TECHNICAL NOTES

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
MICHIGAN

AGRONOMY #27
SUBJECT: Calibration of Seeding Equipment
DATE: December 1989

To: All Offices

Purpose: The purpose of this technical note is to provide information on calibration of seeding equipment.

When planting forage species, adjustment of the equipment to attain the desired seeding rate is important. Most equipment has settings predetermined and furnished with the machine for at least some plant species. Many times, these settings are not correct, have been lost, are not available, or have not been developed for the species being planted.

The following procedures may be used to calibrate equipment to approximate desired seeding rates:

SEED DISTRIBUTION

Most seeding rates are listed in pounds of seed per acre. Each species has an approximate number of seeds per pound. The surest method of determining the amount of seed being distributed by the seeding equipment is to count the number of seeds per foot of drill row or per square foot while the machine is in operation.

The formula for calculating values in Table 1 is:

$$\frac{\text{Seeds per lb. x seeding rate per acre}}{\text{43,560 square feet/acre}} = \text{Seeds per square foot}$$

$$\frac{\text{Seeds per lb. x seeding rate per acre}}{\text{43,560 x (12 divide by drill row spacing inches)}} = \text{Seeds per foot of row}$$

The following table provides seed counts based on the Technical Guide seeding rates for Pasture and Hayland Planting:

TABLE 1

Species	Seeds/ Lb.	Seeds/ Sq. Ft. /Lb.	Seeding Rate Lb./Ac. PLS	Live Seeds Per Row Foot 1/ 6" Row	8" Row	10" Row	12" Row 2/
COOL SEASON GRASSES							
Tall Fescue	206,840	4.7	10	23	32	40	48
Orchardgrass	429,600	9.9	6	30	39	49	59
Smooth Bromegrass	142,900	3.3	10	16	22	27	33
Reed Canarygrass	506,000	11.6	6	35	46	58	70
Timothy	1,125,000	25.8	2	26	35	44	53
LEGUMES							
Alfalfa	200,000	4.6	10	23	31	38	46
Red Clover	272,100	6.2	8	25	33	42	50
Birdsfoot trefoil	375,000	8.6	5	22	29	36	43
Crownvetch	138,600	3.2	5	8	11	13	16
Sweet clover	258,500	5.9	5	15	20	25	30
Ladino	871,650	20.0	1	10	13	17	20
Alsike	680,400	15.6	2	16	21	26	31
WARM SEASON GRASSES							
Switchgrass	389,000	8.9	5	22	29	37	45
Big bluestem	165,000	3.8	10	19	25	32	38
Indiangrass	175,000	4.0	10	20	27	33	40
Little bluestem	255,000	5.9	7	20	27	34	41
Sideoats grama	191,000	4.4	9	20	26	33	39
Sudangrass	54,000	1.2	25	19	25	31	37
Forage sorghum	36,300	0.8	25	10	14	17	21
CEREAL GRAINS							
Wheat	12,000	0.3	90	12	16	21	25
Oats	19,500	0.4	50	11	15	19	22
Barley	13,500	0.3	70	11	14	18	22
Rye	18,000	0.4	70	14	19	24	29

1/ Live Seed Values must be corrected for germination (See Page 3).

2/ Seeds/Row Foot - 12" space is equal to square foot for broadcast seedings.

CALIBRATION OF DRILL

If a drill setting is available, fill drill with seed, make setting, and drive equipment over hard ground or canvas. Count number of seeds dropped per foot of row and adjust according to Table 1.

If drill row spacing is different from Table 1 or different seeding rate is used, use formula to calculate the desired seeds per foot of drill row.

BROADCAST

Many seedings are made with broadcast seeders of various types. To calibrate, place canvas at several locations across the path of seed. Check canvas for proper seed count per square foot. Adjust for proper count according to Table 1.

NOTE: Several checks need to be made to determine width of strip seed is being dispersed.

Another method of broadcasting seed is to mix seed with phosphate and/or potash fertilizer at a bulk fertilizer blending plant. Set the fertilizer buggy or easyflo type spreader for fertilizer rate to be applied. Check seed dispersal distance with canvas and adjust driving spacing accordingly.

NOTE: Seed should be mixed with fertilizer just prior to spreading to prevent seed damage from fertilizer. Blend fertilizer an extra amount of time to insure seed is well mixed with all fertilizer.

CORRECTION FOR GERMINATION

All recommended seeding rates are based on PURE LIVE SEED (PLS) content of the particular seed lot being used. The percent Pure Live Seed is calculated by:

$$\frac{\text{Germination X Purity}}{100} = \text{Percent Pure Live Seed}$$

The number of seeds per unit of area must be increased according to the amount of nonviable seed as indicated by the seed tag for percent germination.

Example: Big bluestem - 62% Germination
10 lbs. seeding rate/acre (@ 100% germination) = 38 seeds/square foot
38 - 0.62 = 61 total seeds/square foot - this seed lot

CALCULATE SEEDING MIXTURE

Example: Pasture seeding mixture - 15 acre field.

