

NET RETRIEVAL SYSTEM
FOR
PINE SEED COLLECTION

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Abstract--Substantial savings in time and energy consumption could be achieved in seed collection operations for at least four species of pine, using equipment now being tested. When trees are shaken mechanically, the seed falls onto netting on the ground. A mechanical system for handling the netting and retrieving the seeds is described.

The basic principles for the net retrieval system of pine seed collection have been developed by the Georgia Forestry Commission over the past 10 to 12 years. About 5 years ago the Missoula Equipment Development Center and the Southern Region of the Forest Service began working with the Georgia Forestry Commission on a mechanized seed collection system. MEDC designed and built a prototype net retrieval and seed separation machine which was tested by the Georgia Forestry Commission and the Forest Service over the past two seasons at Georgia's Arrowhead Seed Orchard. The prototype has been modified and two additional units were fabricated in 1982 (figure 1). The units will be assigned to three Forest Service orchards: (Erambert in Mississippi; Stuart in Louisiana; Francis Marion & Sumter in South Carolina).

The net used in the system is a polypropylene fabric originally manufactured as carpet backing. A weave count of 6X8 per square inch is used to collect loblolly pine seeds. Other weave counts are available and can be used depending upon the size of seed to be collected. The net is spread over the orchard floor several weeks before cone opening is predicted. The Georgia Forestry Commission tried several types of material before choosing the carpet fabric. This netting is tough, light weight, durable, and readily available in various lengths, widths and weave counts. In 1982, the fabric cost about \$1,354 per acre, or \$1.55 per linear yard, for the 6X8 weave count, 16.5 feet wide. Expected life of the fabric is 10+ years if it is not mistreated. A special boom crane mounted on a 20-foot trailer has been built to move the netting rolls between a storage area and the field operation.

The power requirements to operate the net retrieval and seed separation equipment are less than 30 brake horsepower. This power is derived from a wheeled tractor's PTO shaft operating at 1000 RPM. This tractor is also used to transport the units in and to the fields. The PTO shaft drives a hydraulic pump and a 116 volt AC generator which supplies the necessary hydraulic pressure and electric energy to operate and provide controls for machinery. In some instances a speed increaser is required to increase the PTO RPM from 540 to 1000.

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An operator's station, with controls and gauges, is located at the rear of the retrieval vehicle. From this location, all machine functions can be controlled except the lowering of the full rolls of netting. This activity is controlled at a separate location adjacent to the roll drive mechanism.

When the equipment is towed, the tongue of the seed separator trailer hydraulically extends to allow proper tracking and turning clearance. To ensure the adequate delivery from the main conveyor to the seed separator unit, the tongue must be hydraulically retracted, positioning the main conveyor in the seed separator hopper.

EQUIPMENT OPERATION

Optimum seed fall in the South usually occurs in late October, November and early December, depending upon the weather. As weather fronts move through the area, humidity will rise for a day or two. After the front passes, several cool, dry and usually sunny days will produce good collecting conditions. The trees are then shaken mechanically, causing the seed to fall onto the net. Each tree is subjected to several short bursts of shaker power. Shaking dislodges far more from the tree than seed, i.e., pine straw, twigs, and cones. Thus, the need for a field seed separator device.

The net is placed in the orchard several weeks before seed fall; during this period its black color tends to collect heat and keeps the soil surface warm. This greenhouse effect stimulates growth of grass to the extent that the machine may not always produce enough pulling force to free the net from the grass. This potential problem varies with the type of grass growing in the various orchards. Force applied vertically tends to separate the grass and netting. This activity is probably the most labor-intensive procedure in the entire operation.

Once the net is separated from the grass, it is attached to the core on the net retrieval machine and rolled up. Hydraulically-powered hubs at each end of an aluminum core apply uniform power to wind the net from the orchard floor onto approximately 200-pound rolls. The net is pulled over an upper guide roller, which dumps the seeds and other material off the net onto the retrieval machine's main belt conveyor. From here they are conveyed into the receiving hopper of the seed separator. As the material passes through the separator, seed and small trash drop through the shakers and screens into seed collection drawers.

The shaking action moves the material, other than seed, to the back of the unit where it can be discharged to either side of the machine by a reversible conveyor belt. The seed is drawn out of the collection drawers by a vacuum system attached to a plastic drum. The drum container is then shipped to the cleaning and storage area where further processing of the seed takes place.

The net in the orchard alley is placed perpendicular to the row netting and is processed last. This step ensures pickup of any seed which may have been spilled during processing of the individual rows. The netting is very durable and can withstand vehicular traffic if a few precautions are observed.

