Cotton Production in Kansas

Department of Agronomy

Cotton, *Gossypium hirustum L.*, is a major crop in many southern states. Cotton is grown mainly as a source of fiber for clothing and furniture industries. Cotton seed oil is used as light salad oil in the food industry and as a light industrial oil for making paints and lubricants. Crushed seed meal is a highly concentrated feed that contains approximately 40 percent protein and 6 percent fat. Meal is fed to cattle, sheep and horses, but is toxic to swine. Cotton seed hulls are a roughage source in cattle rations and also are spread on fields as cover and fertilizer.

Cotton may be a viable alternative crop in Kansas. This publication provides general information on cotton production practices that may be helpful to Kansas farmers interested in this crop.

Growth and Development

Cotton is a perennial plant native to tropical regions and requires warm days and nights for optimum growth and development. Cotton seedlings are sensitive to cool temperatures during germination and emergence. They will emerge in 4–10 days, depending on soil temperature and depth of planting. Cotyledons, or seed leaves, emerge first; true leaves follow. Flower buds, called squares, are visible about 30 days after plant emergence. The first fruiting branch normally will be at the sixth to ninth node. Though variety selected does play a part, daylength and temperature are the primary influences on fruiting branch initiation. Temperature at germination can also determine the branch on which flowering begins. The boll—a capsule containing the seed, linters (fuzz) and lint—attains maximum size 20–25 days after bloom, and opens 60–75 days after initial bloom. Nearly 75 percent of the yield will be from the third to eighth fruiting branches. Eighty-five to ninety percent of the lint yield will be produced at the first and second boll positions on the branch. Cotton plants, like soybeans, abort many flowers even under ideal conditions. Only 35–40 percent of blooms make bolls. Cotton varieties vary greatly in maturity. Early maturing varieties—120 days—are best adapted to the relatively short growing season in Kansas.

Planting

Optimum planting dates for cotton in Kansas range from May 1–June 1, but planting has occurred as late as June 15. For optimum cotton germination and emergence, the soil temperature at a depth of 8 inches should average 60°F for 3 consecutive days prior to planting.

Cotton is sensitive to soil compaction, but no more than most crops. Subsoil tillage operations to aid root penetration may be desirable in the fall or early spring prior to planting.

The seedbed should be loose and dry on the surface with the seed placed into moisture at a depth of 1–1.5 inches. A rotary hoe may be needed to break any crust that might form and hinder emergence.

Cotton seed used for planting must be delinted. Two types of delinting procedures are used—mechanically with flame, and chemically with acid. Currently, Kansas cotton growers plant cotton seed that has been chemically delinted. In addition to delinting, this process may also destroy harmful seed-surface disease organisms and thus promotes excellent stands from early planting in wet, cool soils.

Treat cotton seed with a fungicide or insecticide, or both, to ensure

protection from diseases and/or insects during germination and emergence.

Seeding rates of 12–14 pounds acid delinted seed (mechanically delinted seed weighs more per pound) per acre dryland and 16–18 pounds per acre under irrigated conditions are recommended. In 30-inch row spacing, a final stand of three to four plants per foot is desired.

Fertilizing

Cotton is highly responsive to fertilizer. Nitrogen, phosphorus and potassium are the major nutrients cotton requires. As with other crops, the amount of fertilizer required for cotton depends on the expected yield. A soil test should be done on each field to ensure that adequate levels of nutrients are present. A profile nitrogen test at a 2-foot depth should be done every 2–3 years. To produce one bale of cotton per acre, approximately 60 pounds per acre of nitrogen must be available. Under dryland conditions in Kansas, 40–50 pounds per acre of actual nitrogen is recommended. Excessive rates of nitrogen, especially when applied early in the growing season, may stimulate excessive vegetative growth, causing plants to grow too tall and to delay fruiting. If a soil test indicates a need for phosphorus and potassium, broadcast and incorporate these materials before planting or band them with the seed at planting. A common practice is to use a starter fertilizer such as 50 pounds per acre of 18-46-0 to supply phosphorus requirements.

