis/paraensis	Basralocus	LA	5	37.6	0.727	0.790	13.4	8.3	5.1	0.766	1,000
Dicorynia paraensis	Angelique	LA	19	78.7	0.600	0.655	14.0	8.2	6.4	1.077	1,072
Didelotia spp.	Gombe	AF	3	60.0	0.500	0.640	13.0	8.6	4.8	0.778	800
Didymopanax morototoni	Morototo	LA	5	61.1	0.497	0.550	16.2	9.7	6.5	0.782	800
Didymopanax morototoni	Guarumo macho	LA	17	87.0	0.530	0.583	15.2	9.2	7.0	1.004	991
Didymopanax morototoni	Morototo	LA	2	151.2	0.410	0.480	15.7	9.1	6.7	0.980	1,030
Dillenia luzoniensis	Malakatmon	AS	11	77.7	0.683	0.768				1.211	1,214
Dillenia megalantha	Katmon-bayani	AS	11	75.2	0.689	0.776				1.201	1,207
Dillenia philippinensis	Katmon	AS	11	108.3	0.566	0.623				1.177	1,179
Dinizia excelsa	Angelim vermelho	LA	5	54.9	0.968	1.050	13.0	8.2	4.8	1.374	1,500
Dinizia excelsa	Angelim vermelho	LA	2	51.8	0.830	0.970	14.5	9.5	5.7	1.143	1,260
Diospyros inclusa	Anang-gulod	AS	11	74.0	0.677	0.760				1.171	1,178
Diospyros mespiliformis	African ebony	AF	18	64.0	0.634	0.686	12.7	7.3	3.6	1.015	1,040
Diospyros mindanaensis	Ata-ata	AS	11	64.7	0.691	0.778				1.109	1,138
Diospyros nitida	Katilma	AS	11	66.6	0.706	0.797				1.151	1,176
Diospyros philippensis	Kamagong	AS	11	60.9	0.800	0.919				1.228	1,287
Diospyros poncei	Ponce kamagong	AS	11	56.4	0.813	0.937				1.188	1,272
Diospyros pyrrhocarpa	Anang	AS	11	84.9	0.590	0.653				1.100	1,091
Diospyros spp.	Flo de guinea	LA	17	92.0	0.410	0.438	10.9	7.0	2.7	0.804	787
Diplodiscus paniculatus	Balobo	AS	11	81.0	0.632	0.704				1.148	1,144
Diploon venezuelana	Abiurana seca	LA	2	41.2	0.850	1.010	15.7	10.1	7.1	0.972	1,200
Diplotropis purpurea	Sapupira	LA	20	61.2	0.780	0.839	11.8	7.0	4.6	1.203	1,257
Dipterocarpus acutangulus	Keruing	AS	9	63.0	0.600					0.954	978
Dipterocarpus basilanicus	Basilan apitong	AS	11	93.6	0.558	0.613				1.091	1,080
Dipterocarpus caudatus	Leaf-tailed panau	AS	11	64.1	0.610	0.677				0.979	1,001
Dipterocarpus caudiferus	Keruing	AS	9	75.0	0.510					0.899	893
Dipterocarpus gracilis	Panau	AS	11	80.5	0.605	0.671				1.098	1,092

Appendix A. Drying properties of tropical hardwoods[a]–Continued

Scientific name	Common name	Region[b]	Ref.	M_g (%)	G_b	G_{12}	S_v (%)	S_t (%)	S_r (%)	DTI	W_g (kg/m^3)
Dipterocarpus grandiflorus	Apitong	AS	11	81.5	0.628	0.699				1.145	1,140
Dipterocarpus kerrii	Malapanau	AS	11	90.6	0.560	0.617				1.079	1,067
Dipterocarpus pilosus	Garjan	AS	1	80.0	0.640					1.155	1,152
Dipterocarpus speciosus	Broad-winged apitong	AS	11	95.8	0.542	0.594				1.072	1,061
Dipterocarpus spp.	Keruing	AS	9	52.0	0.620					0.870	942
Dipterocarpus spp.	Gurjam	AS	13	80.0	0.606	0.664	14.5	11.5	4.0	1.096	1,091
Dipterocarpus warburgii	Hagakhak	AS	11	95.1	0.525	0.574				1.036	1,024
Dipterocarpus zeylanicus	Hora	AS	9	67.0	0.650					1.067	1,086
Dipteryx odorata	Cumaru	LA	2	40.7	0.910	1.060	13.5	8.4	5.4	1.024	1,280
Dipteryx spp.	Cumaru	LA	5	22.0	0.984	1.070	13.4	7.9	5.5	0.417	1,200
Dracontomelon dao	Dao	AS	11	87.3	0.546	0.599				1.035	1,023
Dracontomelon edule	Lamio	AS	11	136.1	0.459	0.496				1.052	1,097
Dryobalanops beccarii	Kapur	AS	9	64.0	0.580					0.933	951
Dryobalanops keithii	Kapur	AS	9	73.0	0.600					1.036	1,038
Dryobalanops lanceolata	Kapur	AS	9	64.0	0.580					0.933	951
Drypetes bordenii	Balikbikan	AS	11	65.0	0.754	0.859				1.208	1,244
Drypetes variabilis	Pau branco	LA	2	74.6	0.710	0.850	15.9	11.3	5.8	1.230	1,240
Duabanga sonneratoides	Bandarhola	AS	1	120.0	0.430					0.942	946
Durio zibethinus	Durian	AS	11	145.3	0.435	0.468				1.023	1,067
Dussia spp.	Bolador/sangrillo	LA	17	88.0	0.475	0.510	11.5	7.7	4.0	0.908	893
Dysoxylum altissimum	Kuling-babui	AS	11	136.4	0.424	0.455				0.975	1,002
Dysoxylum decandrum	Igyo	AS	11	125.0	0.507	0.552				1.122	1,141
Dysoxylum euphlebium	Miau	AS	11	74.9	0.637	0.711				1.112	1,114
Ekebergia capensis	Cape ash	AF	18	74.0	0.471	0.503	10.7	5.9	3.9	0.827	820
Endiandra laxiflora	Usuang-saha	AS	11	109.7	0.536	0.587				1.124	1,124
Endopleura uchi	Uchi liso/uchi	LA	2	51.3	0.780	0.940	15.6	9.6	6.4	1.071	1,180
Endospermum peltatum	Gubas	AS	11	191.0	0.305	0.321				0.794	888
Entandrophragma angolense	Gedu nohor	AF	9	74.0	0.470					0.826	818
Entandrophragma caudatum	—	AF	18	71.0	0.596	0.634	10.1	5.5	3.1	1.015	1,019
Entandrophragma cylindricum	Sapele	AF	9	62.0	0.550					0.870	891
Entandrophragma utile	Utile	AF	9	50.0	0.560					0.767	840
Enterolobium cyclocarpum	Earpod	AS	11	215.3	0.354	0.376				0.953	1,116
Enterolobium maximum	Fava tamboril/tamboril	LA	2	183.8	0.370	0.400	6.7	4.5	2.4	0.947	1,050
Enterolobium schomburgkii	Batibatra	LA	5	43.8	0.765	0.830	13.1	9.0	4.1	0.929	1,100
Enterolobium schomburgkii	Timbauba	LA	20	60.0	0.820	0.895	13.9	8.8	3.8	1.246	1,312

