

HARDWOOD LUMBER MANUFACTURING IN THE UNITED STATES

By

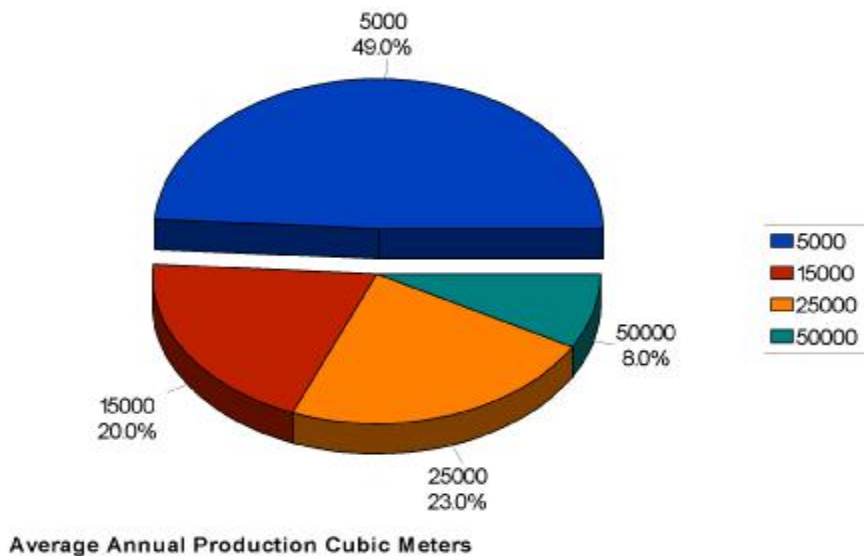
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LGA was asked to provide a brief assessment of the hardwood lumber manufacturing industry in the USA, from a non-engineering point of view. This information is based on visits to several hardwood lumber mills, search of the relevant literature, and discussions with experts at the US Forest Service, universities and private manufacturing firms.

Hardwood Lumber Industry

The industry has changed significantly over the past few decades, from more than 4,000 small, often family-owned mills, to an estimated 2,349 sawmills that saw primarily hardwoods. If the mills that occasionally saw hardwoods but are primarily focused on softwoods are included, another 573 mills are added to the total. Most of these are small mills, producing less than 4 million bd. ft. annually; there are only very few large hardwood mills¹, in contrast to the softwood industry where large mills are the norm. Figure 1 displays LGA's estimates based on analyses conducted by William Luppold and others at the USFS Northeastern Research Station, Princeton, WV.

Figure 1 – Hardwood Lumber Mills in the US



¹ The largest hardwood lumber sawmill in the US is Anderson-Tully, MS, producing about 90 million bd. ft. (212,000 CuM) annually; this is about the size of a medium size softwood lumber mill. The second largest is a Weyerhaeuser mill, AR, cutting about 165,000 CuM annually, mostly yellow poplar and oak, for its "Choice Wood" retail programs with Home Depot and Lowe's.

About two thirds of these sawmills belong to the National Hardwood Lumber Association, and perform NHLA grading, for the furniture, cabinet and millwork industries. Most of the others sell low-end, ungraded material, usually to pallet or crating producers, or for railroad ties. The level of technology in the smaller mills is low.² Only 27 % have head-rig optimizers, 10% have edger optimizers while very few have any other sort of automation. The largest mills, of which there are only three or four, are fully automated, with optimizers at every station, grade mark readers, automated sorting, etc. A distinguishing characteristic of the larger, more advanced mills is a band saw resaw, which allows sawing for the highest grade.

Middle size mills and larger have dry kilns or if the company owns several mills, send their lumber to a common location which has a dry kiln. Otherwise the mills air dry, although this may be for very short periods. About a third of the mills have surfacing equipment. Mills are about equally divided between band saw and circle saw head rigs,³ although mills with circle saws tend to be smaller, and focus on rough green markets, rather than high grade material. Band saws allow cutting thinner boards, with a smoother surface and lower kerf loss; circle saws are less expensive to buy and maintain. Band saw mills more often have automated equipment and dry kilns.

While almost every hardwood sawmill is unique in some aspects, there are some common denominators. The first breakdown is followed by a gang saw, which rips the board as desired, then by an edger which removes the rough edges; some mills have combination gang-saw/edgers. Trim saws cut out defects. The remaining lumber goes either to an automated 'bin sorter' in larger mills, or to the labor intensive 'green chain' where sorting for grade is done visually and by hand.

One of the mills visited by LGA is representative of those in the eastern US, where almost all such mills are located. It produces between 4 and 5 million bd. ft. annually (9400-11,800 cubic meters), saws about ten different species, and sends its lumber to be dried at another company site. It buys higher grade logs and saws for the highest grade, which it sells to the furniture and millwork industries or to export markets. Cores and low grade material is sent to a company owned pallet plant. Figure 2x is a diagram of this mill's operations.

