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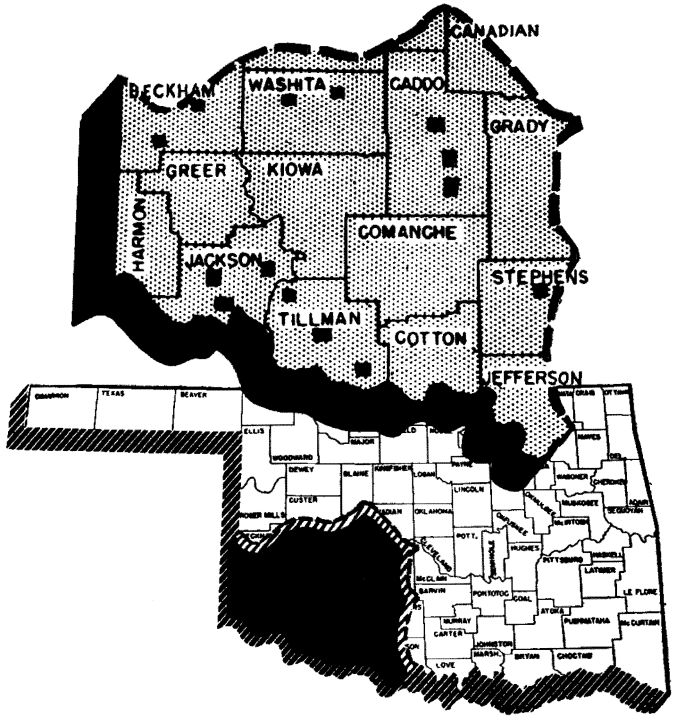
COTTON GROWING In SOUTHWESTERN OKLAHOMA

A Comparison of Present Methods and Recommended Practices



OKLAHOMA AGRICULTURAL EXPERIMENT STATION
Oklahoma A. & M. College, Stillwater
W. L. Blizzard, Director Louis E. Hawkins, Vice Director
in cooperation with
UNITED STATES DEPARTMENT OF AGRICULTURE

SCORE CARD

for

Southwestern Oklahoma

COTTON PRODUCTION PRACTICES

How To Use The Score Card

The use of a scoring system will point up strong and weak points in cotton practices and provide a guide for improvement. It will not furnish an easy solution to the problems of cotton growing. Too much depends on weather and other factors beyond the individual farmer's control.

The way cotton is grown on an individual farm may be evaluated by use of the scoring system presented here, by making adaptations to individual farm conditions.

The fertilization score should not be marked down on farms where soil tests show that fertilizer is not needed. Nor will insect control be needed to the same extent on every farm in every year. Land preparation and cultivation operations need to be evaluated from the standpoint of prior crops and type of soil. Man labor requirements for individual farms may be computed from the farmer's own estimates by operations performed, or from the averages (per acre covered) presented in Appendix Tables 6 and 7 of the Oklahoma Agricultural Experiment Station Bulletin No. B-350. Computed labor requirements may then be compared with lowest probable labor requirements using 4-row tractor equipment (see Table 6, Bulletin B-350). However, proper adjustment in harvest labor requirements in both instances must be made to fit actual yields.

There are other factors in successful cotton production which are even more difficult to measure than the ones considered. For example, rotation of cotton with other crops will aid in controlling insect and plant diseases and reducing soil erosion. In addition, a legume crop in rotation will help to maintain organic matter and nitrogen and improve physical condition of the soil.

SCORE CARD

for

Cotton Production Practices

In Southwestern Oklahoma

Item	Possible Score	Your Farm
Seed and Seeding Rate (20 points)		
Variety	10	
Rate of seeding	5	
Method of planting and spacing	5	
Fertilization (10 points)	10	
Insect Control (10 points)	10	
Land Preparation and Cultivation (30 points)		
Kind of operations	20	
Timeliness of operations	10	
Method and Time of Harvesting (10 points)	10	
Labor Requirements (20 points)		
Compared with lowest probable using 4-row tractor power	20	
TOTAL SCORE	100	

The possible score is based on Experiment Station recommendations and evaluation of information obtained from farmers. Details of how to score the cotton enterprise are presented in Oklahoma Agricultural Experiment Station Bulletin B-350.

What It's All About . . .

Managing a cotton farm to provide a desirable living and an income on investment, and at the same time maintain soil fertility, has been difficult—probably more difficult than for any other important type of farm in Oklahoma. Reduced acreages point up the problem.

Yet cotton remains an important source of income to many Oklahoma farm families, and to the State's economy generally. New production methods now appearing promise to make a stable place for cotton in Oklahoma agriculture. Therefore, research was undertaken to determine the probable value of various new methods as compared to older ways of growing this crop. Results of that research are summarized in this bulletin.

The information presented here was obtained by asking almost 200 representative southwestern Oklahoma cotton farmers how they grew cotton. These men had a total of 16,007 acres in cotton in 1947. Each farm was visited personally, and considerable time was spent in getting complete details as to the methods used by each farm operator. These reports were then compared with experiment station recommendations, which are based on field tests made by station research workers, and on observation of methods that give good results on farms.

Finally, the knowledge obtained was summarized in score card form, to enable an individual cotton grower to compare his methods with those of others, to see in what ways he might save work, increase net income, or both. The score card is given on page 8, and page 8 tells in brief how to use it. Remainder of the publication gives additional information useful in scoring a farm, and in comparing it with other farms in the area.

A general summary of results of the study is given in Table 2 and under the heading "Highlights of the Results" on page 6.

Similar studies have been made of cotton-growing areas in eastern and southeastern Oklahoma. The report on the eastern Oklahoma area has been published as Okla. Agri. Expt. Sta. Bul. No. B-345, "*Cotton Growing in Eastern Oklahoma*," and a report for the southeastern area is being prepared for publication.

