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TREE PLANTERS' NOTES

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TREE PLANTERS' NOTES NO. 14

This issue of Tree Planters' Notes presents a number of articles on the use, modification of and result from tree planting machines; planting bars; and planting stock, These are:

PLANTING MACHINES FURNISHED IN NEW JERSEY

Austin N. Lentz

Extension Forester, New Brunswick, New Jersey

The Hunterdon County Agricultural Extension Service and the Hunterdon County National Bank in 1950 launched a major tree planting program. The purpose was to put to good use idle land which was no longer suited to other farm crops. On the advice of the county agricultural agent and state extension forester this small country bank purchased a mechanical tree planter for about $750 as a part of its public relations program.

A farm custom operator was secured to act as custodian and operator of the machine. He agreed to keep the machine in good mechanical condition, house it, transport it to the job and operate it. The operator's charge to the farmer was $1.50 to move on to any farm and $2.50 per hour for his time while on that farm. The landowner furnished the tractor and operator to pull the tree planter. Repair and maintenance costs of the machine were borne by the bank.

In 1950, twenty-two landowners planted 125,000 trees in 209 hours at an average rate of 600 trees per hour. The best rate was about 900 trees per hour; small areas increased costs. A survey in the summer of 1951 indicated survival of about 90 percent. Furthermore, the results were regarded as satisfactory as where the work had been done by hand.

In reviewing the results of this operation, it is evident that where many farmers are involved the actual operation of the machine must be done by one individual. To let each farmer try to operate the machine invites failure.

In 1952, the planting program resulted in the planting of about 450,000 trees. The County Board of Agriculture had bought another mechanical planter to be operated for the farmers of the county on a similar basis. In 1953 about 500,000 trees will be set out under this program.

SAFETY MODIFICATION FOR LOWTHER PLANTING MACHINE

George K. Schaeffer, Forest Ranger
Florida National Forest, Tallahassee, Florida

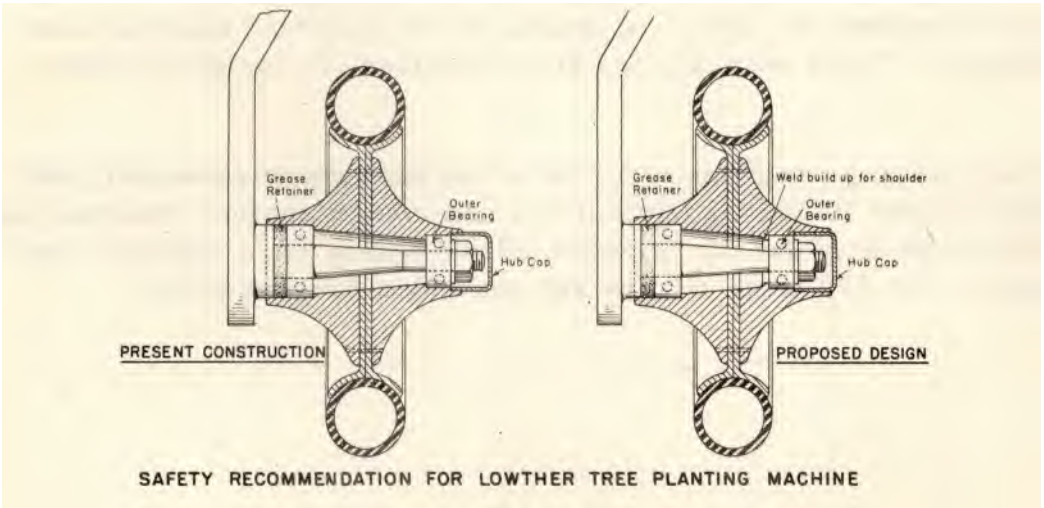
(Editor's note: The following article is taken from a work improvement suggestion sent to the Chiefs office, USFS, from the field.)

The use of very small planting stock this year has pointed up the hazard of the planter's hand being caught by the packing wheels, which can result in a broken arm or at least a lacerated hand and/or arm unless the following safety measure is adopted.

The packing wheels are set very close together, so close that the hub caps are no more than an inch apart. This distance is too close to permit the planter's arm to pass between them. After reviewing this situation, which was brought to my attention by William G. Bevis, Forestry Aide, the problem was discussed with Charles H. Keys, automotive mechanic, who suggested this recommended alteration.

It was considered necessary to widen the space between the hub caps so that a man's arm could pass between them in case his hand was caught by the packing wheels. With the hub caps spaced farther apart the planter could permit his hand to pass through the wheels and pull it out after it was released. Keys suggested that the outer bearing be recessed an additional inch on each wheel, the axles shortened proportionately, and the hub caps threaded into the hub an additional inch.

