SEED HANDLING AND SEEDER CALIBRATION BY WEIGHT

By

Sam Gossard
California Division of Forestry

Seed drills used in forest nurseries are exceedingly variable. Each has been adapted to solve the particular problems of the nursery where it was developed. It may operate at other nurseries with or without modification. Some are activated by man power but the majority are attached in some manner to the nursery tractor. All are manufactured from assembled units and parts of seed drills used in agriculture. Some are pull units but the majority are mounted on the tractor's three-point-hitch.

The seeding apparatus is activated by a chain drive attached to a revolving wheel or drum that is in contact with the ground. This revolving unit can take the form of rubber tired wheels rolling on the paths between the beds or as a cylindrical roller the width of the beds. The roller is preferred where firming of the soil is desirable just before sowing.

Sowing rates are controlled by adjustable gear devices in the gear train system. In addition modification or changing of the hopper openings increases the range of possible sowing rates.

The California Division of Forestry developed a drill with rubber tired wheels, two Oliver Iron Age fertilizer hoppers modified to dispense seed. Each hopper feeds four Planet Jr. ground units. The drill sows four foot wide beds consisting of eight rows spaced six inches apart. Seed moves from each hopper on an eight inch wide rubber belt. A gate that can be raised or lowered above the belt controls the volume of seed moving through the opening. The belt then dumps the seed into a manifold where it is distributed to four of the ground units through flexible seed tubes. In addition to the adjustable gates on each hopper the rate of flow can be controlled by a ten step bevel gear that varies the rate of movement of the belt. Using the number six step as the starting base each position up or down the scale gives a ten percent increase or decrease in the volume of seed.

The method of calibration has been as follows: After approximate adjustment of the hopper gates and placing the bevel gear on the sixth step, as indicated above, the seed drill was rolled over a canvas or sheet of plywood distributing seed as would occur in the sowing operation. Initially two-foot square samples, one from each hopper, were counted. The first adjustment was to balance the flow from the hoppers and at the same time reduce the deviation from the desired sowing rate to less than a fifty percent error. If this is accomplished adjustment of the bevel. gear will produce the desired sowing rate, The sample counting operation should be repeated to verify the proper adjustment of the drill.

Problems involved in this calibration procedure included:

1. Variability of the distribution of the seed on the canvas and the selection of the proper spot to be sampled,

2. The relatively small size of the samples.

3. The excessive time necessary to count samples of seed of poor viability, additional samples, or larger samples.

4. The most discouraging situation occurs when the wind scatters the seed before or during the sample count.

These problems led to the development of a system of calibration by weight. The equipment needed included a balance of the appropriate capacity and accuracy suitable for field use and two-pound coffee cans numbered one through eight. One can for each of the eight flexible seed tubes. A slight modification allowed for the easy removal and replacement of these tubes.

The only change in the sowing schedule calculations was to convert the seeds per square foot data to ounces per square foot or grams per square foot. This depends upon the calibration of available balances.

Next the circumference of the rubber tired wheels that roll along the paths was determined to be 7.5 feet. Two revolutions would cover fifteen feet of bed. Twenty revolutions would sow 150 feet. With the drill elevated on the tractors three-point-hitch large samples can be conveniently cranked out by revolving a wheel. Samples from areas one half, one, two or four feet wide and any multiple of 7.5 feet long can be collected from one, two, four, or all eight of the seed tubes. By weighing these samples and comparing them with the calculated weights derived from the ounces per square foot data for the appropriate footages, adjustment of the drill could be made to sow the correct amount of seed.

The first efforts were confined to unstratified seed. Changes in the seeds per pound figures due to the coating of the seed with a fungicide-repellent were ignored. However, the sowing results conformed closely to the bed space calculations for each seed lot.

The effect of stratification on the seeds per pound figures could not be ignored. The moisture content of seed can increase up to fifty percent during stratification. In Tree Planter Notes No. 71, an article by Leroy Jones entitled "Water Content and Cost of Stratified seed" showed moisture content increases of twenty to fourty percent during stratification of two southern pine species.

In addition, seeds of low viability absorb more moisture during stratification. Thus in adapting weight of seed in drill calibration for all seed lots sown this spring, seeds per pound determinations were made after stratification and/or fungicide treatment. These figures were used in recalculating the sowing rates. Results were comparable to those calculated in the normal manner.

It is planned to continue to develop this procedure. It would be desirable to find a strong correlation between before and after stratification seeds per ncund determinations. This would obviate the latter calculations. This may be possible but would place such rigid controls on stratification, a production not experimental process, that the added work would not justify the result.