Machine-Planting Seedlings with Near-Checkerboard Precision

David F. Van Haverbeke

Research Forester, USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, Forestry Sciences Laboratory, Lincoln, Nebr.

Trees machine-planted on cultivated sites can be aligned in checkerboard pattern by (1) setting several guide flags in each row to be planted, (2) setting three rows of baseline flags outside the plantation at within-row spacings parallel to the first row to be planted, and (3) advancing three rows of baseline flags across the plantation in leap-frog fashion every five rows as planting proceeds.

Plantation trees are more esthetic and easier to maintain and measure when "checkerboard" planted; that is, set so that an observer can sight along the rows, across the rows, and diagonally through the rows from any point inside or outside the plantation.

It is possible to hand-plant trees in a checkerboard configuration; however, hand-planting, especially in heavy-textured soils, is time consuming, laborious, and difficult to justify economically if the planting is large.

Machine-planting is faster, less laborious, and can achieve near-perfect row alignment; but it is more difficult to space trees accurately within rows. Devices commonly used to achieve within-row spacing, such as bells on planter wheels and trailing chains and ropes attached to planters; cannot usually achieve a perfect checkerboard effect. Alignment is especially difficult when planting on hilly or undulating sites.

Machine-planting perpendicular to previously identified rows, such as those set off in grass and sprayed with a herbicide, is a good way to achieve near-checkerboard precision. When planting on completely cultivated sites, however, this method is not feasible. This article describes a procedure to achieve near-checkerboard precision when machine-planting in a completely tilled and unmarked site.

Preparing to Plant

Before planting, the ends of each row to be planted are accurately identified with guide flags. Additional guide flags are set every 60 to 90 meters within each of these rows (fig. 1).

Three baseline rows are marked off outside the plantation boundary adjacent and parallel to the first row to be planted, at the designated between-row spacing. Flags are set accurately along the length of these three rows, marking individual seedling positions at the designated within-row spacing.

Planting

The driver centers the tractor over the first row to be planted and keeps the tractor and planting machine in line with and over the series of several guide flags in that row. The "planting" member of the crew sights across to the rows of baseline flags as the tractor proceeds along the row being planted, and sets a seedling each time three flags designating the same position in the rows come into alignment.

After completing the first plantation row, the tractor returns alongside the row just planted and packs the soil next to the seedlings with the weight of the rear wheel, eliminating any air pockets that may remain near the seedling roots. The tree planter is reloaded and the next row is planted. Beginning at the same end of the row each time enables the "planting" member of the crew to better maintain consistency of planting technique, and thus precision, by always sighting across to the flags from the same side of the planter without having to change position.

Realignment

Accurate alignment can be maintained with the original three rows of parallel baseline flags for about five rows, even over moderately uneven terrain, before plantings begin to drift off line, either behind or ahead of the true across-row alignment.

At this point, a new row of flags is set with a tape line at the correct within-row spacings in the last (5th) row planted-disregarding the positions of the just-planted seedlings (fig. 1). Planting is then resumed for another 5 rows, followed by the setting of additional rows of flags

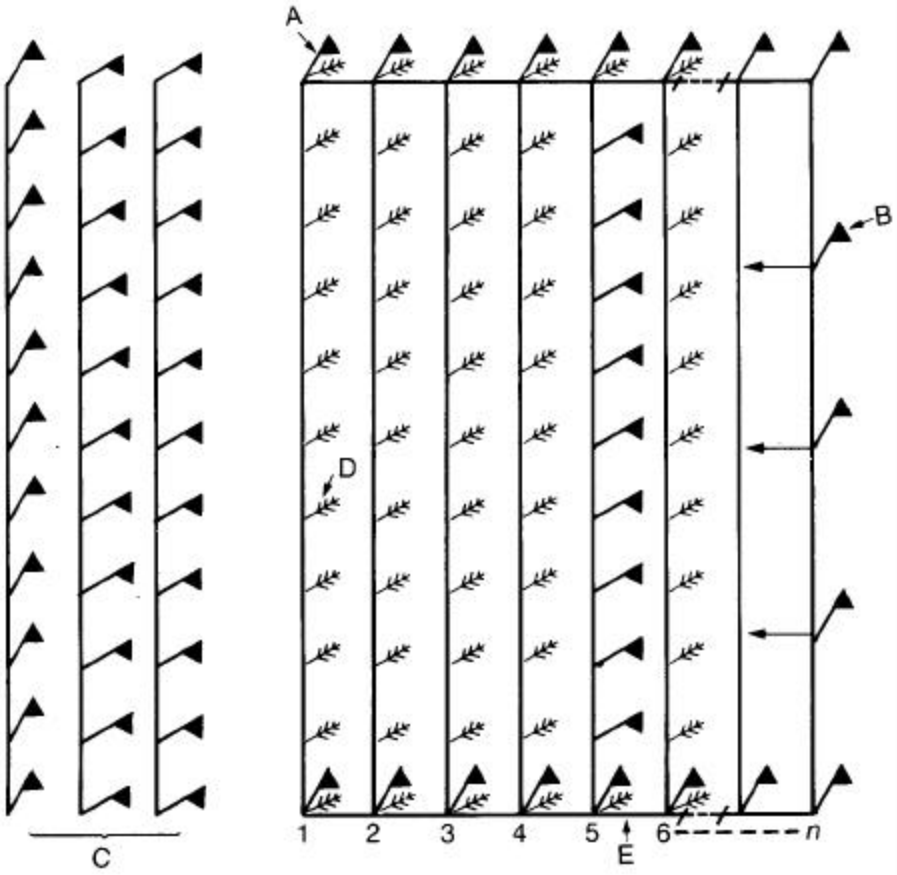

***Figure 1**—Diagrammatic sketch of procedure for checkerboard planting seedlings by machine. A. Identify the ends of each row to be planted. B. Set up tractor guide flags every 60 to 90 meters within each row. C. Mark three baseline rows outside the plantation boundary adjacent and parallel to the first row to be planted. D. From the tractor, sight across the planting row to the baseline flags and set seedlings when three baseline flags come into alignment. E. Set a new row of flags with a tape line using the baseline rows.*

in the 10th, 15th, . . . nth row to the end of the plantation. To conserve flags, only the three rows of flags set at five-row intervals nearest the planting operation plus the first baseline row are needed to maintain proper alignment. All other intervening rows of marker flags can be pulled out and reused for rows yet to be planted.

The occasional out-of-line tree is readily detected by the person walking behind the planter straightening and tamping newly planted seedlings. These seedlings can then be replanted into better alignment. These out-of-line seedlings are most noticeable in the fifth of a set of five rows after the correct spacing distance has been reestablished.

This procedure was recently used to establish two progeny plantations, totaling 7 hectares, on freshly cultivated land. Seedlings were spaced 2.5 meters apart within rows 3.7 meters apart. In a short time, this technique periodically and systematically brought the across-row alignment within the plantation back into the desired checkerboard configuration.