Selling Mill-Run and Graded Oak Lumber

W. J. O'NEIL

FIGURE 1—Log 1 is a cull because knots are spaced less than 2 feet apart. Log 2 is a No. 2 log because it has one clear face. Its quality is lowered by a butt fire scar.

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Many factors determine the amount of profit that a manufacturer will derive from the sale of a product. Some of these are efficiency in manufacturing, market stability, demand for product, volume of product for sale, the buyers' and sellers' bargaining power, and method of selling.

The producers of hardwood lumber in Missouri—small sawmill operators—are confronted with a number of disadvantages in earning a maximum profit on their product. Their operations are small—few mills cut as much as 10,000 board feet per day. The labor force is often transient and not skilled; therefore, labor efficiency is likely to be low. Equipment is frequently old and in poor adjustment. Lumber produced often is inferior because it is too thin, too thick, or otherwise mismanufactured.

The hardwood lumber market is unstable; it follows closely the trend of construction. Oak lumber, the chief type of hardwood lumber produced in Missouri, has rather restricted use—chiefly for flooring and rough construction.

There is no organized marketing through an association or through concentration yards. Individual sawmill owners generally sell their lumber directly to flooring mills, building contractors, and other users of hardwood lumber. Most of the lumber is sold as rapidly as it is produced as "mill-run" or without segregation by grades. A few mill owners grade their lumber and sell it by individual grades and some lump two or more grades together and sell it by these broader categories.

In recent years there has been a growing trend toward selling products by grade. This type of merchandising is generally more profitable to the seller because consumers will pay premium prices for the better grades of products.

If this principle would apply to oak lumber, its producers would find it advantageous to grade their lumber. A study was initiated in 1955 to determine the merchandising method that would return the greatest profit to Missouri producers.

METHOD OF STUDY

After studying the operating methods of several mills, three which operate rather regularly and whose owners were willing to cooperate were selected for this investigation.

The logs from which the lumber was recovered were scaled on the log deck by the International ¼-inch saw kerf log scale rule. The volume of unsound defects (unuseable for lumber) was deducted from the gross volume of each log. Each log was also graded (Fig. 1).

FIGURE 2

LOG SCALE, LUMBER TALLY AND OVERRUN FOR THE THREE MILLS.

LOG SCALE
Bd. ft.

MILL 2
7,675

AVE.
12,898

MILL 3
11,330

MILL 1
19,690

LUMBER TALLY
Bd. ft.

