AN ANALYSIS OF TROPICAL HARDWOOD PRODUCT IMPORTATION AND CONSUMPTION IN THE UNITED STATES

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ABSTRACT

The consumption of forest products emanating from tropical rainforests is an issue that is receiving increasing attention in the United States. This attention stems from concerns over the sustainability of tropical ecosystems. However, trade statistics show the United States imported only 4.0 percent of all tropical timber products traded globally in 1989. In addition, the global trade in tropical timber products is estimated to be directly responsible for only about 4 percent of the volume of tropical forests cut. Therefore, U.S. imports account for less than two-tenths of one percent of the world's tropical deforestation. The U.S. furniture industry consumed less than one-third (on a value basis) of all the tropical timber imported by the United States in 1993. Our calculations show that the U.S. furniture industry tropical wood consumption represents less than one-tenth of one percent of the world's tropical deforestation.

It has been estimated that mature tropical forests once covered 1.5 billion hectares, and that now only 900 million hectares of forest remain (27). Some suggest that at the present rate of deforestation, estimated at 1.8 percent per year, the remaining tropical forests will be consumed in another 55 years (17,18). However, much uncertainty surrounds both the extent and rate of decline of the tropical forest and reliable data are sparse (14). This makes specific and accurate predictions about the effects of deforestation rather difficult. Moreover, it is not fully understood what comprises a tropical forest and the rules that govern how tropical forest ecosystems work (8). Even less information on the potential consequences of the widescale loss of these areas is available (20,21).

The uncertainty over the impact of logging tropical forests has made the importation of tropical hardwood one of the most controversial forest products issues in the United States. As characterized by Ozanne and Smith (21) "extreme" environmental NGOs (nongovernment organizations) have called on some governments to ban all imports of tropical timber. These organizations have also urged consumers to boycott the purchase of such products (2,9). "Moderate" environmental NGOs realize the impracticality of a ban/boycott strategy; they understand that economic. incentives are necessary to encourage using tropical lands to produce wood and discourage conversion to other uses (9,10,14,24,26).

Although there has been considerable discussion concerning tropical deforestation issues, there has been little consideration regarding the tropical products that are being imported into the United States. There is neither information on the users of tropical products nor the relative impact of imports on tropical ecosystems. This study combines an analysis of secondary data, including U.S. Department of Commerce data, with telephone interviews of selected International Hardwood Products Association (IHPA) members in order to: 1) determine the type of tropical hardwood products imported and the source of these products; 2) qualitatively estimate usage by end-use segment with a particular emphasis on the furniture industry; and 3) assess the relative impact of U.S. imports on tropical ecosystems.

U.S. TROPICAL HARDWOOD IMPORTS

The United States imported 4.0 percent of the world's 47 MMm^3 of tropical timber

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Forest Prod. J. 45(4): 31-37.

products traded globally in 1989; Canada imported an additional 0.3 percent of the total volume traded that year (4). Tables 1 and 2 show the countries included in each tropical hardwood product source region and the harmonized tariff codes we included in our analysis, respectively. Table 3 presents specific volume and value data, respectively, for tropical hardwood products imported by the United States and the source region of these products for 1993. The value of total U.S. tropical hardwood product consumption in 1993 was $533 million. Tropical hardwood plywood represented $412 million or 76.9 percent of the value of all tropical wood products consumed by the United States in 1993. Imports of tropical hardwood lumber and veneer were $99 million and $20 million dollars, respectively, in 1993. U.S. hardwood log imports from tropical areas amounted to a relatively minor $2 million in 1993.

Tropical hardwood plywood has been the primary product imported and consumed by the United States since before 1970 (13). Over the past 5 years, tropical plywood has accounted for, on average, 83 percent of the volume and .77 percent of the value of all U.S. imports of tropical wood products. Southeast Asia supplied over 90 percent of the tropical plywood imported into the United States in 1993. The major Asian suppliers of plywood are Indonesia and Malaysia.

Next to plywood, lumber is the second most important tropical hardwood product imported by the United States.

Latin America supplied 64 percent of the volume and 61 percent of the value of tropical hardwood lumber imported by the United States in 1993 (Table 3). Brazil and Bolivia combined to supply 53 percent of the volume of tropical hardwood lumber imported by the United States.

