6-1-2001

PB443 Corn Production in Tennessee

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Contents

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Corn is the most important grain crop in Tennessee. The total acreage of corn grown for grain and silage has been about 700,000 to 900,000 since 1970, with the silage acreage remaining about 140,000 acres each year since 1970. This is about one-fourth the total acreage of corn grown in Tennessee in 1930, but increased yields have tended to offset reduced acreage.

The average yield 55 years ago was about 20 to 25 bushels per acre, which was no better than the yields recorded 100 years ago. Tennessee farmers increased corn yields from 35 bushels per acre in 1955, to about 40 bushels in 1960, to 50 bushels in 1965, to 85 bushels in 1979. Statewide averages continued to increase from 98 bushels in 1985 to 107 bushels in 1989 and 114 bushels in 2000. The record average yield of 124 bushels per acre was obtained in 1992.

Corn Land

Put corn on land that will supply moisture in summer. Do not put corn on steep, droughty soil with low moisture-supplying capacity. Three general types of corn land are:

Excellent – level bottom land with deep soil and good drainage, with excellent ability to supply moisture in summer. Mostly river and creek bottoms. Continuous corn may be grown with minimum soil loss.

Good – level upland or shallow bottom land with good ability to supply moisture in summer. Level fields may be planted in corn year after year, provided measures are used to control erosion and pests.

Medium – rolling or hilly upland with medium ability to supply moisture in summer. This land should not be kept continuously in corn because of its susceptibility to excessive erosion except where no-till corn production is practiced. Use corn in rotation with no-till crops such as perennial hay or pasture.

Corn Planting

Corn may be planted either conventionally into a prepared seedbed or no-till into sod or stubble. When planting conventionally, prepare a firm seedbed two to three weeks before planting time to start the rotting of cover crops or crop residue. Disk as needed to make a firm, smooth seedbed. A firm, smooth seedbed makes it easy to plant at the right depth to obtain a uniform stand.

Corn can be no-tilled into an established cover such as fescue, rye, wheat or vetch. It is **essential** that all the cover crop be killed. The mulch formed by the dead material will reduce soil erosion, water run-off, evaporation and weed germination. Corn may also be planted into the stubble of a previous crop such as corn, cotton, soybeans or small grain. A burndown herbicide will be needed to kill all growing vegetation, whether weeds or a previous crop. Where only a small number of annual weeds or grasses are present, the low rate of the burndown herbicide should be adequate. When either live ryegrass or cheat is present, allow some regrowth before spraying the burndown herbicide one week to 10 days prior to planting. Tank-mix a second application of burndown herbicide with other herbicides at planting time.

Advantages and Disadvantages

No-till corn has the following advantages and disadvantages compared to the conventional method of preparing a seedbed before planting corn.

Advantages:

1. Soil erosion is effectively reduced, which decreases topsoil loss and protects water quality.
2. Corn can be produced on slopes not normally used for conventional corn production with its high soil erosion potential.

3. Seedbed preparation is eliminated, which can reduce the cost of production and the total time required for planting.
4. Root lodging is reduced, which means less total lodging.
5. Soil is firmer at harvest, with fewer harvest delays due to wet weather.

Disadvantages:

1. The planting operation is slower and more difficult than with a prepared seedbed.
2. Planting may be later, due to cold soils under a mulch.
3. Some weeds, such as dallisgrass, bermudagrass, broomsedge and other perennial weeds, are not controlled by chemicals presently labeled. Do not plant no-till corn into fields infested with these weeds.
4. It is more difficult to obtain a uniform stand of corn.
5. A special planter designed for no-till planting is needed.
6. Insects are usually a greater problem in no-till than for conventionally-planted corn.

Select A No-till Planter

No-till planting requires a planter equipped with a fluted, ripple or bubble coulter, double disc openers and press wheel. Coulters can be eliminated on planters that have offset (staggered) double-disc openers.

No-till corn can be planted in 20- to 38-inch row widths. Always match your row width to the corn header on your combine. Narrow rows (less than 36 inches) help shade the row middles quicker than wide rows and help to decrease weed growth. Narrow rows also encourage higher plant populations. There is very little difference in yield from 20- to 38-inch rows with the same number of stalks per acre.

