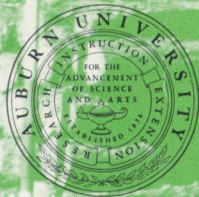


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CIRCULAR 137
SEPTEMBER 1960

PRODUCING FENCE POSTS FROM THINNINGS



AUBURN UNIVERSITY
AGRICULTURAL EXPERIMENT STATION
E. V. Smith, Director Auburn, Alabama

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Producing Fence Posts from Thinnings

SHERMAN W. WHIPPLE, *Associate Forester*

THE CURRENT trend of southern landowners to convert their marginal lands to pine forests has greatly increased the number of young pine stands.

Planting open lands, underplanting low-volume hardwood areas, eradicating hardwoods on land with pine understory, and direct seeding have produced many young stands of pine in the past 10 years. The increased demand for pulpwood, acreage controls of cultivated crops, federal aid programs, and realization of a cash forest crop with low labor output have all helped influence this trend.

In 1951 a study was begun at the Auburn Agricultural Experiment Station's Forestry Unit in Fayette County, on values of thinning young plantations of dense natural pine stands for fence posts.

Planted or naturally seeded areas frequently support more stems per acre than necessary or desirable for a good stand of merchantable pulpwood or sawlog trees. In row crop agriculture, the farm manager generally plants more seed or seedlings than will be needed to produce an optimum harvest. Similarly, the forest manager plants more trees than he expects to harvest in thinnings and at maturity. This ensures maximum use of the soil and a sufficient number of stems, particularly during the early life of the stand. Unlike most agricultural crops forest stands provide financial returns from intermediate cuttings or thinnings made prior to the final harvest.

NEED for INTERMEDIATE CUTTINGS or THINNINGS

As young trees grow and develop, they begin to compete. In dense stands this competition eventually retards diameter growth of individual trees and causes a loss of many stems ordinarily mer-

chantable if timely removal had been made. One of the first rules for good forest management is recognition of the fact that as trees grow they demand more space. For best growth and complete use of the site, it is desirable to keep as many stems as feasible for optimum continued growth in both diameter and volume. This objective requires a periodic cutting to reduce the number of stems as they begin to crowd.

Past experiments have determined some of the densities best suited for optimum growth. Studies conducted by the Tennessee Valley Authority (1) indicate that, when southern pine trees in the Tennessee Valley average 4 inches in diameter at breast height (d.b.h.), stand density should be a few more than 500 trees per acre for optimum diameter growth. Stands averaging 5 inches should have a little more than 400 trees per acre. Cooper (2) reported that natural stands of slash pine thinned to 800 trees per acre at 8 years of age produced a higher financial return than stands thinned to any other density. When planted stands range between 800 and 1,200 stems per acre and natural stands to even higher numbers (sometimes as many as 4,000), it is apparent that optimum diameter growth cannot be obtained without intermediate thinnings.

DESIRABILITY of THINNINGS for FENCE POSTS

The rate of diameter growth is reduced when 6 by 6-foot spaced pine plantations with 80 per cent survival pass 10 years of age, or exceed 4 to 5 inches d.b.h. Such stands are not ready for a pulpwood thinning, since only 1 or 2 commercial bolts per tree would measure 4 inches in diameter at the small end. Markets for such products as mine props, charcoal wood, and other specialities are very limited. This small size restricts the sale of thinnings to farm fence posts. In the South fence posts are salable in diameters ranging from 2 to 5 inches at the small end. Products of this size are cut from stems within the 4 to 6 inch diameter range. Therefore, the combined effect of the need for thinning at an early age and the prospect of merchantable small stems for farm fence posts creates a potential income from early thinnings.

MARKETS for FARM FENCE POSTS

A 1952 estimate by the TVA (1) indicated that the average farm in the Tennessee Valley used more than 60 posts per year.

In the Coastal Plain during the past 5 years, the farming trend has been toward increased number, size, and carrying capacity of permanent pastures.