Appendix A. Drying properties of tropical hardwoods[a]–Continued

Scientific name	Common name	Region[b]	Ref.	M_g (%)	G_b	G_{12}	S_v (%)	S_t (%)	S_r (%)	DTI	W_g (kg/m^3)
Enterolobium schomburgkii	Harino	LA	17	65.0	0.600	0.640	10.3	6.7	3.5	0.972	990
Enterolobium schomburgkii	Fava de rosca	LA	2	44.0	0.840	0.920	12.7	9.3	4.2	1.019	1,210
Enterolobium spp.	Tamboril	LA	5	70.1	0.470	0.490	6.7	4.4	2.3	0.802	800
Eperua spp.	Wallaba	LA	5	31.9	0.834	0.880	8.7	6.5	2.2	0.714	1,100
Eperua spp.	Wallaba	LA	9	58.0	0.780					1.164	1,232
Epicharis cimingiana	Tara-tara	AS	11	63.7	0.729	0.827				1.156	1,193
Erblichia odorata	Pino blanco	LA	17	75.0	0.500	0.545	13.9	8.3	4.1	0.882	875
Erisma uncinatum	Quarubarana/cedrinho	LA	2	141.3	0.460	0.540	13.4	1	4.3	1.069	1,110
Erisma uncinatum/Erisma spp.	Jaboty	LA	5	81.5	0.551	0.600	13.6	9.3	4.3	1.010	1,000
Erythrina fusca	Anii	AS	11	274.4	0.254	0.265				0.740	951
Erythrina subumbrans	Rarang	AS	11	341.4	0.236	0.245				0.730	1,042
Erythrophleum densiflorus	Kamatog	AS	11	83.1	0.687	0.742				1.259	1,258
Erythrophleum spp.	Missanda	AF	9	33.0	0.900					0.803	1,197
Eschweilera amara	Matamata vermelho	LA	2	65.8	0.760	0.900	15.3	10.3	4.9	1.225	1,260
Eschweilera odora	Mata-mata	LA	20	52.7	0.810	0.903	17.1	1	6.7	1.131	1,237
Eschweilera sagotiana	Black kakeralli	LA	19	50.7	0.820	0.898	14.4	10.5	4.9	1.113	1,236
Eschweilera spp.	Guasca/oxito	LA	17	52.0	0.780	0.862	15.9	9.5	5.6	1.081	1,186
Eschweilera spp.	Matamata-ci	LA	2	55.6	0.810	0.970	16.1	10.7	6.0	1.173	1,260
Eschweilera sublandulosa	Manbarklak	LA	20	42.9	0.870	0.962	15.9	10.3	5.8	1.030	1,243
Eschweilera tenax	Coco de mono	LA	20	73.9	0.620	0.663	10.9	6.4	3.4	1.076	1,078
Eugenia spp.	Guayabo de montana	LA	17	44.0	0.840	0.955	20.1	14.1	7.2	1.019	1,210
Eusideroxylon zwageri	Belian	AS	9	40.0	0.860					0.955	1,204
Euxylophora paraensis	Pau amarelo	LA	5	33.2	0.751	0.810	12.2	6.5	5.7	0.683	1,000
Fagara capensis	Lemon thorn	AF	18	48.0	0.750	0.823	14.8	8.3	4.4	0.982	1,110
Fagara davyi	Knobwood	AF	18	51.0	0.709	0.782	15.6	8.4	4.1	0.975	1,071
Ficus benjamina	Salisi	AS	11	81.0	0.649	0.725				1.178	1,175
Ficus botryocarpa	Basikong	AS	11	159.7	0.430	0.462				1.046	1,117
Ficus minahassae	Hagimit	AS	11	188.0	0.419	0.450				1.076	1,207
Ficus spp.	Caxinguba	LA	5	157.2	0.389	0.420	12.4	9.1	3.3	0.944	1,000
Ficus varietata	Tangisang-bayauak	AS	11	273.8	0.282	0.295				0.819	1,054
Franchetella grongrijpii	Abiurana branca	LA	2	72.2	0.720	0.850	15.0	10.1	4.5	1.225	1,240
Gilbertiodendron spp.	Limbali	AF	3	66.7	0.660	0.815	13.9	9.0	4.7	1.080	1,100
Glycydendron amazonicum	—	LA	21	38.4	0.720	0.773	11.5	6.8	3.3	0.776	996
Glycydendron amazonicum	Glicia	LA	2	68.2	0.660	0.760	12.0	7.6	4.9	1.094	1,110
Gmelina arborea	Gmelina	AF	9	100.0	0.420					0.854	840

Appendix A. Drying properties of tropical hardwoods[a]–Continued

Scientific name	Common name	Region[b]	Ref.	M_g (%)	G_b	G_{12}	S_v (%)	S_t (%)	S_r (%)	DTI	W_g (kg/m^3)
Gmelina arborea	Gmelina	AS	18	153.0	0.395	0.458	8.3	5.3	2.8	0.949	999
Gmelina arborea	Gamari	AS	13	130.0	0.419	0.438	7.3	4.9	2.4	0.973	964
Gmelina arborea	Gamari	AS	1	120.0	0.430					0.942	946
Gonioma kamassi	Kamassi/knysna boxwood	AF	18	65.0	0.691	0.775	18.0	11.3	6.1	1.112	1,140
Gonocaryum calleryanum	Taingang-babui	AS	11	84.0	0.639	0.713				1.181	1,176
Gonystylus machophyllus	Lanutan-bagyo	AS	11	98.4	0.528	0.578				1.058	1,048
Gossweilerodendron balsamiferum	Agba	AF	9	56.0	0.420					0.629	655
Gossweilerodendron balsamiferum	Tola	AF	3	81.8	0.440	0.520	7.7	5.5	2.4	0.815	800
Goupia glabra	Cupiuba	LA	5	46.8	0.770	0.840	13.9	8.8	5.1	0.987	1,130
Goupia glabra	Cupiuba	LA	20	65.7	0.700	0.757	12.6	8.0	4.5	1.133	1,160
Goupia glabra	Cupiuba	LA	2	59.2	0.710	0.820	13.2	8.4	4.5	1.079	1,130
Grevillea robusta	Grevillea	AS	18	116.0	0.495	0.532	11.7	7.4	2.5	1.065	1,069
Grewia multiflora	Danglin	AS	11	109.9	0.462	0.499				0.975	970
Guarea cedrata	Guarea	AF	9	99.0	0.470					0.948	935
Guarea excelsa	Cramtree	LA	9	144.0	0.460					1.076	1,122
Guarea thompsonii	Guarea	AF	9	52.0	0.540					0.762	821
Guarea trichilioides	Pico del oro	LA	17	119.0	0.520	0.557	11.2	7.0	3.4	1.128	1,139
Guatteria olivacea	Envira preta	LA	2	117.6	0.510	0.580	13.0	9.3	4.4	1.102	1,110
Guatteria procera	Envira preta	LS	2	80.0	0.650	0.790	18.5	11.4	7.2	1.172	1,170
Guibourtia coleosperma	Rhodesian copalwood	AF	18	52.0	0.599	0.618	5.2	3.2	2.0	0.842	910
Harpullia arborea	Uas	AS	11	74.9	0.623	0.693				1.089	1,090
Hasseltia floribunda	Cocobolo	LA	17	78.0	0.540	0.585	12.8	8.5	4.0	0.969	961
Heritiera simplicifolia	Mengkulang	AS	9	61.5	0.515					0.813	832
Hevea brasiliensis	Para rubber	AS	11	117.0	0.532	0.582				1.145	1,154
Hevea brasiliensis	Rubberwood	AS	9	54.0	0.570					0.824	878
Hibiscus tiliaceus	Malubago	AS	11	119.0	0.571	0.629				1.233	1,250
Hieronyma alchorneoides	Pantano	LA	17	89.0	0.600	0.653	13.6	9.2	5.7	1.143	1,134
Hieronyma laxiflora	Suradanni	LA	21	82.6	0.650	0.711	14.4	9.4	5.3	1.191	1,187
Hieronyma spp.	Urucurana	LA	5	42.9	0.735	0.800	13.6	8.6	5.0	0.879	1,050
Holopaxidium jarana	Jarana	LA	20	48.6	0.850	0.945	16.8	8.3	6.2	1.116	1,263
Homalanthus populneus	Balanti	AS	11	168.5	0.381	0.406				0.947	1,023
Hopea acuminata	Manggachapui	AS	11	75.1	0.626	0.697				1.095	1,096
Hopea foxworthyi	Dalinydingan	AS	11	70.1	0.604	0.670				1.020	1,027
Hopea plagata	Yakal-saplungan	AS	11	43.6	0.890	1.040				1.067	1,278
Hopea sangal	Gagil	AS	9	61.0	0.550					0.861	886

