

## FIELD SELECTION

### Moisture

Soybeans are highly tolerant to excess moisture and require 16–20 inches of water for maximum yield potential.<sup>1</sup> Sandy, drought-prone soils or inadequate precipitation can reduce soybean yield due to this high water demand. In heavy clay soils, soil compaction or crusting can reduce emergence.

### Salinity and IDC

Soybeans and other pulse crops are relatively intolerant to saline soil. Select fields with soluble salt levels <1.0 mmho/cm and avoid soybean production on fields with ≥2.0 mmho/cm.<sup>2</sup> Iron deficiency chlorosis (IDC) is a temporary condition that occurs as early as the V1 stage. Soybeans grown in soils that have high calcium carbonate, moisture and soluble salt levels are susceptible to IDC. Choose IDC-tolerant varieties for fields at moderate to high risk of IDC, according to Table 1. Plants that recover by the V5 to V6 stage should experience minimal yield loss.<sup>3</sup>

**TABLE 1. FIELD RISK OF IDC BASED ON CARBONATE AND SOLUBLE SALT SOIL TEST LEVELS**

SOLUBLE SALTS (mmhos/cm)	CARBONATE LEVEL (%)		
	0 to 2.5	2.6 to 5	>5.0
0 to 0.25	Low	Low	Moderate
0.26 to 0.50	Low	Moderate	High
0.50 to 1.0	Moderate	High	Very high
>1.0	High	Very high	Extreme

Adapted from Agvise Laboratories

## VARIETY SELECTION

Soybeans require 105–125 frost-free days from planting to maturity. Select varieties based on regional growing season length. Varieties are either glyphosate tolerant (Roundup Ready), glyphosate + dicamba tolerant (Xtend), glyphosate + 2,4-D tolerant (Enlist) or non-GM (conventional). See the MPSG *Soybean Variety Guide* or *Seed Manitoba* for days to maturity, yields, IDC ratings, Phytophthora root rot (PRR) resistance and soybean cyst nematode (SCN) resistance. Variety protein values are available at seedmb.ca. Genetics, environment and management can influence soybean protein concentration and research is needed to understand soybean protein in Manitoba.

## SEEDING

### Row Spacing and Equipment

Soybeans can be planted in narrow (<15 inch) or wide (15–30 inch) rows. Narrow rows offer faster and more complete canopy closure for better weed competition and moisture conservation. Wide rows (planters) result in greater planting precision and potentially lower disease pressure due to greater wind movement through the canopy. Existing narrow row equipment can be used with a higher seeding rate, due to lower expected seed survival from mechanical damage. Using higher moisture seed (>12%) and lower fan speed (i.e., variable among seeding systems) can reduce seed damage.<sup>4</sup> Narrow rows have resulted in the same or greater yields than wide rows in Manitoba.<sup>5</sup>

### Seeding Date

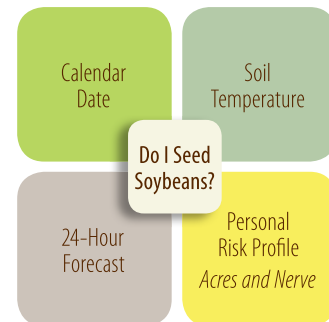
Consider calendar date, soil temperature, the 24-hour weather forecast and personal risk to determine when to plant soybeans in Manitoba.

*Calendar date* – Aim to plant during the second to third weeks in May for high yield potential and reduced frost risk. A rule of thumb for early planting is to seed within two weeks of the last spring frost date to ensure seedlings are not injured by frost after emergence. Emerged seedlings can tolerate air temperatures of -2.2°C for a brief period if plants have had a chance to harden, but cannot recover if the main growing point is killed. If the growing point is only injured slightly, growth may resume from the axillary buds. Avoid planting in June due to lower yield potential.

*Soil temperature* – Soybeans emerge within 24–35 days when seeded into 6–12°C soils and 4–16 days when seeded into 14–22°C soils (based on soil temperatures at a 5 cm depth at 10:00 a.m. for two consecutive days).<sup>6</sup> Warm soil temperatures result in faster emergence and prevent the risk of chilling injury during imbibition. Residue management should have a minor impact on plant population and yield if soybeans are seeded during optimal calendar dates and into warm soil.<sup>7</sup>

*24-hour forecast* – Seeds imbibe water within the first 12–24 hours after seeding. If cold and wet conditions are expected during this period, wait to plant to avoid chilling injury and delayed emergence.

*Personal risk profile* – Adjust planting dates according to individual frost risk and the amount of soybean acres to be planted. Ensure more frost-tolerant crops are seeded before soybeans.



Source: Terry Buss, Manitoba Agriculture

### Target Plant Stand and Seeding Rate

Target 140,000–160,000 live plants/ac. Adjust the seeding rate (seeds/ac) to account for expected seed survival. For example, an average seed survival of 75% and target plant stand of 140,000 plants/ac requires a seeding rate of 190,000 seeds/ac. Use the Bean App *Soybean Seeding Rate Calculator* to calculate customized rates. Yield is maximized at 160,000 live plants/ac.<sup>8</sup> The economic optimum population is often 140,000 plants/ac, depending on economic assumptions. Assess plant stands at V1 using the Bean App *Plant Stand Assessor*.