From data supplied by the Agriculture Stabilization and Conservation Committee, the average farm in Alabama has about 30 acres fenced. This acreage requires approximately 100 chains (6,600 feet) of fence. Based on an average of 6 posts per chain, the average farm requires at least 600 posts. According to TVA (1) only 1 out of 15 treated posts of small sizes needs replacing each year. At this replacement rate, the average farm will use an additional 50 posts or more per year. The 1954 Alabama Census indicates an average of over 3,000 farms per county. If each farm used the estimated number of posts yearly, there would be a potential market for over 10 million posts in Alabama, or 150,000 posts per year in each county.

A typical forest stand, similar to that used in this study, could be thinned at least once before reaching commercial pulpwood size. Each thinning of this nature will yield between 500 and 1,000 posts per acre. Correspondingly, 3,000 farm owners in the average county could utilize the yield of 150 to 300 acres each year. This acreage, although small compared to the acreage being planted or converted to pine from low-value hardwood stands each year, would assist in developing properly managed forest stands. Additional benefits would include added income for many woodlot owners, improved vigor of the stand, and increased availability of good fence posts.

CONDITION of STANDS READY for POST THINNING

Pine plantations started with 1,000 trees per acre will generally lose about 200 the first few years. Under ordinary conditions this type of stand will have 800 stems per acre left after 10 years that average 4 inches in diameter. Individual trees will range in diameter from 2½ to 6 inches. On poor soils stems will not reach this diameter until the stand is 15 years old or older. Such stands will in the future yield a high volume of pulpwood without thinning.

The increased diameter growth following a post-thinning will make the stand ready for a commercial pulpwood cutting earlier than if it were left unthinned.

Natural stands exhibit a greater variation in stocking than plantations. At 10 years of age, stocking may range from a few

hundred to several thousand stems per acre. Stands with 500 trees or less per acre will average 4 inches d.b.h. at 10 years, whereas dense stands of 2,000 or more stems per acre on poor soils will require 25 years or more to reach the same average diameter.

Early thinnings are very desirable in dense natural stands. Because the growth pattern of natural or planted stands is affected by many factors, no general standard can be set for a cutting program that would fit all conditions. Figure 1 shows a stand from which a post harvest would not be recommended. A cutting is not recommended because the original spacing was too wide (indicated by the presence of many limbs on the trees) and the present rate of diameter growth is at an optimum. Figure 2 shows a loblolly pine stand that had been planted at a 6 by 6-foot spacing in 1945. Since then a thinning for posts was made at age 10 and again at age 13 years, harvesting 934 posts, a volume equivalent to 5.4 cords. The 1959 standing volumes were estimated at 16.7 cords. The rate of diameter growth of dominant trees has not been diminished by overcrowding.



FIG. 1. Natural old field stand of loblolly-shortleaf pine above is unsuited for thinning to produce fence posts.



FIG. 2. Loblolly pine stand above is 14 years old and was selectively thinned for fence posts at 10 years and again at 13 years.

Trees to be cut must be large enough to produce at least one and preferably two 6-foot posts with a minimum diameter of $2\frac{1}{2}$ inches at the small end. Trees that average 4 inches d.b.h. reach merchantable heights ranging from 12 to 25 feet at the time a young stand should be cut for fence posts, Table 1. On fair to good sites it takes 10 to 15 years to grow trees of these sizes.

TABLE 1. YIELD OF FENCE POSTS FROM SMALL TREES IN A TYPICAL STAND SUITABLE FOR FENCE POST PRODUCTION

D.b.h.	DIB ¹ at merchantable height	Merchantable height	Average yield of 6-foot posts
<i>Inches</i>	<i>Inches</i>	<i>Feet</i>	<i>Number</i>
3	2.4	12	2.0
4	2.6	17	2.8
5	2.8	22	3.6
6	3.0	25	4.2

¹ Diameter inside bark.

FENCE POST PRODUCTION STUDY at FAYETTE FORESTRY UNIT

Realizing the advantages of early thinnings in dense pine stands, one should see the need to find some product that would make early thinnings profitable. It has been previously mentioned that fence posts were the most feasible product to be produced from such thinnings. The study of fence post production was begun by the Station on its Fayette Forestry Unit (1) to compare row and selective methods of thinning, (2) to determine costs and efficiency of four cutting crews, and (3) to study processing problems connected with production of merchantable fence posts.