This was done, as shown on the attached sketch, at a cost of 3 hours mechanic's time, and $5.00 machine shop work. This changed position of the bearings does not change the working positions of the wheels and has worked very satisfactorily.



SAFETY RECOMMENDATION FOR LOWTHER TREE PLANTING MACHINE

MODIFYING NURSERY STOCK TO FIT MODERN PLANTING METHODS

W. G. Wahlenberg, Silviculturist

Southeastern Forest Experiment Station
Asheville, North Carolina

Nursery practice underwent considerable development in many places before there were any effective machines for planting forest trees. Development was most pronounced where it was stimulated by active constructive thought and experimentation on the part of the men in charge of nurseries. It is a continuing process. Those nurserymen who contribute most are the ones who not only produce ingenious and practical gadgets to further their nursery culture of trees, but who also manage to modify planting stock to make it highly suitable for restoring productivity on different sites in the forests. Planting poor stock on difficult sites is throwing good money after bad.

Stock improvement does not always require elaborate experiments. With tillage, fertilization, root pruning, transplanting, etc., a nurseryman can modify the character of his output. Of course he cannot be expe cted to produce stock that is custom grown for limited and specialized uses. Rather than to cater to the needs of problem areas he must try to meet the needs of many users.

Planting machines are a promising new development, here to stay. Certainly our planting projects should be mechanized everywhere that obtainable machines can operate. However, there are still many planters who cannot get the heavy equipment and many places where it cannot work, particularly in mountainous terrain.

Can a nurseryman supply the needs of hand-tool and machine planting with the same type of stock? Perhaps not always, but in many instances the answer is probably yes. It is recommended that much more attention be paid to physiological quality, as P. C. Wakeley explained in Southern Forest Experiment Station Occasional Paper 122, "Planting the Southern Pine," pp. 286-290. For both machine and hand methods the puny seedlings should be culled out. Root systems in either method need good, well-balanced nursery development. Growth may need to be checked to avoid getting tops that are too large or lateral roots that are tcostiff and difficult to handle. Larger or older trees might be better if they could be

economically produced, handled, and planted, but there is the rub. Medium-sized trees are best in bar or hoe planting, using the cheap slit method. Fortunately for seedling growers the machines employ a modified slit method. The trench is an elongated slit. When it closes, the roots are fanned out in a single plane. This is an unnatural position, of course, but research has failed to trace any growth or survival handicap to this situation on most sites. (Extremely adverse sites are a different problem.)

It would appear that the medium-sized, well-balanced coniferous stock commonly produced can be planted equally well by bars, hoes, or machines. Over-sized seedlings are inferior stock because of the limitations of standardized equipment. The possible benefits from retooling to handle larger stock seem unwarranted in view of the cost. Hence nurseries would do well to grow and to grade their stock to suit modern tools as well as to meet site requirements.

TRACTOR LUG FOR DIGGING TREE PLANTING HOLES

William R. Jalosky, Forester
Superior National Forest, Duluth, Minnesota

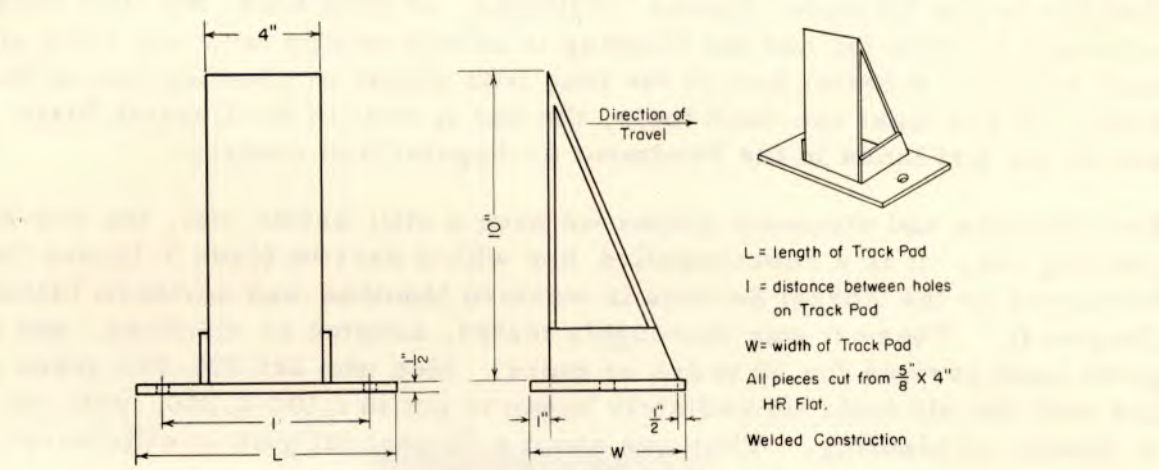
The following sketch illustrates a planting lug which may be attached to a tractor to facilitate planting. The device was suggested by William R. Jalosky, Forester, formerly of the Chippewa National Forest.