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Cotton Growing in Southwestern Oklahoma:

A Comparison of Present Methods and Recommended Practices

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Bureau of Agricultural Economics, U. S. Department of Agriculture

The Rolling Plains cotton section of Southwestern Oklahoma comprises most of 11 counties and parts of 5 others which lie chiefly in the sub-humid rainfall zone (Figure 1). Wide differences in farming systems and crop adaptability are due to variations in soils from sands to "tight" clays and in topography from level to steeply rolling. Cotton is of most importance in cropping systems on the sandier soils. It is somewhat less important on the deep fertile sandy loams, and of least importance on the "tight" shallow clays. Southwestern Oklahoma is the large scale cotton section of the State. From the time the area was opened to settlement up to 1945 cotton was consistently the most important single source of cash income, and over half of the State's acreage has been concentrated here. *In 1944 cotton was grown on 68 percent of the farms in the area.*

Cotton acreage in the area declined from a peak of 2,080,000 acres in 1929 to 532,000 acres in 1948, or 74 percent. This percentage of decline was the same as for the State as a whole during the same period. The greater part of this drastic decline had occurred by the late thirties, when cotton adjustment programs were in full effect (Table 1). During the wartime period, farm labor shortages (particularly shortages of seasonal labor) and relatively high prices for wheat and livestock products contributed in large measure to the change from cotton to wheat and other crops adapted to more nearly complete mechanization.

Cotton yields in the area have varied widely, from a low of 41 pounds of lint in 1934 and 1936 to a high of 223 pounds of lint in 1942. Yield variations have been chiefly due to major differences in quantity and distribution of annual rainfall.

Reduction in wheat acreage is now renewing interest in cotton growing in southwestern Oklahoma. Since significant expansion of cotton acreage is not possible with current adjustment programs, successful farmers will seriously consider ways and means of increasing cotton yields and reducing costs.

With the foregoing considerations in mind, a study of cotton growing methods was begun in the summer of 1948 with a field survey in six counties of the area: Beckham, Washita, Caddo, Stephens, Tillman, and Jackson, The broad objectives of this study were:

(1) To provide a current picture of

* Stationed at Stillwater, Oklahoma, with the Department of Agricultural Economics, Oklahoma Agricultural Experiment Station. This publication is based partly on an analysis of data obtained in a study of cotton growing methods conducted by the Bureau of Agricultural Economics in cooperation with Southern agricultural experiment stations. E. Lee Langsford, BAE, provides national leadership of the project; and Dr. Peter Nelson, Head, Department of Agricultural Economics, Oklahoma Agricultural Experiment Station, is general supervisor of the work in Oklahoma. In addition to the suggestions and helpful criticisms of the above in the planning and analysis of this study, other members of the Department of Agricultural Economics at Oklahoma A. & M. College also helped with the manuscript review. In particular, John D. Campbell gave the manuscript painstaking care with resulting helpful suggestions for improvement, and Ada B. Eden furnished material assistance in assembling, summarizing and checking the data. Valuable aid given by production specialists in the Experiment Station and the Oklahoma Agricultural Extension Service is acknowledged on page 14.

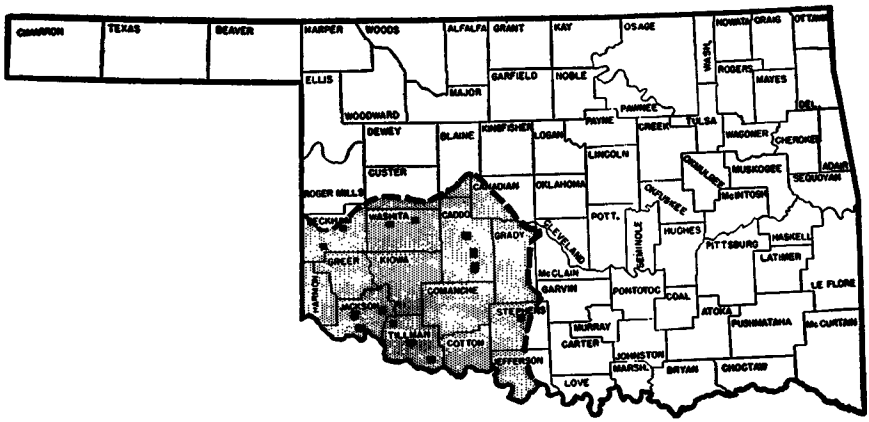

Fig. 1.—Location of Rolling Plains cotton section of Southwestern Oklahoma. Sample areas are indicated by the small, black squares.

practices used in producing cotton and other major crops;

(2) To ascertain the variation in use of fertilizer, insecticides, and other improved practices, and in degree of mechanization; and

(3) To evaluate the economic significance of these production practices and techniques.

This publication describes current methods of growing cotton, presents the variation in these methods, and compares present practices with experiment station recommendations. It also suggests a method of scoring present cotton production practices on individual farms.

Highlights of the Results

Table 2 shows composite scores for the farms visited in making this study. In general, farmers were following a good system of cotton production. They were close to experiment station recommendations on planting seed and seed rates, timeliness of operations, and method and time of harvesting. They were short of recommendations with respect to insect control, fertilization, and kind of needed tillage operations such as contour planting, listing, and chiseling. Labor requirements are higher than justified by the amount of farm land in southwestern Oklahoma adapted to the use of 4-row tractor operations but now cultivated principally with 2-row equipment. Size of farm is now less of a limiting factor to the use of 4-row equipment in the area than in the past.

Out of a possible score of 100, small and medium farms each had scores of 70, and large farms a score of 75. The higher score for the large farms was due principally to three factors: (1) better insect control, (2) good land preparation and cultivation, and (3) low labor requirements per acre and per pound of cotton produced. The high scores for the last two items were due to the higher proportion of 4-row and other large equipment used on the large farms.

Small farms, however, received highest scores for cotton varieties planted and method and time of harvesting.

Table 1.—Estimated Cotton Acreage, Production, and Yield Per Acre; Oklahoma and Southwestern Rolling Plains, Selected Periods.

Item	Yearly Periods; Average				Changes 1943-47 from	
	1928-32	1935-39	1943-47	1948	1928-32	1935-39
Oklahoma						
Acreage (Thousand Acres)	3,804	2,197	1,298	1,069	—2,506	—899
Prod. (Thousand Bales)	1,109	544	379	374	— 730	—165
Yield (Lbs.)*	139	118	140	168	+ 1	+ 22
Southwestern Rolling Plains						
Acreage (Thousand Acres	1,797	1,032	675	532	—1,122	—357
Prod. (Thousand Bales)	552	228	197	220	— 355	— 31
Yield (Lbs.)*	147	106	139	197	— 8	+ 33

* Yield per acre in cultivation July 1.