CUTTING METHODS and COSTS

All natural stands and some of the planted stands were row thinned. Row thinning in natural stands was accomplished by cutting everything in a strip 12 feet wide and leaving strips 3 feet wide to be thinned later. In some of the plantations, se-

TABLE 2. FENCE POST PRODUCTION AND COSTS WITH DIFFERENT METHODS ON PLANTED AND NATURAL STANDS

Stand class and production method	Cutting		Loading and hauling ¹		Peeling cost	Total cost per post
	posts per man-hour	cost per post	posts per man-hour	cost per post		
	No.	Cents	No.	Cents	Cents	Cents
Pine stands planted						
2-man crew			100	1.3		
power saw ²	37.1	4.0			5.3	6.8
bow saw ³	21.2	5.3			6.6	8.1
3-man crew			87	1.5		
power saw	33.5	4.1			5.6	7.1
bow saw	19.5	5.8			7.3	8.8
Natural						
2-man crew			58	2.1	6.5	8.0
power saw	33.5	4.4				
bow saw	17.1	6.6				
3-man crew			47	2.5		
power saw	31.2	4.4			6.9	8.6
bow saw	13.2	8.6			11.1	12.6

¹ Cost of truck at 15 cents per mile. Cost of labor \$1 per hour, administration, and insurance at 10 cents per hour.

² Cost of power saw and hand tools at 98 cents per hour, time of saw use estimated at 6 hours per 8-hour working day.

³ Cost of bow saw and other hand tools at 9 cents per hour. Estimated use of equipment at 6 hours per 8-hour day.

lective method of thinning was used. Data for natural stands were kept separate from those for planted stands, Figure 3.

The four cutting crews used in this study consisted of the following: two- and three-man crews using a one-man power saw, and two- and three-man crews using a bow saw. Customary farm labor was used, with a full-time employee serving as foreman.

Of the steps in harvesting fence posts (cutting, loading, hauling, and peeling) cutting costs amounted to more than 50 per cent of the total cost. The greatest variation in the total cost of harvesting was between the four cutting crews. Table 2 gives the quantity of posts cut per man-hour by the four crews in plantations and natural stands. In addition the cost per post is given for each crew. Row thinning in plantations produced more posts per man-hour than selective thinnings in plantations. Plantation thinning produced more posts per man-hour than any method in natural stands. All woods operations in planted

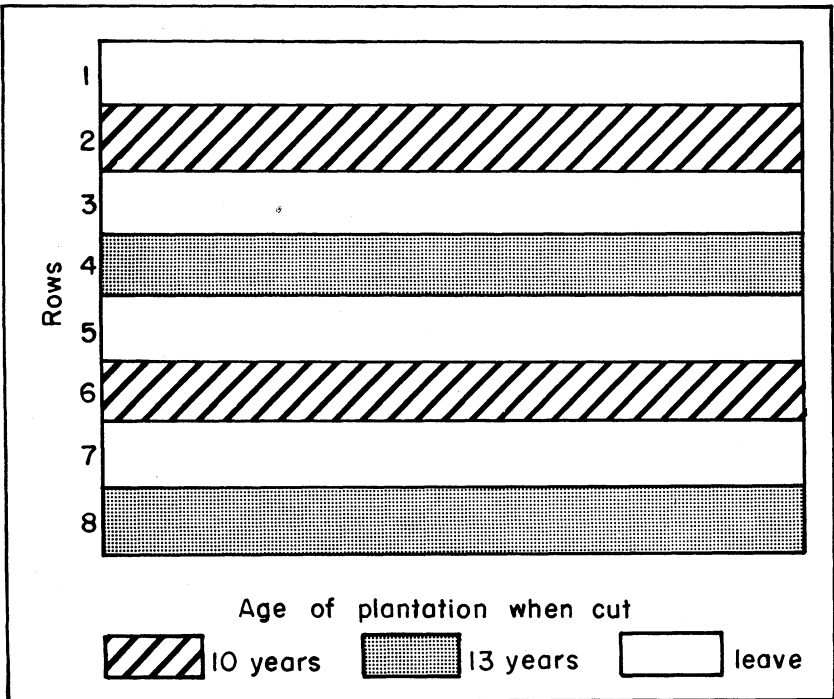


FIG. 3. Row thinning procedure used in plantations is shown above.

