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Primary wood industries of West Virginia

W H. Reid

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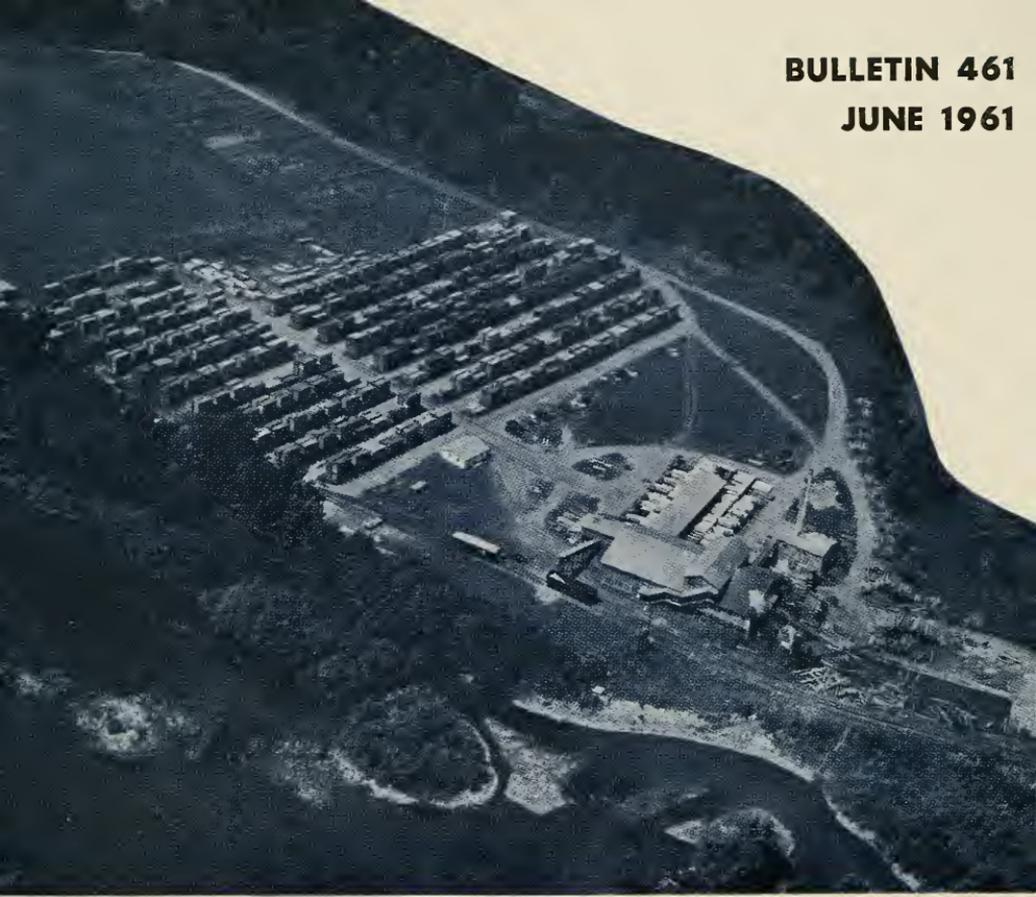
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BULLETIN 461

JUNE 1961



P R I M A R Y **W** O O D **I** N D U S T R I E S

of West Virginia

WEST VIRGINIA UNIVERSITY AGRICULTURAL EXPERIMENT STATION

AUTHORS

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This publication is based on data obtained from West Virginia's contributory project to the Regional Research Project NEM-6, Phase II, Marketing Forest Products. Participating in this regional project are the Northeastern States Agricultural Experiment Stations and the Northeastern Forest Experiment Station of the U. S. Forest Service.

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AGRICULTURAL EXPERIMENT STATION
COLLEGE OF AGRICULTURE, FORESTRY, AND HOME ECONOMICS
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Summary

THIS bulletin presents the results of a study to determine the nature of the components that make up the primary wood-using industry in West Virginia. Data are presented concerning the form, amount, and source of wood raw material, practices used in wood raw material procurement, products manufactured, marketing practices, and market outlets used by the operators.

The sample data indicate that the lumber industry is the largest user of wood raw material. The pulpwood industry and other industries, such as veneer and plywood, stave, charcoal, and turnings, use relatively minor amounts.

RAW MATERIAL PROCUREMENT

More than half of the wood raw material purchased by the primary wood-using industries is purchased in the form of stumpage, and approximately one-third in the form of logs or bolts.

The primary wood-using industries obtained approximately one-fourth of their wood raw material from their own lands, one-fourth from private lands of more than 500 acres in size, and one-half from private holdings of under 500 acres. More than half of the raw material purchased was bought on a basis of verbal agreement between the buyer and seller.

The average maximum hauling distance for wood raw material from point of purchase to mill site was 17 miles for stumpage purchases, 28 miles for log purchases, and 36 miles for bolts.

Approximately 40 per cent of the operators of wood-using industries use their own trucks exclusively in transporting wood raw material, and nearly 20 per cent use contract trucking exclusively. The balance of the operators use combinations of their own trucks, contract trucking, and railroads.

PRODUCTS MANUFACTURED

The lumber industry produces approximately three-fourths of the cubic-foot volume of all products manufactured by the primary wood-using industry. As might be expected, most of the sawmill output is marketed in the form of rough lumber, mine material, and cross-ties. In addition, some of the sawmills, particularly the larger ones, are integrated to produce such products as flooring, dimension, pallets, wood chips, and turnings. Other primary wood-using industries produce veneer and plywood, turnings, charcoal, rustic fence, pulpwood, and staves.

MARKETING

Approximately two-thirds of the volume of all products manufactured by primary wood-using industries is marketed in manufacturer and wholesale outlets. The manufacturer outlet alone accounts for 40 per cent of the total. Sawmills market approximately two-thirds of their output to manufacturers and wholesalers; the other primary wood-using industries sell 96 per cent of their output in these market outlets.

Out-of-state markets take the major proportion of the volume of products manufactured by primary wood industries in West Virginia. The lumber industry sells approximately two-thirds of its volume to out-of-state markets, while other primary wood-using industries market approximately 90 per cent of their production outside the State.

Primary Wood Industries of West Virginia

W. H. REID, W. W. CHRISTENSEN, A. W. GOODSPEED, and N. D. JACKSON

Introduction

THE purpose of this report is to describe the primary wood industry¹ of West Virginia, to indicate its principal components, and to identify and evaluate specific features of the operation and marketing procedures used. It is hoped that improvement in these procedures will eventually strengthen the economic position of the industry.

West Virginia is traditionally a wood-producing state. Approximately 64 per cent of its land area is classified as commercial forest, and it has ranked as one of the nation's top four producers of hardwood lumber for the past half century (1, 2).

The lumber industry of West Virginia reached its peak during the period 1907 to 1917, when lumber production exceeded 1 billion board feet annually (3). During the past 10 years the annual lumber production has averaged 422,000,000 board feet. Although West Virginia is a lumber-producing state, it has relatively few secondary wood industries. This results in the major portion of lumber and other products of the primary wood industries being sent out of state for further manufacturing and processing. During 1913, for example, 1,250,000,000 board feet of lumber were cut by sawmills in West Virginia, but 273,000,000 board feet, or only 22 per cent of the total, were further manufactured within the State (4).

This condition continues to exist; for example, in 1948 approximately 484,000,000 board feet of lumber were produced in West Virginia, 89,000,000 board feet, or 18 per cent, was used for manufacture within the State (5).

The total volume of timber cut in West Virginia in 1952 was 108,848,000 cubic feet, of which 71 per cent was manufactured into lumber, 22 per cent into other wood products, 6.5 per cent into pulpwood, and 0.5 per cent into veneer (2). The total cubic feet of wood raw material purchased by manufacturers included in this survey amounts to 61,784,000, or approximately 57 per cent of the total timber cut.

¹The primary wood industry is composed of those industries which convert wood raw material, such as logs and bolts, into other marketable forms.

Survey Procedure

Data concerning the operational practices of the primary wood-using industry were obtained for the year 1953 through personal interview with operators of 170 primary wood-using firms located throughout West Virginia. The firms contacted were organizations taking first possession of the wood raw material from the forest owner. They consisted of sawmills, veneer and plywood mills, bourbon stave mills, rustic fence mills, insulator pin mills, handle mills, and charcoal plants. Information was obtained from each operator concerning volume, source and price of raw material purchased, products manufactured, measurement practices, permanency of operation, and method of distribution of products.

It was not feasible to obtain a statistical sample of firms due to the lack of an accurate list of primary wood-using industries in West Virginia, therefore, the data presented in this report apply only to the sample. Data from 144 sawmills was obtained. This represents approximately 15 per cent of the total number operating in West Virginia.

Volumes of raw material purchased and products manufactured by the operators of wood industries were recorded by the accepted unit of measure, i.e., board feet, piece, or cord, and converted to cubic feet in order to have a standard unit for comparative purposes.

This report will present the data by giving a general treatment of the primary wood industry (Part A); and by presenting specific treatment of the individual wood industries, such as: sawmills (Part B); veneer, stave, rustic fence, and insulator pin mills (Part C).

PART A—The Primary Wood Industry **Operational Characteristics**

I. Forest Land Owned

In the sample of 144 mills surveyed ownership of forest land was reported by 52 per cent of the primary wood industries. The forest land owned in this sample totaled 289,000 acres. Small holdings comprised the major portion of the pattern, with 58 per cent in the 1- to 499-acre class, 33 per cent in the 500- to 4,999-acre class and 9 per cent in the over 5,000-acre class.

