

Drill Seeding of Forage Ranges

heavy duty drill permits good placement of desirable grass and legume seeds for establishment of pasture on range land

J. E. Street, B. L. Kay, and C. F. Walker

Tremendous increases in quantity and quality of forage production on many acres of California's rangeland could be achieved by establishing and growing selected varieties of grasses and legumes.

However, such lands usually are unsuited for cultivated crops—often on rocky sidehills of relatively poor soil—and in areas where rainfall distribution is not always favorable. Winter temperatures and frost-heaving add to the difficulties.

Furthermore, many of the better range grasses and legumes adapted to California have a very small seed and consequently a small food reserve for growth of the seedlings. Initial development of seeded plants is often much slower than the growth of resident annual grasses and weeds commonly found on the range.

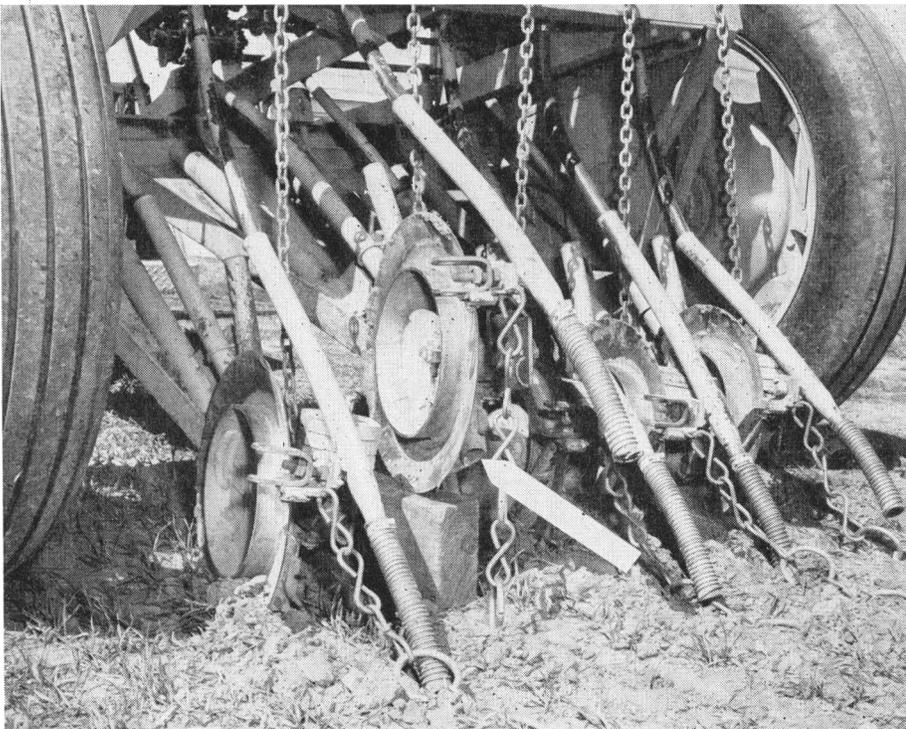
The adversities confronting range seeding require the exercise of extreme care in planting and management during the period of initial development. Careful placement of the seed in the soil—as by drilling—greatly facilitates germina-



Seeding burned brushland in San Diego County with rangeland drill.

tion. Early fall rains during warm weather may not moisten uncovered—broadcast—seeds long enough to permit germination. A covered seed may be germinated by early rains and thereby take advantage of warm fall weather. Moisture collection and slightly higher temperatures benefit seeds planted in a furrow or depression.

Rear view of rangeland drill showing individually suspended disk furrow openers. Depth rings control depth of planting in soft seedbed. Arrow indicates fertilizer and seed delivery boot.



A heavy duty rangeland drill—originally developed by the United States Forest Service for use on sagebrush range—was modified for range seeding trials. Fundamentally, the machine is a grain or grass seed drill with a rugged frame and 51" pneumatic rubber-tired wheels to provide a maximum clearance of 26" to operate over rocks, stumps and brush stubs. Steel wheels can replace the rubber-tired wheels for continuous use in burned brush.

Standard grain and grass seed boxes with adjustable-gate fluted force-feed seed delivery, will handle large and small seed at rates down to one pound per acre.

Single-disk furrow openers of 20" diameter are individually suspended to operate independently of each other. Each disk is mounted on an A frame and is pressed into the soil by weight alone. Additional weight may be added to each opener for operation in hard seedbeds. The underside of the A frame is shielded with steel plate against rocks and brush. Seed may be distributed through boots mounted under the convex—back—side of the disk or through tubes protruding behind the furrow opener. Scrapers and protrusions on the disk opener unit are minimized to avoid catching on rocks and brush or accumulating trash.