Varieties

Use the same recommended hybrid for no-till as for conventional corn. See Extension EC643, *Recommended Field Crop Varieties*. Corn hybrids recommended for grain are also recommended for silage production. The full and medium-season varieties produce the highest silage yields.

Choose a high-producing hybrid from the recommended list. Corn hybrids differ in yield, maturity, stalk strength, grain color and type, and susceptibility to diseases and other stresses. Choose a hybrid that offers the best combination of traits for your production requirements. In johnsongrass-infested fields, it is especially important to select a hybrid with resistance to the corn stunt virus complex. These viruses live in the johnsongrass roots over the winter and in the leaves and stems when the grass resumes growth in the spring. Leafhoppers and other insects carry the virus from the johnsongrass to the corn in spring and summer, and infected corn plants may produce lower yields. It is critical to use a virus-tolerant corn hybrid if the johnsongrass will be sprayed with a selective herbicide to kill the johnsongrass.

Plant Early

April 1 to May 1 in West Tennessee. In some years, the Southwestern corn borer damages corn planted after the first part of May in this area and in some counties in the southern part of Middle Tennessee.

Before June 1 in Middle and East Tennessee. Early planting usually boosts yields on upland soils that dry out quickly. The average yield has gone down one bushel per day when planted from May 1 to June 1, or 30 bushels per acre. The yield reduction is even greater when planted after June 1.

Where corn stunt (virus) is present, early plantings, before May 1, generally produce higher yields and have less disease than later plantings.

Plant in 20- to 38-inch Rows

Fit your row width (20 to 38 inches) to the type of combine, tractor and planter. Research has shown that the number of plants per acre is a more important factor than row width in corn production in Tennessee.

Fit Number of Stalks to Type of Corn Land

The number of stalks needed per acre depends upon the kind of corn land used. The following table shows the recommended number of stalks per acre for the general types of corn land for both grain and silage.

Recommended Number of Corn Stalks Per Acre

Use	Expected Yield Per Acre	Stalks Per Acre
For Grain		
Excellent corn soils	Above 150 bu.	24,000 to 28,000
	100 to 150 bu.	20,000 to 24,000
Medium to good corn soils	Up to 100 bu.	16,000 to 20,000
For Silage		
Excellent corn soils	18 to 25 tons	24,000 to 28,000
Medium to good corn soils	Up to 18 tons	20,000 to 24,000

First determine how many stalks are needed per acre. Then use the following table to determine what the planter setting should be to make sure of getting the desired number of plants.

	16,000 Stalks/Acre		20,000 Stalks/Acre		24,000 Stalks/Acre	
Row Width	Planter Setting	Stand Needed	Planter Setting	Stand Needed	Planter Setting	Stand Needed
Inches	Inches	Inches	Inches	Inches	Inches	Inches
30	12	13	9.5	10.5	8.0	8.5
36	11	12	8.0	9.0	6.5	7.5
38	10	11	7.5	8.5	6.0	7.0
40	9	10	7.0	8.0	5.5	6.5
42	8	9	6.5	7.5	5.0	6.0

Check Seed Drop and Depth of Planting

Check your planter in the field at the speed you plant to determine how many seeds are being dropped and at what spacing they are dropped. Fast planting can produce poor stands.

If you plant at a high speed, be sure you use a planter that will drop enough seed to give the recommended stand. Set the planter depth at 1 to 1½ inches on cool soils; and 1 to 2 inches on warm soils.

Increase the Planting Rate

Conditions for germination are usually not as desirable in no-till planting as in a conventional seedbed. For no-till, increase the seeding rate about 20 percent above the desired stand. To obtain 16,000 to 20,000 stalks per acre on good corn land (80 to 100 bu. yield), plant about 18,000 to 22,000 kernels per acre. For 20,000 to 24,000 stalks per acre on excellent corn land (100 - 150 bu.), plant about 22,000 to 26,000 kernels per acre. To obtain 24,000 to 28,000 stalks per acre, plant about 26,000 to 30,000 kernels of corn for yields greater than 150 bushels per acre.

Lime and Fertilize by Soil Test

Lime and fertilizer should be applied according to soil test recommendations for both conventional and no-till planted corn. General instructions for taking a soil sample are provided on the soil test information sheet. You should also indicate on the sheet if corn is produced for grain or silage as significantly higher rates of potash are removed by harvest of silage.

