Timber Tech Tips

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Improved Tree-Planting Tools

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Little or no change has occurred to planting tools in many years. However, the morphological characteristics of seedlings have changed and so has the diversity of species being planted. The Missoula Technology and Development Center (MTDC) was asked to investigate new developments to hand-planting tools. Possible improvements in planting tools may be better ergonomics or improved efficiency.

After a thorough investigation and market search, MTDC purchased, modified, or manufactured four tools for planting coniferous trees. The tools were field tested at the Plumas National Forest in 1998. Two of the tools are for container-stock planting. Two can be used for either containerized or bareroot stock. The field tests were to determine the overall effectiveness of the tools, their advantages and drawbacks, and to learn the impressions of operators who used them.

MTDC also investigated planting tools used for planting larger hardwood stock in the Eastern States. The Southern Region (R8) requested information on auger systems for planting large hardwood seedlings. MTDC provided them with information on auger-based systems currently used by many Regions to plant coniferous trees.

Tools Evaluated

Hollow Dibble

Description: The hollow dibble (Figure 1) is used to produce holes to plant containerized seedlings. The holes are slightly larger than the containerized stock to minimize hand packing around the root system. The dibble head is interchangeable (Figure 2), allowing heads of different sizes to be used, depending on the size of the container stock. Unlike a solid dibble that compacts the soil around the dibble head, this tool removes the soil, reducing soil compaction, which is thought to retard root growth. Cost was approximately $55 for the planting dibble without modifications, and $30 for the head.

The hollow-dibble tool consists of a 3-foot metal tube with a T-handle attached to the top, and the soil-extractor head threaded into the bottom. Above the extractor head are two flats that the operator steps on to push the head into the soil. The operator can use one foot or both.

Figure 1—Planter using the hollow-dibble planting tool.

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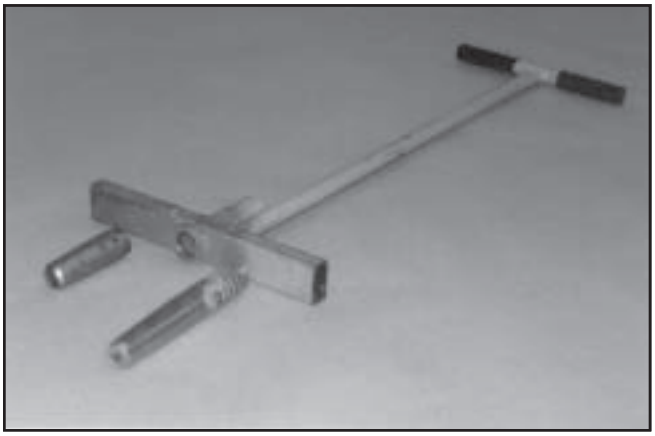

Figure 2—Hollow dibble with interchangeable heads. The heads are threaded into the base. Various-size heads can be used depending on container-stock size.

This tool was modified from the original manufacturer. MTDC added a second stepping flat so the planter's entire weight could be used to push the dibble head into the ground.

This tool can be used on any slope, but it is especially good for planting on flat ground where hoedad planting can create holes that are not vertical.

Operation: The planter steps on the flats of the tool. The hollow-dibble head removes a plug of soil. When the dibble is removed from the hole, the seedling is placed in the hole by hand. If necessary, soil is scraped around the roots and firmed by hand or by foot. When the planter steps down at the next planting spot, the plug from the previous hole is pushed out of the tool. This plug provides soil material that can be used when planting the containerized seedling.

Advantages: Lightweight, fast, interchangeable heads, replaceable, inexpensive, and easy on the operator.

Disadvantages: Soil conditions must be good—it is not suitable in rocky, extremely compacted soils. The head may plug.

Slide Hammer With Soil Extractor

Description: The slide-hammer hand planting tool (Figure 3) is designed to produce planting holes for containerized seedlings. It removes a plug of soil much like the plug removed by the hollow-dibble tool. The tool consists of a slide hammer with an extractor head that is attached to the bottom. The extractor head removes a plug of soil about the same size as the container stock.

The slide-hammer planting tool has a 3-foot metal rod with a soil extractor at its lower end. A heavy slider tube with handles at its top slips over the rod. The operator lifts the slider tube and slams it down on the rod that supports the extractor head, driving the head into the soil.

Operation: The operator slides the hammer portion of the tool toward the ground, driving the extractor head

Figure 3—Slide-hammer-action tree planting tool.

into the ground and removing a plug of soil. After the tool is removed, the seedling is placed into the hole. If necessary, soil is scraped around the root and firmed by hand or by foot. When the operator drives the head into the next planting spot, the plug from the previous hole is pushed out of the tool, providing some soil for planting.