Forest land was held principally by the lumber industry since the amount owned by all other primary wood industries amounted to less than 10,000 acres.

II. Stability of Operation

It appears that a fairly high operational stability exists in the State's wood-using industries. Of the firms interviewed, about nine-tenths had been in business from 6 to more than 50 years, and eight-tenths were operating on a year-around basis. Three-fourths of the industries had been operating in the same geographic location for the five years preceding the time of the survey. Those which moved to another location did so because of a shortage of wood raw material.

III. Operational Flexibility

Operational flexibility of the industry was examined in terms of the operators' ability to produce other wood products, and their changes in scale of operations since 1950. Inflexibility is evident within the industry regarding possible changes in the type of product output, since two-thirds of the operators reported that "no change" was possible. About one-tenth of the operators were uncertain relative to possibility of change, and the remainder stated that they could produce and market other wood products. This indication of inflexibility may be due to equipment limitations, lack of technical ability, and absence of marketing and financing facilities.

The results obtained regarding changes in scale of operations since 1950 parallel those described above for possible product diversification. As indicated in Figure 1, for example, "no change" in scale of operations was the predominant answer. Only in the "machinery" category was a substantial increase reported—42 per cent of the operators stating that they had increased the amount of machinery used since 1950. This fact, in combination with a reduction in volume of business reported by one-third of the operators, may account for the decrease in the "manpower" category.

Operators who indicated an increase in new techniques were primarily those who had a relatively high capital investment. However, 82 per cent of all operators indicated "no change" in initiating new techniques of manufacture and processing since 1950. Similar conditions were shown in "forest ownership" and "raw material from forest land." Approximately 90 per cent of these operators indicated "no change."

IV. Raw Material Procurement Practices

The wood product manufacturers sampled consisted principally of sawmills, and it is this industry group which used the major portion of all wood raw material procured for manufacturing. This fact is

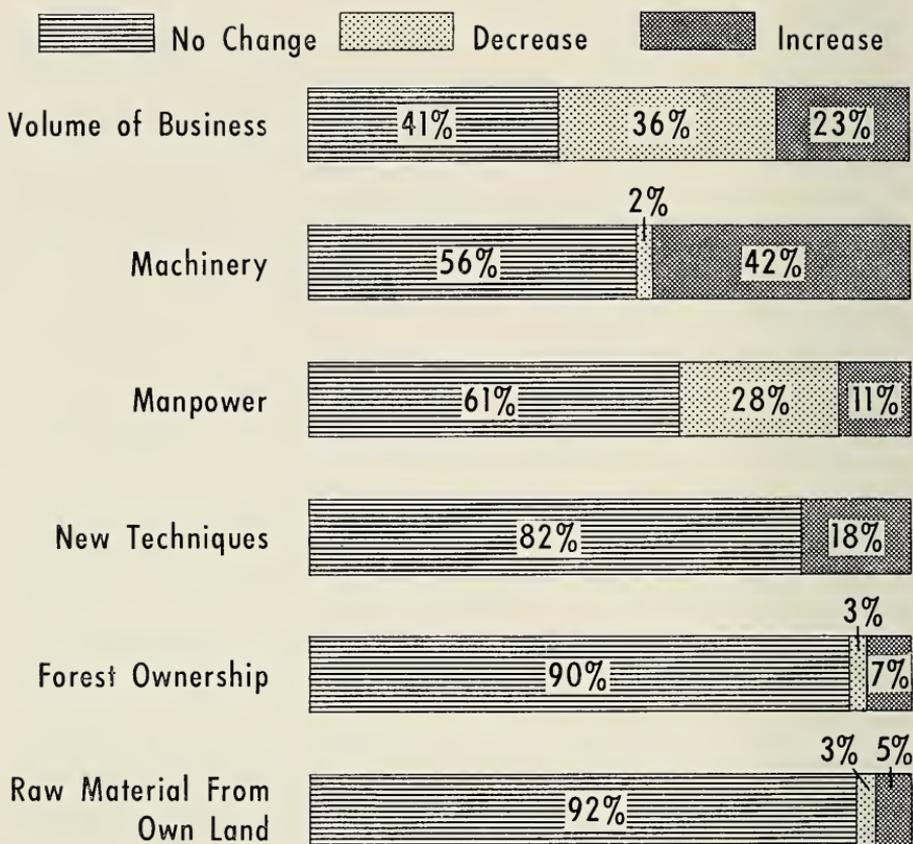


FIGURE 1. Change in scale of operations from 1950 to 1954.

demonstrated in Table 1, which shows that three-fourths of all the raw material used was obtained by the lumber industry and one-fourth by other industries such as veneer and plywood mills, stave mills, charcoal plants, tannin processors and pulp and paper mills.²

FORM OF RAW MATERIAL

Stumpage is the major form in which wood raw material is purchased by the combined primary wood industries, accounting for more than half of the total volume purchased. The high proportion of total volume purchased is influenced by the buying practices of the lumber industry. Sawmills buy stumpage primarily (Figure 2).

The forms of wood raw material purchased by the other wood industries were nearly equally divided between logs, stumpage, bolts and

²The 114,000 cords or 10,415,000 cubic feet of pulpwood produced in West Virginia was shipped to other states for manufacturing into pulp and paper products.

TABLE I. RELATIONSHIP OF HAULING DISTANCE OF RAW MATERIAL TO FORM OF PURCHASE—ALL INDUSTRIES

| FORM OF PURCHASE | HAULING DISTANCE (MILES) | | | | AV. HAULING DISTANCE (Miles) |
|--|--------------------------|--------|---------|------|---------------------------------|
| | 0 — 4 | 5 — 24 | 25 — 49 | 50 + | |
| | % | % | % | % | |
| Stumpage | 28 | 53 | 10 | 9 | 17 |
| Logs | 3 | 50 | 24 | 23 | 28 |
| Bolts | 3 | 28 | 24 | 45 | 36 |
| Other | 3 | 44 | 23 | 30 | 30 |
| Subtotal, exclusive of stumpage | 3 | 47 | 20 | 30 | 30 |
| All forms of purchase | 21 | 45 | 17 | 17 | 22 |

other and, percentagewise, differ from the lumber industry. This difference occurs because the diversity of products manufactured by these industries required raw material in a variety of forms.

Pulpwood was purchased by a pulp and paper company in bolt form from producers.

SOURCE OF RAW MATERIAL

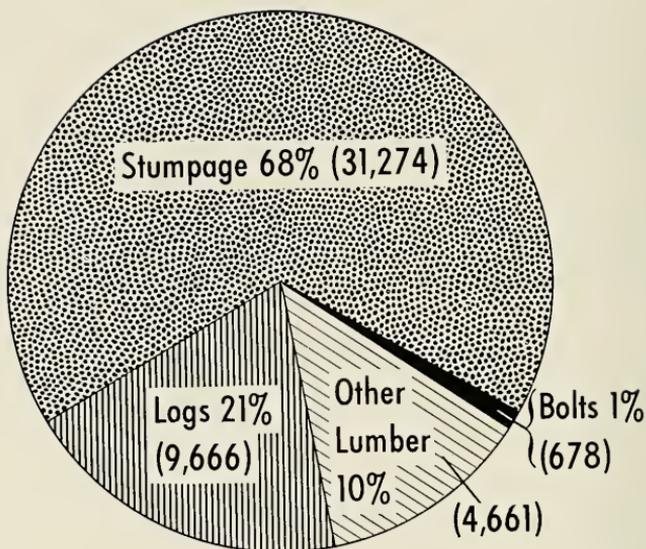
Approximately one-fourth of the total volume of wood raw material obtained by reporting primary wood industries was secured from their own lands; the remainder was purchased from lands under other types of ownerships. Of this purchased volume, two-thirds came from small private holdings of less than 500 acres in size, approximately one-fourth from holdings greater than 500 acres, and the remainder from publicly-owned lands—both state and federal.

Three types of purchase agreements were used by the wood industries in obtaining raw material: verbal, buyer's written, and seller's written. The major portion of raw material, 58 per cent, was secured through use of the verbal agreement between buyer and seller, 31 per cent on written agreement provided by the buyer, and 11 per cent on written agreement provided by the seller.

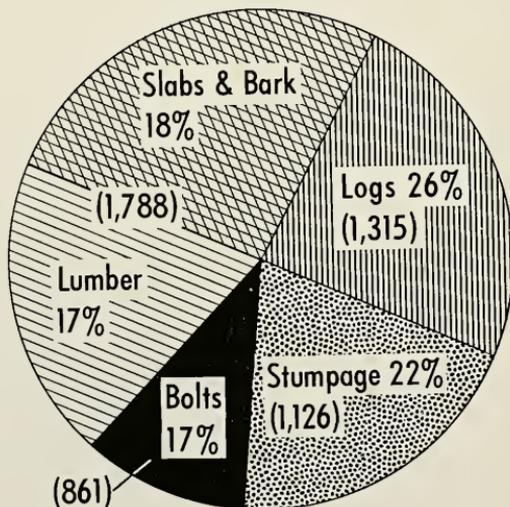
The findings indicate that size and type of ownership (private and public) are characterized by the kind of agreement used between buyer and seller. The verbal agreement comprised the principal contract of purchase from private ownerships of less than 500 acres (62 per cent). On the other hand, the larger private holdings show a greater proportion of the volume sold on written agreement (53 per cent) and, in the case of public lands, all volume is acquired on written agreement.