Appendix A. Drying properties of tropical hardwoods[a]–Continued

Scientific name	Common name	Region[b]	Ref.	M_g (%)	G_b	G_{12}	S_v (%)	S_t (%)	S_r (%)	DTI	W_g (kg/m^3)
Humiria balsamifera	Bois rouge	LA	21	62.7	0.660	0.729	15.7	9.7	7.2	1.042	1,074
Humiria spp.	Corosilio almendro	LA	17	39.0	0.830	0.924	16.9	10.8	7.7	0.901	1,154
Humiriastrum spp.	Chanul	LA	5	27.4	0.863	0.950	15.2	9.5	5.7	0.570	1,100
Hura crepitans	Acacu	LA	5	86.3	0.430	0.450	7.6	4.7	2.9	0.818	800
Hura crepitans	Possumwood	LA	19	67.2	0.380	0.397	7.3	4.5	2.7	0.638	635
Hura crepitans	Ceiba	LA	17	84.0	0.340	0.357	8.1	4.5	2.6	0.643	626
Hymenaea courbaril	Courbaril	LA	19	60.8	0.710	0.769	12.7	8.5	4.5	1.096	1,142
Hymenaea courbaril	Algarrobo	LA	17	51.0	0.790	0.834	8.8	6.7	2.9	1.079	1,193
Hymenaea courbaril	Jutai-acu/jatoba	LA	2	63.2	0.760	0.850	11.4	7.7	3.4	1.197	1,240
Hymenaea davisii	—	LA	19	64.7	0.710	0.779	14.8	7.6	4.1	1.138	1,169
Hymenaea oblongifolia	—	LA	21	48.9	0.740	0.791	10.7	7.4	3.8	0.984	1,102
Hymenaea parvifolia	Jutai-mirim/jatoba	LA	2	44.4	0.900	1.050	13.4	9.7	3.7	1.095	1,300
Hymenaea spp.	Jatoba	LA	5	23.2	0.893	0.955	10.9	7.1	3.8	0.447	1,100
Hymenolobium excelsum	Angelim	LA	20	70.0	0.630	0.671	10.2	7.1	4.4	1.067	1,071
Hymenolobium modestrum	Angelim pedra	LA	2	83.1	0.650	0.740	13.5	7.7	4.6	1.194	1,190
Hymenolobium spp.	Angelim	LA	5	69.1	0.710	0.770	13.1	8.3	4.8	1.181	1,200
Inga alba	Inga	LA	2	88.7	0.620	0.690	13.3	9.6	4.0	1.177	1,170
Inga paraensis	Ingarana/inga	LA	2	53.7	0.820	0.890	15.9	10.7	5.3	1.159	1,260
Inga spp.	Inga	LA	5	53.1	0.620	0.665	11.2	7.4	3.8	0.883	950
Inga spp.	Guabo	LA	17	83.0	0.560	0.594	9.5	5.5	2.8	1.035	1,025
Intsia bijuga	Ipil	AS	11	93.4	0.612	0.679				1.191	1,184
Iryanthera bostmanni	Kirikowa	LA	21	117.2	0.500	0.549	15.0	7.5	5.2	1.079	1,086
Iryanthera lancifolia	Kirikawa	LA	21	74.5	0.490	0.535	14.0	10.2	5.5	0.862	855
Iryanthera sagotiana	Marakaipo	LA	21	52.6	0.570	0.629	15.6	9.4	5.3	0.809	870
Isoberlinia angolensis	—	AF	18	57.0	0.675	0.736	13.8	6.9	5.6	1.004	1,060
Jacaranda copaia	Copaia	LA	21	98.2	0.320	0.348	13.6	8.2	5.1	0.651	634
Jacaranda copaia	Gualandai	LA	17	104.0	0.380	0.409	11.8	6.9	4.8	0.788	775
Jacaranda spp.	Para-para	LA	5	170.1	0.389	0.425	14.2	8.5	5.7	0.969	1,050
Juglans spp.	Nogal	LA	5	54.9	0.581	0.610	7.9	5.2	2.7	0.849	900
Kayea garciae	Bakulau	AS	11	66.8	0.661	0.740				1.083	1,103
Khaya anthotheca	African mahogany	AF	9	61.0	0.440					0.695	708
Khaya anthotheca	African mahogany	AF	9	54.0	0.440					0.642	678
Khaya grandifoliola	African mahogany	AF	9	54.0	0.540					0.782	832
Khaya ivorensis	African mahogany	AF	9	64.0	0.420					0.683	689
Khaya nyasica	African mahogany	AF	9	66.0	0.470					0.776	780

Appendix A. Drying properties of tropical hardwoods[a]–Continued

Scientific name	Common name	Region[b]	Ref.	M_g (%)	G_b	G_{12}	S_v (%)	S_t (%)	S_r (%)	DTI	W_g (kg/m^3)
Kleinhovia hospita	Tan-ag	AS	11	176.5	0.364	0.387				0.920	1,006
Koompassia excelsa	Manggis	AS	11	79.0	0.668	0.749				1.195	1,196
Koordersiodendron pinnatum	Amugis	AS	11	86.2	0.639	0.713				1.196	1,190
Koordersiodendron pinnatum	Ranggu	AS	9	53.0	0.720					1.016	1,102
Laetia spp.	Alcarreto	LA	17	78.0	0.590	0.648	14.9	11.3	4.2	1.055	1,050
Lafoensia punicifolia	Amarillo pepita	LA	17	44.0	0.720	0.779	12.7	8.6	4.0	0.881	1,037
Lagerstroemia piriformis	Batitinan	AS	11	121.1	0.487	0.529				1.066	1,077
Lagerstroemia speciosa	Banaba	AS	11	114.9	0.534	0.585				1.141	1,148
Lannea coromandelica	Jhingen	AS	13	130.0	0.497	0.523	8.4	5.4	3.0	1.117	1,143
Lecythis paraensis	Sapucaia	LA	20	45.9	0.880	0.957	13.4	7.6	6.0	1.102	1,284
Lecythis pisonis	Sapucaia	LA	2	48.8	0.840	0.980	13.9	8.0	5.6	1.107	1,250
Lecythis spp.	Sapucaia	LA	5	27.6	0.940	1.020	13.0	7.9	5.1	0.627	1,200
Lecythis tuyrana	Coco	LA	17	95.0	0.610	0.668	14.4	10.3	4.5	1.196	1,190
Leucaena leucocephala	Ipil-ipil	AS	11	78.5	0.728	0.825				1.293	1,299
Licania arborea	Paragua	LA	17	73.0	0.630	0.694	15.4	10.1	5.8	1.086	1,090
Licania buxifolia	Marishiballi	LA	20	37.3	0.880	0.981	17.2	11.7	7.5	0.909	1,208
Licania hypoleuca	Rasca	LA	17	42.0	0.830	0.934	18.5	10.9	7.4	0.967	1,179
Licania macrophylla	Anauera	LA	20	49.8	0.760	0.842	16.2	9.9	6.1	1.023	1,138
Licania octandra	Caraipe	LA	2	62.3	0.770	0.940	17.4	11.9	6.1	1.201	1,250
Licania platypus	Sapote	LA	17	80.0	0.620	0.684	15.5	10.2	5.6	1.121	1,116
Licania spp.	Carbonero/tuquesa	LA	17	80.0	0.650	0.709	13.8	9.2	4.7	1.172	1,170
Licaria cayennensis	Kaneelhart	LA	20	30.4	0.960	1.038	12.5	7.9	5.4	0.758	1,252
Licaria rigida	Louro amarelo/louro	LA	2	52.1	0.730	0.850	13.5	9.1	5.3	1.017	1,110
Licaria spp.	Sigue canelo	LA	17	65.0	0.420	0.452	11.7	8.4	3.3	0.690	693
Litchi philippinensis	Alupag-amo	AS	11	49.3	0.872	1.015				1.155	1,302
Lithocarpus soleriana	Manaring	AS	11	81.0	0.630	0.702				1.145	1,140
Litsea garciae	Bangulo	AS	11	172.2	0.344	0.364				0.864	936
Litsea perrottetii	Marang	AS	11	103.6	0.486	0.528				0.998	989
Livistona rotundifolia	Anahau	AS	11	60.7	0.787	0.902				1.207	1,265
Lonchocarpus castilloi	Black cabbage bark	LA	9	61.0	0.780					1.201	1,256
Lophira alata	Ekki	AF	9	43.0	0.860					1.021	1,230
Lophopetalum fimbriatum	Raktan	AS	1	101.0	0.530					1.074	1,065
Lovoa trichilloides	Walnut, African	AF	9	61.0	0.450					0.710	725
Loxopterygium sagotii	Hububalli	LA	19	98.0	0.560	0.600	11.1	7.2	3.4	1.117	1,109
Lueheopsis duckeana	Acoita cavalo	LA	2	83.9	0.620	0.710	13.3	9.5	4.6	1.147	1,140