Switchgrass - 1 lb./acre - Purity 99% - Germination 76%.

Big bluestem - 4 lb./acre - Purity 70% - Germination 61%.

Indiangrass - 4 lb./acre - Purity 68% - Germination 80%.

Drill row spacing - 10 inches.

Switchgrass - $\frac{99 \times 76}{100}$ = 75.2% PLS

$\frac{389{,}000 \text{ seed/lb.} \times 1 \text{ lb./acre}}{43{,}560 \times (12 - 10)}$ = 7.4 seeds/row ft. PLS divide by 0.76 (Germ.) =

9.7 Total seeds/row foot.

Big bluestem - $\frac{70 \times 61}{100}$ = 42.7% PLS

$\frac{165{,}000 \text{ seed/lb.} \times 4 \text{ lb./acre}}{43{,}560 \times (12 - 10)}$ = 12.6 seeds/row ft. PLS divide by 0.61 (Germ.) =

20.7 Total seeds/row foot.

Indiangrass - $\frac{68 \times 80}{100}$ = 54.4% PLS

$\frac{175{,}000 \text{ seed/lb.} \times 4 \text{ lb./acre}}{43{,}560 \times (12 - 10)}$ = 13.4 seeds/row ft. PLS divide by 0.80 (Germ.) =

16.8 Total seeds/row foot.

Seed needed:

Switchgrass - 15 acres x 1 lb. = 15 lbs. PLS divide by 0.752 = 20 lbs. bulk seed.

Big bluestem - 15 acres x 4 lb. = 60 lbs. PLS divide by 0.427 = 141 lbs. bulk seed.

Indiangrass - 15 acres x 4 lb. = 60 lbs. PLS divide by 0.544 = 110 lbs. bulk seed.

DEBEARDED SEED

Several warm season grass species have light seed with bothersome seed appendages. Big bluestem, Indiangrass, and little bluestem are those most likely to be used. The seed appendages, awns on the tip of the seed, and hairs on the base of the seed, cause the seed to bridge severely in seeding equipment commonly used by midwest farmers. This may limit acceptance of these species by many operators.

Seed of these species can be processed through a debearder to remove bothersome appendages. After debearding, the seed may be cleaned to a higher purity and seeded through various types of equipment, such as grain drills, brillion seeders, etc.

Seeding debearded seed with specialized rangeland drills requires modification to reduce rate of seeding to recommended rates. Modification entails changing sprocket size and lengthening drive chains. This procedure is rather impractical if changing from debearded to nondebearded frequently.

Seeding with debearded seed can be accomplished with a variety of grain drills. Calibration of the equipment in most cases may be time consuming. Roughness of the field, speed of equipment, and type of metering of the equipment may alter the flow rate of the seed. Relative humidity may affect the flowability of the seed.

Most grain drills are not designed to accurately meter this type of seed. Additional care must be used to obtain proper calibration. The preferred check for seeding rate is to count seeds per foot or square foot while the equipment is operating under field conditions.

A drill setting for smooth bromegrass should serve as a starting point for big bluestem. A setting for tall fescue may serve as a starting point for debearded Indiangrass. Adjustments will need to be made as necessary.

Switchgrass may be seeded through the legume box on grain drills and a setting for alfalfa would be a starting point. This seed does not require debearding.

A concern in using grain drills for grass seedings is a lack of positive depth control. This will be improved if the seedbed is rolled or cultipacked ahead of the drill. Reducing the spring tension on the furrow openers will reduce penetration and assist in placing the seed in the upper half-inch of the seedbed.

Seed metering mechanisms in grain drills are usually corrugated rollers, seed cup, or double seed cup type. The corrugated roller type with agitators will probably work more effectively with the light debearded grass seeds. The seed cup without agitators will seed debearded seed, but limited experience has shown accurate calibration may be difficult to obtain depending on the range of adjustments available on the specific equipment.

Calibration should be made well ahead of expected planting to allow adequate time for adjustments. The accuracy of seed distribution will depend on the care taken to set up and calibrate the specific equipment used.

Broadcasting debearded seed by blending fertilizer with seed and spreading with a fertilizer truck or trailer has proven to be a very effective procedure. Fertilizer application rates should be adequate for equipment calibration.

Seeding in this way eliminates the difficulty of calibrating equipment. The fertilizer spreader application rate may be cut in half, drive at normal spacing, and then drive halfway between the original tracks the second time over. This has demonstrated even seed distribution. Rolling the seedbed to firm the soil and cover seed completes the planting. This procedure is quite simple and effective when seeding on a quality prepared seedbed.

Driving heavy fertilizer equipment over the seedbed when it is wet will cause severe compaction and crusting in the wheel tracks preventing seedling emergence. The seedbed should be dry on the surface during seeding and rolling if at all possible.

Nondebearded seed will not broadcast as effectively through fertilizer trucks or trailers. With seed appendages intact, seed dispersion will be in very narrow bands. Nondebearded seed may be distributed with a gravity type fertilizer spreader, as this equipment drops the seed rather than attempting to throw it. Other procedures would be the same.

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