**University of Missouri Extension**

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# Cotton Tillage and Planting Guidelines

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**Note**
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Tillage operations performed prior to planting cotton should make a firm, well-drained seedbed that will provide a warm environment for seed germination and vigorous seedling growth. Since cotton is a semi-tropical, perennial plant, it grows very slowly early in the growing season compared to other Missouri crops such as corn and soybeans. The slow, early growth nature of this crop requires a grower to provide a seedbed that will allow the young seedling to get off to the best start possible.

With new equipment, especially planters and cultivators, developed to handle high residue conditions, it is possible to plant cotton into stale beds or fields that have received minimal tillage. Clean-till approaches are still the predominant tillage system for cotton, but using fewer tillage operations is one way cotton growers have found to reduce costs yet produce yields equal to those in conventional, clean-till systems.

## Tillage guidelines

### Conventional tillage

The goal of most conventional tillage systems has been to produce a clean-tilled seed bed with no residue on the surface. This approach has a long history in cotton production. Since a cotton plant produces a woody stem that is difficult to destroy, several tillages are needed to completely remove the residue from the surface. Good seed placement was difficult if any residue or cotton stalks were present at planting until the latest generation of planters were developed. Table 1 outlines a typical tillage system for cotton using the clean-till approach.

**Table 1**
Conventional tillage operations for Missouri cotton

| Tillage | Purpose | Advantages | Disadvantages |
|---|---|---|---|
| Shred stalks in fall | Allow stalks to decompose and reduce insect overwintering sites. | Can reduce insect pressure the following season. | None |
| Disk in fall | Mix residue into top layer of soil. | Hastens decomposition of residue. | Less residue on soil surface can allow soil blowing in spring. |

| | | | |
|---|---|---|---|
| Deep subsoil | To break traffic pan layer. | Can improve rooting and water infiltration. | Costly operation and pan may reform if soil is tilled while wet after subsoiling. |
| Disk/chisel in spring | Mix residue in top layer of soil and/or herbicide incorporation. | Remove any winter weed growth. | Less residue on soil surface can permit blowing soil; traffic pan can reform if disking occurs while soil is wet. |
| Form beds with "hipper" | Provide a fresh bed to plant on. | Allows the soil to warm up prior to planting. | May reduce surface drainage and require water furrows in some poorly drained fields. |
| Re-hip beds | To rebuild bed prior to planting. | Re-establishes bed height before planting. | Fuel and labor cost. |
| Knock down beds with do-all | Final seedbed preparation and herbicide incorporation. | Provides smooth, clean, firm seedbed. | Lack of residue may permit blowing sand/soil. |

**Conservation tillage**

Tillage systems with less tillage operations have become a growing trend across the Cotton Belt in recent years. The trend is due in part to Conservation Compliance requirements for fields classified as highly erodible, but an interest in cost-saving and time-saving production techniques have been factors as well. A wide range of new systems have been tested in several cotton growing states. The following guidelines were developed from research at the MU Delta Center and across the Cotton Belt. Results from recent research indicate, in general, that several systems can be implemented that will reduce costs and keep yields stable.

**Reduced tillage guidelines**

If you are considering less tillage in your cotton production scheme, the following principles of reduced-tillage cotton should serve as a guide. Remember, if you are considering a reduced tillage system, try it on a few acres before changing your entire tillage approach.

