2 - Cultural Practices

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Land Selection

Corn performs best on deep, well-drained, medium to coarse textured soils, but producers have successfully produced corn on a wide range of soil types. High rainfall amounts are common in the spring and early summer when the root system of corn is developing. Perhaps the most important consideration for land selection is drainage. Corn production will be limited if drainage is inadequate. No-tillage can be a high-yield method of planting corn if the land is well-drained. Drainage should be corrected or improved prior to planting to increase corn yield potential. In most years, drainage and timely irrigation are the primary factors determining the yield potential of well-managed corn in Arkansas.

Seedbed Preparation

Preparing raised beds and planting into a freshly-tilled seedbed is currently the most common practice in Arkansas, but planting "flat" is practiced. Planting no-till into beds from the previous crop may be cost-effective. Most farmers are satisfied with beds that are formed from fall to early in the spring, where rainfall has settled and "firmed" the bed.

The advantages of planting on a bed versus flat include: (a) beds normally warm more quickly in the early spring, thus allowing for earlier planting; (b) beds provide drainage following heavy rainfall; and (c) in a dry spring, the top of the bed can be knocked down in order to plant into moisture.

Planting no-till corn can be successful if the seedbed is not rutted from the previous harvest operation or washed out from heavy rainfall. A burndown herbicide to kill existing weeds is necessary, but little else is required to get a stand. Timing may be more vital with no-tillage; otherwise, the management of no-tillage varies little from conventional planting. Shredding stalks or a light disking complicate no-tillage planting. An undisturbed seedbed provides a firm surface for cutting through residue and obtaining a more uniform seeding depth.

Subsoiling compacted soils is needed to raise corn yield potential. Where shallow hardpans exist, a ripper-hipper, may penetrate through the root- and moisture-restricting layer. A high-residue ripper-hipper can be used to subsoil under the future row as the beds are formed in the fall. The ripper-hipper has a heavy draft, high horsepower requirement. A good approach is to use a 4- or 6-row ripper-hipper and examine several field locations to assure that the shanks are penetrating the hard soil layer. To be compatible with the number of rows on his planter and combine header, a grower follows by bedding on these rows again with an 8- or l2-row bedder. Several GPS-guided controls (for example, the John Deere AutoTrac™ assisted steering system) may provide a sufficiently accurate row spacing to make a second bedding pass unnecessary.

Some growers use high-residue subsoilers in the fall at an angle to the anticipated rows to eliminate deeper compaction. The advantages of a high-residue subsoiler is that preparatory tillage after the last season's crop is unnecessary because coulters cut the residue, and less tillage is required to prepare the beds after subsoiling.

Planting Precision

Uneven plant spacing and emergence may reduce corn yield potential. Seed should be spaced as uniformly as possible within the row to ensure maximum yields, regardless of plant population and planting date.

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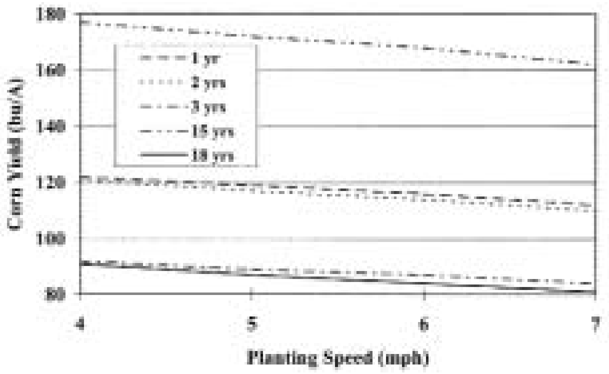
Figure 2-1. Relationship of corn yield to planting speeds from 4 to 7 mph for selected planters



A three-state study evaluating 22 planters of various ages in good operating condition, shows that planting speed may affect yield, regardless of the age of the planter, model of the planter or acres planted per year. In addition, higher speeds modified the seeding rate and increased the seed spacing variability for about half of the planters evaluated. Figure 2-1 shows how yield dropped with increased speed for five planters. The average yield decrease from 4 to 7 mph was approximately 10 percent for the five planters.

For precision planting, try these four steps:

1. Calibrate the planter at the speed intended for planting. Don't risk obtaining a misleading seeding rate from slow speeds.

2. Calibrate on a hard turnrow to be able to locate all the seed and assure that the rate is approximately correct before taking the planter to the field. (If a seed monitor displays population per acre, verify that the monitor is displaying values that coincide with actual seed counts behind the planter. Multiple seeds don't trigger a response if they pass the sensor together. Seed monitors are helpful to warn you about skips, malfunctioning rows or undesirable seeding rates. However, they will not detect erratic spacing between seeds.)