Table 2.—Composite Scores for Present Cotton Production Practices on Farms in Southwestern Oklahoma.

Item	Possible Score*	Small farms	Medium farms	Large farms
Seed and Seeding Rate (20 points)				
Variety	10	9	8	7
Rate of seeding	5	5	5	5
Method of planting and spacing	5	5	5	5
Fertilization (10 points)	10	5	4	5
Insect Control (10 points)	10	1	4	5
Land Preparation and Cultivation (30 points)				
Kind of operations	20	13	12	15
Timeliness of operations	10	9	10	10
Method and Time of Harvesting (10 points)	10	9	8	8
Labor Requirements (20 points)				
Compared with lowest probable using 4-row tractor power	20	14	14	15
TOTAL SCORE	100	70	70	75

* Based on Experiment Station recommendations and evaluation of information obtained from farmers. The method of rating cotton practices is discussed in detail on pages 12 to 27.

How To Use The Score Card

The use of a scoring system will point up strong and weak points in cotton practices and provide a guide for improvement. It will not furnish an easy solution to the problems of cotton growing. Too much depends on weather and other factors beyond the individual farmer's control.

The way cotton is grown on an individual farm may be evaluated by use of the scoring system presented here, by making adaptations to individual farm conditions. A score card for this purpose has been prepared (see below).

The fertilization score should not be marked down on farms where soil tests show that fertilizer is not needed. Nor will insect control be needed to the same extent on every farm in every year. Land preparation and cultivation operations need to be evaluated from the standpoint of prior crops and type of soil. Man labor requirements for individual farms may be computed from the farmer's own estimates by operations performed, or from the averages (per acre covered) presented in Appendix Tables 6 and 7 for the various operations by size of tractor or horse-drawn equipment. Computed labor requirements may then be compared with lowest probable labor requirements using 4-row tractor equipment (see Table 6). However, proper adjustment in harvest labor requirements in both instances must be made to fit actual yields.

There are other factors in successful cotton production which are even more difficult to measure than the ones considered. For example, rotation of cotton with other crops will aid in controlling insect and plant diseases and reducing soil erosion. In addition, a legume crop in the rotation will help to maintain organic nitrogen and improve physical condition of the soil.

SCORE CARD

for

Cotton Production Practices in Southwestern Oklahoma.

Item	Possible Score	Your farm
Seed and Seeding Rate (20 points)		
Variety	10	
Rate of seeding	5	
Method of planting and spacing	5	
Fertilization (10 points)	10	
Insect Control (10 points)	10	
Land Preparation and Cultivation (30 points)		
Kind of operations	20	
Timeliness of operations	10	
Method and Time of Harvesting (10 points)	10	
Labor Requirements (20 points)		
Compared with lowest probable using 4-row tractor power	20	
TOTAL SCORE	100	

The possible score is based on Experiment Station recommendations and evaluation of information obtained from farmers. The method of rating cotton practices is discussed in detail on pages 12 to 27.

Production Resources on Sample Farms

Methods and equipment used in growing cotton frequently vary somewhat according to the number of acres grown on any one farm. Therefore, in this study the farms surveyed were divided into three groups—small, medium, and large—according to the acreage of cotton grown.

In 1944, based on census data including the same size groups as used in the field survey, nearly half (44 percent) of the farms had less than 30 acres of cotton per farm; yet this group accounted for less than one-fifth (17 percent) of the cotton acreage (Table 3). Conversely, only 6 percent of the farms had 100 acres or more of cotton per farm, but they accounted for 24 percent of the cotton acreage. Almost 50 percent of the farms were in the medium or middle-size group, and they had about 60 percent of the cotton acreage and production. In 1944, cotton yields were highest on small farms, 216 pounds lint per acre, and lowest on large farms, 155 pounds per acre. This difference in yield may have been due partly to factors peculiar to the year of 1944. In the field survey, no major differences in cotton yields for the three size groups were apparent for the year of 1947 (see Appendix Table 5 on page 30).

Before a detailed evaluation of the cotton enterprise is undertaken, some of the important characteristics of the entire farm setup should be examined. Indicated in Table 4 is the size of farm, other crops, livestock, and labor on the three groups of farms studied in 1947. Farms with small cotton acreages had an average of about 179 acres of total land and 107 acres of cropland, on small farms, 66 additional acres were in cropland although medium farms had only about 60 acres more of total land. However, medium farms had more than three times as much cotton, 32 percent of the cropland. More than three quarter sections of total land were inbut only 16 acres of cotton, or 15 percent of the cropland. Due to a smaller pasture acreage on medium farms than cluded in the average for large farms and 353 acres of cropland, over half of which was planted to cotton. Wheat was a major cash crop on over one-half of the cotton farms surveyed. Grain sorghums was another cash crop (about 90 percent sold and 10 percent fed) on many cotton farms; and several farms, particularly in the small and medium groups, had sizeable acreages of peanuts. Twenty-four out of twenty-five farmers reporting peanuts in all size groups were located in Caddo and Stephens counties. Hay and other feed crops accounted for most of the remaining crop acreages. The intensive nature of present farming in southwestern Oklahoma is indicated by the very small acreage of idle cropland.

Tractors were reported in 1947 on 88 percent of the small, 97 percent of the medium, and 100 percent of the large farms. Large farms had an average of almost two tractors per farm. A comparison with 1944* indicates the greater extent of mechanization in 1947, particularly on small cotton farms, as well as a probable increase in the average size of farms growing cotton. In 1947, only a few farms had both tractor and workstock; workstock as a source of power in southwestern Oklahoma is practically a thing of the past.

Only three farmers, all located in Caddo county, reported the use of sharecropper labor. Two were medium size farms, and one was in the large group.

* Table 3.