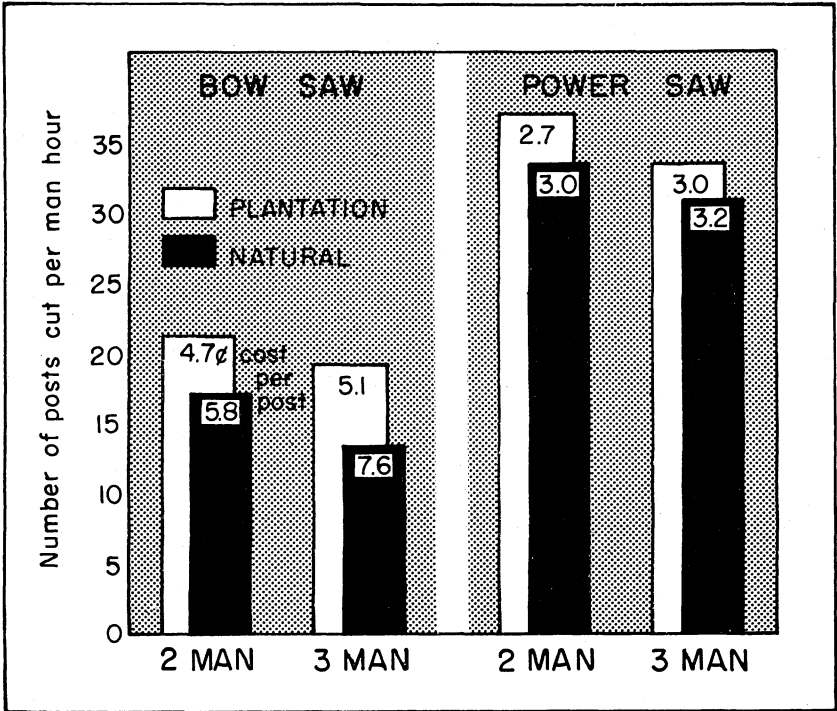


FIG. 4. The chart shows number of posts cut per man-hour by 2- or 3-man crews in natural or planted stands and the labor cost per post at \$1.00 per hour.

stands require less time than in natural stands because of convenience of transportation.

Two-man crews, when cutting or loading, proved to be more economical than three-man crews, regardless of equipment used. A two- or three-man crew using the power saw produced nearly twice as many posts per man-hour as the same size crews using a bow saw, Figures 4 and 5. All costs, Table 2, were apportioned according to figures taken from Reynolds (3) using labor rates of 1950 and adjusted to a minimum of \$1 per hour, Figure 4.

Hauling charges were determined from a fixed expense of 15 cents per mile. The loads ranged from 200 to 500 posts depending on difference in sizes. Distances varied from one-half to 5 miles. Hauling costs averaged two-tenths of a cent per post.

FENCE POST PEELING

Peeling pine fence posts is necessary to allow drying without damage from insects or decay and to facilitate absorption of a