- **Leave some residue on the surface**
  Young seedling cotton plants that are trying to establish leaf area and begin squaring by the fifth or sixth node need some protection from wind and blowing sand in May. Leaving residue on the surface or a killed cover crop can be a big help here. Wind damage has been reduced in field plots at the MU Delta Center and crop development has been advanced when the crop has a little protection. Two years of research suggest that if more vigorous early growth is established, then maturity has been earlier and yields higher.
- **Make new beds on the old row**
  Use the old row established each season for the next year's row. The decomposing root channel can help keep a root penetration zone from year to year. When moving to this system, subsoiling under the row will break the initial traffic pan and allow the root channel to be established. One remaining question is how often it is necessary to subsoil under the row. We hope that future research will provide an answer for Missouri soils.
- **Burndown winter weeds/cover crop with herbicide**
  Make sure to kill the cover crop/winter weeds before they get large enough to start robbing water and nutrients from the seed bed, usually about 3 to 4 weeks before planting. Survey the weeds present and use a burndown herbicide or combination that will give good kill of all the weeds and cover crop present.
- **Don't disk**
  Soil compaction and formation of a traffic pan has been linked by numerous research reports to overuse of a disk. Seed beds can be prepared to plant with modern planters by shredding stalks, hip-up on the old row and do-all to form the seed bed and incorporate herbicide.
- **Look at a high-residue cultivator with a guidance system**
  Another savings that can occur is to improve the efficiency of equipment used. High-residue cultivators with a guidance system (Buffalo, Heinneker, Orthman, Sukup, John Deere, Case IH, etc.) can cultivate

accurately through a crop at faster speeds. At lay-by, the use of a ridging wing can establish next year's bed. The stalks are shredded after harvest and then a row cleaner is used to peel off the top of the bed with the residue (instead of incorporating the residue with a do-all) just before planting. This system has a lot of potential, but requires investment in new equipment to replace a cultivator, hipper and do-all with a ridge-till cultivator and row cleaner.

- **Reduce trips over the field to save fuel and labor**
  Economic analysis of a ridge-till system and a conventional system has shown that lower fuel use and labor costs associated with less tillage can provide significant savings. A ridge-till system analyzed was found to reduce labor costs by 27 percent, fuel costs by 37 percent and repair costs by 24 percent. These reductions more than offset the greater herbicide costs for the burndown herbicide, resulting in a $34.50 per acre greater net return from the ridge-till system. Greater profitability from lower costs are a big advantage in today's very competitive agricultural markets.

# Planting guidelines

**Planting date**
Decisions regarding planting of cotton in Missouri can impact the crop for the entire season. A vigorously growing crop usually starts fruiting earlier, matures earlier and may have greater yield potential. Planting dates for Missouri cotton need to balance the need for as long a growing season as possible with the need to wait for good growing conditions. A general guideline for planting date for cotton in Missouri is from May 5 to May 15. Cotton planted before May 5 probably will encounter greater risk of cool soil temperatures, but may be able to establish a stand in some years. Cotton planted after May 15, until May 20, probably will not have significantly lower yields, but maturity delays begin to be a problem. Cotton planted after May 20 usually has reduced yields due to the shorter season.

**Soil temperature**
Cotton requires a temperature of greater than 60 degrees Fahrenheit for germination. Soil temperatures are typically warming during the daylight hours and cooling at night. Although the variation in soil temperature is not as great as in air temperature, cotton grows most vigorously if the soil temperature is above 65 degrees Fahrenheit for most of the day. A midmorning soil temperature of 65 degrees Fahrenheit is a good threshold temperature for planting cotton.

Several other factors impact the germination and emergence of cotton. If a good forecast indicates a warming trend and no rainfall, then soil temperature should rise. A rainfall of 1 inch or more can drop soil temperatures by 5 degrees Fahrenheit and it may take more than four days to rewarm the soil to the temperature level before the rain. Historically, weather trends show that planting dates after May 15 have less risk of low soil temperatures. However, to avoid problems with late planting dates, growers should probably shoot for an average planting date of May 15 and begin planting near May 5 and finish by May 20.

**Planting rate**
Overplanting cotton seed is costly in terms of seeds and also in terms of wasted resources. A final population of about three plants per row foot results in near-optimal yields. A planting rate of four seeds per row foot to establish a stand of three plants is recommended in most situations. Higher planting rates result in lower fruit retention, while low planting rates result in delayed maturity from the plant needing to compensate by placing more fruit on vegetative branches that mature later.

