SOME ESSENTIALS OF MACHINE PLANTING [1]

Earle H. Meekins
Forest Service, U.S.D.A.
Upper Darby, Pa.

If a planting machine opens up a slit deep enough and wide enough for a planter to place a tree, and closes it without air pockets, and if the slit is snugly closed with no more than a slight lip at the top the machine has done its job. The rest is the responsibility of the planter.

Planting Machines

Many planting machines are manufactured; others are homemade. Light machines are satisfactory for small jobs in friable, light soils. For varied and difficult jobs a planter that weighs from 600 to 1,000 pounds is necessary. A few satisfactory heavy machines are as follows: Lowther, Rootspred, and heavy Whitfield. There are others.

Essential features.--Adapted for 3-point hitch; sturdy heavy frame; 20-26 inch coulter; coulter adjustment for cutting depth; trencher at least 14 inches long; freefloating beam; and ball- or roller-bearing packing wheels.

Desirable features.- -Replaceable planting shoe or point; weights for coultertrencher section; adjustable trencher opening; and scalpers.

Adjusting Machine

A conventional planting machine in good operating condition has several characteristics that are easily checked. The entire train will track well: a large rolling coulter will follow directly behind the drawbar hitch and make a clean cut in the soil. The plow trencher unit will follow in the path of the coulter. The coulter will run as deep, or a little deeper, than plow point. The packing wheels will close the planting slit. On level ground, the planting slit will open equally with no tendency to vary--the same effect as the wake of a boat in quiet water. The trenchers will run about horizontal, with little difference in ground level between point and rear opening. All moving parts will be steady, no wobble or wriggle.

Sometimes adjusting the machine will help correct planting problems. Common problems and items to look for are as follows:

1. Packing wheels do not track.

(A packing wheel may even run over planted seedlings.) Packing wheels are most likely not to track on sidehill planting. Rocky ground may also cause poor tracking. To assure better tracking: (a) Adjust right and left components (draft arms) of 3-point hitch so machine rides level--contour planting. Machines with nonadjustable packing wheels will still wander some on side slopes. (b) Equalize air pressure in packing wheel tires.

1 This article is based on Eastern experiences. Conditions in other areas might change statements.

2. Trees generally planted shallow or flat.

a. Coulter too small for stock. Plant a ruler and see how planting depth compares with root length.

b. Ground hard. More weight needed on coulter-trencher unit to get more depth. Or, more down-pressure needed on hydraulic unit, if unit is equipped with one.

c. The mast arm of the hitch could be shortened to increase ground entering angle of the trencher.

d. Tractor going too fast for planter.

e. Coulter badly worn. (A badly worn coulter may adversely affect the depth of the trencher slit--plowing an unsatisfactory shallow furrow.

f. Rocky ground or ledge outcrops, causing coulter and trencher to ride high.

3. Plow not entering ground.

a. Same reasons as in 2 above.

b. Planting shoe may be worn.

c. Hard ground, dry or packed.

4. Planting slit not closing (most often found in heavy sod and soils).

a. Narrow width of trencher at tree opening.

b. Slightly deflate packing wheel tires.

c. Lengthen mast arm so trencher will be run on horizontal.

d. If angle of packing wheels can be adjusted, consider making these more vertical.

e. Check adjustment of coulter to be sure it is running true-vertical, and with direction of tractor.

f. Modify trencher. A Service forester with considerable experience claims that. planting in wet heavy soil can be improved by the addition of a strip of metal on the . sides of the trencher. He welded two strips of metal beginning at the point of the trencher. The strips run from the point to the back edge of the blade and one-half way up the side.. Soil packs better, eliminating air pockets.

5. Trash and old grass packs between coulter and leading edge of trencher.

a. Burn off old weeds and fine grass before planting. (State laws and organizational edicts and policy will determine.)

b. The Maine Forest Service extended the leading edge of the plow point so that coulter runs in a shallow groove. The coulter cuts well with little or no trash buildup. The less space between coulter and trencher point, the less likelihood that trash will collect, jam, and pack.

c. Plow and disk the summer before planting: either complete or partial.

6. Dirt piles up between trencher and packing wheels (most common on plq~wed and disked ground).- -Lengthen mast arm (center of 3-point hitch) so trencher will be horizontal, not tilted.

The preceding six points apply to many commonly used conventional planters. Our limited experience with one wildland planter in open field planting was not favorable- - packing wheels did not track well on contour planting. Others, however, say that wildland planters consistently give good results. Undoubtedly, where rocks and stumps impede planting, wildland planters are much more efficient than more conventional types.

Planting

A heavy planting machine in good operating condition will generally require only two men--a tractor operator and a planter--if the soil also is in good condition. In some places, particularly in stony ground, a third man follows the planter and firms-in the trees. Under favorable operating conditions, using more than two men is a luxury.