Appendix A. Drying properties of tropical hardwoods[a]–Continued

Scientific name	Common name	Region[b]	Ref.	M_g (%)	G_b	G_{12}	S_v (%)	S_t (%)	S_r (%)	DTI	W_g (kg/m^3)
Macaranga bicolor	Hamindang	AS	11	190.7	0.291	0.305				0.758	846
Machaerium capote	Siete cueros	LA	17	68.0	0.520	0.567	13.8	8.4	5.8	0.869	874
Macoubea guianensis	Rokoroko	LA	21	91.3	0.370	0.393	9.9	7.1	2.2	0.726	708
Madhuca obevatifolia	Pianga	AS	11	93.3	0.589	0.651				1.147	1,139
Madhuca oblongifolia	Malabetis	AS	11	123.5	0.526	0.575				1.157	1,176
Maesopsis eminii	Musizi	AF	9	165.0	0.410					1.010	1,086
Magnifera indica	Mango	AS	1	102.0	0.540					1.098	1,091
Magnolia sororum	Vaco	LA	19	84.8	0.500	0.536	11.2	7.0	3.6	0.938	924
Mallotus multiglandulosus	Alim	AS	11	141.1	0.424	0.455				0.987	1,022
Mallotus philippensis	Banato	AS	11	72.9	0.635	0.708				1.093	1,098
Malouetia duckei	Sorva	LA	2	101.8	0.570	0.660	12.7	9.2	3.7	1.155	1,150
Mangifera altissima	Pahutan	AS	11	110.1	0.549	0.603				1.151	1,153
Mangifera merrillii	Pahong-liitan	AS	11	117.1	0.523	0.571				1.127	1,135
Manilkara amazonica	Maparajuba/macaranduba	LA	2	51.8	0.830	0.960	13.8	8.3	5.9	1.143	1,260
Manilkara bidentata	Bulletwood	LA	19	47.6	0.850	0.946	16.9	9.4	6.3	1.098	1,255
Manilkara huberi	—	LA	21	42.0	0.930	1.029	16.0	9.4	6.8	1.076	1,321
Manilkara spp.	Macaranduba	LA	5	31.2	0.991	1.100	16.5	9.4	7.1	0.812	1,300
Mansonia altissima	Mansonia	AF	9	44.0	0.540					0.670	778
Maquira coriacea Berg.	Muiratinga	LA	5	137.8	0.442	0.470	10.1	6.7	3.4	1.019	1,050
Marmaroxylon racemosum	Angelim rajado	LA	5	36.5	0.901	1.000	16.5	10.5	6.0	0.908	1,230
Mastixia philippinensis	Apanit	AS	11	116.1	0.473	0.512				1.019	1,022
Melia dubia	Bagalunga	AS	11	113.5	0.414	0.444				0.888	884
Melicope triphylla	Matang-arau	AS	11	168.7	0.374	0.398				0.930	1,005
Meliosma macrophylla	Balilang-uak	AS	11	216.9	0.266	0.278				0.723	843
Melochia umbellata	Labayo	AS	11	351.8	0.247	0.257				0.770	1,116
Mezilaurus itauba	Itauba	LA	20	63.4	0.680	0.726	10.6	7.0	2.4	1.079	1,111
Mezilaurus spp.	Itauba	LA	5	36.1	0.786	0.855	13.4	9.7	3.7	0.789	1,070
Michelia champaca	Champa	AS	1	110.0	0.500					1.052	1,050
Michelia platyphylla	Hangilo	AS	11	107.0	0.506	0.551				1.052	1,047
Michonia ibaquensis	Manglillo de montana	LA	17	84.0	0.610	0.664	13.6	9.5	4.3	1.130	1,122
Microcos stylocarpa	Kamuling	AS	11	138.6	0.396	0.423				0.918	945
Micromelum compressum	Tulibas-tilos	AS	11	63.0	0.642	0.717				1.018	1,046
Micropholis guyanensis	Konoko	LA	21	36.5	0.650	0.711	14.3	8.5	5.8	0.667	887
Micropholis venulosa	Rosadinho	LA	2	80.6	0.670	0.780	14.0	9.7	4.7	1.211	1,210
Millettia stuhlmannii	Panga-panga	AF	18	60.0	0.769	0.813	9.0	5.8	3.1	1.173	1,230

Appendix A. Drying properties of tropical hardwoods[a]–Continued

Scientific name	Common name	Region[b]	Ref.	M_g (%)	G_b	G_{12}	S_v (%)	S_t (%)	S_r (%)	DTI	W_g (kg/m^3)
Minquartia guianensis	Manwood	LA	20	66.7	0.760	0.830	14.0	8.3	5.4	1.235	1,267
Minquartia guianensis	Camaroncillo	LA	17	62.0	0.750	0.799	10.3	8.4	3.9	1.169	1,215
Monopetalanthus spp.	Andoung	AF	3	68.4	0.490	0.590	11.0	7.4	4.1	0.824	825
Mora excelsa	Mora	LA	21	60.0	0.780	0.879	18.8	7.6	3.9	1.189	1,248
Mora excelsa	Mora	LA	9	59.0	0.760					1.148	1,208
Mora oleifera	Alcornoque	LA	17	60.0	0.740	0.800	12.5	7.8	5.0	1.131	1,184
Mora spp.	Mora	LA	5	19.1	0.924	1.025	16.5	1	6.5	0.292	1,100
Morus alba	Moerbei	AF	18	99.0	0.588	0.650	15.8	10.2	4.8	1.176	1,170
Myroxylon balsamum/toluiferum	Balsamo	LA	5	24.9	0.881	0.950	12.2	8.0	4.2	0.466	1,100
Nauclea diderichii	Opepe	AF	9	75.0	0.630					1.101	1,103
Nauclea spp.	Bilinga	AF	3	61.5	0.650	0.760	12.3	7.5	4.7	1.015	1,050
Nectandra concinna	Angelino/aceituno	LA	19	88.0	0.560	0.595	9.8	6.0	3.4	1.064	1,053
Nectandra spp.	Sigua/sigua amarillo	LA	17	68.0	0.365	0.385	8.8	5.9	3.0	0.617	613
Nectandra spp./*Ocotea* spp.	Louro	LA	5	77.8	0.506	0.540	10.4	7.0	3.4	0.910	900
Nemaluma anomala	Rosadinho	LA	2	62.7	0.750	0.890	15.2	9.4	6.3	1.176	1,220
Neonauclea bernardoi	Ludek	AS	11	90.2	0.624	0.694				1.194	1,187
Neotrewia cumingii	Apanang	AS	11	94.4	0.546	0.599				1.072	1,061
Newtonia buchanani	Muchehche	AF	9	91.0	0.470					0.913	898
Ochroma lagopus/pyramidale	Balsa	LA	5	122.8	0.153	0.160	7.7	5.4	2.3	0.345	340
Ochroma pyramidale	Balsa	AS	11	238.4	0.295	0.310				0.823	998
Ocotea austinii	Bambito rosada	LA	17	94.0	0.480	0.527	14.8	9.3	4.5	0.946	931
Ocotea bullata	Black stinkwood	AF	18	73.0	0.630	0.692	14.9	7.9	4.9	1.086	1,090
Ocotea neesiana	Louro canela/louro	LA	2	69.1	0.550	0.620	10.2	7.7	4.2	0.926	930
Ocotea porosa (Phoebe porosa)	Imbuia	LA	5	34.9	0.667	0.710	10.1	6.8	3.3	0.649	900
Ocotea rodiaei	Greenheart	LA	5	48.0	0.879	0.970	15.7	8.2	7.5	1.141	1,300
Ocotea rodiaei	Greenheart	LA	19	42.7	0.880	0.981	17.1	9.6	8.8	1.037	1,256
Ocotea rodiaei	Greenheart	LA	9	37.0	0.830					0.853	1,137
Ocotea rubra	Determa	LA	19	83.2	0.520	0.555	10.4	7.7	3.7	0.965	953
Ocotea rubra	Louro vermelho	LA	5	64.7	0.607	0.660	13.3	8.8	4.5	0.980	1,000
Ocotea schomburgkiana	Yekoro	LA	21	48.9	0.460	0.487	9.3	6.7	3.0	0.625	685
Ocotea spp.	Siguaton/bambito amarillo	LA	17	152.0	0.355	0.384	12.4	7.6	3.8	0.853	895
Ocotea spp.	Louro canela/louro	LA	2	65.1	0.630	0.710	11.1	7.8	3.6	1.019	1,040
Ocotea usambarensis	Camphorwood	AF	9	59.0	0.510					0.785	811
Octomeles sumatrana	Binuang	AS	11	245.4	0.265	0.277				0.747	915
Octomeles sumatrana	Binuang	AS	9	69.0	0.320					0.548	541