TRANSPORTATION OF RAW MATERIAL

Trucks provided the principal means for transporting raw material to the point of manufacture. More than 80 per cent of the operators



LUMBER INDUSTRY (46,279 M cu. ft.)



OTHER INDUSTRIES Except Pulpwood
(5,090 M cu. ft.)

FIGURE 2. Volumetric percentage of raw material purchased by lumber and other industries.

reported using this mode of transportation, and approximately one-half of these operators used their own trucks exclusively. Other means used for transporting raw material to the mills were railroads and direct skidding.

Transportation Facilities Used by all Wood Industries

| MODE OF TRANSPORTATION | PERCENTAGE OF INDUSTRIES USING |
|--|--------------------------------|
| Own trucks | 41 |
| Contract trucking | 21 |
| Own trucks and contract trucking | 22 |
| Contract trucking and railroads | 7 |
| Own trucks and/or contract trucking plus direct skidding | 9 |

When transportation distance is compared with form of raw material purchased, exclusive of stumpage, 50 per cent of the industries are located more than 25 miles from their source of raw material (Table 1). The average hauling distance for all forms of wood raw material purchased is 22 miles.

V. Products Manufactured

The importance of the lumber industry is demonstrated in Table 2, which shows that, of the total sample, this industry group alone accounts for 85 per cent of all the mills and about three-fourths of the total volume produced. More than 40 per cent of the total cubic-foot volume is produced in the form of lumber.

VI. Distribution of Products

MARKET OUTLETS

For the industry as a whole, manufacturers and wholesalers take most of its industrial output, accounting for more than two-thirds of the total volume marketed (Figure 3). Considering industrial groups, the wholesaler and retailer outlets absorb two-thirds of the lumber industry output and 96 per cent of the production of the other primary wood industries. In this latter case, the difference in proportions of total volume moving into the two outlets may, in part, result from the fact that a high proportion of the production of mine material produced by sawmills goes directly to consumers.

Approximately three-fourths of the reporting plants were producing one product only. A comparison of marketing channels used by these industries with those of the plants producing more than one product shows that the manufacturer outlet receives 58 per cent of the production of the multi-product industries as compared to 35 per cent of

TABLE 2. CUBIC-FOOT VOLUME AND PERCENTAGE OF PRODUCTS MANUFACTURED BY PRIMARY WOOD INDUSTRIES INCLUDED IN SURVEY

| PRODUCTS AND INDUSTRY GROUP | MILLS | | PRODUCTION | |
|----------------------------------|--------------|--------------------------|--------------|--------------------------|
| | NUMBER | PER CENT OF TOTAL SAMPLE | M CUBIC FEET | PER CENT OF TOTAL SAMPLE |
| Lumber, Green | 121 | 71 | 17,800 | 29.0 |
| Lumber, Dry | 18 | 11 | 7,840 | 13.0 |
| Pallets, Flooring | | | | |
| Dimension | 9 | 5 | 5,186 | 8.5 |
| Crossties | 53 | 31 | 1,230 | 2.0 |
| Mine Material* | 83 | 49 | 10,600 | 18.0 |
| Wood Chips | 3 | 2 | 1,810 | 3.0 |
| Total Lumber | 144 | 85 | 44,466 | 74.0 |
| VENEER & PLYWOOD INDUSTRY | 4 | 2 | 660 | 1.3 |
| TURNED PRODUCTS INDUSTRY** | 8 | 5 | 2,039 | 3.0 |
| | Out-of-State | | | |
| PULPWOOD INDUSTRY | 2 | 1 | 10,415 | 17.0 |
| MISC. PRODUCTS INDUSTRIES | | | | |
| Charcoal | 4 | 2 | 1,002 | 1.5 |
| Fence Posts & Rails | 7 | 4 | 536 | .9 |
| Stave (Bourbon) | 6 | 4 | 439 | .7 |
| Bark (Tannin) | 2 | 1 | 72 | .1 |
| Round & Split | | | | |
| Mine Timbers | 18 | 11 | 910 | 1.5 |
| Total Misc. | 37 | | 2,959 | 4.7 |
| TOTAL SURVEY SAMPLE | 170† | | 60,539 | 100.0 |

*Mine material—headers, half headers, caps, wedges, and mine ties.

**Turned products—tool handle stock, shoe heels, insulator pins and clothespins.

†The total number of mills in Column 1 does not equal 170 because some firms were classified under two industry groups.

the single-product industries. With this one exception, the single- and multi-product industries appear to market their production similarly in other outlets.

MARKET GEOGRAPHY

An investigation was made of the location of market outlets for the output of the primary wood-using industries, classifying market location as "in-state" and "out-of-state." The findings show that 70 per cent of the total volume of products marketed was sold through marketing channels located outside West Virginia. This preponderance of out-of-state markets is due primarily to the fact that there are relatively few *secondary* wood-using industries within West Virginia and that *all* pulpwood produced in the State is shipped to other states for further processing.

Market destination was also analyzed by comparing the lumber industry with all other wood industries combined in terms of out-of-state and in-state volume movements. A larger proportion of the lumber output (37 per cent) remained in-state than was the case for the "other"

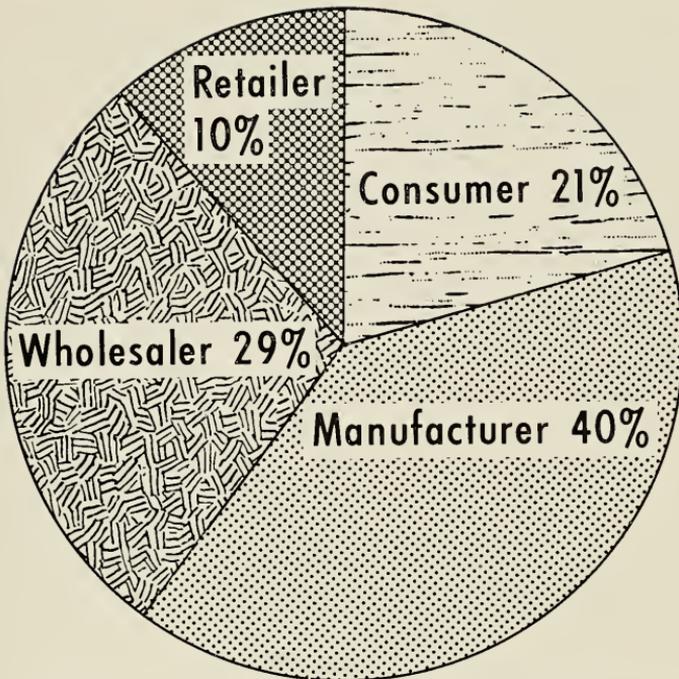


FIGURE 3. Marketing outlets for all primary wood-using industries based on percentage of product volume.

industry production (10 per cent). This difference may be attributed to three general factors:

(a). That there are relatively more secondary processors of the lumber industry output than of the products of the "other" wood-using industries.

(b). That mine materials produced by the lumber industry, a product accounting for almost one-fifth of the total production in the sample (Table 3), are used mainly within the State.

(c). That a certain proportion of lumber produced is low-grade material which usually moves into local markets.

TABLE 3. CLASSIFICATION OF SAWMILLS BY PRODUCTION SIZE CLASS

| MILL CLASS | ANNUAL PRODUCTION RANGE M.B.F. | SAWMILLS | | RAW MATERIAL UTILIZED IN PRODUCTION | | AVERAGE MILL CAPACITY 8-HOUR DAY M.B.F. | POTENTIAL ANNUAL PRODUCTION M.B.F. | PER CENT OF POTENTIAL ACTUALLY PRODUCED |
|------------|--------------------------------|----------|-----|-------------------------------------|-----|---|------------------------------------|---|
| | | No. | % | M.B.F. | % | | | |
| Small | 0-999 | 95 | 66 | 32,120 | 18 | 4.2 | 103,800 | 31 |
| Medium | 1,000-3,999 | 38 | 26 | 58,751 | 33 | 8.5 | 84,110 | 70 |
| Large | Over 4,000 | 11 | 8 | 87,365 | 49 | 32.5 | 92,950 | 94 |
| All Mills | | 144 | 100 | 178,236 | 100 | — | 280,860 | 63 |

PART B—Lumber Industry (Sawmills)

Operational Characteristics

I. Classification of Sawmills

For purpose of analysis the sawmills were classified into "small," "medium," and "large-size" groups according to their annual production measured in board feet (Table 3). These designations will be used throughout the remainder of the report.

The typical small sawmill, producing up to 999,000 board feet annually, is equipped—for the most part—with just the basic machinery necessary for producing lumber. It is further characterized by a relatively low capital investment and intermittency of operation.

The typical medium-size mill, producing from 1,000,000 to 3,999,000 board feet annually, is more efficiently operated and has better facilities for handling, storing, and marketing its production than the small mills. It is more permanently located and operates more nearly on a full-time schedule.

The typical large-size mill, producing more than 4,000,000 board feet annually, is characterized by the predominant use of the band saw for breaking down the logs into lumber as contrasted with the use of the circular saw by the two smaller mill classes. The large mill is frequently integrated to manufacture wood products other than lumber, and therefore has a relatively high capital investment.

II. Potential Production

In addition to annual production, the operator was asked to give an estimate of the amount the mill could produce during an eight-hour day. This daily capacity was multiplied by 260 to obtain an annual production potential. The comparison between actual and potential production by mill size class indicates that the small mills are operating at less than one-third capacity and the large mills are operating at 94 per cent capacity (Table 3). The relatively low ratio of actual to potential production of the small mills may be explained by the intermittent nature of their operations. The small mills frequently operate only when filling orders; also the crew which operates the sawmill may have a dual responsibility of both sawmilling and logging.

