

Rangeland Seeder Development Using Semicircular Seedbox and Auger Agitator Seed Metering Concept

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Abstract

A rangeland seeder featuring a semicircular seedbox and auger agitator mounted to heavy-duty frame has proven reliable and durable under rough rangeland conditions. The experimental seeder reduces the variability in metering fluffy seed due to the improvement in design. Satisfactory metering of slick seed was accomplished with a commercial, cup-feed mechanism. Flexing, runner openers prepared and placed seed in a furrow without undue mechanical breakage while traversing logs, stumps and other debris left after rootplowing. The features of the experimental seeder increase the potential for seeding brush-infested rangeland because of improved reliability and less need for costly clean-up of brush debris.

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Mention of trade name is for identification only and does not imply an endorsement or preference over other products not mentioned.

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There is a current world-wide awareness of the need to maximize production from all usable land sources. Rootplowing and reseeding of brush infested rangeland to productive grasses and forage plants offer excellent potential for increasing productivity of the range resource. Much of the seeding equipment for rangeland has been adapted from cropland farming equipment and requires extensive, costly, land clearing preparation for proper operation of equipment.

In 1969, The Texas Agricultural Experiment Station at Lubbock initiated a rangeland reseeding study utilizing a standard Nesbit grass drill; rangeland drill developed by Agricultural Research Service, USDA in New Mexico; cultipacker drill with Nesbit seedbox; and exhaust-blower broadcast seeder. Many inadequacies of design, seed metering, and seed placement were experienced in these trials (Brock et al. 1970). Research was then undertaken to develop a new concept for a rangeland seeder suitable for seeding rough, log-littered rangeland.

Seed Metering Devices

In a laboratory investigation, the fluffy seed metering mechanism from a Nesbit drill experienced a 99% reduction in the seeding rate before 75% of the seed were metered from the seedbox under static conditions using sideoats gramma (*Bouteloua curtipendula*

(Michx.) Torr.) grass seed and pickerwheel speed of 30 rpm. Bridging of the seed near the pickerwheel appeared to be the main problem.

A semicircular seedbox was constructed to allow seed in the seedbox to be rotated and prevent seed bridging. Pickerwheel widths of 6.4, 12.7, 25.4, 50.8, and 101.6 mm ($\frac{1}{4}$, $\frac{1}{2}$, 1, 2, and 4 in), and agitator styles of fingers, paddles, and augers were evaluated as outlined by Wiedemann et al. (1976). A combination of the semicircular seedbox, auger agitator, and 12.7-mm ($\frac{1}{2}$ -in) wide pickerwheel with eight teeth gave the best results. This experimental metering device produced a seeding rate decrease of only 15% while metering 75% of the seed from the seedbox at a pickerwheel speed of 10 rpm (Fig. 1). The 10 rpm seeding rate was comparable to 30 rpm rate of the standard Nesbit drill. The experimental unit easily

SEEDER COMPARISON

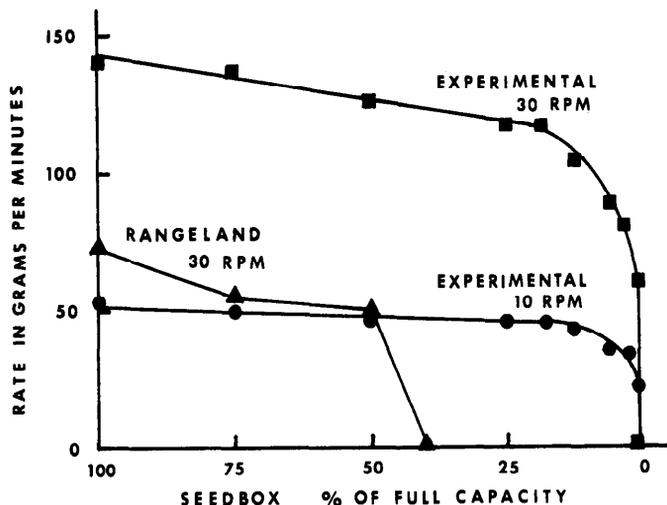


Fig. 1. Comparison of uniform seeding rate of the experimental metering device, a semicircular seedbox and auger agitator, to the nonuniform rates of the standard rangeland seed metering device, courtesy of American Society of Agricultural Engineers.

metered 97% of the seed from the seedbox during static test conditions.