Appendix A. Drying properties of tropical hardwoods[a]–Continued

Scientific name	Common name	Region[b]	Ref.	M_g (%)	G_b	G_{12}	S_v (%)	S_t (%)	S_r (%)	DTI	W_g (kg/m^3)
Olea africana	Olienhout	AF	18	36.0	0.882	0.961	13.7	7.7	4.9	0.876	1,200
Olea capensis	Black ironwood	AF	18	48.0	0.797	0.900	19.1	10.3	6.5	1.040	1,180
Olea hochstetteri	East African olive	AF	9	48.0	0.750					0.982	1,110
Onychopetalum amazonicum	Envira preta	LA	2	96.5	0.570	0.660	14.0	8.1	4.9	1.129	1,120
Ormosia paraensis	Tento	LA	2	74.6	0.670	0.790	14.7	10.3	4.7	1.164	1,170
Ormosia spp.	Amargo blanco	LA	17	104.0	0.550	0.571	6.2	4.5	2.2	1.126	1,122
Ormosia spp.	Tento	LA	5	47.5	0.712	0.770	12.6	8.2	4.4	0.928	1,050
Oroxylon indicum	Pingka-pingkahan	AS	11	184.0	0.317	0.334				0.815	900
Orsmosia paraensis	—	LA	21	74.1	0.680	0.733	12.0	7.4	3.6	1.177	1,184
Osteophloeum platyspermum	—	LA	21	81.9	0.550	0.596	12.8	7.4	4.9	1.011	1,000
Oxandra spp.	Yaya	LA	17	44.0	0.750	0.826	15.4	9.6	6.2	0.916	1,080
Oxystigma oxyphyllum	Tchitola	AF	9	57.0	0.530					0.797	832
Palaquium lanceolatum	Palak-palak	AS	11	87.2	0.548	0.601				1.038	1,026
Palaquium luzoniense	Nato	AS	11	135.3	0.415	0.445				0.952	976
Palaquium philippense	Malak-malak	AS	11	134.6	0.407	0.437				0.933	955
Pangium edule	Pangi	AS	11	112.6	0.504	0.549				1.070	1,072
Parahancornia amapa	Amapa	LA	5	67.4	0.478	0.515	12.0	7.7	4.3	0.798	800
Parashorea malaanonan	Seraya, white	AS	9	66.0	0.420					0.696	697
Parashorea plicata	Bagtikan	AS	11	102.1	0.499	0.543				1.018	1,008
Parashorea tomentella	Seraya, white	AS	9	70.0	0.390					0.669	663
Paratrophis glabra	Amudil	AS	11	59.9	0.771	0.881				1.174	1,233
Parinari campestris/excelsa	Burada/aiomoradan	LA	20	58.2	0.680	0.747	14.9	9.8	5.9	1.024	1,076
Parinari corymbosa	Liusin	AS	11	56.4	0.765	0.874				1.122	1,196
Parinari curatellifolia	Mobola plum	AF	18	96.0	0.587	0.633	12.2	6.5	3.6	1.158	1,151
Parinari rodolphi	Parinari	LA	20	60.3	0.710	0.781	15.2	10.1	6.0	1.091	1,138
Parkia paraensis	Fava arara tucupi	LA	2	129.5	0.440	0.490	11.9	7.6	3.5	0.992	1,010
Parkia pendula	Faveira bolota	LA	2	126.0	0.500	0.560	10.5	7.8	3.8	1.110	1,130
Parkia roxburghii	Kupang	AS	11	225.0	0.344	0.364				0.940	1,118
Parkia spp.	Faveira	LA	5	114.8	0.442	0.470	9.8	7.0	2.8	0.950	950
Peltogyne mexicana	Nazareno	LA	17	57.0	0.830	0.878	9.1	6.7	3.9	1.220	1,303
Peltogyne spp.	Amarante	LA	5	47.9	0.812	0.870	11.2	6.6	4.6	1.057	1,200
Peltogyne spp.	Purpleheart	LA	9	62.0	0.740					1.154	1,199
Peltogyne venosa	Purpleheart	LA	21	70.7	0.670	0.712	9.9	6.1	3.2	1.132	1,144
Peltophorum pterocarpum	Siar	AS	11	91.8	0.616	0.686				1.189	1,181
Pentacme contorta	Lauan, white	AS	11	102.9	0.435	0.468				0.895	883

Appendix A. Drying properties of tropical hardwoods[a]–Continued

Scientific name	Common name	Region[b]	Ref.	M_g (%)	G_b	G_{12}	S_v (%)	S_t (%)	S_r (%)	DTI	W_g (kg/m^3)
Pentacme mindanensis	Mindanao lauan	AS	11	91.4	0.398	0.425				0.779	762
Pericopsis angolensis	Mubanga	AF	18	39.0	0.806	0.855	9.5	5.1	3.7	0.877	1,120
Pericopsis elata	Afrormosia	AF	9	62.0	0.650					1.020	1,053
Persea caerulea	Aguacate chico	LA	17	86.0	0.390	0.422	12.6	8.4	3.7	0.743	725
Persea veraguasensis	Sigua carano	LA	17	61.0	0.390	0.417	10.7	7.5	3.2	0.618	628
Phaeanthus ebracteolatus	Kalimatas	AS	11	92.9	0.561	0.617				1.093	1,082
Pipadeniastrum africanum	Dabema	AF	3	69.5	0.590	0.700	12.4	8.5	3.8	0.993	1,000
Piptadenia suaveolens	Fava folha fina/timborana	LA	2	53.9	0.760	0.870	13.1	8.3	5.1	1.082	1,170
Piptadeniastrum africanum	Dahoma	AF	9	96.0	0.570					1.126	1,117
Pisonia spp.	Peronil	LA	17	95.0	0.420	0.463	15.5	9.6	5.8	0.835	819
Pisonia umbellifera	Anoling	AS	11	393.7	0.214	0.220				0.688	1,057
Pittosporum pentandrum	Mamalis	AS	11	95.7	0.512	0.558				1.014	1,002
Planchonella pachycarpa	Goiabao	LA	5	49.7	0.801	0.910	19.9	13.0	6.9	1.073	1,200
Planchonella pachycarpa	Goiabao	LA	2	58.1	0.740	0.900	18.1	12.6	6.5	1.108	1,170
Planchonia spectabilis	Lamog	AS	11	103.6	0.551	0.605				1.127	1,122
Platonia insignis Mart.	Bacuri	LA	5	42.6	0.772	0.850	15.4	1	5.4	0.915	1,100
Platymiscium trinitatis	—	LA	21	31.1	0.940	1.016	12.5	5.6	5.3	0.769	1,232
Podocarpus imbricatus	Igem	AS	11	84.2	0.469	0.508				0.879	864
Podocarpus philippinensis	Malakauayan	AS	11	72.8	0.503	0.548				0.874	869
Poeppigia procera	Frijolillo	LA	17	65.0	0.710	0.767	12.4	9.1	3.7	1.141	1,172
Polyalthia flava	Lanutan-dilau	AS	11	110.0	0.514	0.561				1.080	1,079
Polyscias nodosa	Malapapaya	AS	11	159.1	0.377	0.402				0.919	977
Pometia pinnata	Malugai	AS	11	91.1	0.559	0.615				1.080	1,068
Pouteria caimito	Abiurana	LA	2	45.5	0.880	1.030	14.5	9.4	5.3	1.094	1,280
Pouteria carabobensis	Chupon	LA	19	63.8	0.680	0.746	14.8	10.5	4.4	1.083	1,114
Pouteria spp.	Mamey de montana	LA	17	63.0	0.590	0.655	16.5	11.0	5.5	0.939	962
Pouteria spp.	Maranoncillo	LA	17	61.0	0.690	0.752	13.8	8.4	4.6	1.069	1,111
Pouteria spp.	Nispero cuascudo	LA	17	59.0	0.730	0.806	14.8	9.5	6.1	1.105	1,161
Pouteria spp.	Nispero mono	LA	17	59.0	0.700	0.774	15.9	10.5	6.0	1.062	1,113
Pouteria spp.	Rosetto blanco	LA	17	70.0	0.600	0.655	14.1	9.4	4.4	1.013	1,020
Pouteria villamilii	Villamil nato	AS	11	124.0	0.474	0.513				1.048	1,062
Prioria copaifera	Cativo	LA	5	85.2	0.459	0.480	7.3	5.0	2.3	0.866	850
Prioria copaifera	Cativo	LA	19	81.2	0.400	0.423	8.9	5.3	2.4	0.740	725
Prioria copaifera	Cativo blanco/negro	LA	17	91.0	0.450	0.483	11.5	8.3	3.1	0.876	860
Protium decandrum	Kurokai	LA	9	72.0	0.530					0.914	912

Appendix A. Drying properties of tropical hardwoods[a]–Continued

Scientific name	Common name	Region[b]	Ref.	M_g (%)	G_b	G_{12}	S_v (%)	S_t (%)	S_r (%)	DTI	W_g (kg/m^3)
Protium spp.	Breu	LA	5	52.8	0.589	0.650	15.6	1	5.6	0.837	900
Protium spp.	Chutra	LA	17	83.0	0.480	0.519	12.4	8.6	3.9	0.893	878
Protium spp.	Breu manga	LA	2	47.4	0.760	0.900	15.0	9.8	5.1	0.985	1,120
Protium tenuifolium	Breu preto	LA	2	63.5	0.630	0.720	12.0	8.4	4.2	1.005	1,030
Prunus spp.	Mamey colorado	LA	17	76.0	0.580	0.652	18.4	11.5	5.3	1.025	1,021
Pseudobombax septenatum	Barrigon	LA	17	394.0	0.140	0.149	10.8	9.4	2.6	0.453	692
Pseudolmedia spp.	Mariabe	LA	17	63.0	0.590	0.649	15.1	10.4	4.4	0.939	962
Pseudosamanea guachapele	Frijolillo	LA	19	60.4	0.560	0.587	7.6	4.5	2.9	0.871	898
Pseudosindora palustris	Swamp sepetir	AS	9	54.0	0.560					0.810	862
Pterocarpus angolensis	Muninga	AF	9	64.0	0.590					0.948	968
Pterocarpus angolensis	Muninga	AF	18	69.0	0.574	0.595	5.9	3.6	2.2	0.964	970
Pterocarpus indicus	Narra	AS	11	109.0	0.530	0.580				1.109	1,108
Pterocarpus officinalis	Sangre de gallo	LA	17	63.0	0.360	0.384	10.6	7.0	3.6	0.583	587
Pterocarpus vernalis	Sangre	LA	19	62.0	0.570	0.609	10.8	6.8	3.9	0.900	923
Pterocymbium tinctorium	Taluto	AS	11	278.8	0.278	0.291				0.812	1,053
Pterygota bequaertii	Pterygota	AF	9	56.0	0.560					0.830	874
Pterygota macrocarpa	Pterygota	AF	9	84.0	0.470					0.880	865
Pygeum vulgare	Lago	AS	11	91.2	0.566	0.623				1.093	1,082
Qualea albiflora	Mandioqueira lisa	LA	2	100.0	0.570	0.670	14.7	9.5	5.3	1.146	1,140
Qualea albiflora/Q. spp.	Gronfoeloe/wiswiskwalie	LA	19	151.8	0.500	0.539	12.0	9.2	3.4	1.188	1,259
Qualea brevipedicellata	Mandioqueira aspera	LA	2	58.1	0.740	0.860	13.6	8.6	4.4	1.108	1,170
Qualea cymulosa	Gorgojo	LA	17	85.0	0.600	0.644	11.4	8.9	3.3	1.118	1,110
Qualea rosea	Mountain gronfoeloe	LA	21	82.5	0.530	0.569	11.4	8.4	4.4	0.979	967
Qualea spp.	Mandioqueira	LA	5	80.6	0.664	0.730	15.0	9.4	5.6	1.201	1,200
Quercus spp.	Mamecillo	LA	17	55.0	0.760	0.855	18.5	11.7	6.4	1.097	1,178
Quercus spp.	Roble	LA	17	77.0	0.620	0.707	20.5	13.4	5.4	1.099	1,097
Radermachera pinnata	Banai-banai	AS	11	152.3	0.506	0.551				1.203	1,277
Rhizophora mangle	Mangle colorado	LA	17	46.0	0.830	0.908	14.3	10.7	5.0	1.045	1,212
Ricinodendron rautanenii	Mugongo	AF	9	238.0	0.150					0.423	507
Rollinia exsucca	Envira	LA	2	96.2	0.520	0.590	12.3	8.8	3.2	1.032	1,020
Roupala montana	Faeira/louro faia	LA	2	61.0	0.770	0.930	18.0	12.3	6.3	1.186	1,240
Salmalia malabarica	Malabulak	AS	11	197.4	0.324	0.342				0.851	964
Samanea saman	Raintree	AS	11	152.8	0.462	0.500				1.104	1,168
Sandoricum koetjape	Santol	AS	11	134.4	0.443	0.477				1.012	1,038
Sandoricum vidalii	Malasantol	AS	11	96.1	0.434	0.467				0.867	851