Southeast Asia was the second leading supply region for tropical hardwood lumber to the United States in 1993. Malaysia and the Philippines were the two largest Southeast Asian supply nations. Malaysia provided 16.8 percent of the total tropical hardwood lumber volume imported by the United States, while the Philippines supplied 4.6 percent. Africa plus all other sources combined to provide only 5.4 Mm^3 (or about 3%) of total U.S. imports of tropical hardwood lumber in 1993.

In 1993, the United States imported 9.3 Mm^3 or $20 million of tropical hardwood veneer (Table 3).[1] Nearly one-third (30%) of the value and approximately 41 percent of the volume of U.S. tropical veneer imports were from Southeast Asia (primarily the Philippines and Indonesia). Latin America was the second largest supplier of tropical hardwood veneers, sourcing 34 percent of the total volume. Brazil accounted for over 93 percent of all veneer imported from Latin American sources in 1993. Secondary suppliers, such

TABLE 1. -*Sources of U.S. tropical hardwood imports* (24).

Southeast Asia	Latin America	Secondary sources	Africa
Australia, Bangladesh, Burma, China, Fiji, Hong Kong, India, Indonesia, Japan, Laos, Malaysia, Papua New Guinea, Philippines, Singapore, South Korea, Taiwan, Thailand, and Western Samoa.	Belize, Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, EI Salvador, Guatemala, Guyana, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Suriname and Trinidad & Tobago.	Canada, Belgium, Denmark, Finland, France, West Germany, Greece, Ireland, Israel, Italy, Netherlands, Poland, Russia, Spain, Sweden, Switzerland and United Kingdom.	Cameroon, Congo, Ghana, Guinea, Ivory Coast, Nigeria, Republic of South Africa and Zaire.

TABLE 2. - *Harmonized tariff codes for U.S. tropical hardwood imports* (24).

Plywood	Lumber	Veneer	Logs
4412111050	4407210005	4408200000	4403310000
4412111060	4407210010		4403330000
4412112010	4407210025		4403350000
4412112020	4407210030		
4412112030	4407210090		
4412112040	4407210095		
4412112050	4407220000		
4412112060	4407230025		
4412112070	4407230030		
4412115000	4407230090		
4412122040	4407230095		
4412293040			

TABLE 3. – *U.S. tropical hardwood product consumption by volume (in thousands of cubic meters).* 1993.

	Southeast Asia	Latin America	Secondary sources	Africa	Total
Plywood					
volume	802.8	60.4	20.8	0.0	884.0
value	379.8	231.0	9.4	0.0	412.3
Lumber					
volume	55.6	109.9	3.6	1.8	170.9
value	34.2	60.0	3.7	0.9	98.8
Veneer					
volume	3.9	3.2	1.6	0.6	9.3
value	6.4	7.0	5.9	0.7	20.0
Logs					
volume	2.0	0.6	0.3	1.4	4.3
value	1.1	0.5	0.2	0.5	2.3
Totals					
volume	864.3	174.1	26.3	3.8	1,068.5
value	421.5	298.5	19.2	2.1	533.4

[1] The u.s. Dept of Commerce reports imported veneer in square meter units. Plywood, lumber, and logs, however, are reported in cubic meter units. Veneer import data must therefore be convened to a cubic meter equivalent in order to be valid for comparison. Due to thickness variations of imported veneer, no standard coefficient exists for convening veneer from square meters to cubic meters. However, industry experts suggested that using .025 inch (1140th of an inch) as a conversion coefficient would provide a reasonable estimate for imported veneer volume. Estimating veneer volume required multiplying Dept. of Commerce veneer data (already in square meters) by .000635 m to obtain a cubic meter equivalent.