Mr. Jalosky makes the following comment in his work improvement suggestion:

> At the present time mattocks are being used on many disked areas on the Chippewa National Forest to make deep holes in which to plant nursery stock. As an alternative, this device was used on about 110 acres on the Cut Foot Sioux Ranger District during the planting season in Spring 1950 on a TD-9 tractor. With six lugs in use, the spacing of the holes on the ground was about 6' x 6'. The advantages of this device are listed as follows:

1. More trees per acre.
2. More trees per planter day.
3. Straight and even rows which aid in survival counts.
4. Planters need carry only their planting stock and no tools.
5. Lug also makes its own scalps when planting open areas.
6. Mixes top soil with mineral soil for better seedling root establishment.

This planting device has widespread applicability and warrants your consideration and possible trial.



TRACTOR LUG FOR DIGGING HOLES FOR FOREST PLANTING
W.R. JALOSKY, Forester

USE OF A SHORT-HANDLED PLANTING HOE IN THE APPALACHIANS

W. G. Wahlenberg, Silviculturist

Southeastern Forest Experiment Station
Asheville, North Carolina

Because forest planting in the Southern Appalachian Mountains in the past has been sporadic, it has too often been done without the benefit of detailed knowledge of methods or suitable tools.

Knowing how to plant ornamental or fruit trees does not necessarily bring skill in forest tree planting, because the two are quite different. For example; a gardner digs a hole to accommodate the natural spread of semi-

rigid roots, puts good loose dirt back to cover those roots, puddle: the soil with water, and tamps in unfavorable portions of soil last. Such a procedure is appropriate in horticulture because the trees are larger, but it is all wrong for extensive planting of the relatively small 2-year-old conifers distributed by forest nurseries. The forestry job calls for adequate slits in the soil rather than large holes. The flexible roots need deep rather than wide setting. Instead of loose soil settled with water, the forest planter frequently has to exert strong pressure on stiff soil to gain firm contact with roots. If he imitates the gardner he may get high survival, but he wastes his time.

Unsuitable tools likewise contribute to inefficiency. Planting machines are primarily for level or gently rolling lands. On mountain jobs it is feasible to use farmers' spades, mattocks, or grub hoes, but they were not made for this job and the planting is unnecessarily slow and often of poor quality. A better tool is the long iron dibble or planting bar of the South. If you must use hand tools, the bar is best in the Coastal Plain and on the flat lands in the Piedmont or Appalachian country.

For hillsides and mountain slopes we have a still better tool, the one-hand planting hoe. It is a short-handled hoe with a narrow blade 9 inches long, developed by the Forest Service in western Montana and northern Idaho (Region 1). There it was thoroughly tested, adopted as standard, and has given good service for 30 years or more. Men who set 800-900 trees per day with the old tools immediately began to put in 1,100-1,200, with no loss in quality of planting. That was about a 35 percent gain in efficiency.

We felt that this tool could work in the Appalachians as well as it has in the Rockies. Because a short-handled hoe is too hard on a man's back when used for planting on flat land, we limited our use of the bar and tree-carrying tray to the bottomland sites. On the slopes we used the new equipment (furnished by Region 1), which included a planting hoe and a watertight canvas tree-bag for each planter. We tried the outfits on laurel replacement work and on inter-planting on the Bent Creek Experiment Forest.

The first thing the men noticed was the difference in weight of the equipment. Together, the bar and tray weighed 17 pounds, 1 ounce; the hoe and bag 4 pounds, 11 ounces — a saving of 12 pounds, 6 ounces per man. This is an appreciable advantage when working over rough ground.

Each member of a two-man planting crew (hole maker and tree setter occasionally has to wait a few seconds for his companion to complete his

task. This is avoided when each man does the whole job. When a worker charged with correct root placement has to widen the slits into proper holes himself, he is directly interested in and solely responsible for quality planting. Designed as a one-hand tool, the short-handled hoe is ideal for a one-man-unit crew. Except on difficult, obstacle-ridden sites, the division of labor between his two hands is complete, i.e. , he manipulates the hoe with one hand and the seedlings with the other. With these motions coordinated in trained planters, the need for a tree-toting assistant is eliminated and maximum efficiency attained.

We do not claim that our crews have reached the degree of perfection possible from long experience, but their output is rising. On an average mountain site each man can put out about 100 trees an hour. Fewer trees can be set on rocky sites and in spot planting, as in under-planting or what is sometimes called reinforcement planting. Experienced planters can probably do still better in uninterruped work on good sites.

Do you want to learn this technique?

