Dryland considerations

The optimum planting date for dryland corn is 10 to 14 days later than irrigated corn in Colorado. This time frame is usually around the second week of May. The reason for planting later is that water availability and not season length limits yield in dryland corn, and planting later may save soil water for later in the growing season.

Corn planter

Photo H.F. Schwartz

Table 2. Optimum planting date for corn growing areas of Colorado.

Optimum planting dates	
NE Plains	April 20 - May 15
SE Plains	April 15 - 30
W Slope Valleys	April 20 - May 10
S Platte	May 1 - 15
Front Range	May 1 - 20
Ark Valley	April 20 - May 5
E Plains Dryland	May 10 - June 1

Optimum Planting Date

The optimum planting date is a small window of days expected to achieve the longest effective growing season in the area. The given range is based on long-term weather records of both the average spring frost free date and an average fall killing frost date. In order to manage field work and unpredictable spring weather, begin planting slightly before the optimum planting date. Planting at the optimum time results in earlier plant emergence and ground cover, increasing competitiveness against later emerging weeds. Earlier planted corn often has better stalk quality and may reduce the exposure to European corn borer, but may increase the chance of seedling blights.

In general, plant corn by the calendar, not the soil temperature, since soil temperatures can fluctuate markedly in spring. However, during time periods when soil temperatures are below 50^{O}F, little germination will occur. If planting is significantly delayed past the optimum date, yield potential is reduced and a grower may want to reduce the nitrogen fertilizer applied, reduce seeding rates, and change to earlier maturing hybrids.

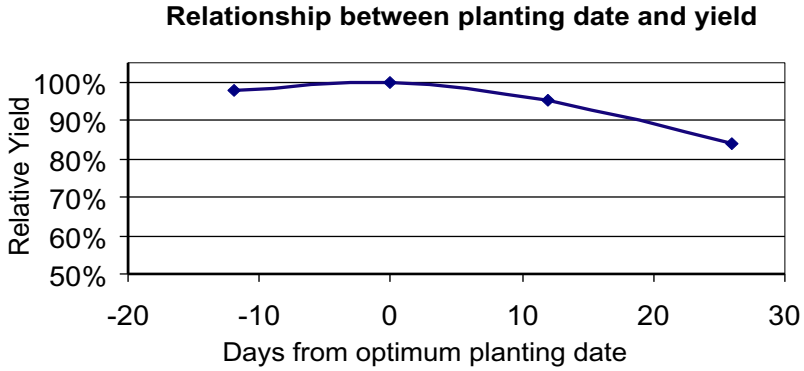

Figure 2. Planting in the early part of the optimum planting period is one thing producers can do to increase net returns without adding production costs. Research has shown that yields begin to decline when planting occurs later than the optimum corn planting date for an area.

Spring Frost Damage

The severity of late spring frosts to corn depends on whether plants experience lethal cold temperatures, at or below 28°F or "simple" frost, warmer than 28°F. Simple frost damage to corn is usually minor and limited to death of above ground plant parts because the growing point of a corn plant remains below ground until about the 5-leaf stage. Corn can easily recover from this type of damage early in its development and suffer little yield loss. When air temperatures drop to 28°F or less for more than a few hours, the growing point region of a young corn plant can be injured or killed, even if it is still below the soil surface.

Yield loss due to early season frost damage in corn is related primarily to the degree of stand loss, not to the degree of leaf damage. Before assessing damage, allow the plants time to recover. While some corn leaves darken and wither within a day after frost occurs, the true extent of plant damage may not yet be discernible until three to five days after the frost.

Surviving corn plants should show new leaf tissue expanding from the whorls, while dead corn plants will show no growth. Examining the growing point of the plant will also help assess the damage. If the growing point has a white fleshy appearance, the plant will recover. If mushy and discolored, the plant is dead.

Frost damaged corn seedling. Cool days following a frost event may slow plant recovery and delay making an accurate assessment of plant recovery.

BMP

Adjust planting, tillage and harvest dates to help minimize weed, insect and disease problems.