MILL 1
20,979

MILL 2
8,312

MILL 3
12,473

AVE. 3
MILLS
13,921

OVERUN
PERCENT

MILL
1
6.55

MILL
2
8.30

MILL
3
8.83

AVE.
3 MILLS
7.93
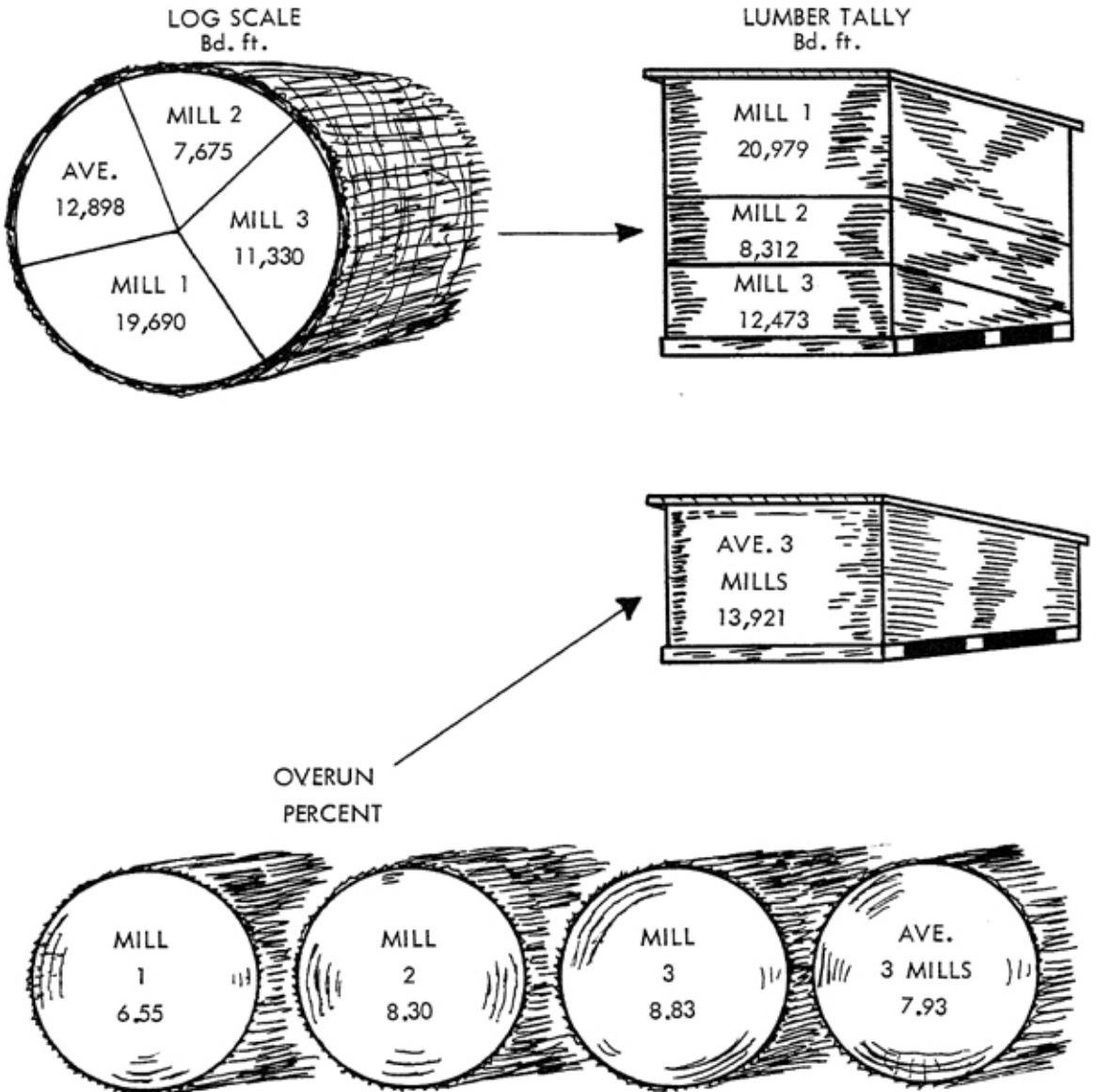
Six hundred ninety-one logs, with a gross scale of 41,130 board feet, a cull of 2435 board feet (5.92 percent), and a net scale of 38,695 board feet, were included in the study. These logs yielded 41,764 board feet of lumber. The difference of 3069 board feet between log and lumber scale gives an overrun of 7.93 percent (Fig. 2).
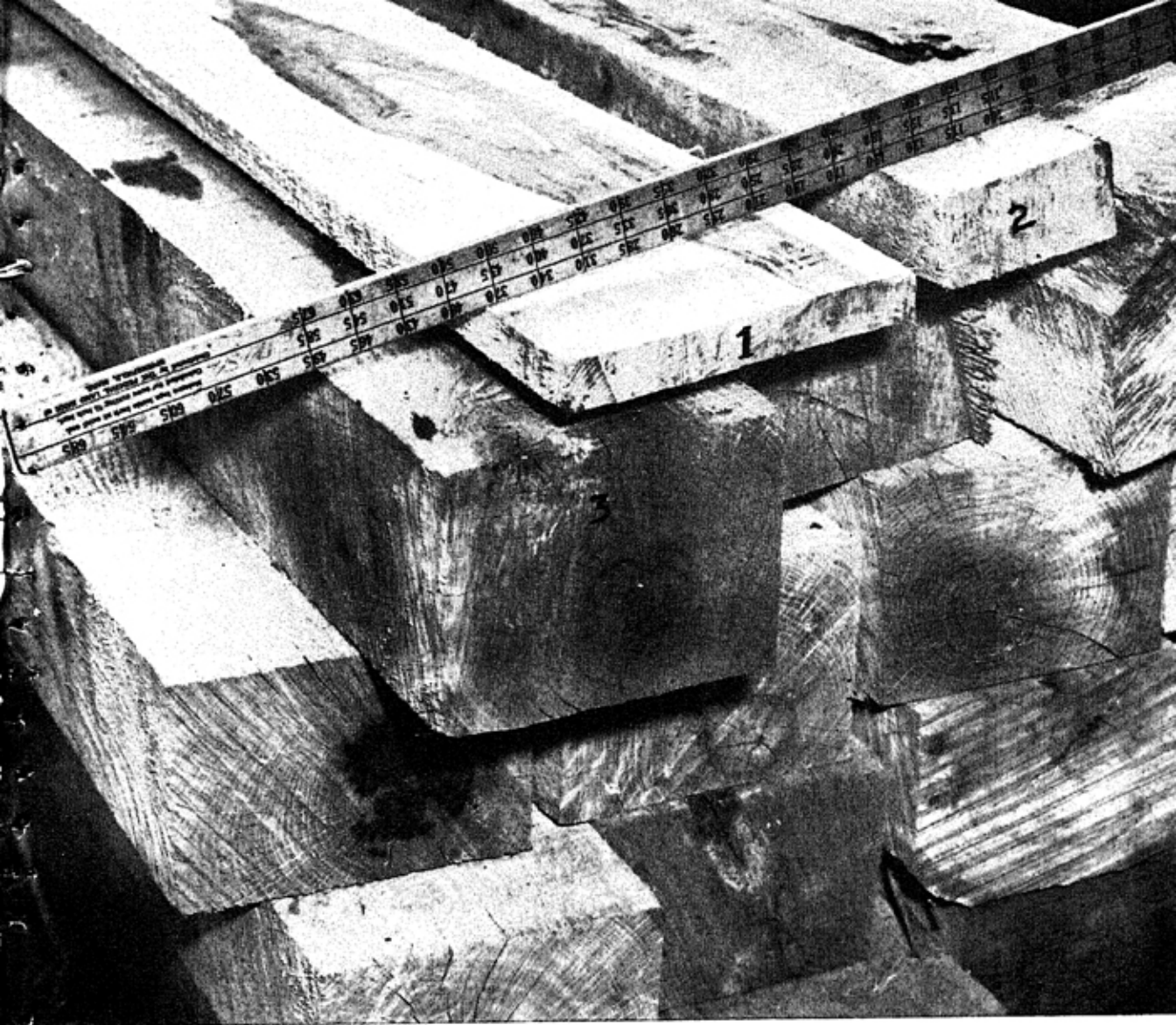
FIGURE 3—A pile of mixed lumber showing boards (1), dimension (2), and timber (3).