Appendix A. Drying properties of tropical hardwoods[a]–Continued

Scientific name	Common name	Region[b]	Ref.	M_g (%)	G_b	G_{12}	S_v (%)	S_t (%)	S_r (%)	DTI	W_g (kg/m^3)
Sandwithiodoxa egregia	Abiu pitomba	LA	2	46.4	0.840	0.970	15.7	11.2	6.8	1.064	1,230
Sapium biglandulosum	Lechero	LA	20	81.6	0.450	0.476	9.2	6.6	3.3	0.832	817
Sapium luzonicum	Balakat-gubat	AS	11	148.2	0.396	0.423				0.941	983
Sapium spp.	Olivo	LA	17	63.0	0.500	0.525	8.0	5.7	3.1	0.801	815
Schima wallichii	Chilauni	AS	13	100.0	0.539	0.585	13.0	8.5	4.5	1.086	1,078
Schizolobium parahybum	Tinecu	LA	17	85.0	0.600	0.644	11.4	8.9	3.3	1.118	1,110
Sclerocarya spp.	Mgongo	AF	9	81.0	0.440					0.811	796
Sclerolobium chrysophyllum	Tachi pitomba	LA	2	75.4	0.610	0.700	12.1	8.0	4.2	1.071	1,070
Sclerolobium melinonii	Jawaledan	LA	21	107.3	0.470	0.507	12.3	8.9	4.4	0.981	974
Sclerolobium paraense	Tachi branco	LA	2	91.8	0.610	0.760	12.3	8.3	4.0	1.178	1,170
Sclerolobium poeppigianum	Tachi pitomba	LA	2	80.0	0.650	0.740	12.6	8.1	4.2	1.178	1,170
Scleronema spp.	Cardeiro	LA	5	53.0	0.654	0.720	15.4	1	5.4	0.928	1,000
Scottellia coriacea	Odoko	AF	9	65.0	0.560					0.910	924
Serialbizia acle	Akle	AS	11	106.5	0.573	0.632				1.183	1,183
Sesbania grandiflora	Katurai	AS	11	184.4	0.397	0.424				1.015	1,129
Shorea acuminatissma	Yellow seraya	AS	9	93.0	0.400	00				0.789	772
Shorea agsaboensis	Tiaong	AS	11	115.4	0.367	0.391				0.795	791
Shorea almon	Almon	AS	11	103.5	0.429	0.461				0.885	873
Shorea astylosa	Yakal	AS	11	54.2	0.825	0.952				1.173	1,272
Shorea ciliata	Yakal-mabolo	AS	11	65.9	0.747	0.850				1.206	1,239
Shorea dasyphylla	Light red meranti	AS	9	56.0	0.410					0.615	640
Shorea faguetiana	Yellow seraya	AS	9	107.0	0.450					0.940	932
Shorea gibbosa	Yellow seraya	AS	9	63.0	0.420					0.677	685
Shorea gisok	Yakal-gisok	AS	11	61.2	0.757	0.863				1.170	1,220
Shorea guiso	Guijo	AS	11	73.4	0.681	0.766				1.172	1,181
Shorea guiso	Red selangan batu	AS	9	52.0	0.670					0.937	1,018
Shorea hopeifolia	Yellow seraya	AS	9	83.0	0.460					0.857	842
Shorea kalunti	Kalunti	AS	11	96.6	0.455	0.492				0.909	895
Shorea lamellata	Manggasinorong-lakihan	AS	11	79.7	0.418	0.449				0.766	751
Shorea leptoclados	Light red seraya	AS	9	73.0	0.360					0.633	623
Shorea macrophylla	Light red seraya	AS	9	74.0	0.300					0.534	522
Shorea malibato	Yakal-malibato	AS	11	59.9	0.778	0.890				1.185	1,244
Shorea negrosensis	Red lauan	AS	11	101.3	0.434	0.471				0.887	874
Shorea parvifolia	Light red seraya	AS	9	84.0	0.340					0.643	626
Shorea pauciflora	Dark red seraya	AS	9	69.0	0.460					0.779	777

Appendix A. Drying properties of tropical hardwoods[a]–Continued

Scientific name	Common name	Region[b]	Ref.	M_g (%)	G_b	G_{12}	S_v (%)	S_t (%)	S_r (%)	DTI	W_g (kg/m^3)
Shorea philippinensis	Manggasinoro	AS	11	117.8	0.420	0.451				0.914	915
Shorea plagata	Malaguijo	AS	11	62.5	0.698	0.787				1.097	1,134
Shorea polita	Malaanonang	AS	11	107.7	0.464	0.502				0.971	964
Shorea polysperma	Tangile	AS	11	88.0	0.461	0.499				0.883	867
Shorea smithiana	Light red seraya	AS	9	64.0	0.350					0.573	574
Shorea squamata	Mayapis	AS	11	145.3	0.386	0.410				0.911	947
Shorea superba	Selangan batu	AS	9	56.0	0.660					0.971	1,030
Shorea waltonil	Light red seraya	AS	9	70.0	0.350					0.602	595
Simarouba spp.	Marupa	LA	5	66.0	0.392	0.415	9.4	6.5	2.9	0.651	650
Simarouba amara	Simaruba	LA	19	69.2	0.380	0.399	8.0	5.0	2.3	0.648	643
Spathodea campanulata	African Tulip	AS	11	265.7	0.245	0.255				0.708	896
Spondias mombin	Jobo	LA	20	131.4	0.400	0.426	1	6.3	2.9	0.909	926
Spondias mombin	Jobo	LA	17	128.0	0.360	0.375	6.8	5.0	2.9	0.813	821
Staudtia stipitata	Niove	AF	9	52.0	0.760					1.055	1,155
Stemonurus luzoniensis	Mabunot	AS	11	206.4	0.367	0.390				0.975	1,124
Sterculia apetala	Panama	LA	17	227.0	0.330	0.355	11.8	8.3	3.7	0.905	1,079
Sterculia ceramica	Malakalumpang	AS	11	261.3	0.270	0.282				0.775	976
Sterculia murex	Lowveld chestnut	AF	18	131.0	0.472	0.511	12.7	7.2	3.3	1.066	1,090
Sterculia oblonga	Yellow sterculia	AF	9	60.0	0.610					0.941	976
Sterculia rhinopetala	Brown sterculia	AF	9	61.0	0.640					0.995	1,030
Sterculia speciosa	Chicha	LA	2	122.4	0.490	0.580	16.2	10.6	5.2	1.077	1,090
Sterculia spp.	Chicha	LA	5	63.2	0.582	0.640	15.1	10.1	5.0	0.929	950
Sterculia spp.	Udal	AS	1	133.0	0.320					0.735	746
Strombosia philippinensis	Tamayuan	AS	11	61.6	0.714	0.807				1.111	1,154
Swartzia bannia	Bannia	LA	21	25.1	1.020	1.093	11.2	7.6	3.9	0.543	1,276
Swartzia leiocalycina	Wamara	LA	9	38.0	0.870					0.917	1,201
Swartzia spp.	Coracao de Negro	LA	5	18.7	1.095	1.200	14.6	8.3	6.3	0.329	1,300
Sweetia spp.	Cocobolo	LA	17	57.0	0.800	0.868	13.1	7.8	4.8	1.178	1,256
Swietenia macrophylla	Mogno	LA	5	24.6	0.602	0.625	6.2	3.6	2.6	0.318	750
Swietenia macrophylla	Mahogany	LA	19	79.6	0.450	0.472	7.7	4.8	3.5	0.822	808
Swietenia macrophylla	Big-leafed Mahogany	AS	11	105.6	0.526	0.575				1.086	1,081
Swintonia floibunda	Civit	AS	1	90.0	0.580					1.112	1,102
Swintonia foxworthyi	Lomarau	AS	11	88.3	0.622	0.692				1.178	1,171
Sycopsis dunni	Parukapok	AS	11	73.5	0.631	0.703				1.091	1,095
Symphonia globulifera	Manil	LA	5	39.7	0.644	0.705	14.4	9.7	4.7	0.722	900