Advantages: The slide hammer can be used in rockier, more heavily compacted soils than the hollow-dibble tool, and it is fast.

Disadvantages: It is heavy (about 20 lb), requires strenuous work, and is fatiguing for the operator.

Tanaka Gas-Powered Hand Drill With Auger

Description: The Tanaka gas-powered hand drill (Figure 4) is a portable, lightweight drill that can be used for auger planting. An auger attached to the drill creates holes to plant either container or bareroot stock. Different augers with diameters ranging from 1 to 4 inches can be attached to the drill. This system is ideal for planting on rocky sites or other sites where a dibble or other planting tools would not be effective. Cost is approximately $450 for the power head, and $20 to $30 per auger.

The Tanaka power head has a 1-hp engine, reversible transmission, and a heavy-duty gearing reduction of 20:1. The head has a ½-inch chuck capacity. The total weight of the power head is 9 lb. The only modification made by MTDC was to add a padded extension handle on the side of the drill to increase the gripping area and to add leg protection if the drill should twist hard.

Two different augers were used. One auger manufactured by Jisco has a diameter of 1¾ inches and is used for container stock. This auger bent after use in rocky soils. The auger was modified by removing the shaft and replacing it with a stainless-steel, ¾-inch shaft. We experienced no further problems with bending. The other auger was purchased from Sherrill, Inc. It has a 3½-inch auger with a sturdy ½-inch shaft and can be used for container or bareroot stock. We had no problems with the auger shaft bending.

Operation: The planting hole is produced by drilling a vertical hole with the auger. After the auger is withdrawn, a seedling is placed in the hole. Soil that the auger heaps around the hole is packed firmly around the roots

Figure 4—Planter using Tanaka gas-powered drill with auger. The padded extension arm was added for leg protection and increased gripping area.

of the seedling. Care must be taken so that the auger does not corkscrew into the soil instead of creating a hole. If this happens, the operator can pull the auger out of the soil (if conditions are good) or reverse the drill and power the auger out.

Advantages: The Tanaka gas-powered auger can be used in much rockier soils than the other planting tools. It is lightweight and does not require strenuous effort by the operator. The reversible transmission allows the auger to be removed if it gets stuck in the soil.

Disadvantages: The powered unit is noisier than the other planting tools. Refueling is necessary, requiring gasoline to be carried to the planting site. If soil conditions are extremely bad, larger power-head units may be required. The system is more expensive than other tools.

Battery-Powered Hand Drill With Auger

Description: The DeWalt 18-volt, battery-powered reversible drill (Figure 5) was used with augers to make planting holes. Augers ranging from 1 to 4 inches in diameter can be attached to the drill. Smaller-diameter augers are better suited for this system. This system is ideal for planting in good to fair soils with some rocks. Cost is about $350 for the DeWalt drill, and $20 to $30 per auger.

The batteries can be quickly recharged by the manufacturer's charger. Only about 100 holes were drilled before the battery ran out of power. A new battery system could be developed to allow more holes to be drilled before the battery has to be recharged.

Operation: The planting hole is made by drilling a vertical hole with the auger. After the auger is withdrawn, a seedling is placed in the hole and the soil that the auger heaps around the hole is packed firmly around the seedling roots. If the auger corkscrews into the soil rather than digging a hole, the operator can pull the auger out of the soil if conditions are good, or reverse the drill and power the auger out.

Advantages: The battery-powered auger is extremely lightweight, quiet, and efficient.

Disadvantages: Good soils are required for operation. The tool is limited to smaller augers. The battery now being used only allows about 100 holes to be drilled before recharging is needed.