Overrun varied from 6.54 to 10.09 percent. The high overrun for mill number 3 speaks well for the efficiency of this mill because cutting of dimension lumber and timbers tends to increase overrun and yet this mill cut the least volume of these classes of material. (See Table 1).

Each board was graded and measured (Fig. 3). Using its dimensions and a lumber tally rule, its volume in board feet was recorded. The boards were graded as they came off the saw. The possibility of up-grading a board through edging or trimming was not taken into account. Scoots 4 and 6 feet long and ¾-inch thick were manufactured at one mill.

The value of the lumber produced at each mill was computed to secure a theoretical value for the lumber if it had been sold by grade. Current prices for the various grades of lumber were used.

TABLE 1--YIELD OF LUMBER BY GRADES FROM THREE MILLS.

Grades	Mill No. 1 Board Ft.	Percent	Mill No. 2 Board Ft.	Percent	Mill No. 3 Board Ft.	Percent	Total Board Ft.	Percent
Firsts	42	0.20	13	0.16	495	3.97	550	1.32
Seconds	50	0.24	148	1.78	520	4.17	718	1.72
Selects	151	0.72	97	1.17	413	3.31	661	1.58
No. 1 Common Board Grade	829	3.95	965	11.61	1722	13.81	3516	8.42
No. 2 Common Board	1334	6.36	602	7.25	1616	12.95	3552	8.51
No. 3 A Common Board Grade	1889	9.00	2216	26.66	2675	21.45	6780	16.23
No. 3 B Common Board Grade	3323	15.84	2510	30.18	3470	27.82	9303	22.28
No. 1 Common Dimension	1320	6.29	----	----	----	----	1320	3.17
No. 2 Common Dimension	5631	26.85	460	5.54	----	----	6091	14.58
No. 3 Common Dimension	5382	25.65	795	9.56	578	4.63	6755	16.17
No. 1 Common Timbers	----	----	256	3.08	----	----	256	0.61
No. 2 Common Timbers	----	----	72	0.87	----	----	72	0.17
No. 3 Common Timbers	----	----	102	1.23	----	----	102	0.24
Four Foot Scoots	305	1.45	----	----	----	----	305	0.73
Six Foot Scoots	519	2.48	----	----	----	----	519	1.24
Mill Culls	204	0.97	76	0.91	984	7.89	1264	3.03
Totals	20979	100.00	8312	100.00	12473	100.00	41764	100.00

CHARACTERISTICS OF THE MILLS

Mill number 1 was a Corley mill equipped with a 52-inch inserted tooth circular saw. It employed seven men. This mill had the least lost time—13.2 percent—and produced the most lumber per day—808 board feet per hour. The mill operator sold his lumber as mill run.