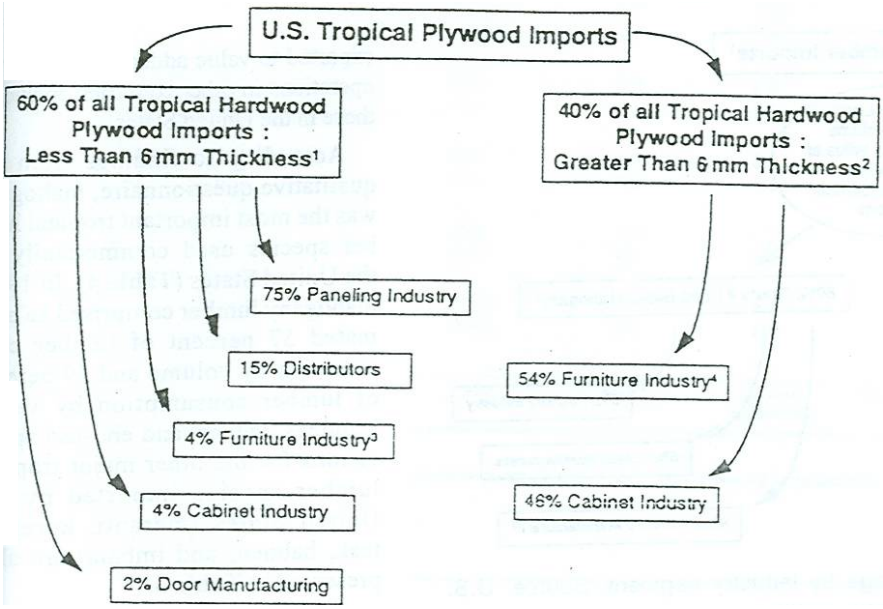

Figure 1. - Tropical hardwood plywood end-usage by industry segment. Source: U.S. Department of Commerce (24) plus industry sources. Breakdown estimates are on a percentage basis by surface measure. Industry estimates are volume-based. Commerce data are value-based. The authors feel the comparison between volume estimates and value ultimately provides QUALITATIVE ESTIMATES ONLY of channel end-use segments and, thus, do not adversely affect general research findings.

1 Using 1993 plywood import values of $412.3 million, the less than 6 mm thickness class has an approximate value of ($412.3 million) x (0.60) = $247.4 million for 1993.

2 Using 1993 plywood import values of $412.3 million, the greater than 6 mm class has an approximate value of ($412.3 million) x (.40) = $164.9 million for 1993.

3 Using the $247.4 million value, furniture industry consumption of plywood in the less than 6 mm class is estimated at ($247.4 million) x (0.04) = $9.9 million for 1993.

4 Using the $164.9 million value, furniture industry consumption of plywood in the greater than 6 mm class is estimated at ($164.9 million)?«O.54) = $89.1 million for 1993.

as Europe and Far Eastern countries provided 17.2 percent of the total volume of tropical hardwood veneer consumed by the United States in 1993.

In 1993, a relatively insignificant 4.3 Mm^3 and $2 million worth of tropical logs were consumed by the United States. Southeast Asia plus Africa combined to supply 79.1 percent of all tropical hardwood logs imported by the United States in 1993. The Ivory Coast and Ghana were the largest African suppliers of tropical logs; Malaysia and Singapore were the major Asian suppliers that year.

U.S. TROPICAL WOOD PRODUCT USE

Industry sources[2] supplied qualitative information via personal telephone interviews in order to develop end-use channel perspectives for various categories of imported tropical wood products (Figs. 1 through 3). These expert testimonials[3] resulted in estimated percentage breakdowns by product category and end-use segments. We then applied U.S. Department of Commerce value of shipment statistics (24) to these estimated percentages (by channel segment) to result in qualitative value estimates for the major usage categories (tropical plywood, lumber, and veneer) in 1993.

The major hardwood plywood products imported into the United States are tropical plywood 6 mm or less in thickness, and tropical plywood greater than 6 mm in thickness. According to industry sources, roughly 60 percent of imported tropical plywood is 6 mm or less in thickness, and 40 percent is greater than 6 mm in thickness. In the 6 mm or less thickness class, the paneling industry consumes an estimated 75 percent; wholesalers/distributors, 15 percent; cabinet manufacturers, 4 percent; furniture manufacturers, 4 percent; and door manufacturers, 2 percent (Fig. 1).

Imported tropical plywood in the greater than 6 mm class is used in the furniture and cabinet industries (Fig. 1). This thicker tropical plywood product is often faced with veneer from a U.S. hardwood species, such as red oak, cherry, or birch before it enters the United States. According to industry experts, U.S. temperate species of logs are often exported and sliced to produce face veneer for plywood in lay-up operations in tropical countries. These plywood products made with tropical cores and temperate face veneers are then sold to the country's local markets and also

[2] The following eight firms were included: Afrasian/Gross Veneer Sales (Frank Sheridan), Mineola, N.Y.: International Specialties: Inc. (Tom Wilson), Germantown, N.Y. Georgia-Pacific Co. (Don Schramm), Atlanta, Ga.; Mitsubishi International Corp. (John Andl), N. Y.; Frost Hardwood Lumber Co. (Bruce Frost), San Diego, Calif.; The Penrod Co. (Mike Clausen), Virginia Beach, Va.; Liberty Woods International, Inc. (Mike Bowler), Orange, Calif.; and Thompson Mahogany Co. (Don Thompson), Philadelphia, Pa.

