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. . . A FOREST MANAGEMENT TOOL

BY

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— A FOREST MANAGEMENT TOOL

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INTRODUCTION

Chipping of whole trees for fiber or fuel is a relatively recent innovation in timber harvesting. Since it has become a common practice, whole tree chipping by portable units is recognized as an efficient means of obtaining maximum wood yield as well as a way to promote forest management. Development of supporting equipment such as mechanical fellers, feller-bunchers, rubber-tired skidders, and other modern logging equipment has increased the efficiency of these chippers and has enabled them to gain the widespread use they have today.

The chipper is the major component of this specialized and mechanized timber harvesting system (Figure 1). Mechanical fellers, such as hydraulic shears, are usually used because of their speed and capability of severing trees at ground line. This leaves no stumps to interfere with movement of other equipment. If combination feller-bunchers are used, tree stems or boles can be placed in piles convenient for skidding (Figure 2). Rubber-tired grapple skidders (Figure 3), or cable skidders, are used to transport piles of stems to a chipping site.

At the chipping site, trees are deposited in a convenient location for the chipper operator to pick up with a boom-type loader attached to the chipper. Stems are then placed on the infeed conveyor where they are fed into the chipper by powered rolls. These rolls also compress the tops so that they can more readily enter the chipper throat or infeed opening.

Wood is diagonally cut into chips by knives attached to a spinning slotted disc. Chips pass through these slots as they are cut, and then through a discharge spout into a chip van.

Figure 1.—Portable Whole Tree Chipper

ADVANTAGES

Whole tree harvesting offers varied options to the forest manager and logger, which are not always available with conventional logging systems. Some of these advantages and benefits are:

I. **Quantities of wood material recovered are significantly increased over conventional harvesting. All tops, limbs, cull and small trees, and non-commercial species can be converted into a useable product. The large volume of wood available from small trees in Georgia is shown in Table 1.**

II. **Whole tree chipping can be an effective forest management tool for removing otherwise unuseable cull and suppressed trees, leaving the better trees for growth and future harvest (Figures 4 & 5).**

III. **Many tracts do not return to full timber production after conventional harvesting because of the relatively large, long-term investment required for site preparation. Whole tree harvesting can reduce or eliminate site preparation costs. Also, clearing of logging debris and**

residual trees is minimal or unnecessary (Figure 6). By elimination of windrows and debris piles, more area is available for planting.

IV. Many acres of forest land are considered unproductive because the quality and species present are unsuitable for conventional products or markets. Whole tree chips provide a profitable use for this wood and allow the site to be converted to productive forest.

V. All tree species and qualities of wood can be used. This is particularly true if chips are to be used for energy. The presence of bark, which is unacceptable in some pulping operations, is of little importance in fuel chips.

VI. Fire hazard is greatly reduced due to the small amount of slash left on site after logging. This also means that if fires do occur, suppression will be much faster and more effective.

Figure 2.—Feller Buncher Equipped for Multiple Stem Accumulation

TABLE 1.--VOLUME OF SMALL TREES ON COMMERCIAL FOREST LAND IN GEORGIA[1/]

Species	ALL LIVE TREES[2/] Diameter (Inches)[4/] 1	2	3	4	GROWING STOCK[3/] Diameter (Inches)[4/] 1	2	3	4
	Thousand Cubic Feet				Thousand Cubic Feet			
Pine	122,863	389,415	746,917	1,059,308	103,881	351,427	703,807	1,005,585
Other Softwoods	14,908	23,494	32,092	39,140	12,970	21,635	29,049	33,678
Total Softwoods	137,771	412,909	779,009	1,098,448	116,851	373,062	732,856	1,039,263
Soft Hardwoods	279,948	405,197	514,011	611,357	124,204	235,505	324,508	440,214
Hard Hardwoods	284,334	446,245	530,060	585,952	71,001	162,860	245,504	296,574
Total Hardwoods	564,282	851,442	1,044,071	1,197,309	195,205	398,365	570,012	736,788
Total All Species	702,053	1,264,351	1,823,080	2,295,757	312,056	771,427	1,302,868	1,776,051

1/ Southeastern Forest Experiment Station, USFS
2/ All Live Trees includes desirable and acceptable trees of commercial species, as well as rough and rotten trees, and trees of non-commercial species.
3/ Growing Stock includes desirable and acceptable trees of commercial species.
4/ Diameter class range is full inch through .9 inch, measured 4½ feet above ground.

VII. Whole tree harvesting also leaves more options open to the landowner and land manager. Conversion of unproductive timber land to agricultural or other uses may be desired. For example, recently harvested areas have been harrowed, seeded, and changed to pasture in only a few weeks.

VIII. Removal of small stems and culls are possible, thereby making revenues available which would normally be lost. Large remaining timber can then be logged more easily and less expensively.

IX. Portable chippers can be used in disaster situations and for other occasions. High winds, floods, and ice storms often leave large quantities of wood which must be quickly removed to clear roads, power lines, and eliminate the threat of insects and diseases. Also, this wood usually must be quickly salvaged before it deteriorates or becomes unuseable.

X. For the logger, whole tree chipping is an efficient woods-to-mill system that provides rapid flow of large quantities of wood. Production rates of 250 tons and more of chips per day are being realized. By means of this system, several loading, unloading, and other handling processes can be eliminated.

XI. Quick set-up of equipment facilitates movement from one chipping site to another. This allows greater flexability in skidding and overall planning. The efficient harvest of relatively small tracts is also made practical.

Figure 3.—Rubber-Tired Grapple Skidder

Figure 4.—Timber Stand with Large Volume of Small, Unmerchantable Wood

Figure 5.—Same Timber Stand Shown in Figure 4, After Removal of ~~18.6~~ 28 Tons of Wood Material Per Acre by Whole Tree Chipping

TABLE 2.--AN EXAMPLE OF EQUIPMENT USED IN A WHOLE TREE CHIPPING OPERATION

No.	Equipment	No.	Equipment
1	Portable Chipper	1	Log Truck
2	Grapple Skidders	2	2-Ton Trucks
1	Cable Skidder	1	Crawler Tractor
1	Feller-Buncher	2	Pickup Trucks
3	Truck Tractors	1	Log Loader
3	Chip Vans		

DISADVANTAGES

As with any industrial method, the use of portable whole-tree chippers has some limitations and disadvantages.

I. These machines cannot be used efficiently without a balanced support system of fellers, skidders, chip vans, etc. Due to the high cost of the chipper and accessory equipment, the system must operate daily at near capacity. Investment for a single chipper operation may require $500,000 or $700,000 (Table 2).

II. High standards of management, supervision, equipment coordination, and maintenance are required. Skill and motivation of equipment operators is often as significant as machine capability.

III. Presence of non-uniform chips, leaves and grit cause some pulp mills to limit the percentage of whole tree chips used. This, along with high capital investment, may limit the use of portable in-woods chipping systems.

Figure 6.—A Clearcut Site, After Harvesting with Whole Tree Chipping, Showing Suitability of the Area for Replanting

SUMMARY

Whole tree chippers have proved their capability and value in all forested areas of our nation. They can handle any species and convert any practical size of trees into chips for pulp, fuel, or other uses. The use of these chipping systems has increased greatly over the past ten years, and twenty-seven are now reported to be operating in Georgia.

Volumes of wood obtained from any given tract of timber can be increased one and a half to two times over volumes obtained from conventional logging systems. This increased saleable wood volume, along with reduced site preparation, timber stand improvement, and other advantages, makes the use of whole tree chippers practical and reasonable for harvesting many stands of timber.

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