1. Planting method.--Trees are taken from the planting racks and held normally in the left hand, roots away. Single trees are transferred from left to right hand, usually held by forefinger and thumb about root-collar depth, or a little above, in preparation for planting. Planting is done by placing the tree in the ground between the trencher blades--well forward ahead of the soil that falls in the trench. The tree is held upright or leaned a little backward with the knuckles touching the ground. The planter follows through holding the tree in position until the forward motion of the machine and soil falling back in the slit holds the tree in place. Sometimes the planter gives the tree a little flip back to counteract any influence the packing wheels might have to slant the trees forward.

Planters form their planting habits early. Once formed, they are extremely hard to break, sometimes impossible. Many planters differ slightly in minor planting techniques--mostly on how they hold the tree. Check a new planter often to correct faulty planting methods before they become a habit.

2. Soil conditions.- -Critical soils (those with high clay content, with almost no structure) create problems in several ways. Planting season is limited to periods when soil can be worked. Special site preparation treatments may be required to condition the soil, decrease competition, improve lateral movement of soil water, or for other reasons. In contrast, in much of the Eastern Coastal Plains south of the Mason-Dixon line, the high sand content permits planting practically any time the ground is not frozen--during late 'fall, winter, or early spring. Light sandy soils permit somewhat faster planting and deeper planting than do heavy soils.

3. Planting rate.--The speed of tractor-planter movement across the field affects quality of planting. There is an optimum rate for each planter and area. Some factors that determine planting rates are as follows: soil quality, condition or tilth, ground cover, presence of stumps, stones, rocks, terrain, equipment factors, size and condition of stock, and ability and skills of the men.

These factors are all interrelated, and any one of them may limit the planting rate. For example: soil conditions, terrain, equipment, and ability of the planter may be ideal for fast planting. But, if stock is much larger than 8 to 10 inches in height with an 8-inch root system, the speed of the planters should be slower than it would be with smaller stock. When the planting rate is too rapid, usually a number of trees will be found planted shallow: some may be flat, infrequently deep. The inconsistence will likely be found on fairly well-defined areas, and many well-planted trees will be intermixed with poorly planted trees. Erratic planting is seldom done by an experienced conscientious planter when the speed of the planting machine is geared to his ability to place a tree properly.

4. Erosion--hazard in planting slot.--An erosion hazard is often created when trees are planted in rolling or hilly ground. Dips, drains, and hollows become waterways. Also, the planting rows are likely to become waterways when slopes exceed 5 percent, if cloudbursts fall on newly planted ground.

The direction of planting rows should be determined in advance. The planting rate generally increases with row length but, when the lay of the land is such that long rows may contribute to erosion, shorter row lengths may prevent erosion.

a. The banks of drainage ways should be left unplanted for the width of a planting row: 5 to 10 feet.

b. The planting machine should be lifted out of the ground every 150 to 200 feet for an interval of 10 to 15 feet when an erosion hazard exists. The unplanted break will serve as a water dispersal and infiltration spot.

5. Spacing.- -Proper spacing, both between and in rows, may be determined by mechanical aids.

a. Some experienced planters can obtain good spacing in the rows without a spacing device. (Some devices can be purchased with the machine; other homemade devices work satisfactorily.)

b. The distance between rows can be easily established with a double outrigger pole projected on each side from the front of the tractor. The pole has an object dragging along the ground that makes a mark at the proper spacing.

If the ground is a bit soft, the tractor wheel prints of the row just planted can be used as a guide for the next row--using an outrigger pole with dangling object.

Innovations, Special Developments, and Accessories

New planting techniques and planting equipment are developed because local needs often require new remedies to cure critical situations. The ingenious tree planter changes equipment design and adds accessories to fit the locale.

1. New machines being developed plant a tree somewhat like a nursery planter. The tree is laid in a traveling belt that places it in the ground. One, using this principle, is the Skinner; another is being developed in the West.

2. A Western Region is reported to have developed a 3-point hitch that will give full stabilized control for sidehill planting. This would be a major boon to planters-the hitches that we have seen will not prevent some wander and slippage on steep side slopes.

(The Arcadia Development Center is experimenting with the Holt 3-point hitch.)

3. Sometimes, a special tooth replaces the wheel coulter when stony or rocky land is to be planted. Or, the machines may not use any device in front of the trencher.

4. In California, rigid hydraulic controlled drawbars have been used to prevent machine side slippage on steep slopes.

The addition of scalpers is not discussed in this article. They are greatly needed in some sections, but used infrequently in others. Some planters have added special innovations and improvements that operators believe have improved the machine, such as mud scrapers, stirrups, spacers, racks, and frame reinforcements.

We would like -to emphasize that quality machine planting requires that the planter knows how to operate the equipment. High-quality planting under all conditions requires good, well maintained equipment and conscientious, reasonably intelligent workmen.