SEED COLLECTION IN THE SOUTHERN REGION

The Forest Service's Southern Region has 230 acres of loblolly pine, 555 acres of shortleaf pine, 50 acres of Virginia pine, and 64 acres of white pine in orchards. Seeds of these pine species are considered difficult to collect because the cone is not easily removed from the tree branch. The seed from a large portion of these orchards can be collected using the net retrieval system. This system offers the same potential advantages to many other seed orchards of State agencies and private firms growing these species.

At present, seed collection is very labor-intensive because the cones must be picked one at a time by hand, using some type of man elevator, platform, bucket-truck, etc. The expense, both in time and energy consumption, of shipping large amounts of cones to a central seed kiln and seed processing plant, and the expense of operating the seed kiln, can be very high. In contrast, shipping only seed to a central location, and eliminating the need for a seed kiln can achieve substantial savings for the entire seed orchard operation. The overall objectives of the net retrieval system were to make this difficult job easier by managing the time of collection, rather than letting nature set the time to manually collect cones. Bringing the seed to the collector, rather than taking a collector to the seed accomplishes more with less personnel.

For additional information, drawings and specifications contact Bob Major, USDA Forest Service, 1720 Peachtree Road, N.W., Rm. 720, Atlanta, Georgia 30367, FTS 257-3748, commercial phone (404) 881-3748.

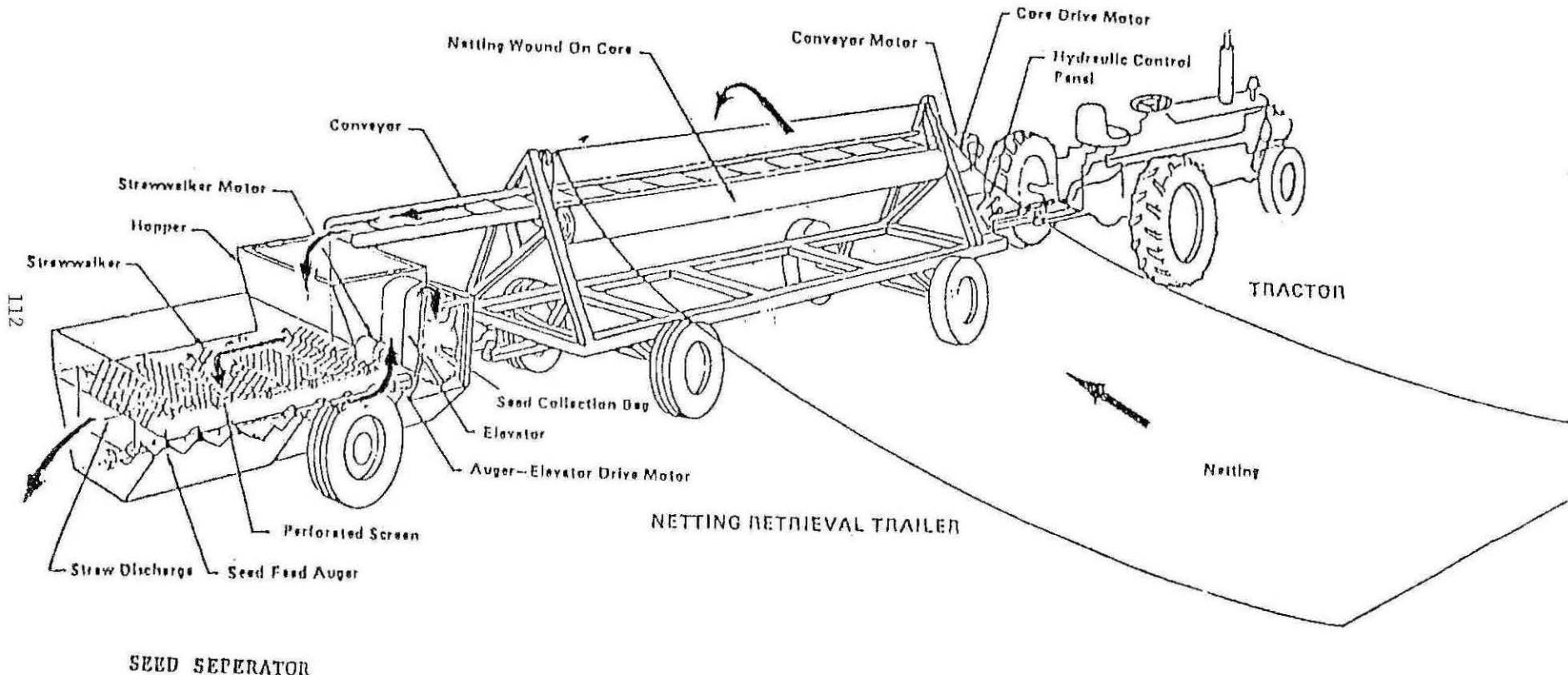


Figure 1. Net retrieval system.