SEED BED PREPARATION

Soil preparation for corn should follow the same general good management practices as for most other crops. The goal should be to achieve a firm seed bed with minimum moisture loss and no wind erosion.

Germination of corn is very temperature-dependent, not occurring when soil temperatures drop below 10°C. Optimum germination and emergence occurs when the soil temperature at a depth of 4 inches reaches 12 to 15°C, usually during the third or fourth week of May in Manitoba.

Zero-till planting can be used successfully on fields that have little trash cover, e.g., corn fields that had been harvested for silage the previous year. Nitrogen fertilizers can be applied by broadcasting ammonium nitrate (34-0-0) on the surface and relying on rain to move it into the soil. Nitrogen can also be applied in the form of anhydrous ammonia using narrow 'knives'. Phosphorous fertilizer should be banded to the side and below the seed, as is done in planting under all conditions.

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SEEDING DATE

Ideally, corn should be seeded between May 1 and May 15. Earlier seeding when possible is acceptable as emerged corn recovers readily from frost injury. When seeded late, yield potential is reduced significantly and the risk of crop failure increases. Research has shown that, on average, a yield reduction of 1 bu/acre/day occurs when the date of seeding is delayed beyond mid-May. When planting earlier than the first week in May, a 5% increase in plant population would be advised to allow for losses.

For silage, the conditions are similar. The amount of grain in the silage is dependent on silking and pollination occurring with a minimum moisture stress. Early planting produces the best quality silage.

When seeded early to mid-May, corn is able to tolerate spring frosts fairly successfully because the growing point is normally below the soil surface during the seedling stage, and generally remains below ground until the danger of frost is over. In fact, there is a greater risk to final yield from planting too late, than too early.

An additional effect of planting date on final grain yield is the soil moisture deficit that normally occurs at silking. Rainfall and evapo-transpiration patterns on the prairies results in an average moisture deficit of 4 inches on July 31 and 8 inches on August 31. Early planting, resulting in early emergence, usually allows silking to occur during the best possible moisture conditions. An additional five to six weeks are normally required for grain to mature following anthesis, which for early hybrids is reached in the last week in August. After grain maturity, fall frosts are no longer a significant factor.

However, there are risks to planting corn too early, since, as planting dates are moved earlier, soil temperature becomes a more important consideration. When soil and air are cool, germination and growth can take significantly longer, during which time micro-organisms and insects can cause damage leading to stand establishment problems. As well, there is the possibility that plants can be damaged from late spring frosts if the growing point emerges above ground level.

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DEPTH

Optimal depth for planting corn is 1.5 – 2" deep. Plant shallower if wet or heavy soils. Plant deeper in sandy soils.

Shallow planted corn will be exposed to warm daytime temps, but also to surface drying.

Deeper planted corn will be exposed to cool soil temps that may result in a higher incidence of seed rot, but soil surrounding the seed is unlikely to dry.

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RATE

Many factors affect plant population including soil type, fertility, drainage, planting dates, location, and the purpose of the crop. Seeding rates are usually given in 1000 kernels/ acre; however, the preferred method to determine optimum seeding rates for corn is to consider final plant stands.

Generally, desired seeding rates range from 26,000 to 32,000 seeds/acre. Optimum population depends on hybrid, date, field selection, condition, management practices, and economics.

Whole-plant silage can tolerate higher plant populations because lodging is less of a concern than with grain corn (harvestability).

30" - 36" spacing	Most common spacing
20" spacing	Or just increase populations; no effect on moisture and density
7.5" spacing	Ensure uniform spacing within rows, consistent seeding rate between rows when solid-seeding ⟹ skips cause greater yield loss than doubles. Harvestability ⟹ how will you harvest a solid-seeded crop? When solid-seeding, uniform spacing within rows is most important. Gaps can cause great yield losses: 4 – 6 feet = 5% loss, 1 – 2 feet = 2% loss

Table 9 provides an indication of the number of seeds required to reach the desired plant population.