Mill number 2 was a Fisher-Davis mill equipped with a 52-inch inserted tooth circular saw. It employed 5 men, who appeared to be less skilled than those employed at the other mills. This mill had 52 percent lost time and its production was 519 board feet per hour.

It sawed more thin lumber than the other mills. The lumber was sold by individual grades.

Mill number 3 was a Corley mill equipped with a 56-inch inserted tooth circular saw. It employed seven men. This mill had 35.7 percent lost time. Its production was 629 board feet per hour. Lumber was sold as mill run.

The average width of the boards sawed was 7.24 inches (Fig. 4). All mills produced more 8-inch lumber than other widths (23 to 47 percent), however

FIGURE 4

WIDTHS PRODUCED BY THE THREE MILLS.

WIDTHS IN INCHES

MILL 1
26.14% — 4"
23.85% — 6"
46.85% — 8"
3.01% — 10"
.15% — 12"

MILL 2
4" — 25.95%
6" — 14.33%
8" — 23.25%
10" — 21.55%
12" — 11.52%
14" — 3.03%
16" — 0.37%

MILL 3
13.74% — 4"
25.60% — 6"
27.19% — 8"
11.10% — 10"
13.94% — 12"
6.13% — 14"
2.30% — 16"

AVERAGE
4" — 22.96%
6" — 23.56%
8" — 37.38%
10" — 7.06%
12" — 6.21%
14" — 2.11%
16" — 0.72%
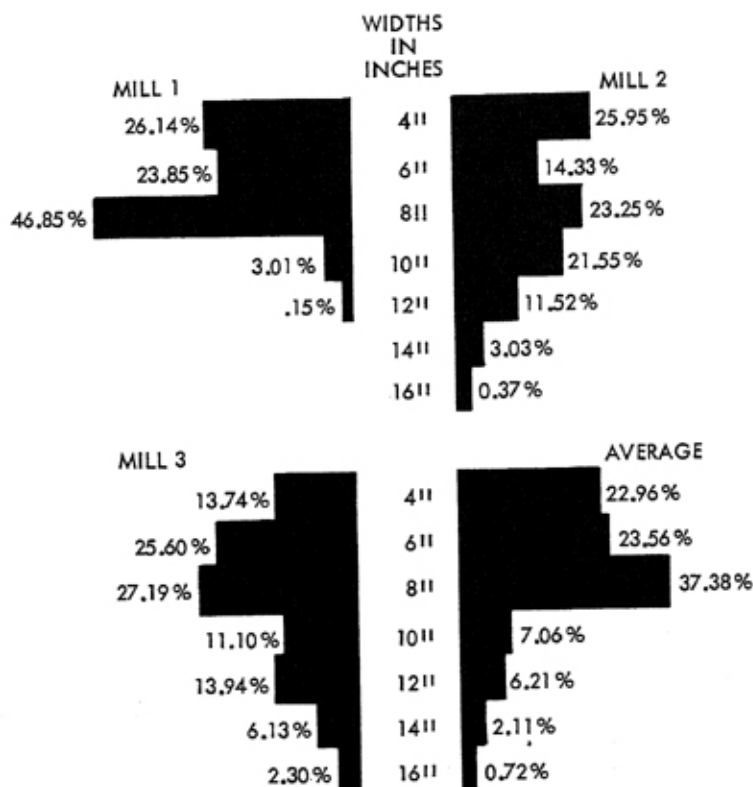
FIGURE 5

LENGTHS OF LUMBER CUT BY THE MILLS.

8 feet

12 feet

10 feet

14 feet and longer

6 feet and shorter

| 36.79% | 28.07% | 17.80% | 12.51% | 4.83% |
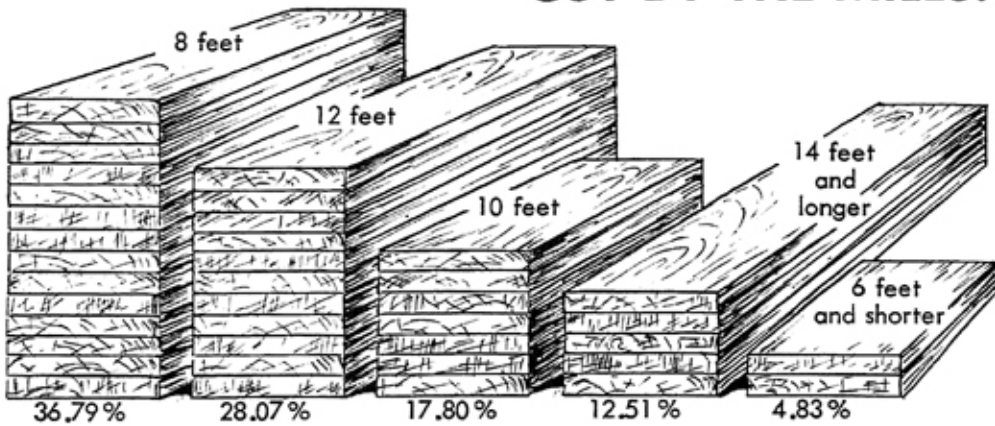
FIGURE 6

THICKNESS OF LUMBER PRODUCED BY THE MILLS.