Fertilizer recommendations for irrigated cotton are similar to dryland fertilizer recommendations. Nitrogen levels may be increased 10–15 pounds per acre, but lodging and delayed fruiting can lead to harvesting problems and yield loss if excessive amounts are applied.

If manure is used, a nutrient analysis should be run to avoid excessive rates. Cotton will grow adequately in soils with pH of 5.6–9.0, but performs best when soil pH is between 6.0 and 8.0.

Weed Management

Weeds interfere with cotton production by reducing yields, quality and value of the harvested crop. Weeds reduce yields by competing with the crop for space, moisture, nutrients and light. Cotton grows slowly and is not competitive with weeds early in the growing season. Once a dense canopy is developed, cotton is quite competitive with weeds. Therefore, weeds must be controlled early in the growing season to avoid yield losses. Late-season weeds usually do not reduce yields, but can interfere with harvest and contaminate the harvested lint. Weed contamination significantly lowers the value of the cotton lint and may make marketing a challenge. Consequently, good, season-long weed control is essential to produce a successful cotton crop.

Field selection and early planning can help avoid possible weed control and herbicide related concerns. Several herbicides, including atrazine, Glean, Ally, Finesse, Amber, Canopy, Pursuit, Scepter, and Tordon can carry over from the previous crop and injure cotton seedlings. Consult field records for previous herbicide use, and the herbicide label for rotational restrictions.

Cotton is extremely susceptible to 2,4-D and other auxin-type herbicides. Pesticide sprayer equipment must be thoroughly cleaned to remove any herbicide residues prior to use on cotton. Avoid spraying adjacent fields with 2,4-D, if possible. Inform farm neighbors, commercial pesticide applicators and the county noxious weed director of the location of cotton fields to help prevent injury from herbicide drift.

Certain weeds, such as cocklebur and velvetleaf, can interfere with harvest. These weed species are difficult to control with herbicides currently labeled for use in cotton fields in Kansas. Avoid planting cotton in fields with a history of these weeds or severe infestations of any other weeds.

Tillage and herbicides are the primary methods of controlling weeds in cotton. Preplant and between-row cultivation are the most cost-effective method of weed control. Cultivator adjustment is critical for good weed control and to minimize crop damage with between-row cultivation. Row guidance systems allow closer adjustment of the cultivator next to the crop rows and also alleviate operator fatigue.

Several herbicides are labeled for use on cotton in Kansas, including trifluralin (Treflan, Tri-4, Trific, and Trilin), Prowl, Cotoran, Fusilade 2000, Poast Plus, Select, Caparol, and Lorox. There are several other herbicides commonly used on cotton in other states, but they are **not** labeled for use in Kansas.

Trifluralin and Prowl can be used preplant incorporated for control of many annual grasses and certain small-seeded broadleaf weeds such as pigweed. Prowl also can be used preemergence, but generally provides more consistent weed control when incorporated.

Cotoran can be applied preemergence and/or postemergence to cotton and weeds for control of certain annual grass and broadleaf weeds. Postemergence treatments should be applied after cotton is at least 3 inches tall and before weeds exceed 2 inches in height. Addition of a nonionic surfactant may enhance weed control with postemergence applications. The use of Cotoran following a systemic insecticide at planting may result in cotton injury. Do not make more than three applications of Cotoran in one growing season.

Fusilade 2000, Poast Plus, and Select can be applied postemergence

in cotton for control of emerged annual and perennial grasses. These herbicides have excellent safety in cotton and generally provide good control of most grass weeds unless the grasses are drought stressed. Always apply these herbicides in combination with a crop oil concentrate as directed on the herbicide label.

Lorox and Caparol can be applied postemergence directed in growing cotton for control of newly emerged annual weeds. Prevent spray contact with cotton leaves or injury may occur. Apply in combination with surfactants and at the recommended timings according to the respective herbicide labels.

Growth Regulators

The use of growth regulators may be important for cotton growers, especially on irrigated fields. In dryland fields where good soil moisture and high levels of residual nitrogen are present, the application of growth regulators may also be advantageous. Growth regulators will reduce cotton height, may aid in boll retention at desired positions, and often enhance early maturity. Growth regulators can cause fruit shed if plants are stressed and if applied before the crop potential is known.