### Seeding Depth

Plant soybeans at 0.75–1.5 inches deep. Ensure seed to soil moisture contact and avoid planting soybeans deeper than 1.5 inches.

### Rolling

As soybeans pod low to the ground, land rolling is beneficial on stony land to facilitate harvest. Land rolling can be done immediately after seeding or post-emergence at the V1 stage during the warmest part of the day.<sup>8</sup> Rolling after seeding can cause soil crusting, reduce water infiltration and increase soil erosion due to pulverized surface soil aggregates. Post-emergent rolling can help prevent soil erosion. Avoid post-emergent rolling if plants have already reached the V3 stage.

## CROP NUTRITION

### Inoculant

Inoculate soybeans with *Bradyrhizobium japonicum* bacteria to facilitate root nodule development and biological nitrogen (N) fixation. Double inoculation is recommended for fields with no history of soybeans. If considering single inoculation, follow the checklist of recommended criteria in the *Soybean Fertility Fact Sheet*. Assess nodulation during the late V to R1 stages. Ensure plants have at least 10 healthy nodules per plant,<sup>9</sup> which appear pinkish-red when split open.

### Fertility

Select fields with <50 lbs/ac of N to promote nodule development. N fertilizer is generally not required due to N fixation. Soybeans are efficient at extracting soil P and K, and have been non-responsive to P-fertilizer in Manitoba.<sup>10</sup> Balance P and K removal with inputs throughout the crop rotation, maintaining P-levels of 10–20 ppm and K levels  $\geq$ 100 ppm.

The maximum safe rate of seed-placed P is 10 lbs/ac for wide rows or 20 lbs/ac for narrow rows in moist soil. See Table 2 for soybean nutrient removal rates. Soils that receive S fertilizer from other crops in rotation (i.e., corn, canola) generally provide sufficient amounts for soybeans.



Soybean root nodule that is actively fixing atmospheric N.

TABLE 2. AVERAGE SOYBEAN NUTRIENT REMOVAL RATES

NUTRIENT	REMOVAL	
	lbs/bu	lbs/ac*
Nitrogen (N)	3.8	152
Phosphorus (P <sub>2</sub> O <sub>5</sub> )	0.85	34
Potassium (K <sub>2</sub> O)	1.4	56
Sulphur (S)	0.20	8

\*Based on 40 bu/ac soybean crop

## PEST MANAGEMENT

### Insects

Monitor for wireworms, seedcorn maggot and cutworms from May to June. Insecticide seed treatment protects against wireworms and seedcorn maggot only. Assess the need for protection on a field-by-field basis. Scout weekly for soybean aphids from R1 to R5. See *Soybean Aphids*:

*Identification, Scouting and Management*. Scout for leaf and pod feeding insects such as grasshoppers, green cloverworm and corn earworm from R1 to R6. See *Soybean Insect and Disease Identification Guide*.

### Weeds

Soybean seedlings are poor competitors against weeds. Yield potential is maximized when weeds are controlled until at least the V3 stage. Glyphosate-resistant kochia has been confirmed in several Manitoba municipalities. A proactive, integrated weed management strategy is recommended to prevent herbicide resistant weeds. This may include diverse crop rotations, improved crop competition via narrower row spacing and higher plant populations, herbicide tank mixes, rotating modes of action and field or site-specific weed management. Herbicide options vary by production system and caution must be taken to prevent herbicide drift. Volunteer canola is the most abundant weed in soybean crops, according to the 2016 provincial weed survey. The action threshold (5% yield loss) for volunteer canola control is 2.5–3.2 plants/m<sup>2</sup>.<sup>11</sup>

### Diseases

Soybeans are susceptible to the root rot complex, including *Fusarium* spp., *Rhizoctonia solani*, *Pythium* spp. and Phytophthora root rot (PRR). Fungicide seed treatment can offer protection against these diseases for up to three weeks after seeding. *Fusarium* spp. and PRR are the most common seedling diseases in Manitoba. Scout for foliar and stem diseases from June to September. Common foliar diseases include bacterial blight, brown spot and downy mildew, although these are not generally of economic importance. Soybeans are susceptible to Sclerotinia (white mould), but are more tolerant than canola, dry beans and sunflowers. The occurrence of stem rot, stem canker, anthracnose, frogeye leaf spot and bacterial pustule is being studied in Manitoba. Soybean cyst nematode (SCN) has not yet been identified in Manitoba. However, it can spread easily and is present near the Canada-United States border in the Red River Valley.

## HARVEST

Direct combine soybeans with a flex header when seed moisture is <14%. Seeds are prone to damage at <12% moisture. Carefully adjust cylinder speed and concave clearance to minimize cracking and splitting of seed. Measure harvest yield loss regularly using the Bean App *Soybean Harvest Loss Assessor*. Over 80% of harvest losses occur at the header. Reduced harvest speed at <5 mph will greatly diminish losses (4 beans/ft<sup>2</sup> = 1 bu/ac).<sup>12</sup> See *Soybean Maturity Guide*.

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