3. PLANTING AND SEEDING

Introduction

Crop planting operations involve placing of the seeds in the soil at a predetermined depth, random scattering (broadcasting) or setting plants in the soil. With appropriate planting equipment; seeds may be distributed according to:

- Broadcasting
- Drill seeding
- Precision planting
- Hill dropping

Planting refers to the precise placing of large seeds such as maize, beans etc. whereas seeding usually refers to a continuous flow of seeds as in the case of small cereals (wheat, barley, sorghum etc.)

Planters are distinguished from grain drills in that they seed in rows to permit inter-row cultivation in the conventional tillage system. Spacing within the row (intra-row) is also possible. When spacing within and between the rows is lacking, planting is referred to as solid planting.

In **conservation tillage (CT),** direct planting/seeding is applied. Direct seeding/planting involves growing crops without prior mechanical seedbed preparation and with minimal soil disturbance. The term direct seeding is understood in **conservation agriculture (CA) systems** as synonymous with:

- No-till
- Zero-till
- Direct drilling etc.

The main function of sowing equipment is to:

- Open a furrow in the soil at the right depth
- Meter the seed
- Deliver the seed
- Cover the seed

- Firm the soil around the seed

Objective

The main objective of any planting operation is to establish an **optimum plant population and plant spacing** while the ultimate goal is to obtain the maximum net return per hectare.

Plant population and spacing requirements are influenced by such factors as:

- Crop
- Type of soil
- Fertility of the soil
- The amount of moisture available
- Effect of plant and row spacing upon the cost and convenience of operations such as thinning, weed control, cultivation and harvesting.

Apparatus (Precision planter**)**

i. Planter
ii. graded seeds
iii. fertilizer
iv. tape measure
v. seed tray (optional)
vi. stopwatch

Calibration Methodology

1. Describe the planter you are using

Brand name: ____

Model: ____

Size: ____

Type of metering device: ____________________________________

Size and diameter of metering device: ___________________________

Type of furrow opener: ______________________________________

Type of covering device______________________________________

Type of press wheel: ____

Prime mover: ____

Metering mechanism driver: __________________________________

Mechanical condition: ____

Recommended user: ____

2. Cell fill and performance test

a. Determine the number of revolutions of the seed plate for each revolution of the drive wheel drive wheel: ______________________

b. Position the planter such that you can collect the seeds to determine the number dropped per a revolution of the driving wheel: __________

c. Rotate the driving wheel 10 times and count or weigh the seeds collected: ____

d. Repeat b, and c, three more times: ________, ________, __________

e. Average number of seeds per revolution: ______________________

f. Average number of seeds per cell: ____________________________

g. Compute the cell fill percentage (show your calculations.

h. Get an operator to practice using the planter until he/she is able to move easily at a uniform speed.

i. Measure out a 30m distance; fill the hopper with seeds and 'plant' at the established speed.

j. Time a single run: ___________________________________ seconds

k. Planting speed: ____ m/s

l. Count the number of revolutions of the drive wheel: _______________

m. Compute the equivalent number of seed plate revolutions

n. Count the number of seeds discharged: _________________________

o. Compute the number of seeds expected to be discharged

p. Percentage cell fill

q. Repeat parts c, through o, at four more speeds lower and higher than the first. Record the data in the table below.

Distance 30 metres.

	Run 1	Run 2	Run 3	Run 4	Run 5
Time (seconds)					
Drive wheel revs(No.)					
Seed plate revs(No.)					
No. of seeds discharged					
Expected No. of seeds					
Percent cell fill					
Speed of operation					

r. Determine the average seed spacing within the row for the first run.

s. Comment on the actual hill spacing obtained during the first run.

t. Compute the theoretical hill spacing for the first run

u. What adjustments would you make for a better relationship between theoretical and actual hill spacing?

v. Plot a graph of percentage cell fill versus the speed of operation (y and x axis respectively. Attach the graph to your report.

w. Comment on the relationship shown by your graph giving reasons for the shape of the graph. Is there an optimum operating speed?

x. What are the advantages or disadvantages of the animal drawn planter compared with planting which you are familiar?

Apparatus (seed drill**)**

i. Seed drill
ii. graded grain seeds
iii. fertilizer
iv. seed containers/bags
v. weighing balance
vi. tape measure
vii. stopwatch

Calibration Methodology

1. Describe the planter you are using

Brand name: ____

Model: ____

Size (number of seed tubes/sowing width): ________________________

Type of metering device: ______________________________________

Size and diameter of metering device: ___________________________

Type of furrow opener: _______________________________________

Type of covering device____

Type of press wheel: ____

Prime mover: ____

Metering mechanism driver: ___________________________________

Mechanical condition: ____

Recommended user: ____

2.

a. Jack up one wheel of the seed drill and support the axle with a stand.

b. Measure the circumference of the drive wheel

c. Assuming no slip of the drive, calculate the area covered (sown) after the wheel has made 20 revolutions

d. Practice for an ability to rotate the drive wheel at a uniform equivalent linear speed as close to 7km/h as possible. Do so by timing the distance covered by 20 wheel revolutions.

e. Select a reasonable seeding rate for the crop you are drilling and set the seed drill for the equivalent output:

Seed Rate: ___________________, Setting: ___________________

f. Put containers under the seed tube for collecting the seeds. Be sure the containers are marked as belonging to specific tubes.

g. Rotate the wheel 20 times at the practiced (equivalent) linear speed of 7km/h. time as in (d) to reconfirm the closeness of the speed to 7km/h.

h. Weigh the collected seeds from each tube and record the weight in the table below in accordance with the tube from which the seed was collected.

i. Repeat steps (a) through (h) for THREE more seed drill planting rate settings.

No.of trial	Machine setting		Output from seed tubes																Total Kg	Required output Kg/ha	Deviation %
	No.	Kg/ha	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16			
1																					
2																					
3																					
4																					
5																					

Y-axis: Machine Setting

X-axis: Kg/ha

ANALYSIS

Plot a graph of actual (y-axis) versus (x-axis) total outputs at different settings. Ideally the graph should be a straight line with a gradient (slope) of unity. Does it? Explain any deviations from this expectation.

Plot a bar chart of the average seed tube output. Explain any differences in height of the bars on the chart.

If the slope of the graph in (1) is greater than unity, what would that mean to the user of the drill? What adjustments would help this situation?

Reference

Fundamentals of Machine Operation (FMO) series, John Deere

i. Tractors and engines
ii. Crop chemicals
iii. Planting
iv. Combine harvesters
v. Hay and forage harvesting
vi. servicing

Fundamentals of Machine Service (FOS) series, John Deere

i. Engines
ii. Power trains
iii. Hydraulics
iv. Belts and chains
v. Mowing and spraying equipment
vi. Electrical systems

Further References

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