3. Check behind the planter in the field to verify that seed placement, depth, and spacing are exactly what you intend. Once seed is planted, it is hard to be sure that you've found all the seed. Roughly prepared ground bounces the planter units and may shift seeding rates either up or down.

4. Check the planting rate every time you change seed size or hybrid. These changes as well as seed treatments or field roughness, may cause multiple seed drops or skips.

Vacuum seed selection planters typically achieve the most uniform plant densities followed by plateless or finger pickup seed selection. With all other factors equal, maximum yields occur when corn is placed uniformly deep into the soil with uniform spacing between seeds. Producers should follow the manufacturer's recommended planting speeds.

Most research in the mid-south region indicates the greatest yields are obtained in row spacings of 30 inches. Row spacings less than 30 inches are typically too narrow to pull up a sufficient bedded row for surface drainage. Experiments have generally shown little yield advantage for row spacings less than 30 inches.

Many mid-south evaluations indicate that 38-inch rows incur a 10 to 15 percent yield reduction compared to 30-inch row spacings. The yield reduction in wider rows may be due primarily to sun light reaching the soil surface; thus less total utilization of solar energy for grain production. Additionally, wider rows may fail to shade the soil, and result in more evaporative moisture loss. This can increase the irrigation cost or potentially reduce yield in dry seasons. Wide rows may also result in more lodging, especially with complications from charcoal rot or midseason windstorms since there is somewhat less mutual plant support with wider row spacings.

Planting Date

Corn growth and development responds primarily to temperature and is not controlled by day length. Thus, the calendar date is not as important as soil temperature and air temperature when considering when to plant corn. Good germination and emergence are expected when the soil temperature at a 2-inch depth is 55˚F by 9:00 a.m. for three consecutive days. This normally occurs in late March in south Arkansas and early April in north Arkansas. Frost may occur after these planting dates in some years, but corn typically withstands frost with little economic injury. Early frosts may remove a single emerged leaf, but a leaf will emerge from the seed. Severe frosts later in corn development can be destructive, but these conditions are very rare in Arkansas.

Early plantings typically yield more than late plantings and there are other possible advantages to early planting dates, including:

- Less conflict with other crop operations (cotton, soybeans, rice and wheat), including drying grain
- Fewer irrigations
- Reduced insect and virus damage
- Earlier harvest

Seed should be planted 1 1/2 and 2 inches deep into moist soil. If moisture is deeper than 3 inches, it is advisable to wait until after a rain before planting. If center pivot irrigation is available, it may be used prior to planting to obtain the soil moisture desired.

Seeding Rate and Plant Populations

The desired final plant population depends on the hybrid, whether the field is irrigated and reasonable yield expectations. The recommended plant populations range from 16,000 to 32,000 plants per acre. Recommended population for dryland production ranges from 16,000 to 24,000 plants per acre whereas irrigated corn has greater yield potential from 26,000 to 32,000 plants per acre. Most seed companies recommend a specific planting range for each hybrid. They suggest the lower end of the range if the field is not irrigated and the yield potential is less than 160 bushels per acre. Where higher yield potential exists and corn is well-irrigated, the higher end of the range is recommended.

Most seeding densities are based on “ear flex.” Full ear flex hybrids can compensate for fewer plants per acre because the ear grows both in length and girth. These hybrids usually produce only one ear per stalk. Individual semi-flex hybrid ears will not compensate to the extent that full flex hybrids will, but with low stand density and excellent growing conditions they may set two or more ears. Few of the modern corn hybrids released today are “fixed” ear. Fixed ear hybrids must obtain the desired population for maximum yields.

Table 2-1 shows the number of seed required per 10 row feet for several plant populations and row widths. To check planting rates, count the number of seed placed in 10 row feet. Tractor speed,

Table 2-1. Corn Seeding Rates

Seeding Rate per Acre	Row Spacing (inches)				
	20	30	36	38	40
	Seeds per 10 Feet of Row				
16,000	6.1	9.2	11.0	11.6	12.2
17,000	6.5	9.8	11.7	12.4	13.0
18,000	6.9	10.3	12.4	13.1	13.8
19,000	7.3	10.9	13.1	13.8	14.5
20,000	7.7	11.5	13.8	14.5	15.3
22,000	8.4	12.6	15.2	16.0	16.8
24,000	9.2	13.8	16.5	17.4	18.4
26,000	9.9	14.9	17.9	18.9	19.9
28,000	10.7	16.1	19.3	20.4	21.4
30,000	11.5	17.2	20.7	21.8	23.0
32,000	12.2	18.4	22.0	23.3	24.5
Linear feet of row per acre	26,136	17,424	14,520	13,756	13,068

Seeding rates are listed as seeds per 10 row feet.
Suggested seeding rate per acres assumes 90% emergence.