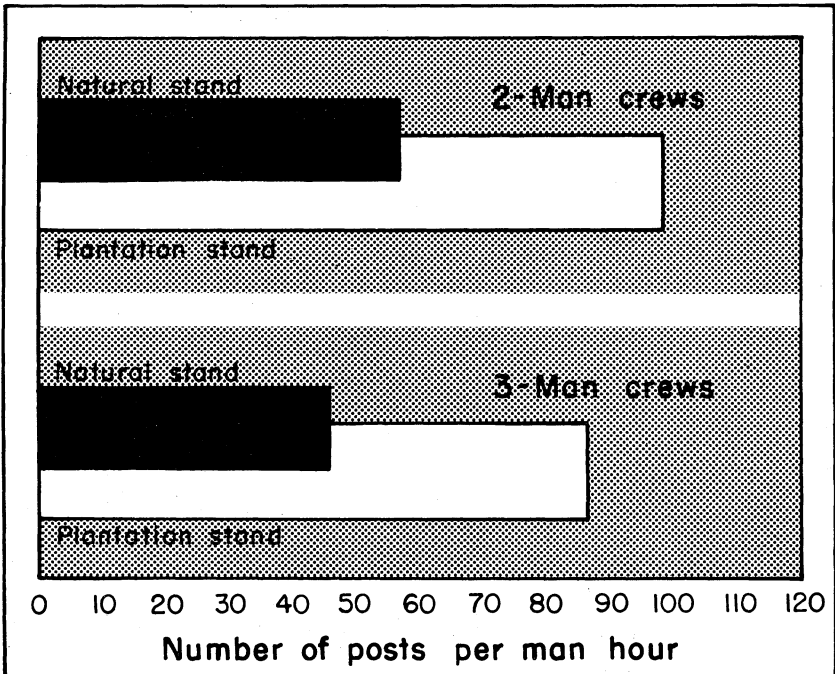


FIG. 5. The chart shows number of posts loaded per man-hour by 2- or 3-man crews in natural or planted stands.

preservative. A post must have both the rough outer bark and most of the thin inner bark removed to allow proper penetration of the preservative.

Peeling can be accomplished by several methods. One man with a hand tool, such as an ax or a curved drawknife, can peel from 100 to 200 posts a day, (4). Machine peeling is more efficient, especially if a large number of posts must be handled. Because of the number of posts and the availability of the mechanical post peeler used in this study, only machine-peeled posts are discussed in this report.

MECHANICAL PEELER

The TVA has developed 3 small machine post peelers (1) a tight chain peeler, (2) a portable drum peeler, and (3) a stationary drum peeler. The tight chain peeler is the most readily portable, but it is very tiring for the operator. The portable drum is nearly as versatile and peels more posts at less cost than the tight chain peeler. However, the initial cost is slightly higher,

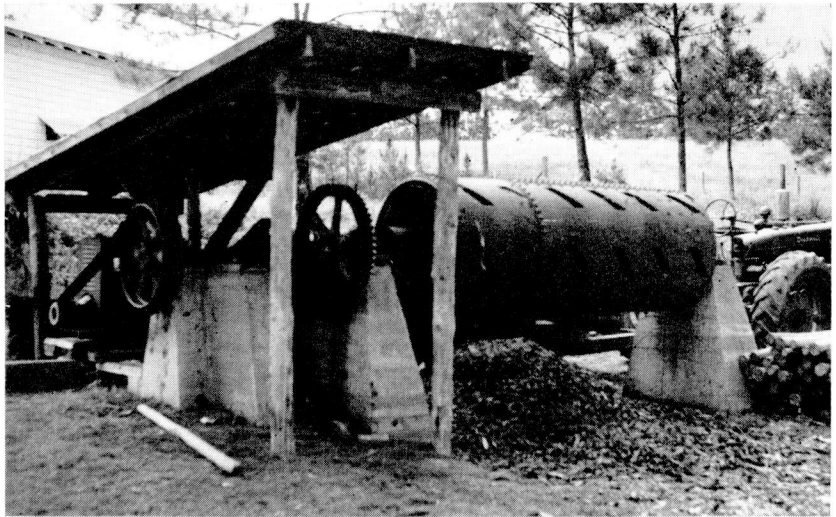


FIG. 6. Shown here is the stationary drum-type fence post peeler.

and maintenance and repair costs are also higher. The stationary drum peeler requires a much higher initial investment, but maintenance and repair costs are very low, and output of peeled posts is the highest of the three. On a long term basis, the stationary drum type peels posts at lower cost than either.

A stationary drum peeler, Figure 6, was installed at the Station's Fayette Forestry Unit in 1951. It was made from an old boiler measuring $3\frac{1}{2}$ by 9 feet. After some alterations, the drum was mounted on bearings on cement pilings at a convenient height to permit loading from the ground or a truck. A reduction gear was found necessary to allow the drum to turn at 28 rpm, the speed best suited for peeling with this equipment. Power was supplied by a stationary gasoline engine.