THICKNESS	4/4 AND THINNER				DIMENSION				TIMBERS		
	MILL I	MILL 2	MILL 3	AVG.	MILL I	MILL 2	MILL 3	AVG.	MILL I	MILL 2	AVG.
	39.6	76.8	90.4	62.2	56.9	17.6	9.6	34.9	3.5	5.6	2.9
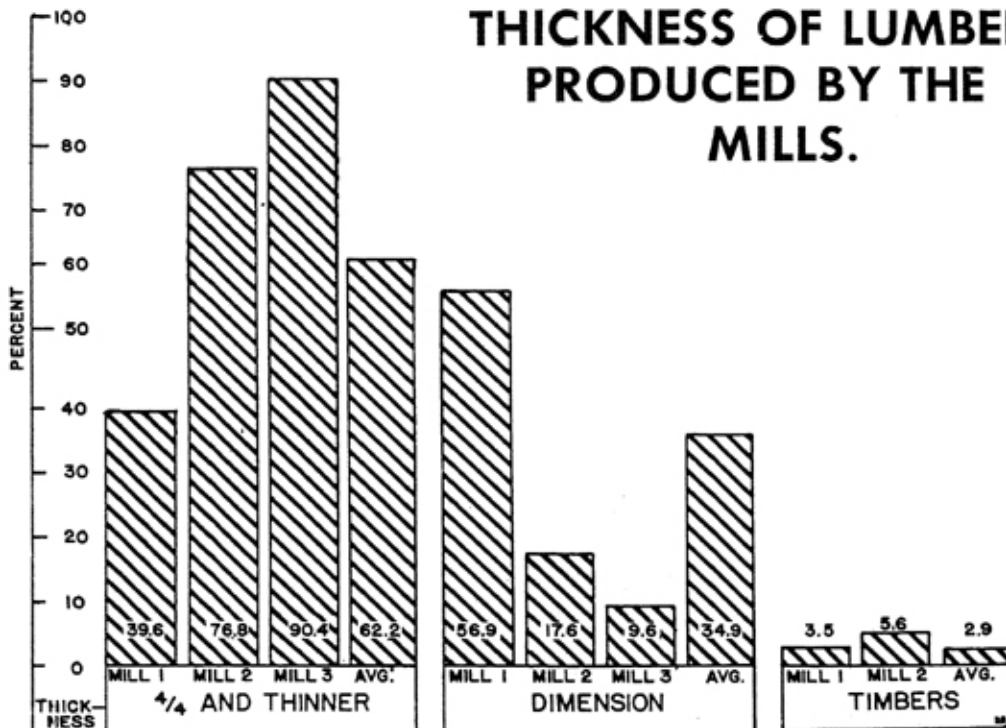
THICKNESS OF LUMBER

there was wide variation in the proportion of various widths produced by the three mills.

The distribution of lumber by lengths is shown in Fig. 5. More than one-third of the lumber cut was 8 feet long; 8- and 12-foot lengths made up nearly 65 percent of the cut.

Sixty-two percent of the lumber produced was 4/4 or thinner, but among mills the percentages ranged from 40 to 90 (Fig. 6). Timbers were cut only at mills number 1 and 2. They constituted only 3 to 6 percent of the total. Mill number 1 produced a high proportion of dimension lumber—nearly 57 percent.

RESULTS

The amount of lumber of various grades (Fig. 7) produced by the three mills is shown in Table 1. The relatively poor grade of lumber produced is evidenced by the fact that less than 17 percent of the lumber consisted of No. 1 Common and better. Mill number 3, with over 11 percent of selects and nearly 25 percent of No. 1 Common and better, produced the largest volume of higher-grade lumber. End-trimming of lumber would have increased the yield of higher-grade lumber.

The value of the lumber produced by mills number 1 and 3 if it had been sold by grade is shown in Table 2. The average value per thousand board feet

TABLE 2--THE VALUE OF LUMBER FROM MILLS NUMBER 1 AND 3
IF IT WERE SOLD BY GRADE.