The following table indicates the soil test recommendations for different yield levels of corn for grain and for silage. The ratings of **Low**, **Medium**, **High** and **Very High** refer to soil test levels of phosphorus and potassium in the soil.

Soil test fertilizer recommendations for corn are:

Use and Yield Level	Nitrogen (lb./A)	Phosphate (P_2O_5) Lb/A)				Potash (K_2O) (Lb/A)			
For Grain (bu.)		Low	Med	High	VH	Low	Med	High	VH
100-125	120	100	50	25	0	100	50	25	0
125-150	150	120	60	30	0	120	60	30	0
150-175	180	140	70	35	0	140	70	35	0
175-200	210	160	80	40	0	160	80	40	0
For Silage (tons)									
15-18	120	120	60	40	0	180	120	80	0
19-25	150	160	80	60	0	240	160	100	0
over 25	180	200	100	80	0	300	200	120	0

Soil test lime recommendations are based on buffer pH readings. Proper pH is critical to efficient fertilizer utilization and crop growth. Thus, soils should be tested to determine the need for lime.

Apply Fertilizer Correctly

Fall application: With soil test levels of medium or higher the phosphate and potash may be applied in the fall, winter or spring where erosion or overflow are not problems. **Do not apply nitrogen** in the fall for corn production.

Spring application: phosphate and potash – When soils test medium to high in both phosphate and potash, all of the phosphate and potash should be broadcast applied. For low- testing soils, the potash and phosphate, along with a small amount of nitrogen, may be banded close to the seed. This results in greatest efficiency. Where moderate rates of fertilizer are used, all of the nitrogen, phosphate and potash can be banded 2 inches beside the seed and 3 inches deep.

Nitrogen – Split applications of nitrogen may be beneficial when rates are greater than 120 pounds per acre. All of the N sources produce similar responses when they are incor-

porated into the soil. When planting no-till into a good cover crop of vetch or crimson clover that has been killed, decrease the nitrogen rate 50-70 pounds per acre.

Time and method of applying nitrogen:

Preplant

1. Apply anhydrous ammonia seven to 10 days before planting by injecting to a depth of 6 to 8inches.(For "Cold-Flo" a 3- to 4-inch depth is adequate).
2. Apply ammonium nitrate by broadcasting immediately before or after planting.
3. If nitrogen sources containing urea are **surface**-applied, some loss of nitrogen may occur if applied to moist soils followed by three or more days of rapidly drying conditions without rainfall.

Sidedress

Apply as a sidedressing within four weeks of planting:

(a) Anhydrous should be injected in the middles, equidistant between the rows.
(b) Use solid dry nitrogen (ammonium nitrate, urea, etc.) for broadcast applications after the corn is growing.
(c) If liquid nitrogen is used, dribble tubes should place the nitrogen on the soil surface between rows. **Do not** broadcast liquid nitrogen over the top of corn.

Some burning of the corn leaves will be evident with the broadcast dry materials. Ammonium nitrate will burn more than urea at the same rate of nitrogen. Tall corn will be burned more than small corn, and wet plants will be burned more than dry plants. This means it is necessary to broadcast the dry materials when the corn is small and dry.

Urea may not be as efficient as other nitrogen sources in no-till. The problem is caused by ammonia volatilization resulting from the breakdown of urea during warm, rapidly drying conditions. Although urea is a good source of nitrogen for topdressing cool-season grasses, nitrogen is usually applied to no-till corn later in the spring when temperatures are warmer and the risk of volatilization is greater. Do not broadcast urea if limestone has been surface broadcast within three months.

Micronutrients – Use five pounds of elemental zinc (Zn) or 15 pounds of zinc sulfate per acre (1) the first year following lime application to soils in Middle Tennessee and the Cumberland Plateau (2) when a zinc test indicates a need for zinc (3) or anywhere deficiencies were observed the previous year. Zinc is usually mixed in the fertilizer by the fertilizer blender for easy distribution. Follow soil test recommendations.

The use of other nutrients, including sulfur and magnesium, has not increased yields in Tennessee.