*Table 3.—Cotton Harvested—Farms Reporting, Acreage and Production, 1944.**

Size Group (acres in cotton)	Farms reporting		Acres of cotton		Bales Produced		Percent of farms having tractors
	Total number	Percent of total	Total number	Percent of total	Total number	Percent of total	
Small (under 30)	8,354	44.3	134,010	17.4	60,556	20.1	50.2
Medium (30-99)	9,285	49.2	450,155	58.5	180,001	59.9	80.7
Large (100-over)	1,221	6.5	185,355	24.1	60,223	20.0	95.5
Total	18,860	100.0	769,520	100.0	300,780	100.0	68.2

* Data from Table 1, Special Report—Cotton Farms Classified by Acreage Harvested, U. S. Census, 1945.

Table 4.—Land Use, Cropland, Livestock and Resident Labor Organization, Average per Farm, by Size of Farm, 1947.

Item	Small farms*	Medium farms*	Large farms*
	Acres	Acres	Acres
Land Use:			
All land in farms	178.6	238.4	490.2
Owned	93.2	83.0	203.9
Rented in	85.4	155.4	286.3
Total cropland	106.9	173.0	352.8
Permanent pasture	56.9	48.6	110.8
Cropland Organization:			
Cotton	16.0	55.2	181.5
Wheat	35.7	38.1	86.7
Corn	4.9	5.4	4.7
Grain sorghums	8.8	21.4	25.3
Other sorghums	15.0	12.6	9.9
Oats	5.5	6.0	5.4
Peanuts	8.3	5.9	6.3
All hay except peanut	8.3	18.6	27.1
All other crops	3.3	7.9	7.9
Idle	1.2	1.9	.7
Acreage double-cropped	.1	—	2.7
	Number	Number	Number
Livestock Organization:			
Workstock	.6	.6	.3
Milk cows	3.7	4.1	2.6
Other cows	3.8	2.0	3.3
All other cattle	7.1	8.1	11.3
Brood sows	.3	.3	.3
Hens and pullets	81.1	67.3	71.9
Tractor	.9(44)**	1.2(63)**	1.8(64)**

Labor organization:	No. families	No. workers	No. families	No. workers	No. families	No. workers
Operator	1.0	2.1	1.0	2.3	1.1	2.0
Cropper	—	—	.03	.14	.1	.3
Other tenant	—	—	—	—	—	—
Wage hand	—	—	.03	.03	.6	.9

* 50 small farms, 65 medium, 64 large farms. Small, 1 to 29 acres of cotton; medium, 30 to 99 acres of cotton; large, 100 acres of cotton and over.

** Figures in parentheses refer to number of farmers reporting tractors. By groups, 45 tractors were reported on small farms, 78 on medium farms, and 118 tractors on large farms.

On one of the medium farms the sharecropper family provided or hired all labor needed for a cropping system including hay and feed crops in addition to cotton. On the other medium farm, two sharecropper families, and on the large farm, 5 sharecropper families, provided labor in addition to that provided by the operator and his family. On these latter farms, the sharecropper family shared on a 50-50 basis only in the cotton enterprise. Two farmers in the medium and 18 in the large group reported the use of regular wage hands in 1947. Only 1 wage hand per farm was reported in the medium group, but as many as 5 wage families were reported on a single farm in the large group.

Indicating the typical ownership pattern in southwestern Oklahoma, the largest proportion of the farm land was owned on small cotton farms and the least on medium cotton farms (Table 4). About 60 percent of the small farms, 47 percent of the medium, and 53 percent of the large farms were operated by full or part-owners. However, only 11 percent of the large farms were held in full ownership, compared with 46 percent of the small and 32 percent of the medium farms. The predominant tenure arrangement was share—one-fourth of the cotton and peanuts and one-third of the wheat and feed crops. Cash rental was slightly more important than share rental on small farms, but was of minor importance on medium and large farms.

The Effect of Wheat on Farm Organization

The differing characteristics of cotton farms with wheat and those without wheat is indicated by much larger acreages of total land and cropland on farms with wheat (Table 5.) In addition, cotton-wheat farms had actually more acres of cotton per farm, although the proportion of cropland in cotton was less. Cotton acreages were only slightly greater for the small and medium groups, but large cotton-wheat farms had 75 acres (55 percent) more cotton than large cotton farms with no wheat. Most of the additional cropland on small and medium cotton-wheat farms was in wheat (about 70 acres per farm), grain sorghums for sale, and feed crops. Wheat, 146 acres, and the additional cotton acreage accounted mainly for the additional cropland on large cotton-wheat farms. In general, peanuts were of most importance on cotton farms with no wheat. There were more cattle on cotton-wheat farms to utilize wheat pasture and greater acreages of other feeds. There were also more tractors per farm on cotton-wheat farms.

Cotton Growing Practices

The following pages present details of the procedure followed in evaluating the various factors used in developing the scoring system. This will aid in using the score card, and will also serve to give a general picture of cotton production practices now in use and recommended. In preparing the scoring system, and rating present practices, economists were aided by produc-

and Without Wheat, 1497.

Item	Small Farms		Medium Farms		Large Farms	
	Without wheat	With wheat	Without Wheat	With Wheat	Without Wheat	With Wheat
	Acres		Acres		Acres	
Land Use:						
All land in farms	127.0	230.1	177.0	294.4	270.4	640.6
Owned	68.0	118.2	57.4	106.3	87.3	283.6
Rented in	59.0	111.9	119.6	188.1	183.1	357.0
Total cropland	65.5	148.2	120.2	221.1	209.2	451.1
Permanent pasture	54.2	59.6	45.3	51.6	53.3	150.2
Cropland Organization:						
Wheat	---	71.4	---	72.9	---	145.9
Cotton	14.8	17.3	52.3	57.8	137.1	211.9
Corn	5.2	4.7	6.4	4.4	5.2	4.4
Grain sorghums	3.0	14.5	14.6	27.6	22.1	27.5
Other sorghums	19.3	10.8	15.4	10.1	14.1	7.1
Oats	.4	10.7	.5	11.0	2.3	7.6
Peanuts	12.5	4.0	9.9	2.2	3.9	7.9
All hay except peanut	5.6	10.9	8.7	27.7	18.7	32.8
All other crops	3.0	3.5	10.7	5.4	4.0	10.6
Idle	2.0	.4	1.7	2.0	1.8	---
Acreage double-cropped	.3	---	---	---	---	4.6
	Number		Number		Number	
Livestock Organization:						
Workstock	.9	.2	.5	.6	.1	.6
Milk cows	2.8	4.6	3.9	4.4	3.0	2.4
Other cows	2.6	4.9	2.7	1.4	2.0	4.2
All other cattle	5.6	8.6	5.8	10.2	7.8	13.7
Brood sows	.1	.5	.3	.3	.3	.4
Hens and pullets	74.9	87.3	64.4	69.9	87.5	61.2
Tractor	.8(20)*	1.0(24)*	1.1(31)*	1.3(32)*	1.3(26)*	2.2(38)*
Number of farms	25	25	31	34	26	38

tion specialists of the Oklahoma A. & M. College experiment station and extension service who are familiar with both research results and cotton practices now in use on farms.*