The Southeastern Forest Experiment Station Paper No. 12 contains brief working directions that specify and illustrate the steps involved in the use of the Region 1 hoe. It notes the reason for making each essential motion, and the reason it is best to avoid certain natural but superfluous movements. A limited number of copies are available for distribution from the Station, Box 252, Asheville, N. C.

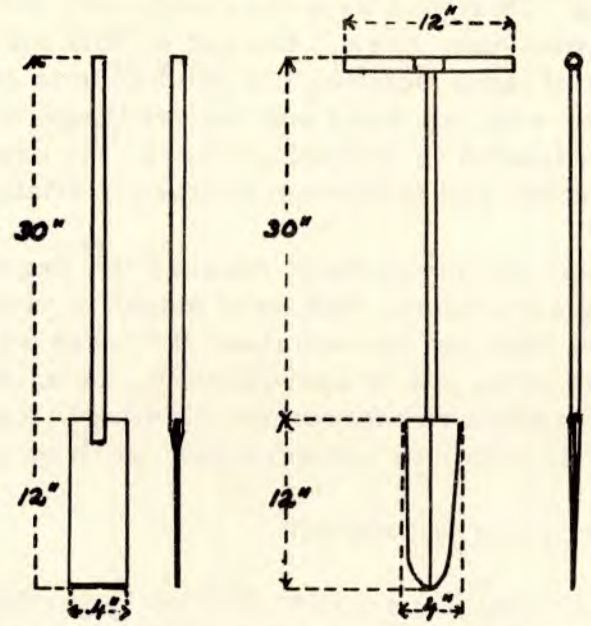
SOME NOTES ABOUT THE PLANTING BAR

E. Bakuzis, Nursery Worker

Badoura State Nursery, Akeley, Minnesota

One of the most popular planting tools is the planting bar. It is known in many variations; many authors of articles claim that they have found the best construction. The true answer could be given only after thorough time studies by specified conditions: species, size of plant, properties of the soil and so on. But this is the work of a special institution for studies of forestry work (like "IFA" or "Gefa" in Germany).

Before such studies are made I should like to draw attention to one form used in Eastern Europe which has some advantages over the form which the CCC made popular in Minnesota and other States. Here are the drawings.



The CCC bar has a sharpened end, but the European form has sharpened sides, too; therefore, it penetrates easier into the ground, especially when the ground is unprepared and full of roots and stones, The European form weighs 5 to 6 pounds; the CCC bar, 8 pounds. The wooden horizontal handle makes the European form handier for the work, especially for physically less strong workers.

The planting machines are taking over a great part of the planting work on suitable sites; but for small plantations, planting under cover, unprepared or partially prepared soils, and replanting on partially failed plantations, the planting tools will also be widely used in the future. Therefore, they must be developed, tested, and manufactured.

PLOWS TO PRECEDE A TREE PLANTING MACHINE

Paul O. Rudolf, Forester

Lake States Forest Experiment Station
St. Paul, Minnesota

(Editor's note: As a result of a recent report of difficulties in operation of planting machines on a national forest in California, Mr. Rudolf offered the following comments and pictures.)

Results with planting machines were reported to be unsatisfactory because brush and other debris hindered their operation. It occurred to us that a practice used in Minnesota might prove successful under such conditions. Both the Minnesota and Ontario Paper Company and the Chippewa National Forest have planted brushy areas with the following equipment: a crawler-type tractor with a Minnesota pusher plow mounted ahead and a Lowther planter pulled behind. The plow is equipped with a shoe and is so mounted as to ride on the ground surface. Its sole purpose is to clear away brush, slash, down logs and similar debris ahead of the planter. It has done this quite successfully. Presumably an Olympic plow could be used in the same manner, but under our conditions the Minnesota plow is preferred.

The photos may give you a clearer idea of this equipment. A TD-9 tractor was used on the M & 0 operation and a T-6 tractor on the Chippewa job. The latter had less debris to contend with.

Minnesota pusher plow ahead of a TD-9 tractor.
Planting machine is pulled behind tractor at the same time.

AGRICULTURAL SWEEPS MAKE SCALPING EASY

Gordon Barrington, Agricultural Engineer

F. B. Trenk, Extension Forester
University of Wisconsin, Madison, Wisconsin

An agricultural tool widely used in the renovation of old pastures for improved forage production is the sweep. It might be described as a modified duck-foot shovel, with shearing spans ranging up to 30 inches in width. It functions principally by severing the roots of grasses and weeds at predetermined depths of up to 6 inches below the surface.