Control Insects

Insects are reducing the stands of corn on many farms in Tennessee by eating part or all of the corn seed and young plants. Also, insects lower yields by boring into the stalks and girdling the stalks, as in the case of the Southwestern corn borer. An insecticide applied in the furrow at planting time is recommended for no-till planted corn into sod or in continuous no-till or conventional corn. The insecticide rate is generally higher in no-till than in conventionally-planted corn. When planting in stubble following small grain harvested for hay or silage, **check the fields for armyworms**. If worms are present, spray with a recommended insecticide. A high population of large worms already present in a field of corn can eat all of the young corn plants in one to two days. For the latest insecticide recommendations see PB1064, ***Insect Pest in Field Corn in Tennessee***.

Weed Control

Weeds must be controlled in both conventional and no-till corn. In conventionally planted corn, cultivation is still an effective method for controlling weeds, although it is not used on many farms. Cultivate 1 to 2 inches deep as many times as needed to control weeds. Thick stands of corn help to control weeds by shading.

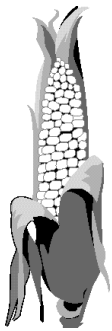
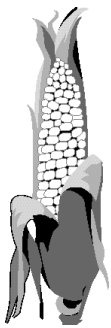
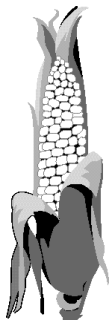
Chemical weed control has proven effective on most weeds in corn fields. For specific chemical recommendations, see current Extension PB1580, ***Weed Control Manual for Tennessee Field Crops***. Also, please read and follow the information on the use of burndown herbicides, Atrazine

restrictions, and the control of johnsongrass, ryegrass, cheat and broadleaf signalgrass in conventional and no-till corn.

Corn Facts

1. The corn plant usually emerges from the soil six to 10 days after planting.
2. Corn seed will not germinate with a soil temperature of 50F or below. At 55F the seed germinate slowly, and at 60F or above, corn germinates rapidly. Measure the temperature at a depth of 1 inch at 7:00 a.m.
3. A corn seed planted 2 inches deep starts its main root system about 1 inch from the top of the soil. A seed planted 4 inches deep starts its main root system about $1\frac{3}{4}$ inches from the top of the soil. Deep planting does not result in a deep root system.
4. The growing point inside a corn plant stem is about at the ground level when the corn plant is 12 to 15 inches tall. Cut a 12-inch high corn plant about 4 inches above the ground level and see if it will continue to grow.
5. Brace roots start forming on the lower nodes, usually about tasseling time.
6. The tassel normally emerges three to seven days before the silks. Pollen from the tassel usually starts shedding two to three days before the first silks are visible. Pollen shedding continues for five to eight days. A single tassel produces from two to five million pollen grains.
7. There is a silk for every grain of corn on an ear. The average ear has from 500 to 1,000 kernels and silks.
8. The tassel is the male portion and the ear is the female portion of the corn plant.
9. An ear of corn has an even number of rows of kernels about the center of the ear. There may be an uneven number of rows near the ends of the ear due to early developmental problems. The average number of rows ranges from 14 to 20 in most hybrid varieties.
10. Silks from the base of the ear emerge from the shuck first; the silks from the tip of the ear emerge last. All silks emerge in three to five days. The kernels are pollinated at the base of the ear first.

11. It is estimated that about 97 percent of the kernels on an ear of corn are pollinated by other plants in the field.
12. The silks turn brown as soon as the kernel is pollinated. The pollen lands on the silk and then produces a tube down the center of the silk and pollinates the kernel.
13. About three weeks after pollination, the ear is in the "roasting ear" stage.
14. A single corn kernel can produce a corn plant that can produce one or more ears containing 500 to 1,000 kernels. The reproduction ratio ranges between 500 and as much as 2000 to 1.
15. The United States produces about 51 percent of the corn in the world.
16. A l0 to 15 percent loss in kernels planted is about average due to diseases, insects and some poor germinating seeds. For sod planting, a 15 to 20 percent loss is about average.
17. The average nutrient removal per acre for a 125-bushel yield is: 115 lbs. nitrogen (N); 45 lbs. phosphate; and 30 lbs. potash (K_2O).
18. For a 20-ton silage yield the loss is: 135 lbs. N; 55 lbs. P_2O_5 and 160 lbs K_2O.
10. A bushel of corn in the shuck weighs 72 pounds, without the shuck 70 pounds and shelled 56 pounds.
11. A bushel of corn contains 80,000 to 100,000 kernels.

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PB443-3M-6/01(Rev) E12-525-00-032-01