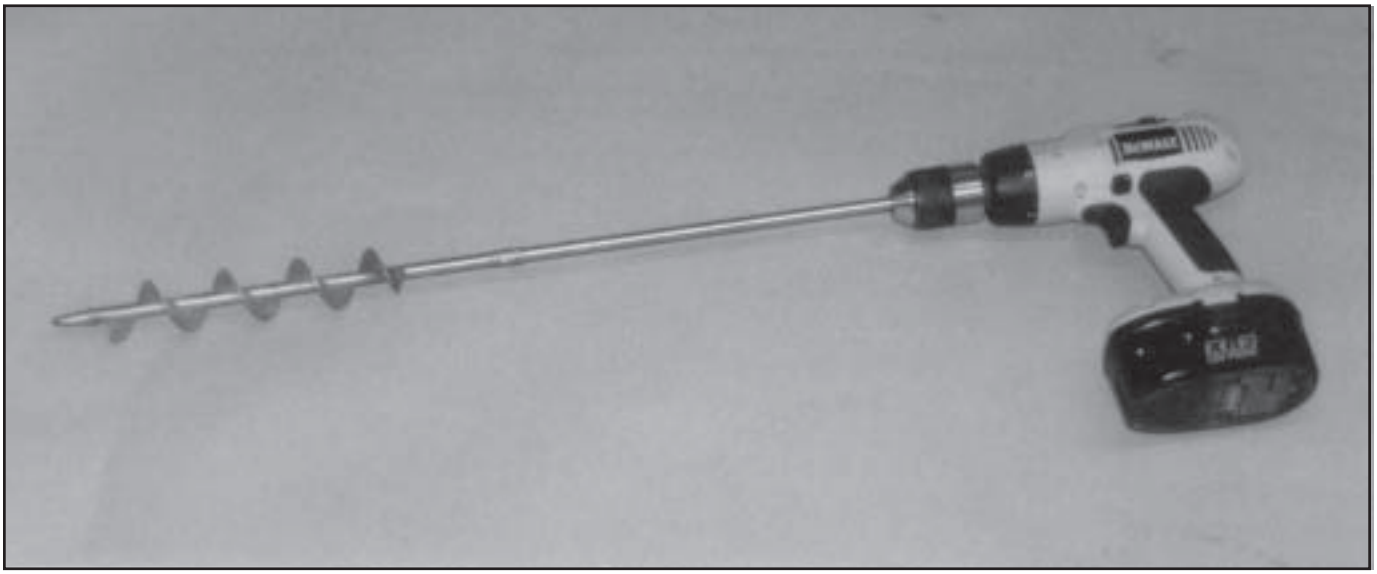

Figure 5—Battery-powered, 18-volt drill with auger.

Testing

A contracted planting crew was used to test the new planting tools. Before using the new tools, the crew had been using hoedads for planting. The crew was divided so that two people were scarifying, one was using the planting tool, and two were placing the seedlings. Site conditions were very good. The soil was moist and loose and had very few rocks.

Hollow Dibble—This was the crew's favorite tool. It was lightweight, easy to use, and required less-strenuous work than the hoedad they were accustomed to. The tool removed a soil plug each time the operator stepped down on it. It was also easier to produce vertical holes on flat ground with the hollow dibble than with the hoedad.

Slide Hammer—This was the crew's least-favorite tool. It was used only to produce a few planting holes. Even in good soil conditions, the tool was hard to drive into the ground and was very tiring to use. It produced good holes, but required too much strenuous work.

Tanaka Auger System—The crew had done some auger planting in the past, and they preferred this unit to the larger, chain-saw-driven auger. They thought it was lightweight and easy to use. Occasionally, the auger corkscrewed into the ground and slowed the planting process. The crew felt that a longer shaft would make the auger easier to use.

Battery-Powered System—The crew's impression of this unit was favorable. It ran at a higher rpm than the Tanaka system and it corkscrewed into the ground less frequently. They liked the drill's quiet operation. Some questioned whether the drill would stand up to a season's drilling since it only drilled 100 holes before it ran out of battery power.

Conclusions

Based on the results of the tests and comments from the operators, the hollow dibble and the Tanaka gas-powered auger system were the better tools of the four. The hollow dibble was well received, easy to use, and easiest on the operator. This tool should be considered for planting containerized stock when soil conditions are relatively good. The Tanaka drill has plenty of power, is lightweight and versatile, and allows holes to be drilled for containerized stock or for bareroot stock. This tool should be considered as an alternative for crews who are using the large chain-saw-powered augers.

Recommendations

Further work could improve the augers for the Tanaka drill, reducing the likelihood that they will corkscrew into the ground. Also, a longer-lasting battery system could be developed for the battery-powered drill.

Obtaining the Tools

All the tools were purchased except for the slide-hammer tool, which was designed and manufactured by MTDC. The hollow dibble and Tanaka auger system were purchased from Ben Meadows Company (P.O. Box 80549, Atlanta, GA 30366. Phone: 800-241-6401). The Tanaka drill should be available from local sources. The augers were purchased locally, but could be obtained from many other sources. The DeWalt 18-volt drill can be purchased from most local hardware stores. Because the hollow dibble, Tanaka drill, and augers were modified, MTDC will be completing the drawings specifying the modifications. The drawings will be available by request from the Center when they have been completed.

About the Author

Andy Trent is a project engineer at MTDC. He received his bachelor's of science degree in mechanical engineering from Montana State University in 1989. He came to MTDC in 1996, and works on projects for the nursery and reforestation, forest health protection, and watershed, soil, and air programs.

Library Card

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Describes field tests of four improved tree planting tools: a hollow dibble, a slide hammer with soil extractor, a Tanaka gas-powered hand drill with auger, and a battery-powered hand drill with auger. The hollow-dibble tool and the Tanaka gas-powered hand drill with auger were the best tools, based on the results of the tests and comments of the operators.

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