² A national Profile of the US hardwood sawmill industry, Bowe, Smith, Araman, Forest Products Journal, October, 2001, pp 25-31

³ Some mills have other types of head rigs (Chipping, Scragg, etc) but these are infrequent

**The Walker Mountain Sawmill
Hollyrock, WV
12,000 CuM/year; One of 3 sawmills**



Markets

There has been a shift in markets for hardwood lumber made in the US, towards higher grade species and higher grade lumber. (Table x)

Table x – **Hardwood Lumber Markets Have Shifted to Higher Value**
(Billion Bd. Ft.)

Industry	1991	1997	% Change
Furniture	3.0	2.0	+50
Cabinets	1.2	0.9	+33
Moulding & Millwork	1.3	1.0	+30
Export	1.4	1.0	+40
Flooring	1.1	0.5	+120
Pallets	4.5	4.6	-2
Rail Ties	0.8	0.6	+33
Total	13.2	10.7	24

Source: Hardwood Timber Product Markets, Hansen, et al, USFS, 1999

In turn, the stumpage prices for preferred species and log grades have risen significantly. As the kitchen cabinet and export markets have grown, there has been a consequent growth in demand for the upper grades, especially FAS, FAS Select (one face) and #1 common. Prices for these products have also risen significantly. These changes have caused a shift in hardwood lumber processing, towards larger mills, band saw head rigs, optimizing stations, dry kilns and better manufacturing processes. Many innovations and informative documents have been developed by the US Forest Service, for the benefit of

the industry, for improved hardwood sawmill performance and technology transfer. Some of the best of these are cited here and are referenced as a matter of interest:

ROMI-RIP Simulator – This is a computer program which analyzes alternative ripping patterns to obtain the highest yield of high grade timber.⁴

Best Opening Face Decisions – This is probably the most important decision affecting log yield, that is, where to make the first cut. Almost all better mills have laser guided BOF decision criteria, although many still rely on the head sawyer's eye.⁵

Decision Criteria for Crosscut Versus Rip-First Processing – This analysis helps mills decide on which to do first, depending on the log and the market for the product.⁶

Grade Optimization Studies – These help mills (especially for red oak) make critical decisions regarding processing for the furniture and cabinet industries.⁷

HaRem Hardwood lumber remanufacturing program – A computer program which determines the optimum way to edge and trim a board for highest value based on the grade and size of the board, and current market prices.⁸

Bucking in the woods to NHLA rules – A study by Purdue University demonstrates that significant added value is achievable if the log is properly bucked (cut) to lengths that maximize high yield lumber.⁹

Improving yields for yellow poplar moulding (and other species) - Considerably higher value was achieved by careful attention to sawing for grade and drying in a dehumidification dry kiln, over alternate methods.¹⁰

Industrial Intelligence for the Solid Wood Manufacturing Industry – A paper that discusses the importance of tracking studies to improve yield and reduce processing costs.¹¹

⁴ Report On Rough Mill Yield Practices & Performance, Wiedenbeck & Scheerer, USFS, talk before the Hardwood Lumber Association Symposium, May, 1996

⁵ Lumber Manufacturing, Williston, Miller Freeman, var ed.

⁶ Deciding Between Crosscut & Rip-First Processing, Wiedenbeck, USFS, Wood & Wood Products, August, 2001, pp 100-104; also Rethinking the design of the furniture rough mill, Gatchell, USFS, Forest Products Journal, March 1987, pp 8-14

⁷ Hardwood lumber widths & grades used by the furniture & cabinet industries, Weidenback, et al, Forest Products Journal, April, 2003, pp 72-80

⁸ Hardwood lumber remanufacturing program for maximizing value, Klinkhachorn, et al, Forest Products Journal, April 2003

⁹ Buck your logs to NHLA rules, Cassens, Purdue University, FNR-190, December, 2001

¹⁰ Factors affecting the value of moulded products from yellow-poplar lumber – Patterson, Armstrong, USFS, Forest Products Journal, June, 1993.

¹¹ Industrial Intelligence for the Solid Wood Manufacturing Industry, Wiedenbeck, USFS, paper delivered to Second SE Conference on Wood, October 12, 1999

Downtime in Hardwood Sawmills – This paper not only discusses the elements of downtime in hardwood sawmills, but compares performance between circle and band saw headrigs¹²

Relative Performance of Hardwood Sawing Machines – This excellent review and study provides detailed performance information on six major types of sawing machines, both headrigs and resaw machines.¹³

Continuing Education for Sawmillers

The USFS produces a bulletin listing each of its 19 experts in various aspects of lumber manufacturing and marketing, by region, accessible to any interested person. Additionally, this bulletin lists 62 specialists at various universities and state agencies, who serve as resource persons for the industry. Most of these universities also conduct frequent workshops, seminars and training courses for industry manufacturing and marketing personnel, in the form of continuing education as well as undergraduate and graduate degrees. Other educational resources are provided by the National Hardwood Lumber Association on manufacturing, grading and other areas of interest.

¹² Downtime in Hardwood Sawmills, Wiedenbeck, USFS, and Blackwell, University of Kentucky, draft paper to be published when approved by USFS, 2003

¹³ Relative Performance of Hardwood Sawing Machines, Steele (Mississippi Forest Products Laboratory), Bullard (Mississippi State University) and Araman, USFS, Proceedings, Nineteenth Annual Hardwood Symposium of the Hardwood Research Council, 1991, pp 119-133