III. Forest Land Ownership

Approximately two-thirds of the operators of sawmills reported ownership of forest land (Table 4). However, more than 80 per cent of

TABLE 4. FOREST LAND OWNERSHIP BY SAWMILL SIZE CLASS

| MILL SIZE CLASS | OPERATORS OF MILLS OWNING FOREST LAND | AMOUNT OF FOREST LAND OWNED | ACREAGE PER MILL |
|-----------------|---|-----------------------------------|---------------------|
| | (Per Cent) | (Acres) | (Acres) |
| Small | 65 | 42,075 | 678 |
| Medium | 63 | 61,114 | 2,546 |
| Large | 82 | 160,369 | 17,819 |
| All Mills | 65 | 263,558 | — |

the operators of large mills own forest lands as compared with approximately 64 per cent of the operators of small- and medium-size mills.

Those operators reporting ownership hold 263,558 acres of forest land. A distinct difference does exist in the amount of forest land owned by mill size class since the average amount owned per mill ranges from 678 acres for the small mill to 17,819 acres for the large mill.

IV. Stability of Operation

The stability of the sawmill operations was investigated from the standpoint of number of years in business, number of years in present location, and continuity of operation. The small and medium sawmills have small difference in stability based on number of years in business and years at present location; however, there is a marked difference between the stability of the large mill class and these two smaller classes. The large mills average 36 years in business and 21 years at present location compared with 15 years and 9 years for the small and medium mills.

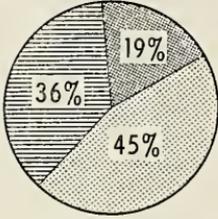
All the operators of large and medium mills reported their operations were a year-around business; however, more than a third of the small mill operators reported that they operated intermittently or only when filling orders.

Only 12 per cent of the operators of sawmills reported that they had moved to a new location in the past five years, and only 8 per cent reported that a move was planned within the next five years. The main reason given for having moved to a new location during the past five years was because of "unavailable raw material," while most of the operators who planned to move indicated that "loss of market" was the principal reason. Only the operators of small mills reported "loss of market" as a reason for moving.

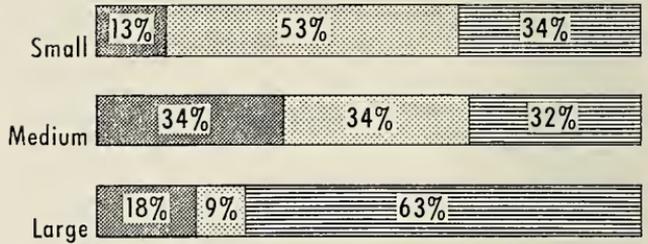
V. Change in Scale of Operation

The changes in scale of operation, as indicated by the occurrence of any increase, decrease, or no change, from 1950 to 1954, are tabulated

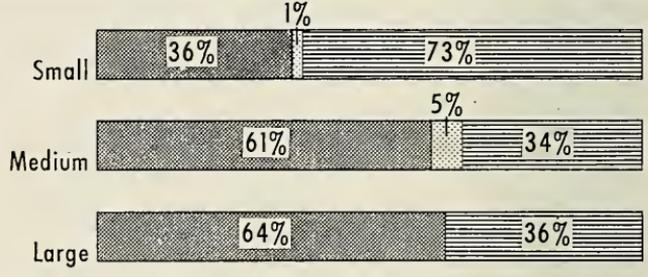
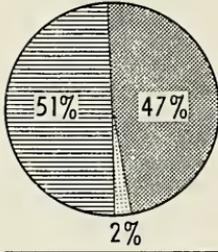
ALL SAWMILLS
Volume of Business



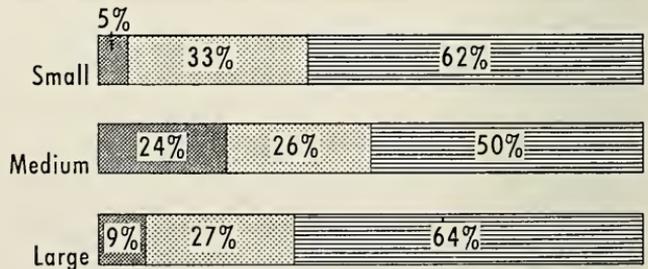
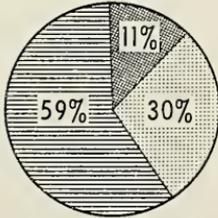
BY SIZE CLASS



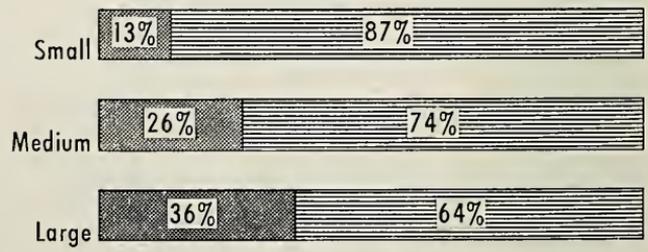
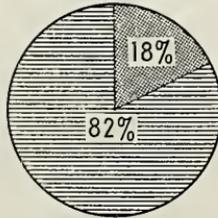
Machinery



Manpower



New Techniques



 No Change
  Decrease
  Increase

FIGURE 4. Change in scale of operations by sawmill size class, 1950-1954.

by total for the industry and sawmill size class in terms of: volume of business, machinery, manpower, and new techniques (Figure 4).

For all categories, except volume of business, there is a predominant reporting of "no change." "Volume of business" and "manpower" categories show significant decreases, while "machinery" and "new techniques" show increases.

Trends between sawmill size classes are evident in "volume of business," "machinery," and "new techniques" categories. For example, in "volume of business" there is a reduction in the percentage of mills reporting a decrease as the mill size increases, and an increase in the adoption of "new techniques" with increasing mill size.

There do not appear to be any significant changes in "manpower" between mill size classes.

VI. Source of Woods Labor

The sources of woods labor used by sawmill operators are separated into three categories: operators who use contract crews, those who use their own crews, and those who use a combination of contract crews and own crews (Figure 5).

With increasing mill sizes there is an increase in the percentage of sawmills using contract crews, a decrease in the percentage of operators

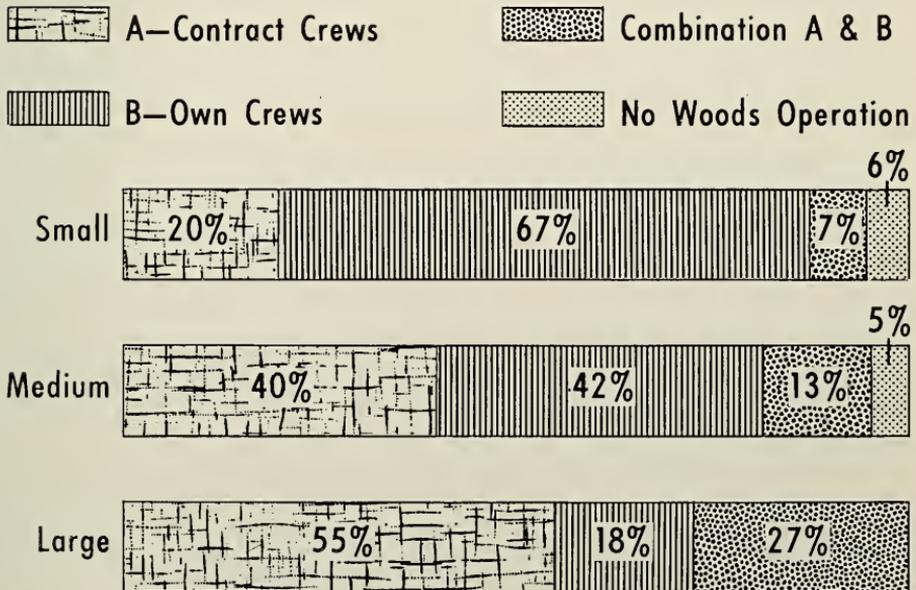


FIGURE 5. Relationship of source of woods labor to mill size classes.

using their own crews, and an increase in the percentage using the combination of own crews and contract crews.

Approximately two-thirds of the operators of the small sawmills use their own crews, whereas a majority of the operators of large mills use contract crews in their logging operations. Operators of small mills frequently use the sawmill crew and logging crew interchangeably. Also, since the operations of sawmilling and logging are under the immediate supervision of the operators, these operators frequently act as both sawyer and logging supervisor or they may employ a sawyer who also supervises the sawmilling. In such cases the operators can accordingly devote a major portion of their time to logging. However, the operators of large sawmills have more involved raw material procurement and manufacturing operations, and they delegate a greater amount of responsibility to the logging contractors.

Replies from the inquiry as to availability of woods laborers indicate that sufficient labor is available since 93 per cent of the mill operators answered in the affirmative.

VII. Raw Material Procurement Practices

SOURCE

The products that the sawmill operators have for marketing may be derived from three raw material forms—stumpage and logs, which the operator manufactures into lumber or other wood products, and lumber purchased from other sawmills, which the operators place on the market as lumber or, after processing into flooring, dimension, or other wood products. It is common practice for the larger mill operators to purchase lumber for marketing from the smaller sawmills. The larger mill operators perform such marketing functions as storing and grading, functions that some smaller mills are unable to do because of lack of finances or facilities. For all mills, approximately 68 per cent of the volume marketed is derived from stumpage, 22 per cent from logs, and 10 per cent from lumber. As mill size increases there is an increase in the percentage of lumber purchased by the sawmill operators, with operators of the large mills buying approximately three-fourths of the purchased lumber (Figure 6).