When calibrating your planter's seeding rate, remember to calibrate to seed per row foot and not pounds of seed per acre. Seed size varies from variety to variety, so you need to make sure that you are planting the correct number of seeds, not pounds of seed. Varieties can vary from 3,500 to 5,500 seeds per pound. If you calibrate for a large-seeded variety and then switch to a smaller-seeded variety, you could establish thousands of extra plants per acre.

## Row spacing

Comparisons of cotton grown in 30-inch rows and in 38-inch rows in Missouri and many other states indicate a typical yield increase of 10 to 15 percent from narrowing the row spacing. Closer row spacing results in earlier canopy closure and more efficient use of solar radiation for photosynthesis. Cotton grown in 30-inch rows typically matures a few days earlier, usually related to the canopy closure response. Planting rates for 30-inch rows need to be reduced about 15 to 20 percent (in seed per row-foot) compared to 38-inch rows, to plant the same population per acre in either row spacing. Research on 30-inch rows indicates that they may require more intensive management than 38-inch rows. Since it is using solar radiation more efficiently, 30-inch row cotton has shown greater demand for nutrients and a more consistent need for Pix (mepiquat chloride) growth regulator.

## Variety selection

Selecting the best varieties to be grown on your farm requires comparison of varieties in local tests that match your growing conditions, followed by fine-tuning the management of a variety on your soils. When trying a new variety, limit your acreage during the first season you grow it, no matter how great it looks in the variety test data. Although the differences between most varieties are subtle, learning to manage a variety for your farm may take some time. Concentrate on what works for you.

The varieties listed in Table 2 are those tested in Missouri locations for the last three years (1991-1993). They are listed with 3-year average yields from Portageville (silt loam) and Senath (silt loam), and 2-year average yields from Sikeston (sandy loam).

**Table 2**
Three-year average yields for Missouri Cotton Variety Test, 1991-1993

| Variety | Senath | Sikeston[1] | Portageville | 8 location per year average[2] |
|---|---|---|---|---|
| | Lint yield (pounds per acre) | | | |
| Stoneville 453 | 1275 | 887 | 1023 | 1084 |
| DPL 50 | 1183 | 982 | 1021 | 1072 |
| DPL 20 | 1233 | 927 | 998 | 1068 |
| Stoneville LA 887 | 1245 | 874 | 998 | 1059 |
| DPL 51 | 1235 | 932 | 952 | 1053 |
| Stoneville 132 | 1186 | 870 | 1007 | 1040 |
| Terra C-40 | 1171 | 870 | 997 | 1030 |
| DES 119 | 1201 | 878 | 942 | 1023 |
| Chembred 1233 | 1158 | 909 | 932 | 1011 |
| Hyperformer HS-46 | 1147 | 883 | 910 | 992 |
| Chembred 333 | 1071 | 931 | 948 | 990 |
| DPL 5690 | 1154 | 870 | 899 | 987 |
| DPL 5415 | 1149 | 895 | 869 | 980 |
| Terra 207 | 1162 | 777 | 931 | 979 |
| Hyperformer HS-23 | 1139 | 835 | 911 | 977 |
| Chembred 1135 | 1074 | 849 | 928 | 963 |

| | | | | |
|---|---|---|---|---|
| Suregrow S-1001 | 1104 | 830 | 897 | 958 |
| Delcot 344 | 1109 | 787 | 906 | 952 |
| Stoneville 907 | 1110 | 723 | 879 | 926 |

**[1]Sikeston test from 1992 and 1993 only.**
**[2]Total of 8 locations tested over 3 years.**

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## Related MU Extension publications

- G355, No-Tillage and Conservation Tillage: Economic Considerations
  http://extension.missouri.edu/publications/DisplayPub.aspx?P=G355
- IPM1025, Cotton Pests: Scouting and Management
  http://extension.missouri.edu/publications/DisplayPub.aspx?P=IPM1025
- M164, Missouri No-Till Planting Systems
  http://extension.missouri.edu/publications/DisplayPub.aspx?P=M164

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