Grades	Price Per M. Bd. Ft.	Mill Number 1		Mill Number 3	
		Volume	Value of Lumber	Volume	Value of Lumber
	Dollars	Bd. Ft.	Dollars	Bd. Ft.	Dollars
Firsts	115.00	42	4.83	495	56.93
Seconds	115.00	50	5.75	520	59.80
Selects	85.00	151	12.84	413	35.11
No. 1 Common Boards	72.00	829	59.69	1722	123.98
No. 2 Common Boards	58.00	1334	77.37	1616	93.73
No. 3 A Common Boards	40.00	1889	75.56	2675	107.00
No. 3 B Common Boards	30.00	3323	99.69	3470	104.10
No. 1 Common Dimension	72.00	1320	95.04	----	-----
No. 2 Common Dimension	58.00	5631	326.60	----	-----
No. 3 Common Dimension	35.00	5382	188.37	578	20.23
Mill Culls	15.00	1028	15.42	984	14.76
Totals		20979	961.16	12473	615.64

of the lumber from mill number 1 is $45.82 and that from mill number 3 is $49.36. The higher average value of the lumber from mill number 3 reflects the higher quality of the lumber from that mill.

Since there was no established market in Missouri from which prices could be secured, prices were obtained from the three mill operators.

The three mills sold their lumber on different bases. Mills 1 and 3 sold most of their 4/4 lumber mill-run, with the exception of FAS and 3 B Common, which were sold on grade locally. The dimension and timbers were sold as sound or unsound. The mill-run price was established by using the grade prices shown in Table 2.

Mill number 2 sold its lumber by grade.

The common practice of Missouri saw mills in disposing of oak lumber is to sell it to flooring mills. They will not take grades lower than 3 A Common, and prefer not to take 3 A Common.

Table 3 shows the value of the lumber from mills 1 and 3 based on actual sale. The values are $52.24 and $52.44 per thousand board feet, respectively. The

Figure 7—Five grades of lumber: (1) Second (2) No. 1 Common (3) No. 2 Common (4) No. 3 A Common (5) No. 3 B Common.

TABLE 3--VALUE OF LUMBER FROM MILLS NUMBER 1 AND 3
BASED ON ACTUAL SALE.

Grades	Volume	Price Per M. Bd. Ft.	Lumber Value
	Bd. Ft.	Dollars	Dollars
Mill Number 1			
FAS and Selects	243	100.00	24.30
Number 1 Common Boards	829	70.00	58.03
Number 2 and No. 3 A Common Boards	3,223	50.00	161.65
Number 3 B Common Boards	3,323	35.00	116.31
Dimension and Timbers	12,333	57.50	709.15
Four Foot Scoots	305	20.00	6.10
Six Foot Scoots	519	30.00	17.37
Mill Culls	204	15.00	3.06
Totals	20,979		$1095.97
Mill Number 3			
3 A and Better	7,441	60.00	446.46
Sound 3 B Common	3,470	50.00	173.50
Unsound 3 B Common	578	25.00	14.45
Mill Culls	984	20.00	19.68
Totals	12,473		$654.09

actual sale based on mill-run price produced more income than the theoretical sale based on grade (Table 2). For mill number 1 the difference was $6.42 and for mill number 3, $3.08 per thousand board feet.