Appendix A. Drying properties of tropical hardwoods[a]–Continued

Scientific name	Common name	Region[b]	Ref.	M_g (%)	G_b	G_{12}	S_v (%)	S_t (%)	S_r (%)	DTI	W_g (kg/m^3)
Symphonia globulifera	Chewstick	LA	21	85.4	0.580	0.640	15.6	9.7	5.7	1.085	1,075
Symphonia globulifera	Cerillo	LA	17	101.0	0.550	0.598	13.5	9.4	4.3	1.112	1,106
Symphonia globulifera	Anani	LA	2	93.1	0.580	0.670	13.2	7.9	4.5	1.129	1,120
Symphonia globulifera	Waike chewstick	LA	9	97.0	0.590					1.169	1,162
Symplocos spp.	Mangle blanco de montana	LA	17	91.0	0.490	0.549	17.9	9.8	4.9	0.951	936
Syzygiopsis oppositifolia	Abiu branco	LA	2	84.6	0.650	0.740	12.5	7.8	4.6	1.204	1,200
Syzygium luzonense	Duktulan	AS	11	83.1	0.630	0.702				1.159	1,154
Syzygium nitidum	Makaasim	AS	11	64.2	0.744	0.845				1.184	1,222
Syzygium simile	Panglongboien	AS	11	106.1	0.558	0.613				1.152	1,150
Tabebuia donnell-smithii	Primavera	LA	19	57.7	0.400	0.423	9.1	5.1	3.1	0.612	631
Tabebuia guayacan	Guayacan	LA	17	33.0	0.850	0.928	14.0	8.1	6.0	0.761	1,131
Tabebuia guayacan	Guayacan	LA	6	35.4	0.850	0.933	14.8	8.5	6.8	0.830	1,151
Tabebuia guayacan/beterotricha	Guayacan	LA	19	38.0	0.820	0.892	13.5	8.6	6.2	0.868	1,132
Tabebuia heterotricha	Guayacan	LA	7	40.5	0.800	0.863	12.2	8.6	5.6	0.903	1,124
Tabebuia pentaphylla	Roble blanco	LA	19	68.2	0.520	0.551	9.5	6.1	3.6	0.871	875
Tabebuia serratifolia	Bethabara	LA	20	31.2	0.920	0.999	13.2	8.0	6.6	0.758	1,207
Tabebuia spp.	Ipe	LA	5	33.2	0.976	1.050	11.7	6.5	5.2	0.873	1,300
Tachigalia cf. myrmecophila	Tachi preto/tachi	LA	2	96.5	0.570	0.650	11.9	7.5	5.2	1.129	1,120
Tarrietia sylvatica	Dungon	AS	11	61.8	0.778	0.890				1.207	1,259
Tarrietia utilis	Niangon	AF	9	47.0	0.540					0.707	794
Tectona grandis	Teak	AS	19	52.0	0.580	0.605	6.8	4.2	2.3	0.816	882
Tectona grandis	Teak	AS	11	116.0	0.499	0.543				1.073	1,078
Tectona grandis	Teak	AS	9	48.0	0.550					0.731	814
Tectona grandis	Teak	AF	9	80.5	0.530					0.967	957
Tectonia grandis (plantation)	Teak	LA	19	72.3	0.560	0.578	5.1	4.6	2.1	0.965	965
Teijsmanniodendron ahernianum	Sasalit	AS	11	41.4	0.903	1.058				1.033	1,277
Terminalia aff. lucida	Amarillo	LA	17	71.0	0.700	0.740	9.0	6.0	3.4	1.182	1,197
Terminalia amazonia	Nargusta	LA	19	67.3	0.640	0.693	12.7	7.9	4.8	1.054	1,071
Terminalia amazonia	Nargusta	AF	9	67.0	0.640					1.052	1,069
Terminalia amazonia	Amarillo carabazuelo	LA	17	51.0	0.680	0.747	14.9	8.7	6.4	0.937	1,027
Terminalia chebula	—	AF	18	56.0	0.744	0.821	15.6	7.2	5.2	1.088	1,162
Terminalia citrina	Binggas	AS	11	65.8	0.739	0.839				1.193	1,225
Terminalia copelandii	Lanipau	AS	11	81.1	0.458	0.495				0.844	829
Terminalia foetidissima	Talisai-gubat	AS	11	86.2	0.547	0.600				1.031	1,019
Terminalia guyanensis	Guayabo de Monte	LA	19	73.6	0.570	0.604	9.3	6.1	4.0	0.991	990

Appendix A. Drying properties of tropical hardwoods[a]–Continued

Scientific name	Common name	Region[b]	Ref.	M_g (%)	G_b	G_{12}	S_v (%)	S_t (%)	S_r (%)	DTI	W_g (kg/m^3)
Terminalia microcarpa	Kalumpit	AS	11	104.8	0.528	0.577				1.087	1,081
Terminalia nitens	Sakat	AS	11	95.4	0.595	0.658				1.170	1,163
Terminalia servicea	Nkonola	AF	18	41.0	0.738	0.788	10.6	6.4	3.8	0.847	1,041
Terminalia spp.	Criollo	LA	17	56.0	0.580	0.622	11.2	6.5	4.5	0.858	905
Testulea gabonensis	Izombe	AF	3	66.7	0.600	0.720	10.2	7.0	4.0	0.986	1,000
Tetragastris altissima	Breu manga	LA	2	40.5	0.740	0.850	13.0	9.0	4.6	0.839	1,040
Tetragastris balsamifera	Masa	LA	19	60.5	0.670	0.731	13.9	8.5	4.4	1.035	1,075
Tetragastris panamensis	Breu preto	LA	2	55.8	0.770	0.920	15.0	9.9	5.1	1.121	1,200
Tetragastris spp.	Secuadra	LA	17	54.0	0.640	0.688	11.6	8.1	4.7	0.920	986
Tetragastris spp.	Ciruelo	LA	17	77.0	0.660	0.709	11.5	7.7	4.2	1.167	1,168
Tetragastris spp.	Sali	LA	5	25.0	0.800	0.870	13.2	8.6	4.6	0.428	1,000
Thespesia populnea	Banola	AS	11	109.0	0.523	0.571				1.094	1,093
Tieghemella heckelii	Makore	AF	9	44.0	0.540					0.670	778
Toona calantas	Kalantas	AS	11	124.2	0.294	0.309				0.659	659
Toona ciliata	Toon	AS	13	100.0	0.424	0.453	10.7	7.3	3.4	0.862	848
Trattinickia cf. burseraefolia	Breu/amescla	LA	2	120.0	0.500	0.570	11.7	6.8	4.1	1.089	1,100
Trattinickia spp.	Amesclao	LA	5	103.4	0.541	0.585	12.6	8.2	4.4	1.106	1,100
Trattinickia spp.	Carano	LA	17	87.0	0.410	0.436	1	6.7	4.0	0.784	767
Trema orientalis	Anabiong	AS	11	238.6	0.305	0.321				0.850	1,033
Trichilia lecointei	Pracuuba da terra firme	LA	2	41.1	0.900	1.040	13.2	8.2	4.4	1.023	1,270
Triplaris guayaquilensis	Fernansanchez	LA	5	40.6	0.587	0.630	11.4	7.3	4.1	0.675	825
Triplochiton scleroxylon	Obeche	AF	9	76.0	0.300					0.541	528
Tristania decorticata	Malabayabas	AS	11	43.8	0.921	1.083				1.106	1,293
Tristania micrantha	Tiga	AS	11	45.3	0.885	1.033				1.096	1,286
Turpinia ovalifolia	Anongo	AS	11	172.0	0.364	0.387				0.912	990
Ulmus mexicana	Cenizo	LA	17	77.0	0.550	0.598	13.4	8.6	5.3	0.980	974
Vantanea parviflora	Uchirana	LA	2	39.5	0.860	1.040	17.6	10.3	8.2	0.944	1,200
Vatairea paraensis	Faveira amargosa	LA	5	53.2	0.718	0.770	11.3	7.8	3.5	1.016	1,100
Vatairea paraensis	Fava amargosa	LA	2	59.0	0.780	0.900	14.0	9.8	4.8	1.176	1,240
Vatairea sericea	Faveira bolacha	LA	2	71.8	0.710	0.820	13.9	8.4	4.5	1.206	1,220
Vatairea spp.	Amargo amargo	LA	17	88.0	0.640	0.695	13.1	8.1	4.6	1.209	1,203
Vatica mangachapoi	Narig	AS	11	76.2	0.663	0.743				1.165	1,168
Vatica pachyphylla	Thick-leafed narig	AS	11	55.2	0.771	0.881				1.114	1,197
Virola koschnyi	Virola, light	LA	9	75.0	0.440					0.780	770
Virola melinonii	Hill dalli	LA	21	49.5	0.420	0.456	13.1	9.2	5.5	0.577	628