Approximately 35 per cent of the raw material utilized by the sawmills is produced from lumber industry-owned land, 60 per cent from other privately-owned, and 5 per cent from publicly-owned land. The major proportion of raw material comes from privately-owned lands of less than 500 acres.

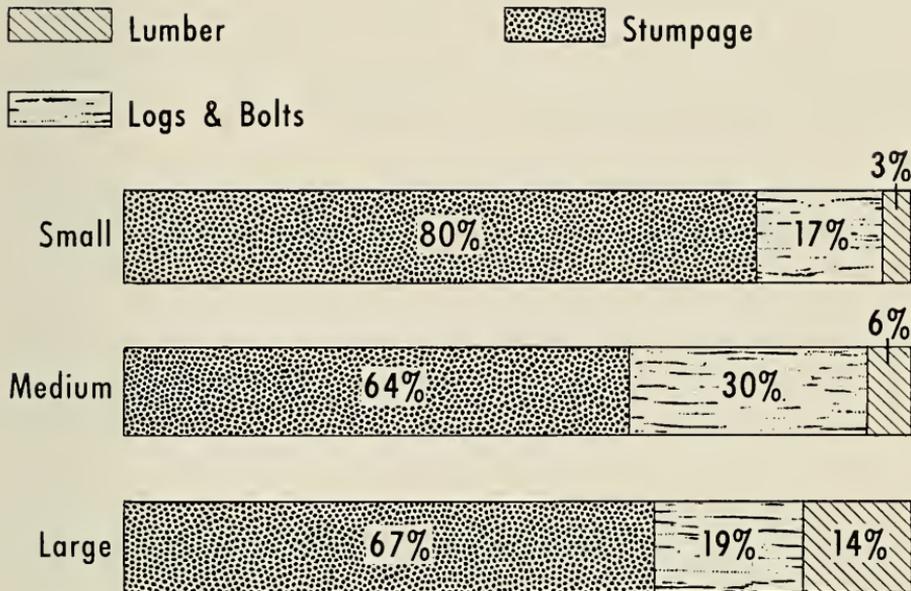


FIGURE 6. Per cent of volume of raw material and lumber purchased by sawmill operators according to mill size class.

The small- and medium-size class mills are comparable as to percentage of raw material coming from the four sources (Figure 7), with most of the raw material (65 per cent) coming from privately-owned land of less than 500 acres in ownership size. However, the mills classified as large obtain approximately half of their raw material from their own lands, with fairly equal amounts coming from private less- and private greater-than 500 acres in ownership size. Eighty-two per cent of the raw material coming from publicly-owned land is obtained by the mills classified as "large."

MEASUREMENT PRACTICES

The measurement practices used by sawmill owners in the purchase of stumpage from forest ownerships of less than 500 acres in size are classified as the "ocular estimate," "cruise," "volume scale," and "mill tally" (Figure 8). More than two thirds of the owners use the ocular estimate as a basis for estimating the amount of stumpage available in the purchase. However, there is an inverse relationship between mill size and the percentage using the ocular estimate. Eighty-five per cent of the small sawmills use the ocular estimate, while only 10 per cent of the large mills use this technique. With increasing mill size there is an increase in the use of both the cruise and log scale measuring techniques.

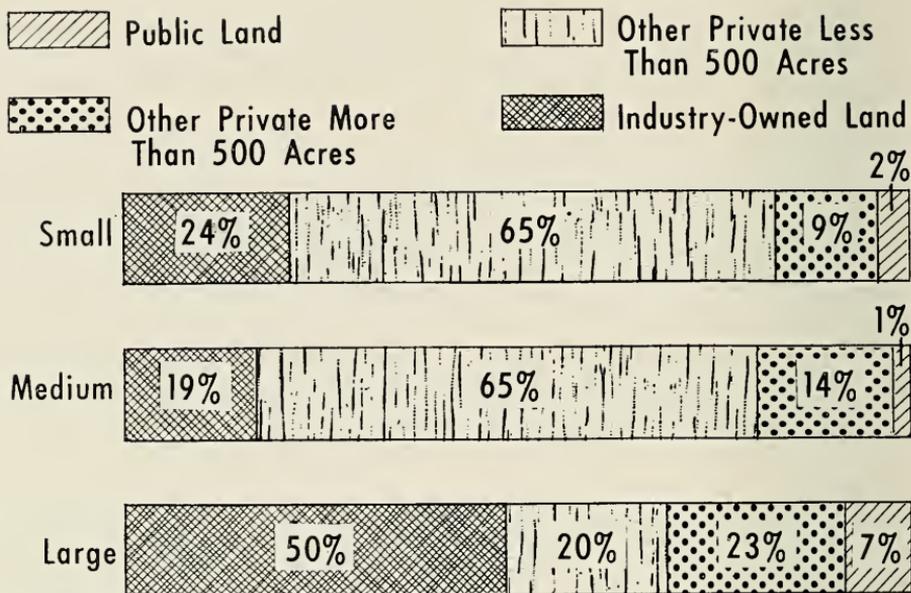


FIGURE 7. Source of raw material by class of forest ownership and sawmill size class.

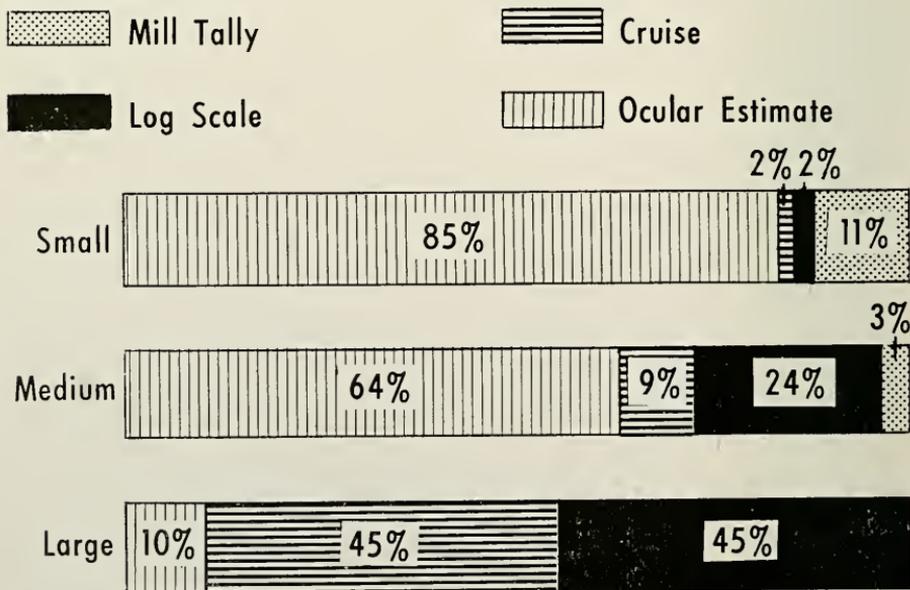


FIGURE 8. Measurement practices of sawmill operators buying stumpage from forest ownerships of less than 500 acres in size.

A majority (85 per cent) of the "small" sawmills use the ocular estimate with a more limited use of mill tally as a basis for buying stumpage. The medium-sized mills use principally the ocular estimate and log scale, and the large sawmills use principally the cruise and log scale.

QUALITY REQUIREMENTS

The use of written specifications or grades in the purchasing of raw material was found only in the medium and large mills. These quality requirements are not applicable to stumpage purchases, thus eliminating two-thirds of the raw material from being purchased by specification of grade. Approximately 93 per cent of the reporting sawmills did not use written quality requirements. Sixteen per cent of the medium-size class mills and 36 per cent of the large mills use written specifications or grades. However, sawmills which do not have written quality requirements do allow a price differential for raw material, an example being that of sound straight logs of good quality which bring a higher price than logs of an inferior quality.

PRICES

The range of prices paid per thousand board feet of raw material by point of purchase and mill size is shown in Table 5. With increasing mill size there is an increase in the amount paid for raw material at all points of purchase. There are several factors that might contribute to this condition where, seemingly, the raw material is the same at each point of purchase regardless of mill size. However, the larger mills in using raw material of comparable quality are able to and do produce a higher-valued product than the small sawmills. Part of the increased

TABLE 5. RANGE OF AVERAGE MINIMUM AND MAXIMUM PRICES PAID PER M. B. F. BY POINT OF PURCHASE AND MILLS SIZE CLASS

| MILL SIZE | STUMPAGE | | LOGS ROADSIDE |
|--------------|-------------------|-----------------|-------------------|
| | MIXED HARDWOOD | MIXED OAK | MIXED HARDWOOD |
| Small | \$8.00—\$ 9.89 | \$10.00—\$12.00 | \$25.00—\$35.00 |
| Medium | \$8.24—\$10.84 | \$11.50—\$15.00 | \$30.00—\$36.00 |
| Large | \$8.60—\$12.40 | ————— | \$30.00—\$40.00 |

| MILL SIZE | LOGS MILL YARD | | |
|--------------|-------------------|-----------------|-----------------|
| | MIXED HARDWOOD | MIXED OAK | YELLOW-POPLAR |
| Small | \$28.00—\$40.00 | \$30.00—\$45.00 | \$27.50—\$40.00 |
| Medium | \$32.16—\$44.21 | \$40.00—\$62.50 | \$34.92—\$46.00 |
| Large | \$35.00—\$50.00 | \$40.00—\$90.00 | \$40.00—\$80.00 |

value is due to the greater care in seasoning and handling which the large mills give to their products, and too, the larger mills are able to produce lumber to a greater dimensional accuracy. Probably the most important factor, however, that permits larger mills to pay more for their raw material is that they have developed a greater diversity of markets and products and are thereby better able to channel their raw material into its most efficient use.