A standard grain drill fertilizer attachment box handles pelleted or granular fertilizers in quantities up to 500 pounds per acre. Delivery tubes are arranged to mix the fertilizer and seed and place them together—through the boot—into the bottom of the furrow. Fertilizer alone may be fed through a boot into the bottom of the furrow and the seed band seeded over the fertilizer through another tube after the furrow has been partially filled with soil. Drag chains are attached to each furrow opener unit to cover the seed. A ring roller pulled behind the drill provides additional seed coverage.

The standard model range drill is 13.5' wide and seeds 10 rows 1' apart, a spacing that is satisfactory for most range seeding. The modified model used in the seeding tests is only 8' wide, so a special permit for hauling on the highway is not required. Despite its weight of 2,100 pounds the machine pulls easily and can be used efficiently wherever a small

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DRILL SEEDING

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crawler type tractor can be operated with facility. A wheel tractor may be used on gentle slopes.

Test plots—in 21 counties—were established on control-burned brushland, cultivated seedbeds, sprayed sagebrush, burned and unburned medusahead range, and in sudan fields.

One representative test area of burned brushland on Auburn-type soils—at 1,400' elevation in Mariposa County—was dense chamise that had not burned for at least 20 years. The brush was crushed with a log drag in the spring of 1957 and control-burned in August. Comparative plots—10' by 150'—were seeded with two mixes on September 29, 1957. One seeding was a perennial grass and annual legume mix. The other mix duplicated an aerial seeding on the remainder of the burn.

Seeding Methods Tested

Broadcasting without covering the seed, broadcasting and ring rolling to cover the seed and drilling were the three methods of seeding tested with four replications of each treatment and each seed mix.

Four additional replications were repeated with pelleted single superphosphate added at 450 pounds per acre. A ring roller was drawn behind the drill on the drilled plots and covered the seed to 1/2" depth in 1" deep furrows. To assure a constant broadcast seeding rate on the remaining plots, the furrow openers on the drill were raised and the seed and fertilizer tubes pulled out of the boot

so seed and fertilizer were broadcast the width of the drill. A standard 16" diameter ring roller was trailed behind the drill for seed coverage on one third of the plots. The seed was left uncovered on the remainder. A heavier roller with sharper teeth probably would have been much more effective in covering the seed than the standard ring roller.

Seeding	Single superphosphate lbs./acre	Oven dry forage lbs./acre	
		Annual Mix*	Perenni. Mix**
Drilled	450, in furrow	2,990	1,210
		3,140	1,930
Broadcast covered	450, broadcast	2,040	340
		1,900	460
Broadcast not covered	450, broadcast	1,580	240
		1,730	190
L.S.D.	0.05	1,020	340
L.S.D.	0.01		470

* 2.5 lbs. annual ryegrass, 0.5 lb. blando brome, 1.0 lb. smilo, 1.0 lb. rose clover. Total: 5 lbs./acre.

** 4 lbs. hardinggrass, 2 lbs. smilo, 1 lb. rose clover, 1 lb. crimson clover, 1 lb. Mt. Barker sub clover. Total: 9 lbs./acre.

By December 10, 1957, only 1.90" of rain had fallen but the drilled seed had germinated and hardinggrass seedlings were 2" high. Broadcast seedings were just starting to germinate at that time. At the time of sampling, May 10, 1958, the ryegrass was mature and dry and the hardinggrass was starting anthesis. Forage yields were determined by clipping a 21" x 60' strip from each plot with a power mower. Plots were not grazed prior to clipping.

Greenhouse plot-test fertilizer assays showed a clear response to phosphorus

and sulfur. The addition of single superphosphate at time of planting produced a significant increase in yield of the perennial mix.

Species not seeded—resident—made up less than 5% of the samples.

The slow starting perennial mix—largely hardinggrass—showed the greatest response to drilling. The increased stand density was achieved by placing the seed in an environment favorable for germination and rapid initial development. The annual mix forage was primarily ryegrass, which germinates readily and grows rapidly. Therefore, it was not so greatly benefited by seed coverage as was the hardinggrass.

Even with annuals the advantage of drilling as compared with broadcasting without seed coverage was significant and more evident during the winter months than in May. Greater competition for moisture during April and May was more apparent in the drilled stands than in the broadcast stands, where the fewer plants grew to larger size. Furthermore, covered seed is partially protected from depredation by birds and rodents. Inoculum on legume seed is also protected from sunlight when drilled.

Other studies—in San Diego and Mendocino counties—corroborated the experience in Mariposa County and demonstrated the advantage of seed coverage on burned brushland seedings.

J. E. Street is Associate Specialist in Agronomy, University of California, Davis.

B. L. Kay is Assistant Specialist in Agronomy, University of California, Davis.

C. F. Walker is Assistant Specialist in Agronomy, University of California, Davis.

Farm advisors and ranchers in counties where drill was tested cooperated in studies reported.

Hardinggrass and clovers growing on control-burned chamise land in Mariposa County. The stump is in a drilled plot; the area in the right foreground was broadcast seeded with the same seed at the same time. Photo taken in August, 1958.