Appendix A. Drying properties of tropical hardwoods[a]–Concluded

Scientific name	Common name	Region[b]	Ref.	M_g (%)	G_b	G_{12}	S_v (%)	S_t (%)	S_r (%)	DTI	W_g (kg/m^3)
Virola spp.	Virola	LA	5	60.0	0.484	0.533	15.2	9.8	5.4	0.754	775
Virola spp.	Miguelarillo	LA	17	97.0	0.370	0.407	15.2	9.3	4.7	0.745	729
Virola spp.	Mollejo	LA	17	76.0	0.360	0.389	12.3	9.0	3.5	0.647	634
Virola surinamensis	Banak	LA	20	93.8	0.420	0.470	17.6	12.4	5.3	0.831	814
Vitex cooperi/kuylenii	Rajate bien/flor azul	LA	19	98.8	0.530	0.565	10.4	6.4	3.2	1.063	1,054
Vitex gaumeri	Fiddlewood	LA	19	42.5	0.560	0.603	11.9	7.3	4.8	0.673	798
Vitex giganteum	Cuajado	LA	17	64.0	0.520	0.551	9.4	7.1	2.9	0.840	853
Vitex orinocensis	—	LA	21	115.4	0.530	0.558	8.4	6.1	2.1	1.134	1,142
Vitex parviflora	Molave	AS	11	66.9	0.736	0.836				1.200	1,228
Vitex turczaninowii	Lingo-lingo	AS	11	121.7	0.487	0.529				1.068	1,080
Vochysia ferruginea/hondurensis	Corosillo	LA	17	146.0	0.400	0.425	9.7	8.8	2.2	0.945	984
Vochysia ferruginea/hondurensis	Pegle	LA	17	158.0	0.410	0.441	11.7	10.9	2.0	0.995	1,058
Vochysia guianensis	Quaruba rosa/quaruba	LA	2	111.1	0.540	0.640	17.5	11.5	5.0	1.137	1,140
Vochysia guianensis/hondurensis	Quaruba	LA	19	191.9	0.370	0.408	15.4	8.2	4.8	0.960	1,080
Vochysia hondurensis	Quaruba	LA	9	165.0	0.380					0.938	1,007
Vochysia lanceolata	Quillo sisa	LA	21	117.9	0.520	0.575	15.9	11.0	5.0	1.123	1,133
Vochysia maxima	Quaruba verdadeira	LA	2	126.5	0.490	0.570	12.1	8.8	4.0	1.090	1,110
Vochysia melinonii	Quaruba rosa/quaruba	LA	2	125.5	0.510	0.590	14.1	10.8	4.7	1.130	1,150
Vochysia obidensis	Quaruba rosa/quaruba	LA	2	116.0	0.500	0.580	12.7	1	3.2	1.075	1,080
Vochysia spp.	Quaruba	LA	5	74.4	0.473	0.515	13.6	9.8	3.8	0.833	825
Vochysia spp.	Quaruba	LA	9	63.0	0.440					0.708	717
Vouacapoua americana	Acapu	LA	20	47.9	0.790	0.857	13.0	6.9	4.9	1.030	1,168
Vouacapoua americana Aubi	Wacapou	LA	5	27.3	0.864	0.925	11.0	6.7	4.3	0.566	1,100
Wallaceodendron celebicum	Banuyo	AS	11	105.8	0.550	0.604				1.135	1,132
Weinmannia luzoniensis	Itangan	AS	11	132.3	0.490	0.532				1.109	1,138
Xanthophyllum excelsum	Bok-bok	AS	11	91.5	0.623	0.693				1.200	1,193
Xylopia nitida	Envira beanca	LA	2	94.6	0.560	0.660	16.6	11.4	6.7	1.100	1,090
Xylosma spp.	Rosetto	LA	17	69.0	0.650	0.715	15.2	10.9	4.9	1.085	1,099
Zanthoxylum rhetsa	Kaitana	AS	11	172.8	0.333	0.352				0.838	908
Ziziphus talanai	Balakat	AS	11	92.2	0.527	0.576				1.026	1,013

[a]Abbreviations for properties are as follows: M_g is green moisture content, G_b basic specific gravity, G_{12} gravity at 12 percent moisture content, S_v volumetric shrinkage, S_t tangential shrinkage, S_r radial shrinkage, DTI drying time index, and W_g green weight.

[b]Abbreviations for regions are as follows: AS is Asia, AF Africa, and LA Latin America.

Appendix B. Estimation of Drying Properties

Chichignoud and others (1990) did not provide data on basic specific gravity and green moisture content. These properties were estimated from green weight W_g (kg/m^3), specific gravity at 12 percent moisture content G_{12}, tangential shrinkage St from green to ovendry, and radial shrinkage S_t from green to ovendry. The calculations for green moisture content M_g, ovendry weight OD, and basic specific gravity G_b are given in Equations (7) to (9), respectively:

$$M_g = \frac{W_g - \mathrm{OD}}{\mathrm{OD}} 100 \qquad (7)$$

$$\mathrm{OD} = G_b \rho V_g \qquad (8)$$

where V_g is taken as 1 cm^3 and ρ is the density of water:

$$G_b = G_{12}\left(1 - S_v \frac{30 - 12}{30}\right) \qquad (9)$$

where S_v is volumetric shrinkage estimated as the sum of radial and tangential shrinkage. Shrinkage is assumed to begin at the fiber saturation point of 30 percent moisture content, although some tropical species have lower values.

Example:

$$G_b = 0.68\left(1 - (0.066 + 0.048)\frac{30 - 12}{30}\right) = 0.634$$

$$\mathrm{OD} = 0.634(1\,\mathrm{g/cm^3})(1\,\mathrm{cm^3}) = 0.634\,\mathrm{g}$$

$$M_g = \frac{0.900\,\mathrm{g} - 0.634\,\mathrm{g}}{0.634\,\mathrm{g}} 100 = 42.0\,\mathrm{percent}$$

In two reports (Anonymous 1988, 1990), green moisture content data were not provided. These sources provided data for basic specific gravity, green density (g/cm^3), specific gravity at 12 percent, and volumetric, tangential, and radial shrinkage. Using Equations (7) and (8) to calculate green moisture content and ovendry weight,

$$\mathrm{OD} = 0.38(1\,\mathrm{g/cm^3})(1\,\mathrm{cm^3}) = 0.38\,\mathrm{g}$$

$$M_g = \frac{0.675\,\mathrm{g} - 0.38\,\mathrm{g}}{0.38\,\mathrm{g}} 100 = 77.6\,\mathrm{percent}$$

Other sources (Dickinson and others 1949, Hess and others 1950, van der Slooten and others 1971, Wangaard and others 1952, 1954, 1955) did not provide data for specific gravity at 12 percent moisture content but did provide data for basic specific gravity, green moisture content, and volumetric shrinkage. Specific gravity at 12 percent was calculated by Equation (9).

In the study by van Vuuren and others (1978), neither basic specific gravity nor specific gravity at 12 percent moisture content were given. The study provided data for green moisture content, green weight, and volumetric shrinkage. Basic specific gravity was calculated by Equation (8), and ovendry weight was calculated by

Specific gravity at 12 percent moisture content was calculated by Equation (9). Example:

$$\mathrm{OD} = \frac{0.88\,\mathrm{g}}{121/100 + 1} = 0.398\,\mathrm{g}$$

$$G_b = \frac{0.398\,\mathrm{g}}{1\,\mathrm{cm^3}(1\,\mathrm{g/cm^3})} = 0.398$$

$$G_{12} = \frac{0.398}{1 - 0.09[(30 - 12)/30]} = 0.421$$

Green weight density D_g was calculated as described by Panshin and deZeeuw (1980). The working equation is

$$D_g = [G_b + G_b(M_g/100)]1,000\,\mathrm{kg/m^3}$$

Example:

$$D_g = [0.430 + 0.430(86.3/100)]1,000 = 801\,\mathrm{kg/m^3}$$

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