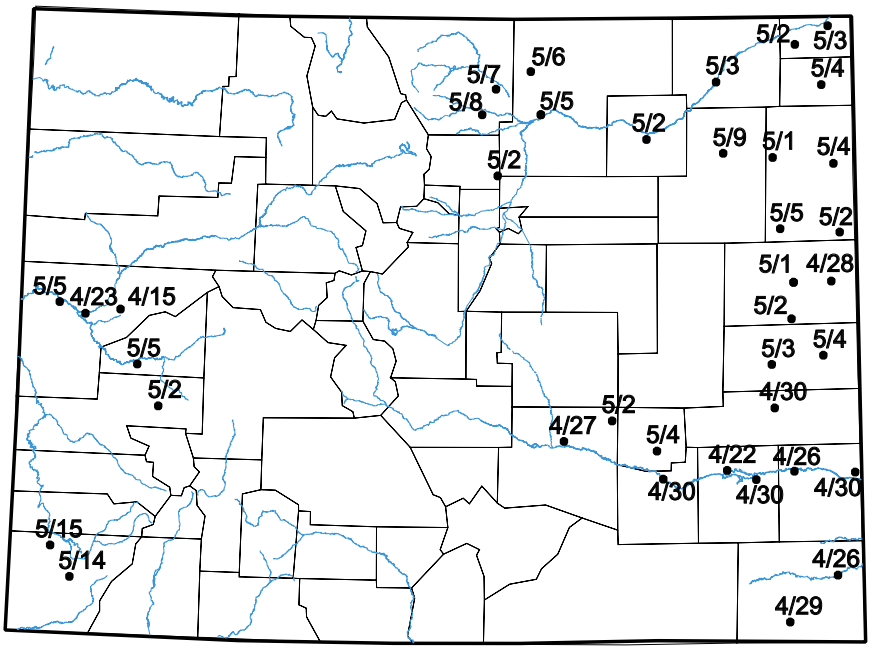

Figure 3. Average last spring killing frost (28°F) date for corn growing areas of Colorado. There is an 80% probability that the last 28°F frost will occur on or before these dates.

Data Source: Colorado Climate Center.

Counting plant population

When planting on 30" rows - 1/1000 of an acre is 17' 5". That means if you count 26 seeds in that length of row - you are planting 26,000 seeds per acre.

Plant Population and Seed Depth

The best place to get the correct plant population for a given hybrid is from your seed dealer. Many irrigated growers routinely plant between 28,000 and 34,000 seeds per acre. Plant population is somewhat field-specific and should vary according to other yield impacting factors such as fertility, weed pressure, irrigation and others. For most growers, the risk of planting too few plants is greater than planting too many.

- In general, plant 5 to 10% more seeds than the target population to compensate for germination or seedling losses.
- Boost target plant populations by 10 to 15% when planting early maturity hybrids, or for silage corn.
- Increase planting rates up to 15% above target stands when planting into poor seedbed conditions, or very early planting into cold soils.
- Know general regional soil and climatic conditions and make adjustments to plant populations based on the risk of severe soil moisture deficiency. Consult your seed representative to help fine-tune planting rates for local conditions.
- Maintain your planter by replacing worn parts and make adjustments so that it plants at the desired population with consistent seed spacing.
- Proper planting depth for seed corn is 1.5 inches to 2.5 inches. However, herbicide, soil condition and moisture, and planting date can alter that ideal slightly upwards or downwards. Planting depths below 3 inches may result in significant yield loss. It is especially critical to make sure seed is planted into moisture. Check and calibrate the planter before planting season starts and then check seed drop and depth several times during each day of planting.

