

Precision sowing of soybean

Pneumatic seeding in south-eastern Europe

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High and stable soybean yields require the careful combination of practices. In practical terms, this means the right choices in selecting the land used, placing the soybean effectively in the cropping sequence, making the right decisions at sowing, followed by good husbandry practices throughout the growing season (from planting to harvest). The use of certified seed reduces the risk of genetic impurity, low seed viability, and the spread of weed seeds in this region. Here we address the decisions made in sowing using a pneumatic precision seeder.

Pneumatic seeding machines place each seed precisely in the plant row. Therefore, they must be fitted and adjusted to attain the desired seeding rate. This gives equal planting depth and precise spacing within the row, leading to uniformity in crop emergence, plant height and overall crop condition.

Once the distance between rows is set, the key parameter is the spacing of seeds within the row as affected by the target plant population and pure live seed (PLS) value. This together with the average seed size (weight) determines the quantity of seed needed. Research-backed

Applicability

Theme: Crop management

For: All soybean growers

Where: Where soybean is planted

Timing: March/April

Equipment: Pneumatic seeding machine

Follow-up: Weed control, especially inter-row cultivation

Impact: High crop yield with reduced weed problems

information is presented here to optimise seeding with these machines.

Outcome

The right decisions at sowing lead to optimum crop establishment and growth. It is the foundation of high yield and the commercial success of the crop. The crop is planted on time, at a consistent ideal depth, with adequate planting density, good seed-to-soil contact, resulting in uniform growth in later spring. This increases yield and reduces costs.



Pneumatic precision seeding machine for soybean. Photograph: IFVCNS



Within-row plant spacing as affected by between-row spacing and target plant density for different maturity groups.

Maturity group	Target plant density (plants per m ²)	Row spacing (cm)	
		50	70
		Within-row plant spacing (cm)	
000	60	3.0	2.4
00	55	3.6	2.6
0	50	4.0	2.9
I	45	4.5	3.2
II	40	5.0	3.6

Sowing date

The optimum sowing date depends on soil temperature. Planting may begin when the soil layer at the planting depth reaches 10-12°C, which in south-east Europe is usually between late March and early April. Where several cultivars are grown, choosing the cultivar to sow first depends on how quickly they progress to maturity. Cultivars that mature relatively late take most advantage of the longer growing season from early sowing and therefore should be given priority. This means that in south-east Europe late cultivars (Maturity Group II) should be planted first, followed by cultivars from Maturity Groups I and 0.

Target plant population

Establishing the optimum plant population is key to success. It depends on the cultivar used, especially how quickly it progresses to maturity (maturity group).

The crop compensates for lower plant populations by increased branching of each plant. However, this branching does not fully compensate for low populations. Lower than optimum plant population significantly reduces yield potential and increases the emergence and growth of weeds that compete for water and nutrients. Plants in optimal crop stands have fewer branches but create a full canopy early. In addition, the lowest pod is produced higher on the stem which reduces harvest losses. Crops with above optimum plant populations may be susceptible to lodging and to diseases. For this reason, reaching the optimum plant population is important.

Row width

With this precision seeding system, soybean is planted on 45 or 50 cm rows but 70 cm is also an option. The row spacing of 40–50 cm is commonly used in south-eastern Europe, considering available machinery, inter-row cultivation possibilities, and weed control. These relatively narrow rows have a number of advantages such as rapid canopy closure. This decreases moisture loss in the soil and minimises weed competition.

In practice, the row width is often determined by the machine being used and by matching inter-row hoeing equipment. Once the between-row distance is set, the machine must be adjusted to achieve the desired within-row spacing between the seeds.

Within-row seed distance

The optimum within-row seed distance depends on the target plant population, the pure live seed rating and the distance between rows. Pure live seed is the proportion of seed in a given lot (seed bag) that is capable of germination and emergence, i.e., of developing into plants.



Seed to seed spacing within a row varies from 3 to 5 cm. The optimum number of plants per unit area is one of the important preconditions of high yield in soybean production. Photograph: IFVCNS

$$\text{Within-row seed distance (cm)} = \frac{\% \text{ pure live seed} \times 100}{\text{Target plant density (plants/m}^2\text{)} \times \text{distance between rows (cm)}}$$

Sowing rate

The exact quantity of seed needed for planting depends on target plant density, pure live seed % and the 1,000 seed weight. Because of a large variation in seed size, the required amount of seed per hectare may vary from 60 kg (500,000 seeds × 120 g/1,000 seeds) to 100 kg (500,000 seeds × 200 g/1,000 seeds) for the same stand density and pure live seed rating. Seed packs include information on basic characteristics, such as 1,000 seed weight and pure live seed percentage. The precise seed quantity required for each specific soybean planting is calculated as follows:

$$\text{Seed quantity (kg/ha)} = \frac{1,000 \text{ seed weight (g)} \times 1,000}{\text{Within-row seed distance (cm)} \times \text{distance between rows (cm)}}$$

Planting depth

The optimum planting depth for soybean is 4–5 cm. Uniform depth is very important for even emergence and ripening. Sowing should be timed so that the seed is placed on a moist layer that has reached or is about to reach 10–12°C. Ideally, the seedbed preparation will have conserved soil moisture so that the soil beneath the seed retains the moisture accumulated in the winter.



Seeding mechanism in pneumatic precision seeding machine. Photograph: IFVCNS



Soy sowing field. Photograph: IFVCNS

Key practice points

Soybean is a low input crop with a relatively short growing season. Unlike winter wheat, the yield depends on rapid and continuous growth of the canopy. The scope for compensation for above- or below-optimum plant populations is limited.

Pneumatic precision seeding machines result in a uniform crop. Seed is one of the most costly inputs and precision sowing ensures that this is used most effectively. The overall optimum seed rate varies from about 60 to 100 kg depending on cultivar maturity group, 1000 seed weight and pure live seed.



A field sown on the left, unsown on the right. Photograph: IFVCNS

Sources

Information presented in this practice note results from research carried out by the Institute of Field and Vegetable Crops Novi Sad, Serbia.

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Further information

Taifun-Tofu and LZ Soja 2020. Video: www.youtube.com/watch?v=9v0ZpVSK6RI

Sources

Information shared in this practice note results from the trials and studies carried out by the Institute of Field and Vegetable Crops Novi Sad, Serbia.

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