[3] Secondary data analysis provides a first level examination of the U.S. tropical timber import situation. These data, however, do not show which industry sectors consumed these imports. Industry experts were thus identified and contacted to better understand the end-use markets for tropical hardwood imports. Wood products importers were identified from the membership directory of the International Hardwood Products Association (IHPA), which lists 165 firms, representing an estimated 85 percent of U.S. tropical wood imports (2). A non-probability convenience sample of eight firms was subjectively selected and contacted to qualitatively estimate the usage of imported tropical timber products by industry segments. Selection of these eight firms was based upon their size, the variety of tropical wood product imports, the experience of the owner (duration. past and current offices, and recommendations from other experts (snowball sampling procedures (15». Thus, they theoretically would have a broader industry sector knowledge of U.S. tropical wood product distribution channels. Exploratory telephone interviews employed open-ended qualitative inquiries to provide distribution channel data by estimated percentage of use by value. Additional probing techniques, employed to gain further insight on channel activities, were performed as pennitted by respondents (7).

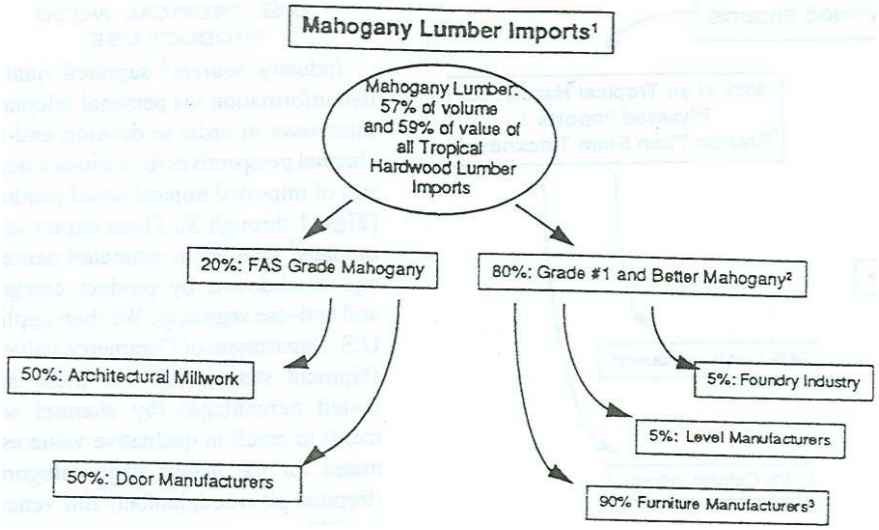

Figure 2. - Mahogany lumber end-usage by industry segment. Source: U.S. Department of Commerce (24) plus industry sources.

1 Data for 1993 show mahogany lumber imports with a value of ($99.3 million)x(0.59)= $58.6 million for 1993.

2 Using the $58.6 million estimate, grade NO.1 and Better mahogany imports had an approximate value of ($58.6 million)x(0.80) = $46.9 million in 1993.

3 Using the value of $46.9 million, furniture industry consumption of mahogany lumber is estimated at ($46.9 million)x(0.90) = $42.2 million in 1993.