TRANSPORTATION FACILITIES

Approximately 85 per cent of all the sawmill operators either use their own trucks or depend on other trucks for transporting their logs (Table 6). With increasing mill size there is an increase in the use of contract trucking.

The operators of small and medium sawmills principally use their own trucks for transporting raw materials to the mill, and while both depend on contract trucking, the small mill operators also do direct skidding of the logs to the sawmill site. The operators of the large mills transport 84 per cent of their logs by contract means, using either truck or railroad.

The average maximum distance for hauling logs to the sawmill site increases with increasing sawmill size (Figure 9). The small mills have an average hauling distance of 10 miles, medium mills have an average maximum hauling distance of 17 miles, and large mills have a hauling distance of 36 miles. The weighted average maximum hauling distance for all logs hauled to the sawmill, including all size classes, is 20.4 miles.

VIII. Products Manufactured

The principal products produced by the sawmill operators are rough lumber and mine material (84 per cent of the total production). The remainder of the production is comprised of flooring, railroad ties,

TABLE 6. FACILITIES USED BY SAWMILLS FOR
RAW MATERIAL TRANSPORTATION

| MILL SIZE | A EXCLUSIVELY USE OWN TRUCKS | B EXCLUSIVELY DEPENDS ON OTHER TRUCKS | USES BOTH A & B | DIRECT SKIDDING | DEPENDS ON OTHER TRUCKS & RAILROADS | A &/or B PLUS DIRECT SKIDDING | AVERAGE MAXIMUM HAULING DISTANCE |
|-------------------|---------------------------------------|---|-----------------------|--------------------|--|--|---|
| | % | % | % | % | % | % | (Miles) |
| Small | 54 | 6 | 12 | 2 | — | 26 | 10 |
| Medium | 51 | 17 | 31 | — | — | 1 | 17 |
| Large | 8 | 34 | 8 | — | 50 | — | 36 |
| All Classes | 49 | 14 | 22 | 1 | 4 | 10 | *20.4 |

*Weighted average—based on volume produced by each mill class.

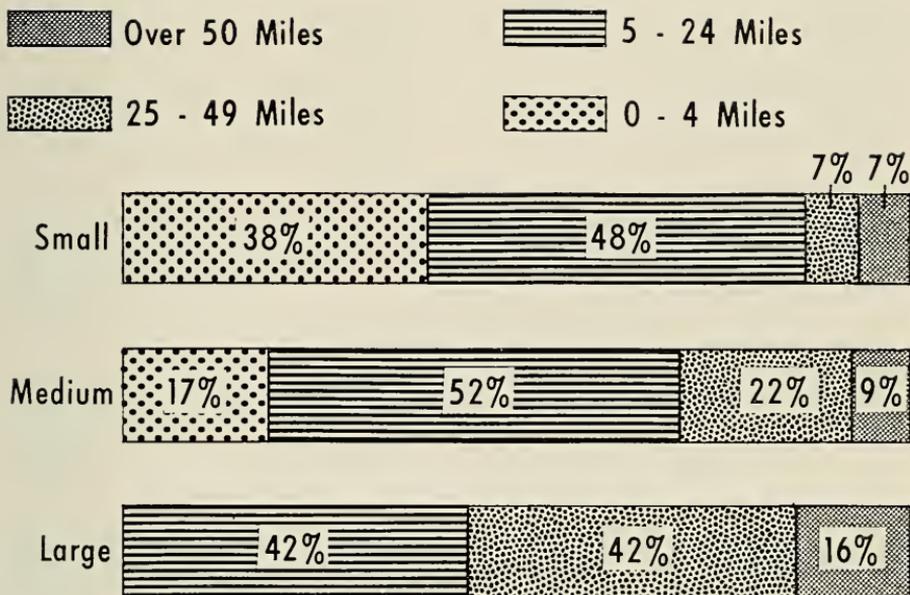


FIGURE 9. Relationship of hauling distance of raw material to sawmill size class.

steel mill blocking, construction timbers, wood turnings, dimension lumber, and miscellaneous products.

With increasing mill size there is an increase in the percentage of rough lumber produced and a decrease in the amount of mine material produced, although the total percentage of rough lumber and mine material combined in each mill class remains fairly uniform (Figure 10). Mills in the small- and medium-size classification produce other products such as steel mill blocking, railroad ties, and construction timbers. These products do not require installation of special machinery and tools beyond that of a basic sawmill for their manufacture. However, large mills produce other products such as flooring, wood turnings, and dimension. In manufacturing these products additional facilities are needed beyond the basic equipment found in smaller mills. Examples of this equipment would be wood moulding machines, planers, and dry kilns. The complexity of the marketing channels is greater than that for the other products of the two smaller mill classifications.

IX. Distribution of Products

MARKET OUTLETS

The market outlets for products produced by the sawmills are classified as consumer, manufacturer, wholesaler, and retailer.

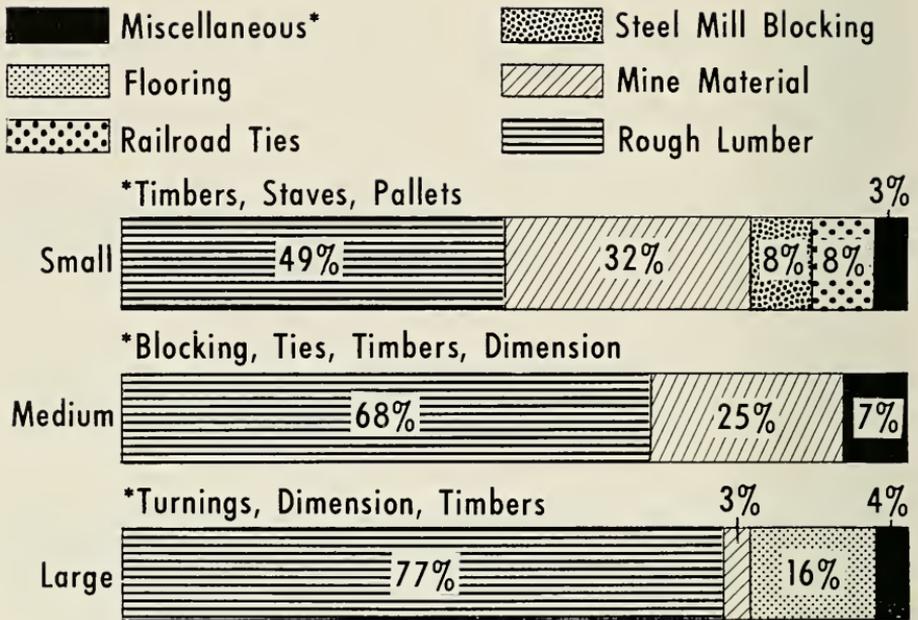


FIGURE 10. Per cent of volume of products manufactured by sawmill operators, classified according to mill size.

Operators of small sawmills market nearly equal volumes to the consumer and wholesaler, with 87 per cent of their production going to these outlets. The operators of medium- and large-size sawmills, however, utilize the manufacturer as a principal outlet and the wholesaler as a secondary outlet. These two larger mill classes do differ in practices in that one-fourth of the production from medium-size mills is channeled to the consumer and approximately one-fourth of the production from the large-size mills is channeled to the retailer (Figure 11).

With the increase in mill size class there is an increase in the number of market outlets used by the sawmill operators. The operators of large sawmills use an average of 2.7 outlets per mill and the operators of small and medium sawmills use an average of 1.6 and 1.8 market outlets per mill, respectively. The percentage of sawmills by size class using specified market outlets is shown in Table 7.

TABLE 7. PERCENTAGE OF SAWMILLS BY SIZE CLASS USING SPECIFIED MARKET OUTLETS

| MILL SIZE | MARKET OUTLET | | | |
|--------------|---------------|--------------|------------|----------|
| | CONSUMER | MANUFACTURER | WHOLESALER | RETAILER |
| | % | % | % | % |
| Small | 77 | 24 | 61 | 3 |
| Medium | 68 | 59 | 59 | 3 |
| Large | 33 | 83 | 75 | 75 |

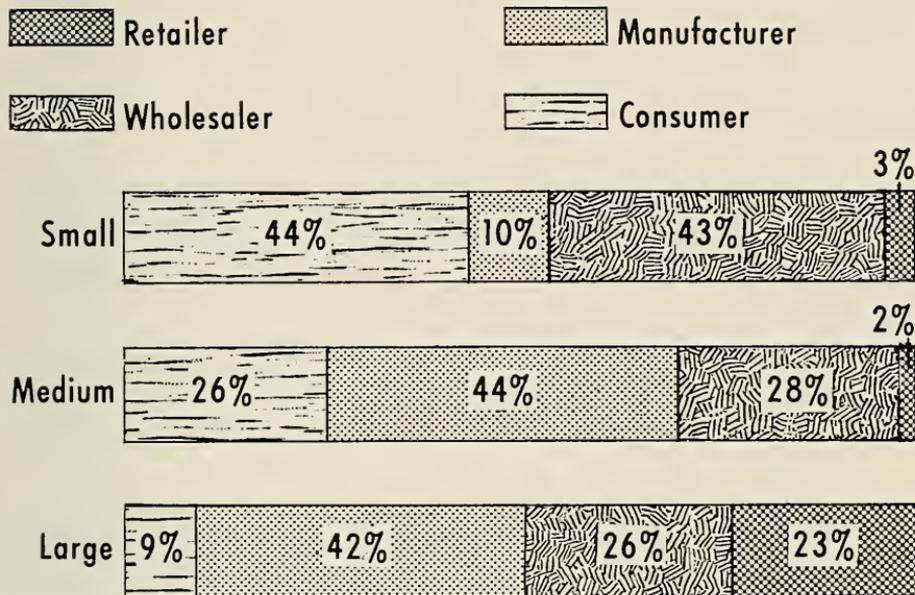


FIGURE 11. Per cent of volume of products marketed by sawmill size class and by market outlet.