TABLE 9. Corn seeds required per 3 metre (10 ft) row for various populations (assuming 85% of the seeds survive and produce a viable plant)

Target population (plants/acre)	30" row spacing # of seeds per 3 m row (10 feet)	36" row spacing # of seeds per 3m row (10 feet)
18,000	12.2	14.6
20,000	13.5	16.2
22,000	14.9	17.8
24,000	16.2	19.4
26,000	17.6	21.1
28,000	18.9	22.7

Under good growing conditions, an increased plant population results in higher yields because of the increased number of ears per unit of land. However, increased plant density also places plants under more stress through inter-plant competition for light, moisture and nutrients. This results in smaller ears, more barren plants, thinner stalks and increased stalk breakage. If the population is pushed too high, these factors combine to cause a yield reduction and higher harvest losses.

Hybrid selection is a critical factor in determining the optimum plant population. It is important to look at the stalk lodging resistance of the hybrid. Under high plant populations, there is often increased incidence of lodging due to a reduction in average stalk diameter. Hybrids with a good reputation for stalk strength can generally handle the shift to higher populations

Increased plant densities are not appropriate for all situations because of the many factors that interact with plant population to place the crop under stress. Factors such as drought, weeds, insects, diseases, soil compaction, inadequate fertility and poor drainage all serve to exaggerate the stressful effects of increased plant populations. The more severe these stresses are, the lower the optimum plant population.

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SPACING WITHIN THE ROW

Corn can tolerate some variability in seed spacing. Yield is not significantly affected by small gaps as long as the proper seeding rate is delivered. Uniform seed distribution within the row should be the goal of the seeding operation. Therefore, producers should consider evaluating their planter performance to ensure uniformity of plant spacing. A well-tuned planter operating at a reasonable speed should help to minimize non-uniformity of plant spacing within the row. Planting at high speeds with a poorly maintained planter can result in a large number of doubles (two-plant hills) and skips (missing plants). Doubles can result in barren stalks and skips can cause significant yield loss, both resulting in lost yield potential for the field. Producers can also do some crop scouting once the crop is up and growing to determine if plant spacing is acceptable.

Producers should also consider increasing their target plant populations. Studies at the University of Guelph suggests that at relatively high populations (28,000 to 36,000 plants per acre), populations with less uniform corn plant spacing have generally not yielded lower than plots with more precise planting. Simply put, higher population may compensate for sloppy spacing - but at the cost of more seed per acre.

SEED TREATMENT

Seed corn is sold treated with a fungicide to protect the seed against decay organisms. An insecticide may also have been added to control insects that attack seed in storage. At planting, additional insecticide could be added to the seed to give protection from soil insects such as wireworms and seed maggots. For seed treatment recommendations, consult the Manitoba Agriculture, Food and Rural Initiatives publication 'Guide to Crop Protection'.

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SEED QUALITY

Canada has a Seeds Act to assist producers in purchasing high quality seed. In addition, companies have seed quality control programs. Farmers should, therefore, encounter few problems with vigor and germination levels of corn seed. However, if emergence problems occur it may be necessary to check the quality of the seed involved. Tags on each bag of seed corn indicate the germination level, the date it was tested and the seedlot from which it was obtained. Unless these tags are saved it is impossible to identify the seedlot that was sown. Therefore it is also impossible to recheck the quality of the seed if a problem arises. A set of tags from each seedlot along with a small sample of seed should be saved to assist in tracing the cause of such problems.

It would be wise to check the germination of carry-over seed before planting. One approach is to place 100 kernels of seed between wet paper towels. The towels should be kept moist and at room temperature. At the end of a week, the number of kernels with healthy sprouts represents % germination. A more reliable test involves planting the seed in a flat of soil. This test should be conducted at a lower temperature (12 to 15°C). The number of healthy plants that emerge within two weeks represents percent emergence. Planting rate should be increased to compensate for reduced emergence.

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WHEN TO REPLANT

Poor seed quality, cool weather, wireworms, seed corn maggots, seed rots, incorrect seed placement, herbicide damage, fertilizer burn or extremes in soil moisture content can all result in reduced emergence. With poor emergence, the question of replanting arises.

A very significant reduction in stand is needed before replanting can be justified. Consider the following factors:

- The yield potential of replanted corn will be reduced because of the later planting date.
- Additional costs for tillage, seed, planting and perhaps chemicals.
- Replanting corn will usually be less profitable than accepting the reduced stand if it is over 16,000 plants per acre. Even at lower populations, replanting is not always advisable.

Replanting should be undertaken only after carefully weighing the costs against any potential gain.