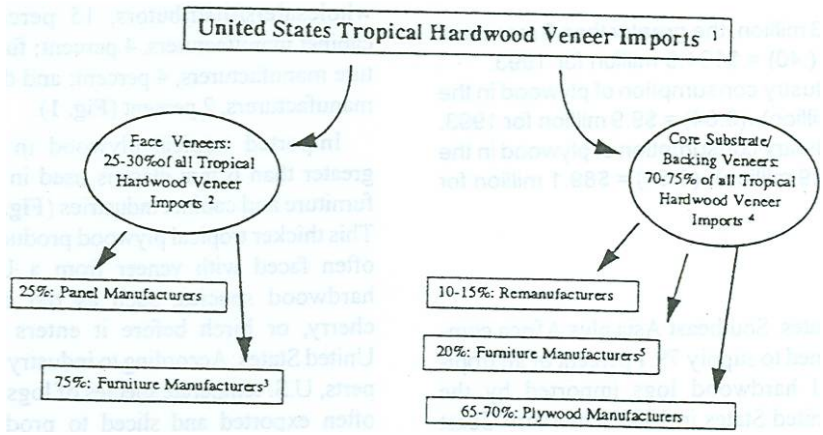

Figure 3. - Tropical hardwood veneer end-usage by industry segment. Source: U.S. Department of Commerce (24) plus industry sources. Breakdown estimates are on a percentage basis by surface measure. Industry estimates are volume-based. Commerce data are value-based. The authors feel the comparison ,between volume estimates and value ultimately provides QUALITATIVE ESTIMATES ONLY of channel end-use segments and, thus, do not adversely affect general research findings.

1 Data show that tropical veneer imports were valued at $20.3 million in 1993.

2 Assuming that face veneer makes up (on average) 27.5% of veneer import value, face veneers would have had an approximate value of ($20.3 million) x (0.275) = $5.6 million in 1993.

3 Furniture industry consumption of face veneers in 1993 can be estimated at ($5.6 million) x (.75) = $4.2 million.

4 Assuming that core substrate/backing veneer makes up (on average) 72.5% of veneer import value, this veneer class would have had an approximate value of ($20.3 million) x (0.725) = $14.7 million.

5 Furniture industry consumption of core substrate/backing veneers in 1993 can be estimated at ($14.7 million)x(0.20) = $2.9 million.

exported to value added manufacturing operations in other countries, including those in the United States.

According to findings from the qualitative questionnaire, mahogany was the most important tropical lumber species used commercially by the United States (Table 4). In 1993, mahogany lumber comprised an estimated 57 percent of lumber consumption by volume and 59 percent of lumber consumption by value. Volumes, values, and end-use applications for the other major tropical lumber species imported by the United States (meranti, keruing, teak, baboen, and imbuia) are also presented in Table 4.

Mahogany lumber is usually imported in two grades, FAS and No.1 and Better (Fig. 2). Industry sources indicated that the FAS grade accounts for approximately 20 percent of all mahogany lumber imports, and finds equal use by architectural millwork manufacturers and door manufacturers. The grade No.1 and Better accounts for the other 80 percent of mahogany lumber imports. No.1 and Better mahogany is used by the following industry segments: roughly 5 percent is used by the foundry industry as pattern stock; another 5 percent is used in the manufacture of levels; and the balance (90%) is consumed by the furniture industry.

Imported tropical veneers are classified as either face veneers or core substrate/backing veneers (Fig. 3). Approximately 25 to 30 percent of imported tropical hardwood veneers are face veneers as reported by respondents. It was further estimated that 75 percent of these face veneers are used by the furniture industry, while the other 25 percent are used by the panel industry.

Core substrate/backing veneers reportedly account for about 70 to 75 percent of tropical hardwood veneer imports. An estimated 10 to 15 percent of these core/backing veneers go to remanufacturers and 20 percent are used by the furniture industry. The remaining 65 to 70 percent of core substrate/backing veneers are used to manufacture hardwood plywood. Overall, we estimate that approximately 35 percent of all imported tropical veneers are ultimately used by the U.S. furniture industry (Table 5).

Hardwood logs represented a mere 2

percent of the value of U.S. tropical wood imports in 1993. These logs are generally used in the production of lumber and veneer (13). An estimated 90 to 95 percent of all tropical logs imported by the United States are used for veneer production; the remaining 5 to 10 percent are used to produce lumber.

TROPICAL WOOD USE BY THE U.S. FURNITURE INDUSTRY

The furniture industry has traditionally been a major consumer of imported tropical hardwood products. Table 5 provides estimates of the U.S. furniture industry's use of tropical hardwood imports (percent by value) in 1993. This industry consumed approximately 24 percent of the total value of tropical hardwood plywood, 42.5 percent of the lumber, and 35 percent of the veneer imported in 1993.