Approximately two-thirds of the volume of lumber and wood products manufactured by sawmills is marketed to out-of-state outlets. With increasing mill size there is an increase in the percentage of their total production marketed to these outlets. For example, of the total production from the small mills approximately 55 per cent is marketed in-state and 45 per cent out-of-state, whereas approximately one-fourth of the production from the large mills is marketed in-state and three-fourths marketed to out-of-state outlets.

IN-STATE MARKET OUTLETS

The consumer is the principal market outlet for products of sawmills marketed in-state. More than half of the production that is marketed in-state goes to this outlet and consists principally of mine material. Approximately two-thirds of the production from the small-size mill is marketed to the consumer; however, with increasing mill size there is a decrease in the percentage of total volume moving to this outlet (Figure 12).

OUT-OF-STATE MARKET OUTLETS

While approximately half of the volume marketed in-state goes to the consumer, in contrast, approximately half of the volume marketed out-of-state goes to the manufacturer. As would be expected the whole-

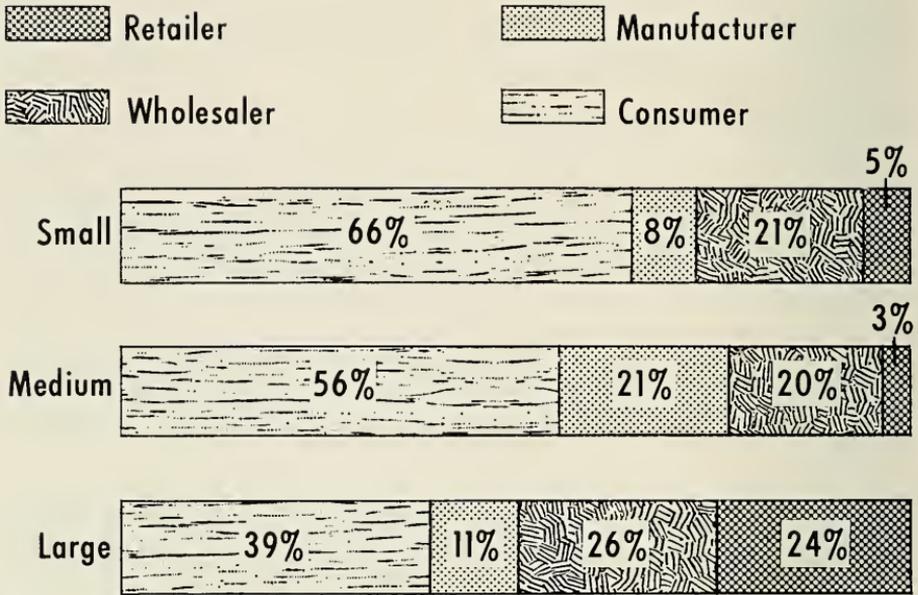


FIGURE 12. Per cent of volume of products by sawmill size class going to in-state market outlets.

saler has an important position in the marketing chain with nearly one-third of the out-of-state production going through this outlet. The operators at the small mills, particularly, depend upon this outlet for moving their production out-of-state since 70 per cent of their production moves through this outlet. However, with increasing mill size there is less dependence on the wholesaler (Figure 13).

X. Market Information or Service

Table 8 shows the results of an effort to determine to what extent various sources of information and service had been of help to the operators of sawmills in marketing their products.

The most common technique used by all mill operators to determine market conditions is by obtaining information from individuals or private companies. This method of keeping informed of market conditions is used particularly by operators of small mills, 93 per cent of whom indicated that they used it. An example of this method is apparent when a mill operator obtains information from wholesalers and/or brokers concerning the lumber market. This technique is used by mill operators to a lesser degree with increasing mill size.

The regional market bulletins, particularly the *Hardwood Market Report* and *Wests' List of Appalachian Hardwoods*, are used by the

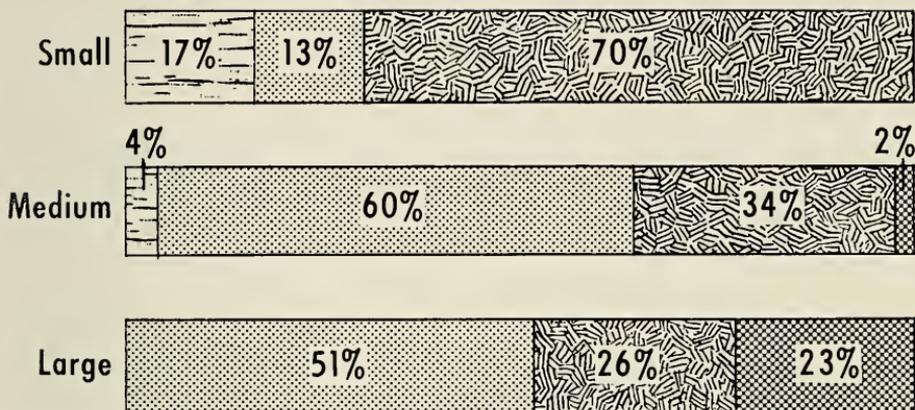


FIGURE 13. Per cent of volume of products going to out-of-state market outlets by sawmill size class.

TABLE 8. PERCENTAGE OF SAWMILLS BY SIZE CLASS USING VARIOUS SOURCES OF INFORMATION OR SERVICE IN MARKETING THEIR PRODUCTS

| MILL SIZE | LOCAL MARKET BULLETINS | | REGIONAL MARKET BULLETINS | | OTHER PUBLISHED SOURCES | |
|-----------------|------------------------|-----|---------------------------|----|-------------------------|----|
| | YES | NO | YES | NO | YES | NO |
| | % | % | % | % | % | % |
| Small | 2 | 98 | 6 | 94 | 7 | 93 |
| Medium | 3 | 97 | 24 | 76 | 24 | 76 |
| Large | — | 100 | 45 | 55 | 45 | 55 |
| All Mills | 3 | 97 | 14 | 86 | 14 | 86 |

| MILL SIZE | RADIO | | COUNTY FORESTER | | CONSULTING FORESTERS | | OTHER INDIVIDUALS OR PRIVATE COMPANIES | |
|-----------------|-------|-----|-----------------|----|----------------------|-----|--|----|
| | YES | NO | YES | NO | YES | NO | YES | NO |
| | % | % | % | % | % | % | % | % |
| Small | — | 100 | 4 | 96 | — | 100 | 93 | 7 |
| Medium | — | 100 | 5 | 95 | 3 | 97 | 63 | 37 |
| Large | — | 100 | 9 | 91 | — | 100 | 36 | 54 |
| All Mills | — | 100 | 5 | 95 | 1 | 99 | 81 | 19 |

mill operators for price information. Other published sources such as the *Southern Lumberman* and *The Northeastern Logger* are used also. There is an increasing use of these sources of marketing information

with increasing mill size. Approximately 6 per cent of the operators of small sawmills used regional marketing bulletins or other published sources, whereas 24 per cent of those classified as medium and 45 per cent of those classified as large use these sources.

Five per cent of the sawmill operators indicated that County Foresters had provided marketing information or service, and 3 per cent of the medium-size mill operators reported receiving assistance from Consulting Foresters.

PART C—Other Primary Wood Industries

I. Veneer

Data were obtained from four of the five veneer producing plants located in West Virginia. These plants are engaged in producing hardwood veneer by three principal processes: (1) Rotary cutting, (2) Stay-log, (3) Slicing. Two of the plants are integrated with plywood and lumber producing mills.

The total amount of veneer logs consumed by these plants amounted to approximately 6 million board feet (approximately one-half is secured from West Virginia's forests). The relative low percentage of raw material obtained from West Virginia is primarily due to the location of the plants. Three of them are located near the state border and therefore obtain their raw material from adjacent states as well as from West Virginia.

Raw material for production of veneer is purchased by the plant operators in the form of logs and stumpage. Most of the raw material, 85 per cent, is purchased in log form and a price differential is paid based on grade and species. Each mill has its own system of grading.

Red and white oak make up approximately three-fourths of the volume used in producing veneer, with yellow-poplar, black walnut, and black cherry being secondary in importance. Other species used are maples, birches, elms, ashes, and sycamore.

Transportation of raw material is a particularly important aspect of the veneer industry due to the relatively high quality raw material required and the immobility of the processing plant. More than one-third of the total of raw material is transported 100 miles or more and 60 per cent is transported 50 miles or more.

All mills use both trucks and rail for transporting raw material.