FACTORS INFLUENCING PEELING EFFICIENCY

Several factors cause great differences in the number of posts peeled in a designated length of time. Some of these factors are (1) length of time between cutting and peeling, (2) size of posts, (3) number of posts per drum load, (4) season of cutting, and (5) roughness of posts. The cost of peeling was based on the use of one man as the operator at \$1 per hour.

Other costs include 20 cents per hour for gas and oil, 16 cents per hour for depreciation of motor and drum, and 10 cents per hour for administration and insurance—a total of \$1.46 per hour.

The effect of length of time between cutting and peeling resulted in variation in peeling time of more than 100 posts to as low as 50 posts per hour over a 12-day period. The cost of peeling also increased over the same period from 1.3 to 2.7 cents per post. Posts cut and peeled the same day, peeled more easily and quickly than those peeled two or more days after cutting. The number of posts peeled per hour decreased with each day the posts were left after cutting up to 12 days, at which point the peeling time became nearly constant. Two weeks after cutting the amount of bark left on the posts after drum peeling required an extra man to complete the job by hand.

The variation in peeling time by size of post was less pronounced. The time required to peel a drum load of 5-inch posts was 10 minutes less than that required to peel a load of 2-inch posts. One reason for this is that large posts are heavier and knock off more bark than small posts. However, 110 posts per hour were peeled when posts were 2 or 3 inches in diameter, while only 90 posts per hour were peeled when posts were 4 or 5 inches in diameter.

The volume of posts loaded in the drum is another factor that influenced the number peeled per hour. Loading the drum slightly more than half-full produced best results for all post sizes. Peeling random-sized posts produced as many peeled posts per hour as peeling after separation by sizes.

Posts used in this study ranged in diameter from 1.8 to 5.3 inches at the small end and averaged 2.8 inches. The greatest number of posts peeled per hour resulted from an average drum load of 45 posts of 2.5 inches in diameter. Loads of more or less than 45 resulted in a lower number of posts peeled per hour of this average diameter. The number of posts in the drum had greater influence on cost of production than did the size of posts. Filling the drum just over half-full allows for free tumbling movement, which causes the posts to bump each other, thereby aiding in debarking. Too many posts retard free movement and reduce debarking action. Too few posts move freely without creating enough friction to cause bark removal.

The dormant season and drought periods had a retarding effect on post peeling time. Posts cut in the fall or winter peeled poorly

and required longer peeling time. Efficient peeling was not possible until a week after sap movement began in spring, and after 3 or 4 weeks of dry weather even during the growing season. Posts peeled nearly as well during a wet August as during the earlier part of the year. Posts apparently should be produced between the latter part of March and the middle of August. Posts left in the open during hot days of low humidity were more difficult to peel than those left under shelter or outside during days of high humidity.

Rough, crooked, or knotty posts that are not well trimmed did not peel as well as clean, straight posts. Commercial buyers reject posts with short or abrupt crooks or a sweep in more than one plane. Knots larger than one-half the diameter of the post or groups of smaller knots in a ring larger than one-half the circumference at that point are other causes for rejecting a post (5). Any number of small knots and crookedness not described above are usually acceptable. Nevertheless, posts definitely sell better when they are straight and clean.

The factors mentioned caused peeling rate to vary from 50 to 130 posts per hour. An average of 95 posts per hour was peeled under methods described. Cutting good, clean, posts during the right time of year, peeling soon after cutting, and loading the drum to optimum level will produce good results and reduce the cost of peeling. With total costs of \$1.46 per hour for machine time and labor (including loading and unloading, some hand cleaning around knots, and sorting), peeling costs varied from 1 to 3 cents and averaged $1\frac{1}{2}$ cents per post.

SEASONING PEELED FENCE POSTS

Green posts do not absorb preservatives well; therefore, stacking for air seasoning is necessary. Sorting by size classes makes stacking easier and selling much less of a problem. Peeled posts should be stacked at least one foot off the ground and far enough apart to allow good circulation of air, Figure 7. Figure 8 illustrates poor stacking. A drying period of 60 to 90 days in the summer is usually ample. A more accurate method requires weighing a sample post each week until the weight loss is less than one pound per week.