Despite the furniture industry's significant share of tropical hardwood product consumption, this consumption represents a relatively insignificant portion of the furniture industry's total lumber usage by volume. For the years 1989 to 1992, a 4-year average of only 1.2 percent of all hardwood lumber used by the furniture industry was of tropical origin (Table 6).

TROPICAL TIMBER TRADE AND THE DEFORESTATION ISSUE

Although many suggest that the trade in tropical wood products is the primary source of tropical deforestation, consideration must be given to the fact that the volume of tropical hardwood products that are traded internationally account for, at most, only 4 percent of the total volume of the forests cut (3,4,11,12,18,21). More importantly, it is often overlooked that the root causes of tropical deforestation are abject poverty and overpopulation.

According to a recent study by the Institute fur Weltwirtschaft (IfW) commissioned by Greenpeace (1), agriculture (including shifting cultivation by landless, impoverished farmers) is responsible for about 90 percent of the hectares of tropical forests destroyed annually. Others believe that agriculture/ranching account for about 75 percent of the world's tropical deforestation, followed by industrial logging (including fuelwood), which contributes about 20 to 30 percent, and industrial development (such as road building, mining, and dam construction), which contributes about 4 to 5 percent (3,4,11,12,18,21). Further examination of the industrial logging component (20% to 30% of tropical deforestation) shows that fuel-wood use, including charcoal production, accounts for approximately 80 percent of total industrial logging removals (11,20). The remaining 20 percent of all industrial logging is used by the local forest products industries, of which at least half is consumed domestically (17,3 I). Therefore, only about 10 percent of the industrial logging component is exported.

Despite the relatively minor role of tropical timber trade among the causes

TABLE .1. - *U.S. tropical hardwood lumber imports and end uses, 1993*[a]

Species group	Lumber import volume	Lumber import value	Percent of imported tropical lumber volume	Percent of imported tropical lumber value	End uses
	(m3)	($1,000)	(%)		
Mahogany	98,293	58,577	57.2	59.0	furniture, pattern stock, architectural millwork, levels, door construction
Baboen and Imbuia	10,780	3,856	6.3	3.9	mouldings, picture frames
Keruing	21,579	11,242	12.6	11.3	truck flooring
Meranti	22,277	12,639	13.0	12.7	boat trim. mouldings
Teak	15,561	11,578	9.1	11.7	boat interiors and exteriors
Okume. Obeche. Sapelli, Sipo, Makore	3,319	1,402	\.9	\.4	household mouldings
Totals	171,309	99,295	100.0	100.0	

[a]USDC (24) plus industry sources.

TABLE 5. - *Tropical hardwood consumption by the U.S. furniture industry by value, 1993.*

Wood product category	Total U.S. tropical wood product consumption by value	Furniture industry tropical hardwood consumption by value	Furniture industry tropical hardwood consumption as a percentage of U.S. tropical hardwood consumption[d]
	- - - - - - - - - - - - (million $) - - - - - - - - - - -		(%)
Tropical hardwood Plywood[a]	412.3	98.9	24.0
Tropical hardwood Lumber[b]	99.3	42.2	42.5
Tropical hardwood Veneer[c]	20.3	7.1	35.0
Totals	531.9	148.2	27.9

[a] Furniture industry consumption values were combined from Figure 1.

[b] Refer to Figure 2 for furniture industry consumption calculation.

[c] Furniture industry consumption values were combined from both face and core substrate/backing veneer classes. Refer to Figure 3 for the appropriate calculations.

[d] By value, the authors estimate that the U.S. furniture industry consumed 27.9 percent of all tropical hardwood products imports in 1993. The 27.9 percent represents a weighted average of tropical hardwood product consumption by value. By volume, however, the authors conservatively estimate that the furniture industry's consumption of tropical hardwood products ranges between 30 and 50 percent There is a wide range because of the difficulty in determining the precise product mix used by the furniture industry. For example, hardwood plywood is divided into two thickness classes, which may be priced altogether differently, but combined account for 82.6 percent of imported tropical hardwood volume. Hence, if large amounts of less expensive plywood are consumed by the furniture industry, the net effect (in terms of value) may be the same as if a small amount of expensive plywood was consumed. The 30 to 50 percent volume range is based on telephone interviews with industry experts and the authors' best judgment

TABLE 6. - *Tropical hardwood lumber as a percent of total U.S. furniture industry hardwood lumber consumption by volume.*