Dryland considerations

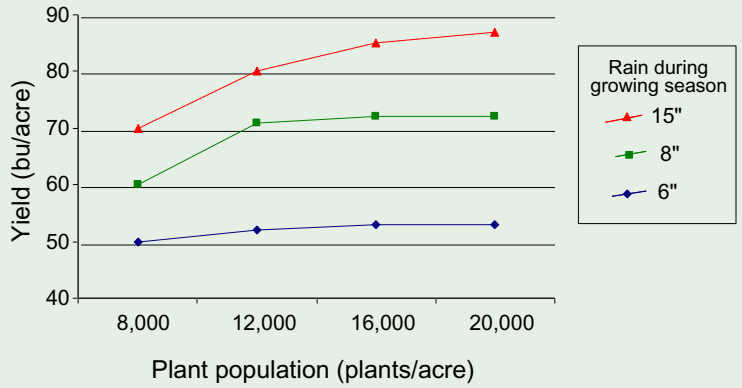

Figure 4. Growers can plant for expected yield potential and not hurt yields with higher populations if less than average rain falls. In eastern Colorado, planting populations between 12,000 and 16,000 plants per acre maximizes yield for seasons with average to low rainfall.

Source: Wayne Fithian

Planting Considerations

- Adjust harvest, tillage and planting equipment under conditions of substantial surface crop residue so that residue cover is distributed uniformly over the row area after planting.
- Use recommended herbicide application rates to avoid injuring corn.
- After planting, closely monitor corn emergence and rotary hoe if soil crusting prevents uniform corn emergence.
- Create as little surface compaction as possible prior to planting.
- Avoid working wet ground and creating cloddy seedbeds.
- Don't plant earlier than normal. Seed fungicide treatments only provide 10 to 14 days of protection under "normal" conditions.
- Plant high-vigor hybrids first.
- Plant the best quality seed lots first.
- Plant the best (highest yielding) fields first.
- Consider seed-applied or planter-applied insecticide for protection against wireworm and seedcorn maggot if you are certain of their presence.
- If soil conditions are unusually dry at planting, aim for a seeding depth that maximizes soil moisture uniformity in the seed furrow.

Nodal Root System and Stand Establishment

Corn stand establishment refers not only to the success of germination and emergence, but to critical initial formation of the nodal (permanent) root system. Poorly established nodal roots leave the corn crop susceptible to various early season stresses that may injure the seedling, seed roots and mesocotyl. Vigorous nodal root establishment is largely dependent on initial nodal root growth from about the 2-leaf (V2) to 6-leaf (V6) stages. Severe stress during this period can cause a healthy emerging corn field to die or stunt over a few weeks.

Soil temperature and moisture content are two interacting factors that influence how early-season stress affects stand establishment. When early nodal root development is significantly delayed, other stress factors (especially soil insects and diseases) have more time to damage the seed and mesocotyl and injure or kill young seedlings.

Stresses that affect nodal root formation include damage from below-ground insect feeding (wireworm, seedcorn maggot, grub), seedling blights, seed rots, fertilizer injury (starter fertilizer, anhydrous ammonia), excessively dry soils and excessively wet soils.

A healthy kernel, seed roots, and mesocotyl are vital until the nodal roots are well established. Energy reserves from the kernel move through the connecting mesocotyl "pipeline" to the seedling's stalk and leaf tissues. If the mesocotyl or seed is damaged prior to substantial nodal root development, seedlings will either die or be severely stunted. The importance of the seed reserves and the mesocotyl declines as the nodal roots develop.

Uneven emergence. Evaluate nonuniform emergence by comparing growth stages. If the delay in emergence is less than two weeks, replanting will have minimal effect on yield, regardless of the uneven pattern.

Increasing seed depth as little as 0.50 inches can often eliminate uneven emergence when seed-zone soil moisture is marginal.

Uneven Emergence and Replant Decisions

Stands with uneven emergence

Uneven stands typically yield less than even stands due to competition of plants at two different growth stages next to one another. Older plants generally out-compete younger plants for light, water and nutrients. In some cases, late-emerging plants are more vulnerable to silk clipping by corn rootworm beetles that can interrupt pollination and reduce kernel set on the ears.

If one half or more of the plants in the stand emerge three weeks late or later, then replanting may increase yields by up to 10%. Base replant decision by comparing the estimated economic return of the increased yield to replanting costs and the risk of emergence problems with the replanted stand.

Filling in poor stands

If stand loss is 50% or greater, growers can either replant the whole field or fill in the existing stand and accept resulting uneven emergence. If growers can determine the final stand within two weeks after planting, filling in the existing stand may be an option.

