Mechanized Application of Bird Netting to Protect Germinating Seedlings

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Netting is used to cover newly sown seedbeds to protect seed and emerging seedlings from birds. The USDA Forest Service Bend Nursery has tested an automated method of applying and removing the netting. This article describes a method of mechanizing the application and removal of netting with a hydraulic stake driver and a hand-pulled netspreading cart. Tree Planters' Notes 40(4):14-17; 1989.

Bird predation of newly sown seed and emerging seedlings has long been a problem at Bend Nursery, located on the east side of the Cascade Range in central Oregon. Migratory doves are the primary damaging agents, with quail and other bird species minor, secondary agents. In the spring of 1986 alone, birds damaged or destroyed about 120,000 seedlings in 8,400 linear feet of unprotected nursery bed (57% of the seedlings in these beds). Small areas of seedbed had been left unnetted as part of a cost/risk evaluation. The areas unprotected were judged to hold the least risk of bird predation. This experience confirmed the usefulness of bird netting in the nursery.

Bird netting had been applied manually over new seedbeds and removed from them manually for many years. The process is costly and time consuming and has many inherent safety hazards associated with long hours of stooping, bending, kneeling, lifting, and pounding. Mechanization of this process is a means to reduce risk of injuries and increase efficiency.

Improved Netting Process

In the manual netting process, wooden stakes are pounded into the ground at set intervals down each tractor path (fig. 1). Rolls of plastic bird mesh (14 feet wide with 1/2-inch by 1/2-inch mesh) are unrolled and suspended over the stakes. The netting is then hooked over small nail heads pounded into the end of each stake. Each roll covers the width of two beds. A soil covering holds the netting in place at the edge of the netting and keeps birds from entering underneath the suspended netting.

In 1984-85, Don Langmo of Oregon State University completed a time/motion study of the process of driving stakes, laying and fastening netting, etc.

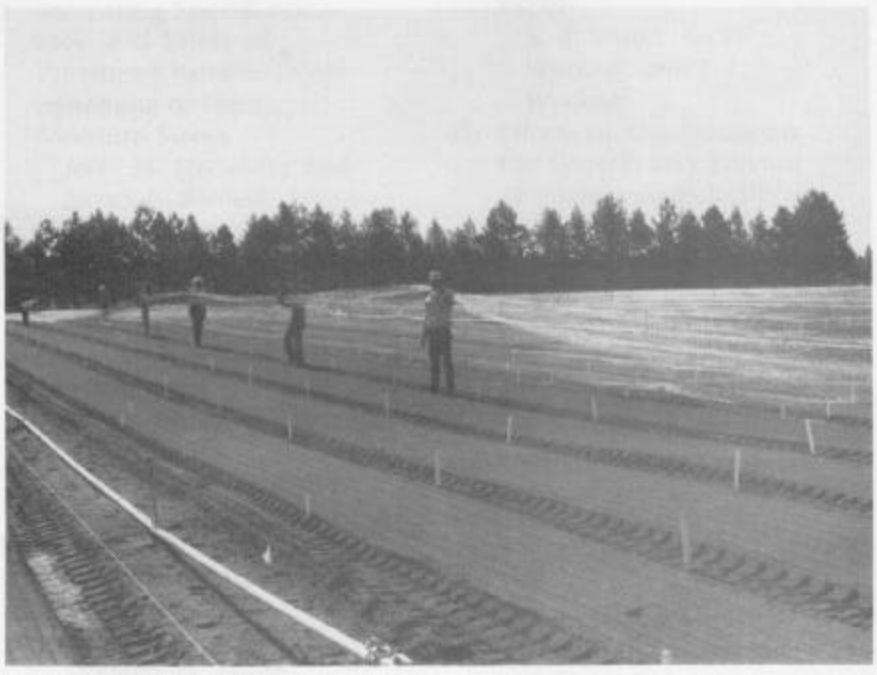

Figure 1—*Hand netting process.*

(1). He concluded that a simple mechanical hand-pulled "rickshaw" device could minimize the risk of back injury and increase efficiency of net spreading (2). Using this concept, the maintenance shop at the nursery designed and constructed a netspreading device.

Langmo's study also identified stake driving as a high-risk, high-hazard job. The nursery requested help from engineers at the USDA Forest Service Missoula Technology and Development Center. MTDC developed a hydraulically operated, tractor-mounted device that would mechanically drive wooden stakes.

The improved netting application process incorporates both the hydraulic stake driver and the rickshaw net spreader. The hydraulic stake driver can be mounted on any tractor that has remote hydraulics and a 3-point hitch. It requires one tractor operator and one person riding the stake driver. An experienced operator can drive about 1,800 stakes per hour. Stakes are 3/4 inch by 1½ inches by 16 inches and are driven an average of 6 to 8 inches into the ground. The machine can be set to drive stakes at various depths as required by the nursery (fig. 2). Wooden stakes are made to measure by the Central Oregon

Figure 2—*Hydraulic stake driver.*

Opportunity Center, a center that primarily employs and trains handicapped adults. The stake-driving process takes two people working part-time over about 8 days (12 person-days) to complete 110,000 linear feet of seedbed.

After stakes are driven for a section, one person hand-draws the net spreader, while two others, on each side of the netting, hook the netting to nails hammered on the ends of the stakes (fig. 3). In this way, netting is suspended over the seedbeds high enough to protect emerging seedlings from birds and high enough to prevent damage from minor net movement in the wind. Two additional people cover edges of the netting with soil to complete the netting project. Approximately 6 weeks later, netting is removed mechanically by the net spreading device, using a hand-crank, reverse-application process.

Figure 3—*Hand-pulled ("rickshaw") net-spreading cart.*

Results and Conclusion

The improved process using the hydraulic stake driver and rickshaw netting cart has been tested for three seasons at the Bend Nursery with good results. Mechanically driving the stakes and mechanically spreading the netting have greatly improved efficiency and safety of the netting task. Much of the hazardous work has been mechanized, which minimizes the risk of injury. Table 1 shows a breakdown of production rates before and after mechanization.

The mechanization of the netting process has reduced the job by 150 person-days per year and has increased job safety. The mechanized netting system has proved effective and, in the case of risk of severe damage from birds, can be extremely costeffective as well. Complete drawings of the stake driver are available from the

USDA Forest Service
Missoula Technology and Development Center
Building 1 Fort Missoula
Missoula, MT 59803.

Information on the rickshaw cart is available from the

USDA Forest Service
Bend Nursery
63095 Deschutes Market Road
Bend, OR 97701.

Table 1—*Production rates for covering 110,000 linear feet of seedbed*

	Before mechanization		After mechanization	
Process	Rate (days x people)	Total person-days	Rate (days x people)	Total person-days
Stake driving	13 × 2	26	6 × 2	12
Net installation	13 × 12	156	9 × 5	45
Net removal	11 × 5	55	6 × 5	30
Total		237		87

Literature Cited

1. Langmo, R.D. 1983. Nursery work improvement through work measurement. Paper PNR 83-502. Proceedings of the Pacific Northwest regional meeting, American Society of Agricultural Engineers, Victoria, BC. 13 p.
2. Langmo, R.D.; Washburn, J. 1984. Seedling net spreading aid. Proceedings, Western Forest Nursery Council/Intermountain Nurseryman's Association; Coeur d'Alene, ID.