Year	U.S. furniture industry hardwood lumber consumption[a]	U.S. tropical hardwood lumber consumption[b]	U.S. furniture industry tropical hardwood lumber consumption[c]	Tropical hardwood lumber percent of U.S. furniture industry hardwood lumber consumption
	- - - - - - - - - - - - - (MMBF) - - - - - - - - - - - - -			(%)
1989	2,343	94.2	38.62	1.6
1990	2,425	53.2	21.8]	0.9
1991	2,566	65.5	26.86	1.0
1992	2,752	79.]	32.43	1.2
4-yr. average	2,522	73.0	29.93	1.2

[a] Source: Meyers et al. (]6); Forbes et al. (5).
[b] Source: USDC (24).
[c] Estimated at 41.0 percent by volume and 42.5 percent by value of total U.S. tropical hardwood lumber consumption.

of tropical deforestation, estimated at less than 4 percent by volume, trade in tropical wood products has received attention for several reasons. First, logging activities provide access to the forest and are thus considered by some to be the first link in forest destruction activities (20,23). Second, logging for export generally selects few species and utilizes heavy harvesting equipment in contrast to domestic consumption activities (11). Third, environmental group members recognize that they are able to effect change in the tropical timber trade through their purchasing decisions (21,25). Last, solutions to the fundamental problems, such as poverty, overpopulation, and land tenure, are unrealistic in the short term (22).

THE RELATIVE IMPACT OF U.S. IMPORTS ON TROPICAL DEFORESTATION

In 1989, the United States consumed roughly 4.0 percent of the world's tropical hardwood log, lumber, and plywood exports, which represented about 1.882 MMm^3 or $668 million[4] (4). Furniture, the major tropical timber end-use industry segment in the United States, consumes an estimated 30 to 50 percent of the total volume of U.S. tropical hardwood imports. Using data from the F AO (4) regarding tropical timber exports plus industry expert estimates of end use segment consumption by product type, we can calculate the net impact of U.S. consumption on tropical deforestation. For example, the effect of U.S. furniture industry tropical hardwood consumption on tropical deforestation can be computed as follows for 1989[5]:

(1) world trade totaled 47.0 MMm^3 and represented at most 4 percent of tropical deforestation (4,22);
(2) the United States consumed 1.882 MMm^3 or 4.0 percent of all tropical timber traded globally (4);
(3) the furniture industry consumes 30 to 50 percent of the volume of U.S. tropical timber imports (Table 5);
(4a) at 30 percent of U.S. tropical timber imports consumed by the U.S. furniture industry:
(.30) x (1.882 MMm^3 imported) = 564.6 Mm^3
(564.6 Mm^3/47.0 MMm^3) = .012 (.012) x (.04) = .00048
(4b) at 50 percent of U.S. tropical timber imports consumed by the U.S. furniture industry:
(.50) x (1.882 MMm^3 imported) = 941 Mm^3
(941 Mm^3/47.0 MMm^3) = .020 (.020) x (.04) = .00080

Therefore, according to our calculations, the U.S. furniture industry's consumption of tropical timber products may be estimated to account for less than one-tenth of one percent (between .00048 and .00080) of tropical deforestation. Total U.S. tropical hardwood imports. (including furniture), therefore, accounted for less than two-tenths of one percent of the world's tropical deforestation.

SUMMARY

The U.S. component of the global trade in tropical timber is small. The most recent data indicate that the United States imported only 4.0 percent of the total volume of tropical timber traded in 1989. Given the relatively minor role of tropical timber trade among the causes of tropical deforestation, U.S. imports account for less than two-tenths of one percent of the world's tropical deforestation. There is little evidence to suggest that the U.S. share of global trade in tropical timber has increased significantly since 1989, or that it will in the future.

Consumption of tropical timber products by the U.S. furniture industry represented less than one-third (an estimated 27.9% of the value) of all tropical timber imported in 1993. Moreover, the tropical wood component of hardwood lumber used by the furniture industry accounted for an estimated 32.43 MMBF or only about 1.2 percent of all hardwood lumber used by the furniture industry that year. Overall, the U.S. furniture industry tropical wood consumption represents less than one-tenth of one percent of the world's tropical deforestation.