Table 4 gives the value of the lumber produced by mill number 2 which was sold by individual grade. The average return was $46.98 per thousand board feet.
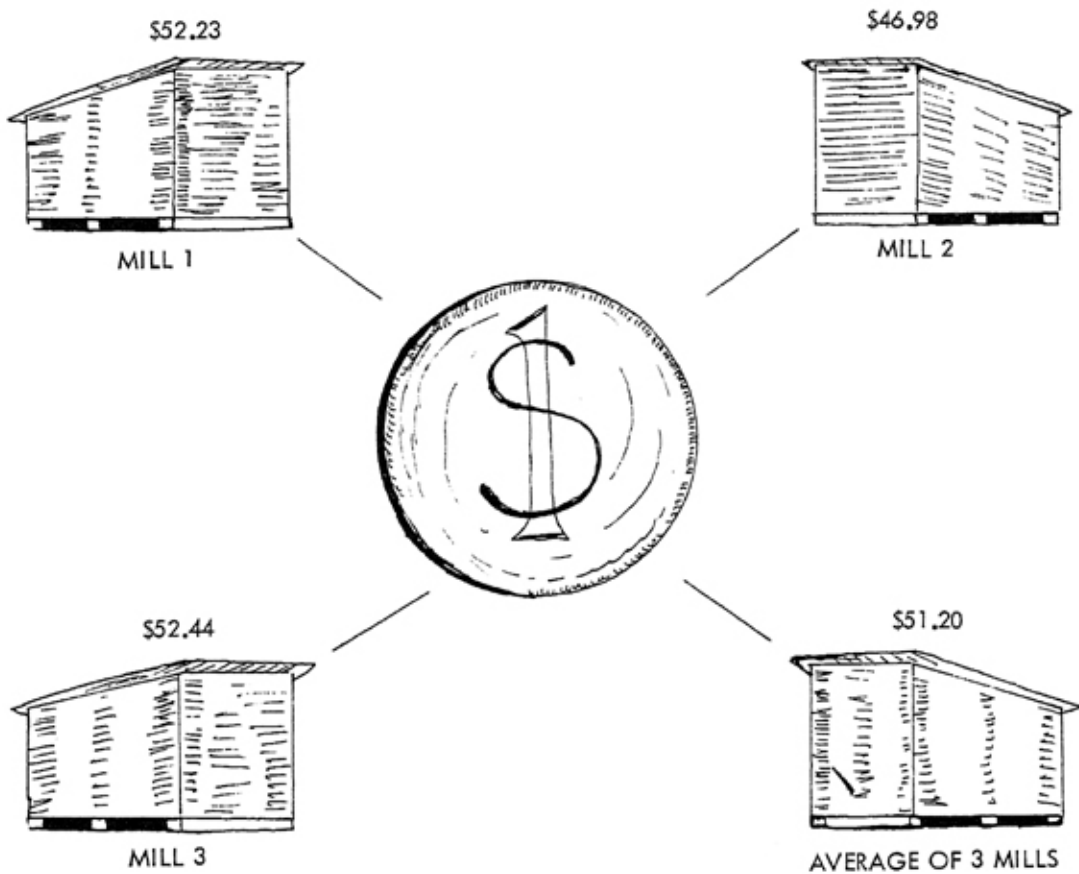
TABLE 4--VALUE OF LUMBER FROM MILL NUMBER 2 WHICH WAS
SOLD BY GRADE.

Grades	Volume	Price Per M. Bd. Ft.	Lumber Value
	Bd. Ft.	Dollars	Dollars
Firsts	13	115.00	1.50
Seconds	148	115.00	17.02
Selects	97	85.00	8.25
No. 1 Common Boards	965	72.00	69.48
No. 2 Common Boards	602	58.00	34.92
No. 3 A Common Boards	2216	40.00	88.64
No. 3 B Common Boards	2510	30.00	75.30
No. 2 Common Dimension	460	58.00	26.68
No. 3 Common Dimension	795	35.00	27.83
No. 1 Common Timbers	256	125.00*	32.00
No. 2 Common Timbers	72	58.00	4.18
No. 3 Common Timbers	102	35.00	3.57
Mill Culls	76	15.00	1.14
Totals	8312		$390.51

* This was special timbers cut for a church. They were 8" x 16" - 24'. Because of their size a special price was paid.

FIGURE 8

Price Received for Lumber at Mill Per Thousand Bd. Ft.

$52.23 — MILL 1

$46.98 — MILL 2

$52.44 — MILL 3

$51.20 — AVERAGE OF 3 MILLS

The value of the lumber from mill number 2, if it had been sold at the prices paid for mill number 1 or 3 lumber, is shown in Table 5. A return of $3.56 and $2.54 more would have been realized under these circumstances.

The total value of the lumber from the three mills, based on prices paid for individual grades, is shown in Table 6. The average value per thousand board feet is $47.02.

Figure 8 shows price per thousand board feet received for the lumber F. O. B. mill at each of the mills.

It is evident that producers of hardwood lumber in Missouri would not realize greater profits by selling lumber by grade. Actually they would stand to lose because they are actually realizing a greater return by selling mill-run lumber and they are eliminating the cost of grading the lumber. This situation may be due in part to the fact that such a small portion of the lumber produced is

TABLE 5--THEORETICAL VALUE OF LUMBER FROM MILL NUMBER 2 IF SOLD MILL-RUN AT PRICES RECEIVED AT MILLS 1 AND 3.

Grades	Volume	Price Per M. Bd. Ft.	Lumber Value
	Bd. Ft.	Dollars	Dollars
Value Based on Mill Number 1 Prices			
FAS and Selects	258	100.00	25.80
No. 1 Common Boards	965	70.00	67.55
No. 2 Common Boards and			
No. 3 A Common Boards	2818	50.00	140.90
No. 3 B Common Boards	2510	35.00	87.85
Dimension and Timbers	1685	57.50	96.89
Mill Culls	76	15.00	1.14
Total	8312		$420.13
Value Based on Mill Number 3 Prices			
3A Common and Better	5426	60.00	325.56
Sound 3 B Common	1010	50.00	50.50
Unsound 3 B Common	1800	25.00	45.00
Mill Culls	76	20.00	1.52
Total	8312		$422.58

TABLE 6--VALUE OF LUMBER FROM THREE MILLS BASED ON PRICES FOR INDIVIDUAL GRADES.