Under ideal dryland conditions, three applications of growth regulator may be necessary. The first application should be made when the first squares are at "match-head" size. If soil moisture levels continue to be adequate, another two applications should be made at 2- to 3-week intervals.

Irrigated cotton should be treated with a growth regulator at first bloom and again in 2 weeks.

Harvest Aids

Use of harvest aids to speed maturation and drying of cotton is considered "insurance" in areas with a short growing season. To be effective, harvest aids must work slowly so that the leaves fall off rather than burn off. Ideal conditions for harvest aid effectiveness are warm, sunny and calm weather; dry soil, and plants without water stress; low soil nitrogen; leaves still fairly active; and little or no secondary growth.

If harvest aids are used, several decisions must be made. Later bolls may have to be sacrificed if other conditions are right for the chemical application. Nearly 85 percent of the lint is produced from bolls that were set during the first 3 weeks of bloom. Fields are ready to be defoliated when the topmost first position boll that can be harvested is only four nodes above the cracked boll (NACB) in the highest first position. If the field has a high percentage of late plants or bolls not on the first position, wait until the topmost first position boll ready for harvest is at three NACB. The harvest aid must get onto the boll, so if the canopy is heavy, use of a defoliant may be necessary to clear the leaves. Desiccants are used to prepare the plants for stripper-type harvesters; they should be used with care so that the chemical does not drift to adjoining fields and areas.

Disease and Insect Control

Cotton is susceptible to numerous diseases, some of which may not occur widely until the crop has been grown for several years. Seed and seedling diseases are especially important, even in fields new to cotton. Seed treatments and in-furrow fungicide placements are standard in the industry. Soil fungi that can damage cotton seed and seedlings include *Rhizoctonia*, *Phythium*, and *Fusarium*. These fungal diseases can be controlled by numerous protectant and systemic seed treatment products that are labeled in Kansas.

Kansas cotton producers have not faced major damage by insects, but as acreage increases, the potential for insect damage also increases. The cotton boll weevil, historically the major cotton insect in the United States, probably will not survive Kansas winters.

Read and follow all directions, warnings, and precautions on the label before applying any pesticide.

Harvesting

Most cotton is mechanically harvested with pickers or strippers. Picker machines pull the cotton from open bolls, leaving the unopened bolls for later picking. Stripper machines pull all the bolls from a plant. The short-season cotton varieties grown in Kansas are harvested by stripper machines.

Ginning and Marketing

A cotton gin removes burs, sticks, dirt, leaves and other foreign matter to obtain clean lint and seeds. The lint is packed in bales weighing 480 pounds and sent to textile mills. The seed goes to oil mills or is rolled or crushed for cattle feed.

Marketing involves the sale of ginned cotton to textile mills. The value of cotton is determined by the U.S. Department of Agriculture from samples taken from each bale. These samples are classified according to staple and grade. Staple is a measure of the length of the cotton fiber. The longer the fiber, the more valuable the cotton. Color and amount of foreign matter determine grade.

Economics

The total acres of cotton planted and harvested in Kansas showed a steady but modest increase from 1982–1992. In the early 1980's, approximately 400–800 acres of cotton were planted and harvested in Kansas. Planted acreage totaled 2,000 acres in 1991 and 3,000 acres in 1992. Harvested acreage totaled 2,500 acres in 1992.

Two areas of Kansas have most of this cotton acreage—Cowley County and neighboring counties in the south,

and Rice, McPherson and Stafford counties in the central part of the state.

Yields of harvested cotton have ranged from a low of 120 pounds of lint per acre in 1982 to a high of 480 pounds per acre in 1987. The average yield per harvested acre for the 1982–1992 period was 298 pounds of lint. Market prices for lint have ranged from 48.9 cents per pound in 1982 to 58.4 cents per pound in 1987. The average price for the 1982–1992 period was 52.3 cents per pound. Cotton seed prices averaged $103.44 per ton.

Cotton producers depend on lint and cotton seed sales to generate gross income. Producers who are considering adding cotton to their enterprises should evaluate the profit potential of cotton and decide if cotton can add net income to their total operation.