SEED AND SEEDING RATE:

Variety, Rate of Seeding, and Method of Planting and Spacing

Recommendations

A good cotton variety should be a high yielder, have a good lint turnout, stormproofness, a length of staple in market demand, and a fiber which cleans well at the gin and has good spinning quality. A cotton variety with relatively large boll size is important in hand harvesting. Close fruiting and medium maturity are also desirable. Some of the more common varieties which appear to meet most of the above tests are Mebane 140 (Lockett 140, Mebane 6801 and Marv-L-S-Cluster), Northern Star, Lankart 57, Stoneville 62, and Deltapine.** Northern Star and Lankart appear better adapted to tight upland than to bottomland soils, and Stoneville and Deltapine to the eastern counties of the area. To insure varietal purity, the farmer needs a reliable source of planting seed, and the seed should be certified or eligible for certification. Therefore, the use of purchased planting seed is considered more desirable because home-grown seed involves greater possibility of contamination and mixing. However, farmers with gin and other facilities available to preserve purity of seed should not hesitate to save home-grown seed of high quality. A good practice is to plant sufficient registered seed each year to insure quality seed for the next year's crop.

In southwestern Oklahoma seeding rates as low as 8 pounds of high germinating non-delinted seed and 5 pounds of delinted seed are sufficient to plant an acre of cotton, provided weather conditions are favorable. However, about 16 pounds of fuzzy and 8 pounds of delinted seed per acre are more usual seeding rates. Spacings of from 8 to 16 inches with 1 to 3 plants in the hill appear to be satisfactory.

Present Practices

The total cottonseed used per acre of cotton planted in 1947, for both planting and replanting, amounted to 21 pounds on small farms, 20 pounds on medium farms, and 17 pounds on large farms. The usual seeding rate per acre (once over) was 16 pounds for non-delinted seed and 8 pounds for delinted seed. A majority of the cotton acreage was planted with purchased seed, with the percentage of purchased seed greater on the small and medium farms than on large units. However, on large farms, 39 percent of the cotton acreage was planted with home-grown seed in 1947. About three-fourths of the purchased seed had been treated when bought, but a much smaller quantity had been delinted. Only a small proportion of the home-grown seed (none on small farms) was treated or delinted.

In 1947, Half and Half and Hi-Bred were the chief varieties grown in terms of acreage planted. Northern Star and the Mebane 140 strains (including

* Dr. John M. Green, Agronomist, in charge of cotton research, Oklahoma Agricultural Experiment Station, (Co-op U.S.D.A.), I. M. Parrott, superintendent of the Oklahoma Cotton Research Station at Chickasha, and Wesley C. Chaffin, Oklahoma Extension Agronomist, reviewed the entire manuscript and furnished suggestions for the agronomic sections. Dr. Horace J. Harper, Soils Scientist, Oklahoma Agricultural Experiment Station, furnished suggestions for the sections on fertilization and land preparation and cultivation. Dr. F. A. Fenton, Entomologist with the Experiment Station, furnished suggestions for presentation of the section on insect control. W. J. Oates, Agricultural Engineer in charge of the Experiment Station's cotton mechanization research, reviewed the manuscript and furnished suggestions for the sections on land preparation and cultivation and labor and power requirements.

** Oklahoma Agricultural Experiment Station Bul. No. B-343, *"Cotton Varieties for Oklahoma."*

Lockett 140 and Marv-L-S-Cluster) were other important varieties. Deltapine was a considerable proportion of purchased seed on small and medium farms in the eastern counties. Eleven varieties were reported by farmers in the small group and 10 varieties by farmers in both the medium and large groups. Most of the cottonseed was of recent origin, although 22 percent of all seed, 15 percent of purchased and 33 percent of home-grown, on large farms was over three years from breeder or not known.

In southwestern Oklahoma, cotton was planted usually solid-in-drill and hand chopped to a stand in 1947. However, on large farms, 13 percent of the acreage was hill dropped and 30 percent of the cotton planted solid-in-drill was left unspaced. Therefore, on large farms 39 percent of all cotton was planted to a stand. Two farmers reported the use of mechanical cotton choppers on 3 percent of the acreage in the large group. About half of the cotton was planted in 40-inch rows and half in 38-inch rows. A few farmers reported 36-inch or 42-inch rows. Spacing in row ranged from about 5 inches to 16 inches.

Details of "Planting Seed and Method of Planting and Spacing" are summarized in Appendix Tables 1 *and* 2.

Rating of Present Practices

(20 points)

Variety, with a total of 10 possible points, was evaluated on the basis of kind, source of seed, and years from breeder. A top score of 5 was given for a variety, such as Lockett 140, Lankart 57, Northern Star, and Deltapine and Stoneville 62 (in eastern counties), which had shown up well in experiment station tests. Other varieties, which were not as good, were rated 4, 3, etc. Purchased seed was given a rating of 2 points and home-grown seed 1 point. Seed which was direct from breeder was given a rating of 3 points. Seed two years from breeder was rated 2 points, and seed three years from breeder, 1 point. Any seed more than three years from breeder was given 0 points. On the basis of these ratings, small farms appeared to have the best seed, followed by medium and large farms.