A Planet Junior mechanism was selected to meter small, slick seed because of its wide use on Nesbit and other drills. The unit gave erratic seed metering because trash and irregular size seed plugged the small metering orifice. A John Deere, double-run, internal cup-feed seeding mechanism (part number AN 161321) was selected for the experimental seeder and has functioned well using a variety of trashy seed.

Laboratory and field tests of both seed metering concepts were evaluated under a broad range of conditions. Results have been very promising (Wiedemann 1975, Wiedemann and Brock 1975, Wiedemann et al. 1976, and Wiedemann et al. 1980).

Seeder Prototype

The semicircular seedbox was constructed from 30-cm (12-in) steel pipe and the open-center auger was fabricated from 10-gauge steel. Pickerwheels were placed on 30-cm (12-in) centers in the 1.8-m (6-ft) long seedbox. Individual seedboxes were constructed from 14-gauge steel for the six, cup-feed seeding devices. All seedboxes were mounted on a heavy-duty frame constructed with 76.2 × 76.2 × 6.4-mm (3 × 3 × $\frac{1}{4}$ -in) steel tubing with 41 cm (16 in) of ground clearance (Fig. 2). A special hitch was built that would oscillate and articulate to allow necessary movement between the seeder and tractor as they traversed rough land.

A flexing, runner opener was designed to place the seed in the seedbed without undue breakage from stumps, and other debris up to 12 inches in diameter (Fig. 3). The runner opener, 50.8 ×

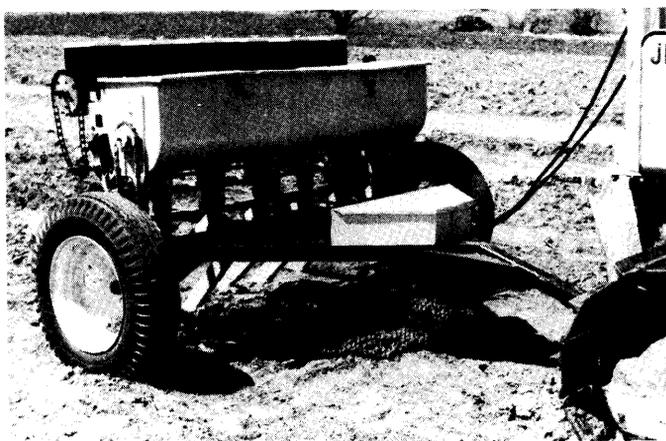


Fig. 2. Semicircular seedbox with auger agitator (for fluffy seed) and individual seedboxes with cup-feed metering mechanism (for small, slick seed) mounted on heavy-duty frame with 8-ply tire.



Fig. 3. Experimental rangeland seeder equipped with flexing, running openers to place seed in seed furrow without undue mechanical breakage from logs up to 30 cm (12 in) in diameter.



Fig. 4. V-shape wedge welded to runner-opener forms desired seed furrow and the tubular steel opener also serves as seed tube.

76.2-mm (2 × 3-in) rectangular steel tubing, also served as the seed tube. A V-shaped wedge welded to the bottom of the seed tube (Fig. 4), formed the desired furrow to trap the dispensed seed (Wiedemann et al. 1971). Openers for each pickerwheel were individually pinned to the frame to facilitate broadcast and row seedings. Lifting of the openers and termination of seed dispensing was controlled by a single hydraulic cylinder.

Field performance of the experimental rangeland seeder has been excellent and 5-years of testing is extensively covered by Wiedemann et al. (1979). The seeder has operated successfully on seedbeds prepared by chaining, rollerchopping or discing following rootplowing when sparse amounts of logs and stumps up to 30 cm (12 in) in diameter or sparse to moderate amounts of lesser debris were present.

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