The expected costs and returns from a cotton enterprise are shown in the following budget.

The variable costs shown will vary, depending on the practices of the producer, labor efficiency and the production potential of the soil. With any type of soil, yields can vary greatly, and the producer wishing to increase yields usually can do so by increasing variable inputs and costs.

Fixed costs of production do not vary with the level of production. Once a producer purchases the required equipment or secures land, these costs may be continued even if there is no production. In order to compare the profitability between two potential enterprises, managers can compare the returns over variable costs and select those enterprises which have a high likelihood of increasing net income.

The cost-return budget for cotton production shows expected variable costs, expected fixed costs and expected returns for an average Kansas cotton producer. The budgeted yield is for 450 pounds of lint and 800 pounds of cotton seed per acre. This is above the average yield for all Kansas producers. Because there are few acres of cotton in Kansas, this budget may vary significantly from any single producer. It is important for managers to formulate their own cost and return expectations and to make their decisions on these more specific forecasts. For the new cotton producer, it is important to secure harvest and hauling services before investing in a growing crop.

Cotton is one of the crops covered by USDA/ASCS programs. Producers who have a base in cotton production from prior years may need to divert some of their base acreage to conserving use in order to qualify for deficiency payments. Growers who have no base can plant cotton and establish a base upon which future payments may be earned. Interested producers should contact their county ASCS office for program details.

Summary

With increased interest in cotton as an alternative crop, this publication addresses general production practices for Kansas. Planting early is important to ensure crop maturation before frost. Stand establishment is often difficult due to cool, wet soils. Early maturing varieties have been developed that are adapted to Kansas. Cotton responds to fertilizer applications. Fertilize as recommended by soil test results. Weed control is necessary to produce a high-yielding, quality product. Because cotton is susceptible to phenoxy herbicides, avoid spray drift or sprayer contamination.

As with other alternative crops, production and/or marketing obstacles hinder crop acceptance. Because cotton requires special equipment for harvesting and ginning, make these arrangements before planting.

References

Kansas Agricultural Statistics
KSU Farm Management Guide, MF-939

The use of trade names in this publication is for informational purposes only, and does not constitute an endorsement of a product, nor is any criticism implied of similar products not mentioned.

Table 1. Cost-return budget for cotton production in Kansas

	Example Farm	My Farm
VARIABLE COSTS PER ACRE:		
1. Labor (2 hours @ $8.00 per hour)	$16.00	_____
2. Seed (12 pounds @ $.75 per pound)	9.00	_____
3. Herbicide ($16.75) and insecticide ( )	16.75	_____
4. Fertilizer (45 lb N; 25 lb P_2O_5)	11.40	_____
5. Fuel and Oil	10.00	_____
6. Machinery and equipment repairs	14.00	_____
7. Crop insurance	—	_____
8. Stripping—custom services	40.50	_____
9. Ginning	62.70	_____
10. Trucking	19.00	_____
11. Custom hire	—	_____
12. Crop consulting	—	_____
13. Miscellaneous	15.40	_____
14. Interest on ½ variable costs @ 9%	9.66	_____
TOTAL VARIABLE COSTS	$224.41	_____
FIXED COSTS PER ACRE:		
15. Real estate taxes @ 1%	$5.70	_____
16. Interest on land ($570/A @ 6%)	34.20	_____
17. Cash rent	—	
18. Depreciation on crop machinery ($180/A)	18.00	_____
19. Interest on crop machinery (½ @ 9%)	8.10	_____
20. _____	—	_____
21. _____	—	_____
22. Insurance on crop machinery @ .5 %	.90	_____
TOTAL FIXED COSTS	$ 66.90	_____
TOTAL COSTS PER ACRE	$291.31	_____
RETURNS PER ACRE:		
23. Yield of lint:	450 lb	_____
Yield of cotton seed:	800 lb	_____
Price of lint:	$ .52/lb	_____
Price of cotton seed:	$ .055/lb	_____
24. Net government payment	—	_____
25. Returns per acre:	$278.00	_____
26. Returns over variable costs per acre:	$ 53.59	_____
27. Returns over total costs per acre:	($ 13.31)	_____

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