Rate of seeding (5 points) was based on an average of at least 12 pounds of seed not delinted and 8 pounds of delinted seed per acre. All size groups were given a rating of 5 out of 5 possible points, but one point should be subtracted for each 2 pounds under the minimum seeding rates. The low seeding rates reported by some farmers indicate a deliberate chance of replanting should weather conditions prove unfavorable. However, chopping labor saved is expected to more than offset this risk. A rating of 5 out of 5 possible points for method of planting and spacing was given to all size groups.

In summary, small farms received 19; medium farms, 18; and large farms, 17 out of 20 points for this general group.

FERTILIZATION

Recommendations

In southwestern Oklahoma the profitable use of commercial fertilizers is doubtful except on the sandier, low producing soils; a lack of proper moisture, rather than lack of plant food in the soil, is frequently the major limiting factor in cotton production. Favorable results with fertilizer appear more likely in Caddo, Cotton, Comanche, Stephens, and Grady counties than in areas farther west. For maximum returns, fertilizers (100 pounds of 4-16-0 or 4-12-4 per acre) should be applied on sandy soils with normal cotton yields of 150 pounds lint or less per acre. The response to fertilizer will depend upon

age rainfall during the growing season, fertilizer may result in significant increases in yields on soils with normal cotton yields up to 300 pounds lint per acre. Fertilization combined with deep plowing appears promising on some sandy soils. The application of cotton burs to the land may also serve to increase yields.

Present Practices

Only 4 percent of the cotton acreage on small farms and 3 percent on large farms was fertilized in 1947. No cotton was fertilized on medium size farms. On one of the small farms, located in Jackson county, 100 pounds of 0-10-10 per acre was used on sub-irrigated sandy loam soil with a normal cotton yield of 275 pounds; and on the other small farm, located in Caddo county, 200 pounds of 5-10-5 per acre was used on sandy soil with a normal yield of 250 pounds lint. On the four large farms, 4-12-4 was used in each instance at the rate of about 100 pounds per acre. All of the large farms were located on sandy loam soils, two each in Caddo and Tillman counties.

Rating of Present Practices (10 points)

Since fertilizer treatment may pay each year on about 10 percent of the cotton acreage in the area and under favorable conditions on an additional 10 to 20 percent, 10 points have been assigned in the score card for fertilization. In rating fertilizer practices on individual farms, soil type, normal cotton yields, and usual moisture conditions must all be considered. Ratings on this basis for the three size groups indicated 5 points for small and large farms and 4 points for medium farms.

INSECT CONTROL

"In the western part of the State the boll weevil either does not occur or is not a limiting factor in cotton production. For this section, we recommend two applications of 3-5-40 or 20 percent chlorinated camphene (toxaphene) plus 40 percent sulfur at the rate of 10 to 12 pounds per acre per application or a 10 percent DDT dust at the same rate, depending upon availability and comparative costs. These applications should be made to control the bollworm and only under conditions where this pest occurs."*

In the eastern counties of the area, Grady, Stephens, Cotton, Comanche, and Caddo, ... the weevil does not occur in injurious numbers early in the season but may... migrate into the cotton fields in mid-season and cause damage. Since the bollworm is also a problem in this section, we recommend three applications of 3-5-40 or 20 percent chlorinated camphene plus 40 percent sulfur in mid-season beginning about July 30 and spaced at 5-7 day intervals primarily timed to control bollworms."*

Grasshoppers often cause considerable damage to cotton. In years of heavy infestation, farmers are usually able to obtain bait at mixing stations by paying a small fee.

In southwestern Oklahoma regular and periodic checks of cotton for indications of insect activity are advisable (at least once-a-week). If infestation is allowed to progress too far, the damage may be done before poison applications can be effective.

Present Practices

About 75 percent of cotton farmers interviewed reported no poison used during the past ten years. On the other

* Oklahoma A. & M. College Extension Service Cir. No. 499, *"Control Recommendations for Cotton Insects."*

hand, many of those using poison had several years' experience with its application. On 23 percent of the large farms, 12 percent of the medium farms, and 8 percent of the small farms, poison had been used two or more years during the past ten. In 1947, about 9 percent of the cotton acreage was poisoned by 11 percent of the farmers. Calcium arsenate only (for boll weevil) was used on 42 percent of the acreage poisoned; while sulfur only or in mixtures was used on the remaining acreage.

The application per acre, once over, varied from 6.8 pounds for calcium arsenate and sulfur to 12.1 pounds for sulfur alone. Most cotton was poisoned one or two times during the month of July. Two to four applications were more important for cotton poisoned with calcium arsenate than for other insecticides.

Twelve of the 19 farmers who poisoned in 1947 were in Caddo county, 4 in Washita, and 3 in Stephens. Although no poison was used in 1947, 11 Tillman county farmers reported poison used during the past 10 years, for boll worms or fleahoppers.

Details of "Poison Practices" are summarized in Appendix Tables 3 *and* 4.

These data indicate the nucleus for an effective insect control program in southwestern Oklahoma. New insecticides, now increasingly available, should furnish farmers with more adequate means of control.

Rating of Present Practices (10 points)

Rating of present practices was based on 5 points for need, correct kind, and quantity of poisoning. An average of use of poison three times during the past ten years was considered desirable for control with 3 points for this factor. For individual farm evaluation 3 points would be given for use of poison three years in past ten, 2 points for two years in past ten, and 1 point for one year in past ten. One point each was assigned for proper kind and quantity of material. Two points were assigned for proper number of applications (usually two) and 3 points for proper time of application. On the basis of these evaluations, small farms received 1 point; medium farms, 4 points; and large farms, 5 points.

LAND PREPARATION AND CULTIVATION

Recommendations

In general, operations recommended are those which will result in thorough preparation of the seedbed; thoroughness of cultivation to destroy weeds and grass, loosen the soil, and conserve moisture; and chopping or planting to the desired stand. All of these operations must be performed on time for maximum production. In southwestern Oklahoma these recommendations boil down to a proper system of soil and water management. Planting cotton in rows approaching the contour instead of parallel with the slope, terracing, and the erection of level terraces with closed ends on land with a slope of less than 1 percent, are important water conservation practices in sub-humid southwestern Oklahoma. Deep plowing on sandy land with a sandy clay subsoil to increase the clay content of the surface soil reduces wind erosion and increases cotton yields at little cost. This would be a profitable practice on approximately 200,00 acres of land adapted to cotton in southwestern Oklahoma. Other desirable tillage operations for storing moisture and reducing wind erosion are listing and chiseling. Deep tillage offers little opportunity for increasing

cotton production on soils with dense clay subsoils ("tight land"), although good yields may occur when rainfall is favorable.