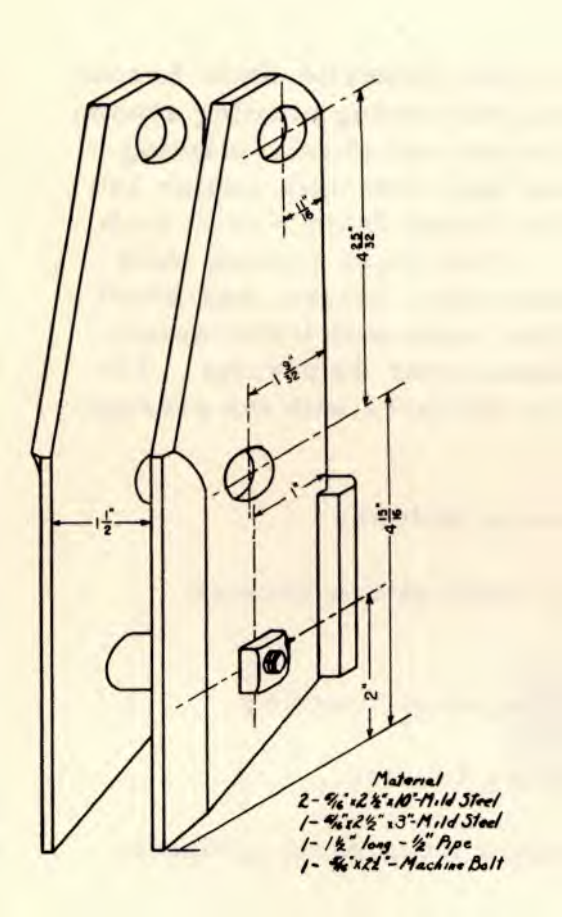
In some places hand scalping or its equivalent is required for tree planting. Furrowing, although practical, may be definitely objectionable, either because of the continuous trench which results, or because of the clearly defined rows, especially when landscape effects which suggest natural stands are desired. Regardless of the tool used, the severing of the roots of shrubs and sod represent the most severe part of the labor involved in hand scalping.

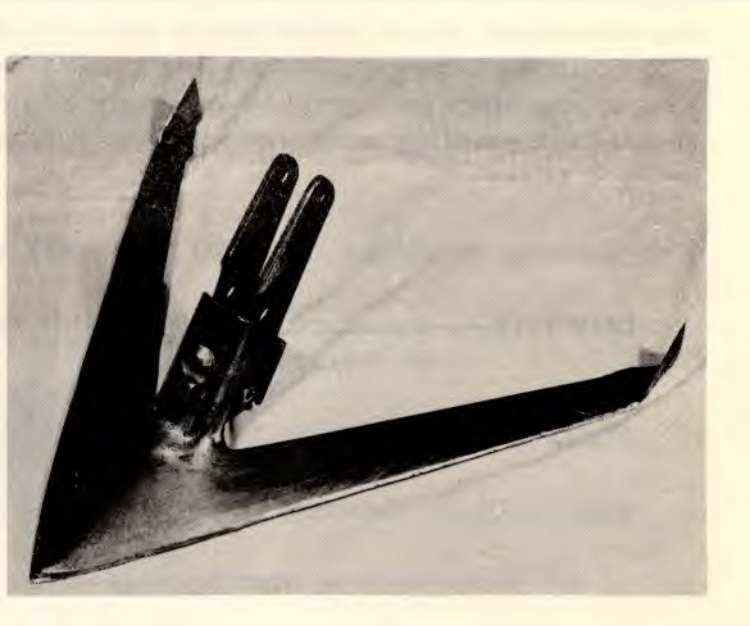
A modified sweep, mounted on a single plow beam, and set to operate at a suitable depth on a hydraulically operated three-point-hitch type of tractor does a very effective job severing the roots of grasses, weeds, and small shrubs. (See photo following.) A disk coulter operates in front of the sweep. Lateral incisions in pairs were made into the ribbons of turf with long-handled spades at intervals which were determined by the spacing desired for the planted trees. The short strips of turf between incisions, about 12 inches in width, were rolled back, leaving in effect short, intermittent furrows appearing to be the work of a shallow middle-breaker plow.

The rollback of the turf was made much easier when vertical blades 3 inches in height were welded to the tips of the sweep. Their cutting edges slope backward, and are parallel to the line of draft. They score, but do not completely sever, the sod strip, producing what might be described as a hinge, which makes it much easier to tip the sod back. At the same time the sod strip lies flat, thereby more effectively smothering the live sod under it.

The sweeps which were used are available from various manufacturers but they generally are intended to be mounted on a cultivator. A special

mounting bracket is therefore required to mount the sweep on the plow beam. The drawing shows the bracket which was used to mount the sweep on a Dearborn plow beam. A 3/4 inch carriage bolt passes through the sweep mounting hole and through the clamp piece at the rear of the bracket. It will probably be necessary to change the location of the mounting holes to adapt the bracket to fit another make of plow. Mounting holes for plow bottoms are not standardized. Washers may be used to fit the bracket to the beam if the beam is tapered.