Fill in new seed as uniformly as possible so yields will be similar to a replanted stand. If filling in a poor stand three weeks after the initial planting, yield potential is typically 10% less than replanting completely and starting over with an even-emerging stand. Balance possible yield increases against the additional cost of tillage, seed and elevator dockage.

Replanting results - late emergence

Late emerging plants have higher grain moisture content at harvest that can possibly result in harvested grain with varying moisture levels. Late plants also lodge more due to smaller stems, weaker stalks, and fewer brace roots. Adjusting settings on combines during harvest for variable ear sizes between early and late plants is difficult. However, problems range from minimal with a one and a half-week delay in emergence, to serious with a three-week emergence delay.

Avoid uneven emergence

Avoid excessive tillage trips that dry or compact the seedbed. Check seed depth during planting in several areas of the field - if contact between seed and soil is poor or seeding depth isn't uniform, adjust seed openers and/or press-wheel pressure.

Slowing planting speed may also improve uniformity; approximately 5 miles per hour is optimum for most conditions. A change in secondary tillage operations may improve soil conditions for more uniform planting.

Late Planted Corn

When wet spring weather significantly delays planting, or if replanting is necessary, switching to earlier or medium maturity hybrids may be justified. As planting is delayed, the yield difference among full, medium and early season maturity groups becomes smaller. Full season hybrids may not reach physiological maturity before the first fall frost with delayed planting. Frost before the grain reaches black-layer results in lower yield, lower test weight, higher grain moisture levels and lower grain quality. Consider switching to earlier hybrids when the calendar date is 20 or more days after the optimum planting date for the area. This is a critical decision that impacts producer risk and profitability, especially in areas of the state where shorter growing seasons may limit yield. Planting full-season hybrids too late incurs the risk of cool weather and fall frost damage before maturity, but switching to early hybrids too soon can result in lost yield and profit.

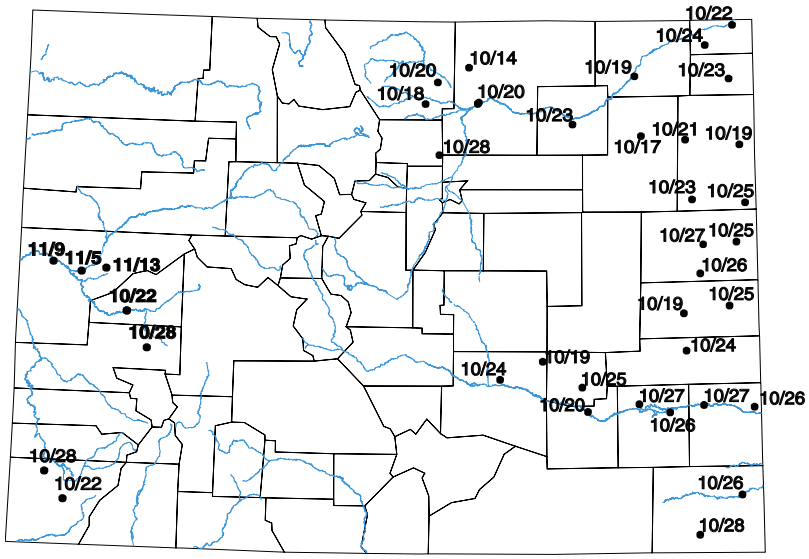

Figure 5. Average fall freeze dates in Colorado. There is an 80% probability that the first killing frost (28°F) will occur by these dates.

Data Source: Colorado Climate Center.

Row Spacing

Corn planted in narrow rows has the potential to produce higher yields in highly productive environments. The yield advantage associated with growing corn in narrow rows (22, 20 and 15" spacing) ranges from about 8% in the northern areas of the Corn Belt to almost no change in the Southern corn belt. Research in eastern Kansas showed yield gains up to 10% for 15-inch compared to 30-inch rows. In Colorado, there is little research-based evidence that row spacing narrower than 30-inch rows will increase yields enough to offset costs of switching to narrower rows.

Before changing row spacing, consider factors such as: number of corn acres, yield level, potential increase in yield, tire size, equipment size, and age and condition of current equipment. Costs of switching to narrower spacing must be offset by increased yields and increased net returns.