Present Practices

Most cotton farmers were doing a fair job of land preparation and cultivation, both as to kind and timeliness of operations, but the best jobs were found on the large farms. A greater proportion of the cotton acreage was listed on small and large farms than on the medium units. *Details of kind of operations performed may be determined from Appendix Tables* 6 *and* 7, *and "time of operations" is discussed under "Labor and Power Requirements," page* 22.

Rating of Present Practices (30 points)

Kind of operation was given a rating of 20 points and time of operation, 10 points. The higher rating for kind of operation is to emphasize the importance of water conservation measures, and of special tillage operations needed on some but not all cotton farms. Small and medium farms received a rating of 22 points for the two comparisons; and large farms, 25 points.

METHOD AND TIME OF HARVESTING

Recommendations

Cotton should be harvested as soon as possible or profitable after the bolls open to reduce weather damage. In southwestern Oklahoma most cotton is hand snapped and snapped cotton from varieties adapted to the area can be well cleaned by modern gin machinery available in most localities. Gin operators with this equipment also can do much toward cleaning mechanically harvested cotton which does not contain excessive quantities of foreign matter.

Present Practices

Most of the cotton grown in 1947 was harvested by hand snapping. However, one percent of the cotton on medium farms and two percent on large farms was harvested with two-row strippers. Principally, these strippers were used late in the season to salvage cotton not harvested by hand. On small farms, one percent of the cotton was hand picked. Hired labor was important in cotton harvesting for all size groups. Farmers and their families on small farms were able to harvest a larger proportion of cotton with their own labor than on the other size groups. Three of the 9 farmers with 14 percent of the cotton that was stripped reported the machine hired on a custom basis; and one farmer reported 40 bales stripped for others. The farmers interviewed reported that about 1900 pounds of snapped cotton and 2200 pounds of stripped cotton were required to make a 500-pound gross bale.* Of this amount, about 825 pounds were seed. Lint turnout varied by variety and to a lesser extent by general type of soil. For example, lint turnout reported on large farms was higher due to a greater proportion of Half-and-Half and Hi-Bred cotton planted. Variation in the quality of harvesting also affected the lint turnout. *Details of "Cotton Harvesting Practices" are summarized in Appendix Table* 5. Also, further consideration of the harvesting operation is presented under the heading "Labor and Power Requirements".

Rating of Present Practices (10 points)

The quality of the harvesting opera-

* The difference as reported probably was due to differences in seasonal conditions. Recent results at the Oklahoma Cotton Research Station at Chickasha indicate that there is less than 50 pounds difference in snapped and stripped cotton harvested on same day required to make a bale. Figures reported above include seasonal averages and all varieties reported.

tion is influenced by the variety planted and weather conditions, including frost dates, as well as by the harvesting method used. In rating present harvesting practices, these factors have been considered. For best quality, at least 70 percent of the cotton should be open and available for first pulling before frost, about November 1. For 70 percent or more cotton harvested by November 1, a rating of 4 points was given; 60-69 percent, 3 points, and 50-59 percent, 2 points. An additional rating of 4 points was given for *all* cotton harvested by December 1. For each 5 percent or fraction of cotton remaining for harvest after December 1, one point was subtracted. Two points were assigned for snapping and 1 point for mechanical harvesting. Based on these considerations, small farms received a rating of 9 points; medium farms, 8 points; and large farms, 8 points.

The problem of harvesting affected the varieties planted by farmers on the several size groups. Early, even-maturing and easy-to-harvest varieties were of most importance on large farms and least important on small farms. Operators of large cotton farms must employ large crews of cotton pullers to get their crop harvested. This problem of seasonal labor is less intense on the smaller farms. The balancing of resources to fit needs must be considered by all farmers, and the degree to which it is attained has much influence on success or failure. For example, no cotton variety has yet been developed that ranks first in all of the desirable factors of good yield, high gin turnout, ease of harvest, early maturity, and long staple.

LABOR AND POWER REQUIREMENTS

The most efficient and profitable cotton production practices are the ultimate goals of cotton research. In any kind of planning on cotton farms, consideration should be given to both the labor *needed* to grow cotton and major competing crops and the labor *available* for crop production. This evaluation will influence the amount of cotton which can be safely grown, and the other crop and livestock enterprises which can be introduced into the farming system. A first step in this process is the determination of labor and power requirements for cotton. Therefore, the purpose of this section is to summarize man labor and power requirements for cotton and to provide a standard for evaluating efficiency of labor and power use.

Present Practices

Usual Labor Requirements.—Usual labor requirements on cotton when using tractor-drawn equipment, as reported by the farmers visited, varied from 27.7 man hours per acre on farms with 4-row equipment to 34.6 man hours per acre on farms with 1-row equipment (Table 6). Most of the cotton, 77 percent, was produced with 2-row equipment which usually required 30.1 man hours and 5.1 tractor hours. Four-row equipment accounted for 16 percent, and 1-row equipment 2 percent of the cotton in 1947 on farms visited. A combination of 2 and 4-row tractor equipment was used on four percent of the cotton acreage. Average hours required to produce cotton with horse-drawn equipment, 1 percent of the cotton acreage, were 36 hours of man labor and 28.2 hours of horse labor.*

Preharvest man labor requirements using 2-row tractor equipment were 75 percent of the requirements with 1-row equipment and 126 percent of requirements with 4-row equipment. Man labor for chopping and hoeing required 7.5 hours on 1-row and 2-row tractor farms and 6.6 hours on 4-row tractor

* Averages reported in Appendix Table 7 adjusted to 175 pounds lint yield.

Table 6.—Usual Operations, Labor and Power Requirements, for an Acre of Cotton, Using Tractor-Drawn Equipment, 1947.

