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Calibration for Sowing, and Planting Machinery

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INTRODUCTION

Accurate seed placement, an ideal plant population, consistent crop emergence, and effective input use all depend on properly calibrated sowing and planting equipment. The concepts, methods, and significance of calibrating different kinds of crop planting equipment, such as broadcasting machines, planters, and seed drills, are examined in this paper. It talks about variables like seed size, machine speed, seed rate, and field conditions that affect calibration accuracy. The methods for both laboratory and field calibration are emphasized, underscoring the contribution of precision agriculture to increased productivity and crop yield. The advantages of proper calibration, such as decreased seed waste, increased germination rates, and consistent crop stands, are demonstrated by case studies and performance reviews. The study underscores that regular calibration is essential for sustainable and profitable crop production.

Importance of calibration

- Ensures Accurate Seed Rate: To achieve optimum plant population per hectare.
- Reduces Input Waste: Avoids seed and fertilizer overuse.
- Improves Crop Stand: Uniform emergence and spacing.
- Supports Precision Agriculture: Data-driven sowing practices.
- Increases Economic Returns: By reducing losses and optimizing inputs.

Key parameters for calibration

- Seed rate (kg/ha)
- Row-to-row spacing (cm)
- Plant-to-plant spacing (cm)
- Number of rows
- Effective field width (m)
- Forward speed of the implement (km/h)
- Field efficiency (%)

Calibration procedure (general steps)

- Determine Desired Seed Rate: (kg/ha or seeds/m²).
- Mark a Calibration Area: Usually 1/100th hectare or appropriate length on a flat surface.
- Operate the Machine: In static or dynamic conditions over the marked length.
- Collect and Weigh Seeds/Fertilizer: From each metering unit or row.
- Calculate Actual Seed Rate: using collected quantity and area covered.
- Adjust Metering Device: Modify roller, orifice, or gear settings as per requirement.
- Repeat Calibration: Until desired accuracy is achieved.

Calibration of specific machinery

1. Seed drill / Fertilizer-cum-seed drill

- Used for cereals, pulses, and oilseeds.
- Adjust seed metering device (fluted roller, cup feed, cell feed).
- Calibration involves: Collecting seed from all flutes for a known wheel rotation. Calculating seed output per hectare.Adjusting fluted roller exposure or speed as needed.

Fig. 1 Seed cum fertilizer drill and inclined planter machine

2. Inclined plate planter

- Common for maize, cotton, and soybean.
- Uses a rotating plate with cells to pick individual seeds.
- Calibration focuses on: Ensuring correct number of seeds per cell.Matching plate speed with ground speed. Measuring actual drop per row and adjusting plate type or gear ratio.

3. Pneumatic planter (precision planter)

- Used for precision crops like maize, sugar beet, and sunflower.
- Utilizes air suction and vacuum plates.
- Calibration involves: Adjusting vacuum pressure. Selecting correct cell size. Measuring drop accuracy per meter.Adjusting ground wheel drive or sprockets.

Fig. 2 Pneumatic planter and drum seeder machine

4. Drum seeder (for paddy)

- Manually or power-drawn device with seed-filled drums.
- Calibration requires: Filling drums with pre-weighed seed. Operating over a measured distance.Counting seedlings per row.Adjusting seed hole size or drum rotation.

5. Potato planter

- Used for planting tubers.
- Metering done via cup/belt/chain mechanism.
- Calibration includes: Setting proper spacing between cups.Adjusting conveyor or cup speed. Measuring planted tuber count per unit length.

Fig. 3 Potato planter and sugarcane planter machine

6. Sugarcane planter

- Handles sett cutting and placement.
- Calibrate for: Number of setts per furrow meter.Uniformity in sett size and orientation. Adjusting sett feeding and dropping mechanism.

Formula for seed rate calculation

$$Seed\ Rate\ (kg/ha) = \frac{Collected\ seed\ weight\ (g) \times 10000}{Row\ spacing\ (cm) \times Plant\ spacing\ (cm) \times 100}$$

Or,

$$Seed\ Rate = \frac{Seed\ collected\ per\ revolution \times Wheel\ circumference \times Number\ of\ revolutions\ per\ ha}{Area\ covered}$$

Effective calibration

- Always calibrate before sowing a new crop or changing seed variety.
- Conduct calibration under field conditions for realistic results.
- Repeat calibration if major adjustments are made.
- Maintain equipment regularly to avoid calibration errors.
- Use weighing scale, measuring tape, and stop-watch for accurate measurement.

CONCLUSION

Proper sowing and planting machinery calibration is essential for achieving uniform crop stand and maximum yield. It ensures optimum seed placement, reduces input losses, and enhances mechanization efficiency. With the advancement of precision agriculture, calibration practices have become more data-driven and should be adopted routinely before each sowing season.