Table 2-2. Final Plant Population for Corn					
Final Stand per Acre	**Row Spacing (inches)**				
	20	**30**	**36**	**38**	**40**
	Plants per 10 Feet of Row				
14,400	5.5	8.3	9.9	10.5	11.0
15,300	5.9	8.8	10.5	11.1	11.7
16,200	6.2	9.3	11.2	11.8	12.4
17,100	6.5	9.8	11.8	12.4	13.1
18,000	6.9	10.3	12.4	13.1	13.8
19,800	7.6	11.4	13.6	14.4	15.2
21,600	8.3	12.4	14.9	15.7	16.5
23,400	9.0	13.4	16.1	17.0	17.9
25,200	9.6	14.5	17.4	18.3	19.3
27,000	10.3	15.5	18.6	19.6	20.7
28,800	11.0	16.5	19.8	20.9	22.0
Linear feet of row per acre	26,136	17,424	14,520	13,756	13,068

seed size, and several other factors can affect the seeding rate. Furrow counts should be done several times during planting, especially where a planter is prone to bounce. Initially it is advisable that each row be checked, since row units may fail to plant at the same rate. If each row has a separate seed box, monitoring the fill levels will help to detect planter unit skips. However, a good seed monitor is highly recommended to detect seeding failures immediately. The corresponding number in Table 2-1 should closely estimate the planting rate of corn on a particular row spacing.

Table 2-2 shows the number of plants required per 10 row feet to determine the final plant stand on several different row widths. Several locations within a field should be checked to give a good representation of the entire field. Table 2-2 gives a good estimate of the final plant population or stand.

Hybrid Selection

Hybrid selection is one of the important decisions a producer will make. Yield is an important factor but maturity, stay green, lodging, shuck cover, ear placement, disease and insect resistance play a role in hybrid selection. In Arkansas, 112 to 120 day maturity hybrids usually produce the highest yields. Producers with a relatively large amount of rice may use 108 to 110 day hybrids, and sacrifice a few bushels of corn so they can pick corn prior to rice harvest. Hybrids that stay green later into their maturity usually retain better stalk strength and have less lodging potential. Shuck cover is important since good ear coverage reduces the introduction of soil fungi, thus less potential for kernel damage. Ear placement can be very important in corn planted later in the season.

Most corn hybrids will grow taller as day length increases due to increased day and night temperatures. Rapid growth results in more space between nodes, thus ear placement can be substantially different within the same hybrid planted at different times. Usually, the higher the ear placement, the greater the lodging potential. If possible, select late-planted hybrids that have lower ear placement. Biotechnology advances have resulted in corn hybrids that are resistant to insects due to toxins produced in the plant tissue. There are also some hybrids that are herbicide resistant. A few hybrids contain both of these traits and are referred to as “stacked” trait hybrids. Selecting hybrids and managing them to utilize genetic strengths are addressed in the weed and insect control sections.

Growing Degree Days

Yield potential and maturity are important when selecting a hybrid that will produce mature, sound grain during a normal growing season for a particular region in Arkansas. Relative maturity among hybrids is best evaluated by grain moisture content in performance reports.

The number of days that are required for a hybrid to reach maturity depends on location, date of planting, and the weather during the growing season. A hybrid that is labeled as a 115-day hybrid may take 110 to 120 days to mature depending on the above factors. This system of measuring corn maturity does not take into account the complicated physiological processes that control growth and development of corn.

Growing degree days (GDD) are a daily accumulation of heat for crop growth. A hybrid's GDD rating is determined from planting to black layer formation (physiological maturity). Most seed corn suppliers include a GDD rating on their seed tags or in their hybrid descriptions. Corn does not grow when temperatures are below 50°F and temperatures above 86°F do not increase plant growth rate. Therefore, 50°F is set as the minimum temperature and 86°F is set as the maximum temperature for calculating GDD.

The formula for calculating growing degree days is to add the daily high temperature (86°F maximum) and daily low temperature (50°F minimum), divide the result by 2 and then subtract 50. The answer represents the heat units for one day.

GDD = [(daily high + daily low) ÷ 2] – 50

Example 1:

83°F (daily high temp); 63°F (daily low temp)

83 (daily high) + 63 (daily low) = 146

146 ÷ 2 = 73

73 - 50 = 23 GDD

Example 2:

95°F (daily high temp); 70°F (daily low temp)

Since the daily high temperature is greater than 86°F, 86°F will be used as the daily high temperature.

86 (daily high) + 70 (daily low) = 156

156 ÷ 2 = 78

78 - 50 = 28 GDD

Producers can use a thermometer that reads both maximum and minimum temperatures to calculate and record GDD for their crop.