PERFORMANCE OF TREE-PLANTING MACHINES ON PENNYRILE STATE FOREST

John P. Rhody, Nursery Technician

Division of Forestry, Commonwealth of Kentucky
Dawson Springs, Kentucky

Over one quarter million trees were planted on the Pennyrile State Forest, located near Dawson Springs, Kentucky, during the spring planting season of 1952. Almost all of the area was planted by the use of tree-planting machines. Most of the trees planted were pine but a few tulip poplar and white ash were also planted. The size of Stock ranged from 6 to 10 inch tops; the roots were in keeping with the tops. The areas planted were old abandoned fields which had a cover of broomsedge, briars, and brush. The soils were heavy, consisting mostly of clay loam with little topsoil. The topography was level to rolling with no slopes over 30 percent. The size of the planting areas were from 2 acres to 20 acres with the average being 5 acres,

The planting machines used for this work were as follows:

LOWTHER, standard model, trailer type, used with a Farmall M Tractor.

ROOTSPRED, floating type, used with a Ferguson Tractor.

WHITFIELD, floating type, used with a Ford Tractor.

All of the tree-planting machines used had rubber tired packing wheels.

The following specific comparisons of the tree planters apply only to conditions found on areas comparable to the planting sites on the Pennyrile State Forest. The degree of performance used in comparison of the tree planters are: excellent, good, average, fair, and poor.

	LOWTHER	ROOTSPRED	WHITFIELD
ST ABILIT Y (while tree planter is in operation)	Excellent	Average	Good[1]

(Continued)	LOWTHER	ROOTSPRED	WHITFIELD
OPERATIONAL (ease on operator while actually planting)	Good[2]	Average	Excellent
MANEUVERABILITY (ability to plant in corners & close areas)	Poor	Excellent	Excellent
PROTECTION (protection to operator from brush, etc.)	Excellent	Poor	Good
VERSATILITY (ability of planter to be used on all types of soil & conditions)	Fair	Average	Good
PLANTABILITY (ability to open sufficient slit before planting & close slit after planting)	Good	Fair[3]	Good
CONSTRUCTION (general makeup & sturdiness)	Good	Fair	Excellent

1/ Stability can be improved by the use of strap braces from the two lower points of suspension to the tractor. These braces are standard equipment for Ford or Ferguson tractors.

2/ Improved by moving the hub caps completely into the hubs of the packing wheels to give the operator's hand more room between the packing wheels. This is also a safety measure.

3/ Plantability was improved when the rear packing wheels were made as stable as possible. Set screws in hub of packing wheels have a tendency to work loose and the wheels fall off while planting.

The following are general advantages and disadvantages of the three planting machines as applied to Pennyrile State Forest planting conditions:

LOWTHER

Advantages - In large areas of well-drained soil where the rows are long and there are no sharp turns or small areas to be planted, the Lowther tree-planting machine is the best to use* This machine can be operated with any tractor the size of a standard Ford tractor or larger.

Disadvantages - The Lowther tree-planting machine is hard to turn and takes considerable area to make a 180 turn. Time is consumed on all sharp turns as the tree-planting operator must lift the plow out of the ground by a lever hydraulic system. The tree-planting machine will not operate in heavy, wet soils as the soil will ball up in the packing wheels.

ROOTSPRED

Advantages - On uneven and steep ground this planter will follow the contour and not bind or slide. It can also plant in small areas and can start planting near any obstacle. On any turn the tractor operator can easily and quickly raise the planting machine out of the ground.

Disadvantages - The articulation of the rear portion of the tree planter makes the planter unsteady for the tree-planting operator while the planter is out of the ground and making a turn. Practically no protection is offered the tree-planting operator by the planting machine as the foot rests on the sides of the machine are made up of single steel bar stirrups, This planter can be used only on equipment that has power lift and 3-point suspension. The adjustments on the packing wheels makes this portion of the planter less sturdy; and if the wheels are not tightened periodically there is wheel wobble.

WHIT FIELD

Advantages - On any turn the tractor operator can easily and quickly raise the planting machine out of the ground. Small or large areas can be planted equally as well with this planting machine. It will plant in most type soils and plant fairly well in wet heavy soils. The machine is sturdy and the angle of the back packing wheels facilitates ease of planting and firm packing. This planting machine protects the operator from brush.

Disadvantages - This planter can be used only on equipment that has a power lift and 3-point suspension.

General remarks - This planter was used with one operator. One of the seats was removed and the other was shifted to the back center of the tree planter. If two operators are used on the Whitfield the exhaust pipe on the tractor should be extended away from the operator. On standard Ford or Ferguson tractors this exhaust is practically in the face of one of the operators.