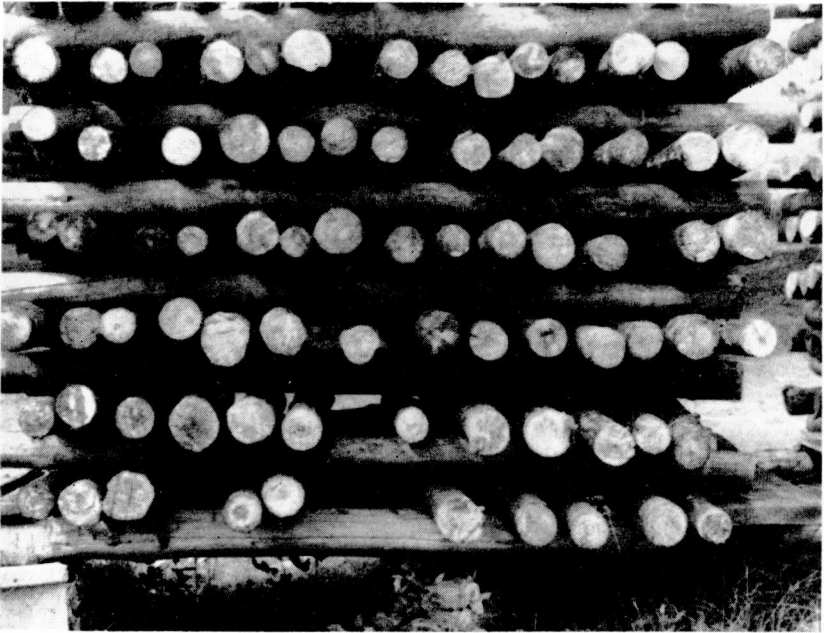


FIG. 7. Posts above are properly stacked for seasoning.



FIG. 8. These posts are stacked too close for proper seasoning.

SELLING FENCE POSTS on a LOCAL MARKET

Peeled and seasoned untreated posts are salable at rates of 8 to 20 cents per post, or about 4 cents per inch of diameter at the small end. A local creosoting plant in Fayette County will purchase delivered peeled posts $2\frac{1}{2}$ to 4 inches in diameter, 6 feet long for 15 cents each and posts of the same diameter, 7 feet long for 20 cents each. Local farm operators prefer to purchase posts by size classes and expect the prices to vary by size. The sale price of fence posts does not remain fixed. It varies somewhat according to demand and supply. With production costs varying from less than 8 to 13 cents per post, cost can be estimated in relation to size. On the average market 2-inch posts sell for enough to cover cost only, but a small profit can be made on $2\frac{1}{2}$ - to 5-inch posts by careful selection of production methods and good management of the entire operation. Additional values accrue for the increased growth that is added to the trees left after thinning.

SUMMARY

1. Dense natural pine stands or plantations averaging 4 to 5 inches d.b.h. may be thinned profitably for farm fence posts.

2. Early thinnings for posts increase the overall returns from each acre of forest land.

3. Thinning benefits the woodland owner by: increasing diameter increment on residual stems and growing trees to a larger size in a shorter period of time, better utilizing soil productivity for growing marketable volume of wood, improving the quality of the residual stand by leaving the best trees for future growth, and decreasing the potential loss from diseases, insects, and mortality due to overcrowding.

4. More posts can be produced per man-hour from plantations than from natural stands.

5. Under similar conditions, two-man crews produce more posts per man-hour than three-man crews.

6. A power saw requires about one-half the time to cut posts as a bow saw.

7. An investment in a mechanical post peeler is necessary to keep costs at a low figure if posts are produced for sale.

8. Posts should be peeled as soon as possible after cutting. The number of posts peeled per hour decreased with each day of delay.

9. Post cutting and peeling should be limited to the wet part of the growing season.

10. A small fence post production operation can supply the local market and make a profit if managed efficiently.

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