LITERATURE CITED

1. Amelung, T. and M. Diehl.] 992. Deforestation of tropical rain forests: economic causes and impact on development InstitUt fur Weltwinschaft (IfW), an der Universitat Kiel, Germany. (Study commissioned by Greenpeace e.V. Hamburg. Gem1any) ISSN 0340-6989.]60 pp.
2. Anonymous.]993. International Hardwood Products Association publication. IHPA, Alexandria, Va.
3. Food and Agriculture Organization of the United Nations. 1992. FAO Yearbook of Forest Products 1979-]990. FAO, Rome, Italy. 332 pp.
4. Food and Agriculture Organization of the United Nati'Ons. 1991. FAO Yearbook of Forest Products: The Directions of Trade]985-]989. FAO, Rome, Italy. 306 pp.
5. Forbes, C.L., SA Sinclair, and W.G. Luppold. 1993. Wood material use in the U.S. furniture industry: 1990 to 1992. Forest Prod. J. 43(7/8): 59-65.
6. _____. J. Punches, S.A. Sinclair, and W.G. Luppold. 1991. Wood and wood based material use in the wood furniture industry. Center for Forest Prod. Mktg, Virginia Tech., Blacksburg, Va.
7. Fowler, FJ., Jr. 1984. Survey Research Methods. Sage Publications, Inc., Beverly Hills, Calif.
8. Gradwohl, J. and R. Greenberg.]988. Saving the Tropical Forests. Earthscan Publications Limited, London.
9. Hamilton, L.S.] 990. Boycotts of tropical timber products will not stop deforestation. Position paper. Environment and Policy Institute, East-West Center, Honolulu, Hawaii.
10. Jagels. R. 1990. Alternatives to boycotting. J. of Forestry, October, pp. 30-31.

[4] FAO data do not deduct re-exports from totals.
[5] 1989 FAO Directions of Trade data (4) are the last available figures. The numbers. although somewhat dated, still illustrate the relative magnitude of the impact on tropical forests.

11. Johnson, B. 1991. Responding to tropical detorestation: an eruption of crisis - an array of solutions. World Wildlife Fund Publications. Panda House Pubs. Godalming, UK
12. Lindell, G. 1992. Alleviating tropical deforestation. Extend Newsletter, National Wood Prod. Ext. Program. Vol. 5. USDA Forest Serv., Forest Prod. Lab., Madison, Wis.
13. Luppold, W.G. and D. McKeever. 1988. NOI:thAmerican industrial markets: current wood use and trends. USDA Forest Serv., Northeastern Forest Expt Sta., Princeton, W.Va.
14. Mather, A.S. 1990. Global Forest Resources. Belhaven Press, London.
15. McDaniel, C. and R. Gates. 1993. Contemporary Marketing Research. West Publishing Co., Minneapolis/St Paul, Minn.
16. Meyers. C.1., J.H. Michael, SA Sinclair, and W.G. Luppold. 1992. Wood material use in the U.S. wood furnitUre industry. Forest Prod. J. 42(5):23-30.
17. Myers,N.1984. The Primary Source. W.W. Norton, New York.
18. _____. 1989. Deforestation rates. Tropical forests and their climatic implications. Friends of the Earth, London.
19. _____. 1992. Tropical forests: The policy challenge. The Environmentalist 12 (1): 15-27.
20. Nectoux, F. and Y. Kuroda. 1990. Timber from the South Seas - an analysis of Japan' s tropical timber trade and its environmental impact A World Wildlife Federation Inter. Pub. October. Gland, Switzerland.
21. Ozanne, L. and P. Smith. 1993. Strategies and perspectives of influential environmental organizations toward tropical deforestation. Forest Prod. J. 43(4): 39-49.
22. Smith, P. and L. Ozanne. 1993. The environmental movement and tropical timber trade. Taiwan Forest Prod. Ind. J. 12([]: [17.
23. Sullivan, F. 1990. The fragile forest. Timber Trades J. June, 9: 12-13.
24. U.S. Department of Commerce. Wood import and export statistics: 1989- [992. US DC, Bureau of Statistics, Washington, D.C.
25. Vincent, J.R. [990. Don't boycott tropical timber. J. of Forestry. My Chance. 88: 56. March.
26. Willie, C. 1991. Buy or boycott tropical hardwood? Am. Forests, July/August, p. 26.
27. World Commission on Environment and Development. 1987. Our Common Future. Oxford Univ. Press, Oxford, U.K.