All three planting machines had difficulty in planting large and small stock. The ideal stock to plant is trees with 8 to 12 inch tops and 8 inch roots.

SURVIVAL OF MACHINE-PLANTED VS. BAR PLANTED LONGLEAF SEEDLINGS

Gulfcoast Research Center, Southern Forest Experiment Station
Gulfport, Mississippi

In tests installed in 1947 and 1948 on the Chickasawhay Ranger District, Mississippi National Forests, machine-planted longleaf seedlings have survived nearly as well as bar-planted seedlings. In both years the machine-planted rows were spaced about 12 feet apart; between these rows seedlings were planted with Council bars.

Machine vs. Bar Planting

There was no great difference in survival between machine- and bar-planted seedlings. Two years after planting, the average survival of seedlings in the 1947 test was 64 percent for machine planting and 71 percent for bar planting, In the 1948 test, the average second-year survival was 44 percent for machine planting and 52 percent for bar planting. The differences were not statistically significant in either test, although considerably larger samples might have shown differences of 7 or 8 percent to be significant.

On the basis of these tests it appears that if hand-planted longleaf survive any better than machine-planted longleaf the difference is so slight that it is easily offset by the lower costs of machine planting.

Planting Quality and Survival

In 1947, 43 percent of the machine-planted seedlings had their root collars over 1/2 inch above the ground line. Twenty-three percent had their buds buried and 34 percent were planted correctly.

Eighty-four percent of the bar-planted seedlings were planted correctly; most of the incorrectly planted seedlings were set too high. Planting depth was not checked in the 1948 test.

In July of the first growing season the average survival was 82 percent for all correctly planted seedlings, 72 percent for those planted high, and 65 percent for those planted deep.

After four years in the field, the average survival was 55 percent for correctly planted seedlings, 44 percent for those planted high, and 51 percent for seedlings planted too deep.

LARGE LONGLEAF SEEDLINGS SURVIVE WELL

R. M. Allen, Forester

Gulfcoast Research Center, Southern Forest Experiment Station
Gulfport, Mississippi

Planters who are planting longleaf pine by machine want large stock. They say that with large stock it is much easier to separate an individual seedling from the handful held during planting, and to place the seedling in the furrow.

Since the first-year survival of large longleaf seedlings tends to be lower than that of smaller stock, a test was inititated in 1949 to determine how survival of machine-planted longleaf is affected by seedling size.

Longleaf pine seedlings were separated into three diameter classes after they came off the grading table. The seedlings in the large size class had

an average root-collar diameter of 0.41 inch, the medium class 0.25 inch, and the small class 0.16 inch.

The seedlings were planted by an experienced crew using a Lowther machine on the Leaf River Ranger District, Mississippi National Forests.

Planting Quality

On the average, 59 percent of the seedlings were planted right. 33 percent were planted with their root collars over 1/2 inch above the ground line, and 8 percent had their buds buried. There was little difference between the three size classes in the number of seedlings planted right. The large class had more seedlings planted high (41 percent) and the small class had more planted deep (14 percent). The medium size class had the same percentage of misplants as the average of all sizes.

Field Survival and Growth

Both planting quality and stock size influenced first-year survival.

The large seedlings had 81 percent survival medium seedlings 88 percent, and the small seedlings 89 percent. The small seedlings planted correctly survived the best (94 percent) and the large seedlings planted deep survived the worst (60 percent). The medium seedlings seemed to stand incorrect planting better than either large or small seedlings.

After 3 years in the field, 28 percent of the large seedlings were over 3 inches in height, as compared to 18 percent of the medium seedlings and 9 percent of the small.

On the basis of this test it appears that the old legend about large stock and poor survival going hand-in-hand is not very important. In fact, the faster growth of the large stock may far outweigh the slightly better survival of the small stock.

PLANTING HARDWOODS FOR STAND IMPROVEMENT IN NORTH MISSISSIPPI

B. J. Huckenpahler
Southern Forest Experiment Station
New Orleans, Louisiana

A study in northern Mississippi demonstrates that valuable hardwood species can be successfully underplanted to improve low-grade upland hardwood

stands. The degree of success attained is affected by at least 3 factors: species, topographic position of planting site, and release from undesirable overstory hardwoods.

During each of three consecutive years beginning in 1949, five species of hardwoods (1-0 stock) were planted beneath low-grade hardwoods on upper, middle, and lower slopes, and on minor bottoms. The planted hardwoods were white ash, black walnut, white oak, yellow-poplar, and black locust. For comparison, loblolly pine was also included. On half of the plots, all overstory hardwoods larger than 0.5 inch d.b.h. were removed or killed to release the underplanted seedlings.

This report summarizes the second-year results from all three annual replications, and mentions some of the fourth-year data from the earliest replication.