The veneer mills in West Virginia produce principally face and commercial veneers. The face veneers are of high quality and are pro-

duced by slicing or stay-log techniques and used for the facing of plywood panels. The commercial veneers are used in the cores and backs of plywood and are usually cut by the rotary process.

The markets for these veneers are furniture, radio and television cabinets, parquet flooring, and plywood.

Approximately 90 per cent of the veneer produced in West Virginia is shipped out-of-state for further processing and, whether marketed in-state or out-of-state, is sold to manufacturers.

II. Bourbon Staves

Five stave and heading mills in West Virginia produce bourbon staves for out-of-state tight cooperage industries. Two of the stave mills are integrated with sawmills.

Raw material consisting of top quality white oak, free from worm holes, is purchased either in bolt form by the bolt foot, or in log form by log scale. The logs are cut into round bolts 38 to 39 inches in length and split into stave bolts. The standard measurement, bolt foot, is the chord distance across the end of the bolt, and is measured from sapwood to sapwood. One bolt foot is equivalent to approximately 10 to 12 board feet log scale and produces an average of six staves.

The average price for stave bolts delivered to the mill was \$0.92 per bolt foot, and prices reported by the operators ranged from \$0.85 to \$1.00 per bolt foot. Stave quality white oak logs delivered to the mill site brought from \$60 to \$80 per thousand board feet.

The five mills contacted purchased 118,000 bolt feet, or approximately 1,180,000 board feet of white oak in 1953. A total of 686,000 staves were produced. The average daily production capacity was 5,400 staves. The total potential annual production based on 260 working days for five mills was 7,000,000 staves. This indicated that the mills were producing approximately 10 per cent of their potential. The main reason given for low production was "unavailable market for staves."

The principal markets for staves are the cooperage plants located in Baltimore, Maryland; Louisville, Kentucky; Oil City, Pennsylvania; and Cleveland, Ohio.

Average maximum hauling distance for raw material was 75 miles.

III. Rustic Fence

The rustic fence industry produces two- three- and four-rail fences that are used by home and estate owners. The industry is characterized by: (1) relative low manufacturing equipment investment, (2) consider-

able hand labor involved in producing rails and posts, and (3) dependency in part on a wood raw material, "dead chestnut," that is not renewable.

Chestnut and sassafrass are the species used for rails; chestnut and black locusts are used for posts. Approximately 500,000 split rails and 188,000 posts were produced by the five reporting plants. Specifications for the raw material require that the split rails be 11 feet long with a 4 1/2-inch face. The specifications for posts require that round posts have a minimum 6-inch top diameter and split posts a minimum 7-inch face. The length of posts may be 6 or 7 feet. The average price paid for chestnut posts and rails delivered to the plant is \$0.26 each and the average price for locust posts is \$0.54 each.

The average maximum raw material hauling distance for all mills is 40 miles. Approximately 20 per cent of the raw material was obtained from Federal lands. All of the mill operators contracted their woods operations and one operator also hired his own woods crew.

The operators reported that practically all of their markets were out-of-state and existed principally in the Eastern metropolitan areas of the Atlantic seaboard.

IV. Insulator Pins and Billets

Black locust insulator pins are used to support glass or ceramic insulators of telephone and power transmission lines.

Two companies manufacture insulator pins and one company produced just the blank or billet that is further processed into an insulator pin by an out-of-state company.

The raw material for producing insulator pins is purchased either by the cord or by log scale. Approximately 873,000 board feet of black locust logs or bolts were utilized by the three companies. The specifications require that the bolts have a minimum diameter of 7 inches and a minimum length of 58 inches. The log or bolt is cut into blanks or billets 1 5/8 x 1 5/8 x 8 inches in size. The billets are placed in an automatic lathe that turns, tapers, and threads them to form the insulator pins. The annual production of the three plants is approximately 4,250,000 insulator pins and 1,571,000 billets.

Approximately 80 per cent of the black locust for insulators is purchased from owners of forest land of less than 500 acres in ownership size. The average maximum hauling distance is 36 miles. Prices paid for black locust based on point of purchase and unit of measure are as follows:

| UNIT OF MEASURE | POINT OF PURCHASE | | |
|-----------------|-------------------|-----------------|-----------------|
| | STUMP | ROADSIDE | MILL YARD |
| Cord | \$ 7.00-\$ 9.00 | \$15.00-\$20.00 | \$22.00-\$30.00 |
| Log Scale | \$18.00-\$20.00 | \$40.00-\$55.00 | \$60.00-\$65.00 |

V. Charcoal

The charcoal-producing industry in West Virginia has been in a period of transition within the past ten years due to development of domestic charcoal markets and the utilization of small batch and continuous charcoal-producing processes. The relatively recent development of the domestic market for charcoal was preceded by the use of charcoal principally for industrial purposes.

Two plants, using large brick beehive kilns, provided information concerning their operations. Raw material is delivered by suppliers in the form of slabs or bolts and is purchased by the cord. Approximately $3\frac{1}{4}$ cords of raw material are required to produce a ton of charcoal. A kiln holds from 50 to 90 cords of wood. During 1953 nearly 12,500 cords of wood were converted to 3,780 tons of charcoal by the two reporting firms. The raw material is transported to the charcoal plant by the suppliers. The delivered price is \$6.00 per cord for slabs and \$8.00 per cord for bolts. The charcoal is marketed principally in carload quantities to the steel and chemical industries.

Since 1953 there have been several 1- and 2-cord cement block kilns installed by sawmill operators to utilize slabs to produce charcoal. One of the major problems of this enterprise was the absence of satisfactory marketing channels for the charcoal.

The development of metal retorts for the continuous processing of charcoal has shown considerable promise. The raw material used is developed from slabs that are cross-cut into blocks with lengths of 12 to 16 inches. The retorts are arranged at the plant so that from four to five may be operated from one source of raw material supply. The charcoal is collected in metal drums which may be sealed, when full, for cooling. The production of charcoal briquettes completes the processing of the charcoal. The principal market is for domestic uses.

The portable-metal-beehive retort is the latest addition to charcoal production in West Virginia. These retorts have capacities of approximately $1\frac{1}{2}$ cords of round or split bolts. Several batteries of kilns, under one ownership, are strategically located near available raw material. The charcoal is transported to a central plant for processing into briquettes.

Coke ovens have also been adapted for the production of charcoal.

One of the most significant developments in the charcoal industry has been the increased domestic use of charcoal. This has offset losses in the industrial market.

VI. Tanbark

Operators of two tanning companies reported that they purchased 1,784 tons of chestnut oak bark from West Virginia producers in 1953. One cord of bark weighs approximately one ton.

The bark is cut into four-foot lengths, dried, and delivered to the tanneries. Prices paid range from \$18 to \$22 per ton. A reduction of \$1.00 per ton is made for "old" or "green" bark.

VII. Miscellaneous Plants

Approximately 8 million board feet of raw material in the form of stumpage or logs was purchased by three companies producing products classified as wood turnings, namely, handles and clothespins.

Ash and hickory are the principal species used for tool handles, while birch, beech, maple, and yellow-poplar are used for broom and mop handles. Clothespins are manufactured from birches, beeches, and hard maple.

The producers of turnings use principally the wholesaler for a market outlet. More than 80 per cent of the products of these industries are marketed to out-of-state outlets.

Conclusions

The primary wood-using industries in West Virginia provide examples for paradoxes in alternative markets, competitive position, diversity of products, and manufacturing and marketing efficiency. The contrasts are particularly evident between the positions of the large sawmill and the small sawmill groups. The products of small sawmills as a rule have a limited market, with a higher percentage of the market confined within West Virginia. Furthermore, their market is for relatively low-valued wood products, such as mine material, steel mill blocking and flooring stock. Such factors as low production capacity, limited financial resources, and substandard product manufacturing and handling techniques have acted to prevent many of the small mill operators from developing alternative markets. In contrast, the larger sawmill operators as a group are on the opposite end of the scale with reference to the above factors.

The location of additional secondary wood-using industries within West Virginia would help to bring in balance the in-state and out-of-state markets for lumber. Such additional secondary industries as furniture, dimension, flooring, general millwork, and woodenware could improve the utilization of wood raw material, and at the same time provide employment and general economic improvement.

West Virginia is well endowed with the potential for producing wood and has maintained a position as one of the leading hardwood producing states in the United States. In comparing West Virginia with three adjacent states, Ohio, Pennsylvania, and Kentucky, it is noted that West Virginia has approximately one-fourth of the total forest land, one-fourth of the total number of active sawmills, one-fourth of the total lumber production and one-third of the total saw-timber acreage. This indicates that West Virginia has the ability to maintain its position as a producer of wood raw material. The latest data available indicate that the total amount of wood used in manufacture in the four-state area was 1,456,270,000 board feet. West Virginia used 93,250,000 board feet, which is only 7 per cent of the total for the area. Ohio and Pennsylvania each used approximately 40 per cent of the total. This indicates that both West Virginia and Kentucky are lacking in industries for producing wood into fabricated parts.

The lumber, wood product, and wood furniture industries had 54,650 employees in the four-state area during 1954. West Virginia had 8,316 employees engaged in these industries, approximately 15 per cent of the total. In comparison, Ohio and Kentucky each had 22 per cent and Pennsylvania 41 per cent. Using as a goal the average for the four-state area, West Virginia could provide employment for an additional 5,000 workers in the lumber and wood product industries. The total payroll in these industries in West Virginia could be increased by \$20 million.

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