Grades	Lumber Volume	Price Per M. Bd. Ft.	Lumber Value
	Bd. Ft.	Dollars	Dollars
Firsts	550	115.00	63.25
Seconds	718	115.00	82.57
Selects	661	85.00	56.19
No. 1 Common Boards	3516	72.00	253.15
No. 2 Common Boards	4084	58.00	236.87
No. 3 A Common Boards	6779	40.00	271.16
No. 3 B Common Boards	9304	30.00	279.12
No. 1 Common Dimension	1277	72.00	91.94
No. 2 Common Dimension	5010	58.00	290.58
No. 3 Common Dimension	6680	35.00	233.80
No. 1 Common Timbers	299	72.00	21.52
No. 2 Common Timbers	621	58.00	36.02
No. 3 Common Timbers	177	35.00	6.20
Four Foot Scoots	305	20.00	6.10
Six Foot Scoots	579	30.00	17.37
Mill Culls	1204	15.00	18.06
Totals	41764		$1963.90

of high quality. Lack of strong competition among buyers of rough lumber may be a contributing factor also. Until the market structure or consumer demand changes, sawmill operators will find it most convenient and profitable to sell hardwood lumber by mill-run.

SUMMARY

Three small sawmills which produce largely oak lumber were studied to determine the relative merits of selling lumber by grades or mill-run. Two of the mills sold their lumber as mill-run, the third mill sold by grade.

Six hundred ninety-one logs which yielded 41,764 board feet of lumber were included in the study. Each piece of lumber produced from these logs was graded and measured so that its board-foot volume could be computed.

The actual income derived from the sale of the lumber was recorded. When the lumber was not sold by grade, calculations were made of its value if it had been sold by grade, using prices being paid for various grades.

The two mills which sold mill-run lumber received average prices per thousand board feet of $52.44 and $52.24. The mill which sold graded lumber received an average price of $46.98 per thousand board feet. If the two mills which sold mill-run lumber had sold their lumber by grade they would have received $45.82 and $49.36 per thousand board feet, respectively.

Under present market conditions producers of hardwood lumber in Missouri are realizing the best price by selling lumber mill-run.

GLOSSARY

Cull is waste material that cannot be marketed at a profit.

Cull log scale is that portion of the log deducted from the gross scale because it is not merchantable.

Dimension is lumber 2 to 4 inches thick.

8/4 lumber is lumber that is 2 inches thick in the rough.

End trimmed lumber is lumber that has the ends cut square at 90 degrees to the main axis of the board. Split, broken or rotten ends have been trimmed off.

4/4 lumber is inch lumber in the rough. Lumbermen use the term quarter to designate ¼ inch of thickness in the rough.

Gross log scale is the scale of the log before any deductions are made for defect.

Log Scale rule is a tabulation of values based upon diagram, formula, mill tally or a combination of any of these which gives the estimated contents of a log in board feet of lumber.

Lost time is the actual time the mill was not operating during its regular shift while this study was being carried on.

Lumber tally rule is a device by which the number of board feet in a piece of lumber may be read direct from the rule.

Mill culls are boards which do not meet any of the standard grades but which do have a sales value locally at a nominal price.

Mill-run is all the lumber produced in a shift regardless of the grades.

Mis-cuts are boards that do not meet the manufacturing specifications.

Net log scale is the scale of the log when the cull or defective portion has been deducted. It is gross scale minus cull scale.

Operating time is the actual time the mill operates during a shift or any such stated period. If a mill shift is 8 hours and the mill does not operate for 1½ hours then the operating time is 6½ hours.

Over-run is the excess of lumber in mill tally produced by the mill over log scale. Over-run occurs because with modern machinery and a smaller saw-kerf more lumber can be produced from a log than the scale rule indicates.

Scoots are short pieces of lumber below the minimum length which sometimes can be sold to customers.

Surface measure of a board is the square feet of the board. Thickness has no bearing upon surface measurement. The formula for the surface measure is the width of the board in inches multiplied by the length of the board in feet divided by the constant 12.

Timbers are pieces of lumber 5 inches or larger in cross section.

Total time of study was the elapsed time during the regular shifts from the start of the study until it was completed at the mill.