Species. - All but one of the hardwoods show promise of being useful for underplanting.

Yellow-poplar has made a particularly good showing. Its 2-year survival (table 1) has been satisfactory and its height growth has been exceeded only by black locust, a species of less value. Yellow-poplar has kept up with loblolly pine even on upper slopes — sites to which loblolly is usually better adapted. After 2 years' growth, released plantings of yellow-poplar on lower slopes averaged 3.6 feet tall. (Table 2.) Two-year-old released black locust on similar sites averaged 4.2 feet in height.

White ash on all sites and black walnut on minor bottoms have made satisfactory if not spectacular height growth. In addition, white ash had the best survival of any species tested (including pine) regardless of site or treatment. Survival of black walnut was good on minor bottoms but only fair on the three slope sites.

Survival of white oak has been only fair and early height growth was the poorest of any species tested.

On the one set of plots that has been growing for 4 seasons, released black locust is 9.2 feet tall on minor bottoms and lower slopes, while released yellow-poplar has attained a height of 8.5 feet on minor bottoms and 9.3 feet on lower slopes. Even on upper slopes, 4-year-old released yellow-poplar is 7.6 feet tall, as compared with 7.8 for loblolly pine, After a slow start, released white oak picked up somewhat and averaged about 2 feet tall on all sites.

Table 1. --Average survival of underplanted hardwoods at the end of the second growing season, by species, treatment, and site

Species and treatment	Site			
	Upper slope	Middle slope	Lower slope	Minor bottom 1/
	- Percent of seedlings alive - -			
White ash:				
Released	95	99	99	97
Unreleased	97	93	97	94
Black walnut:				
Released	55	53	61	79
Unreleased	75	73	67	73
White oak:				
Released	75	69	61	53
Unreleased	58	73	62	37
Yellow-poplar:				
Released	83	80	89	76
Unreleased	73	83	71	76
Black locust:				
Released	85	70	69	75
Unreleased	47	51	48	21
Loblolly pine:				
Released	81	81	80	43
Unreleased	74	61	63	17

1/ Minor bottoms are those which, with their terraces included, are less than one-quarter mile wide.

Table 2. --Average height of underplanted hardwoods at the end of two growing seasons, by species, treatment, and site

Species and treatment	Site			
	Upper slope	Middle slope	Lower slope	Minor bottom
	- - - - - - - Feet - - - - - - -			
White ash:				
Released	1.8	1.7	1.9	1.8
Unreleased	1.1	.9	1.0	1.2
Black walnut:				
Released	1.5	1.3	1.4	2.1
Unreleased	1.5	1.4	1.7	1.8
White oak:				
Released	.8	.8	.8	.9
Unreleased	.8	.8	.8	.8
Yellow-poplar:				
Released	2.8	2.6	3.6	3.4
Unreleased	1.1	1.0	1.1	1.1
Black locust:				
Released	3.2	3.5	4.2	4.9
Unreleased	1.5	1.2	1.2	1.1
Loblolly pine:				
Released	2.8	2.6	2.5	2.2
Unreleased	1.2	1.0	1.2	.8

Topographic position . - Indications are that planted hardwoods will do better on minor bottoms and lower slopes than on middle or upper slopes. The height differences noted between lower and upper slopes at 2 years are tending to increase. Pine has not done well in minor bottoms.

Release from overstory hardwoods . - Overstory competition is intense on minor bottoms and lower slopes, so release from it is absolutely essential. Even after such release, accelerated growth of grass, vines, and shrubs reduces survival somewhat, and may retard the young hardwoods until their crowns rise well above the jungle of low vegetation. The better moisture and fertility of the lower sites will eventually be reflected in much superior hardwood growth, however.

On middle and upper slopes the effects of release were somewhat inconsistent, but similar trends are indicated. Other studies show that in the first few years after planting release affects height growth more than it does survival. After several years, survival differences also become quite pronounced. Released seedlings suffer their greatest losses in the first few years after planting, whereas loss of non-released seedlings continues until only a few fortunately placed individuals remain.

No hardwood (or pine) underplantings should be made unless early release is contemplated.

Invitation

All persons who work in reforestation, or who are interested in it or some allied field are invited to send in material for publication in Tree Planters' Notes. If their material is not yet in final form for publication, they are invited to at least send a letter to Tree Planters' Notes and tell what they are doing and what manner of information should be published. Beautifully typed articles of flawless grammar are not required, although such would not be rejected. Manuscripts written in lead pencil during noon hour are acceptable if that is what it takes to get an account of what has been done. The address is: Chief, Forest Service, U. S. Department of Agriculture, Washington 25, D. C.

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Tree Planters' Notes will be sent upon request to persons and organizations doing reforestation work, and to libraries, forest schools, and similar appropriate places. The address is given above.