Item	Size of Equipment	Acres per 10 hour day	Times Over	Hours per acre	
				Man	Tractor
	Two-Row				
Cutting stalks	2-row	33	0.5	.15	.15
Flat breaking	2-14″	10	0.5	.50	.50
Listing (bedding)	2-row	20	1.0	.50	.50
Harrowing	2-sect.	33	1.0	.30	.30
Planting	2-row	20	1.0	.50	.50
Cultivating	2-row	20	5.0	2.50	2.50
Chopping (hoeing)	Hand	2	1.5	7.50	---
Total pre-harvest				11.95	4.45
Snapping	Hand	400*	---	17.50	---
Hauling**	2-bale	15	---	.68	.68
Total				30.13	5.13
	Four-Row				
Cutting stalks	5-row	65	0.5	.08	.08
Flat breaking	2-14″	10	0.5	.50	.50
Listing (bedding)	4-row	40	1.0	.25	.25
Cult. before planting	5-row	65	2.0	.30	.30
Planting	4-row	40	1.0	.25	.25
Cultivating	4-row	40	6.0	1.50	1.50
Chopping (hoeing)	Hand	3	2.0	6.60	---
Total preharvest				9.48	2.88
Snapping	Hand	400*	---	17.50	---
Hauling**	2-bale	15	---	.68	.68
Total				27.66	3.56
	One-Row				
Flat breaking	1-plow	6	0.5	.85	.85
Disc harrowing	5-ft.	17	0.5	.30	.30
Listing (bedding)	1-row	10	1.0	1.00	1.00
Harrowing	2-sect.	33	1.0	.30	.30
Planting	1-row	10	1.0	1.00	1.00
Cultivating	1-row	10	5.0	5.00	5.00
Chopping (hoeing)	Hand	2	1.5	7.50	---
Total preharvest				15.95	8.45
Snapping	Hand	400*	---	17.50	---
Hauling**	1-bale	9	---	1.11	1.11
Total				34.56	9.56

* Pounds per 10-hour day. Usual per acre yield of cotton is 175 pounds lint (.37 bale) which is equivalent to 700 pounds seed cotton and trash snapped.

** In each case, tractor and trailer.

farms. This one operation accounted for 63 percent of total preharvest labor requirements on farms with 2-row equipment and 70 percent on farms with 4-row equipment. Examination of the data indicated that farmers with 4-row equipment were saving approximately 1 hour of chopping and hoeing labor per acre by one additional cultivation requiring .25 hours of man labor and tractor power.* Successful mechanization of this operation would reduce preharvest labor requirements materially.

Tractor hours required with 1-row equipment are 86 percent greater than with 2-row equipment and 169 percent greater than with 4-row equipment. Compared with the average reported for horse power, one hour of 1-row tractor power has replaced about 2.9 horse hours; 2-row tractor power, 5.5 horse hours; and 4-row tractor power, 7.9 horse hours in cotton production.

Snapping, the usual method of harvesting cotton in southwestern Oklahoma, required a total of 17.5 hours per acre, or 58 percent of labor requirements on farms with 2-row equipment and a lint yield of 175 pounds (.37 bales). The addition of chopping and hoeing to harvest labor requirements resulted in a total equal to 83 percent of the usual labor requirements per acre of cotton on 2-row tractor farms. These data point up the reasons for the intensive efforts of researchers and farmers to find means of reducing cotton chopping and harvesting labor through mechanization. In computing harvest labor requirements, the usual rates were 40 pounds of snapped cotton (10 lbs. lint) per hour.

In general, large cotton farms had larger equipment and consequently lower labor and power requirements than did the smaller farms. Out of a total of 64 large farms, 10 farms (16 percent) had 4-row tractor equipment and none of the large farms had any 1-row equipment. In addition, there were 4-row planters on 2 farms with predominant 2-row equipment. There was only 1 farm in each of the small and medium size groups reporting any 4-row equipment. Six farms (12 percent) in the small group and 2 farms (3 percent) in the medium group reported the use of horse power.

Of the 241 tractors reported on farms visited, 96 percent were general purpose row-crop type, 3 percent standard or wheat-land type, and 1 percent crawler type. Fifty-five percent of these tractors had rated drawbar horsepower (Nebraska tests) of from 12.0-18.4, 22 percent from 18.5-24.9, 15 percent less than 12.0, and 8 percent 25.0 and over. As would be expected, relatively greater proportions of higher rated tractors were on large farms, and of lower rated tractors on small farms. In 1947, 55 percent of these tractors were from 3 to 8 years old, 21 percent were less than 3 years old, and 10 percent were more than 12 years old. There were no significant differences in age of tractors by size of farm.

Variation from Usual Operations and Equipment.—A wide variety of machinery and equipment was used in producing the cotton crop in 1947 (details of these variations and the proportion of the cotton acreage affected are available in Appendix Tables 6 and 7). These variations included differences in both type of operation and size of equipment; and they are due to the diversity of soil and other resources between farms as well as the changing climatic pattern, including rainfall, from year to year on the same farm. Because of these factors, no farmer in southwestern Oklahoma is

* Although not entirely conclusive, one hour of chopping and hoeing labor per acre was saved by farmers planting less than 7 lbs. of delinted and 11 lbs. of fuzzy seed per acre. Total hoeing labor required will also vary considerably with rainfall differences.

able successfully to produce cotton in the same way from year to year, although a predominant production pattern is evident. The greatest variations in equipment were in equipment for seedbed preparation: harrows, stalk cutters, go-devils, chisels, and a rotary hoe. Other farmers listed, waited for the beds to settle, and then planted in lister furrows of medium depth. Among unusual equipment reported was a 4-bottom 16-inch breaking plow and an 18-foot tandem disc harrow pulled with a crawler-type tractor.

The Effect of Mechanical Strippers on Labor and Power Requirements.—In 1947, farmers reporting the use of cotton strippers used them for harvesting an average of 20 percent of the cotton produced on their farms. The range was from 4 percent to 75 percent. By the use of strippers these farmers, as a group, saved 3.3 hours per acre, or 19 percent, of the usual man labor requirements for snapping. The farmer who stripped 75 percent of his cotton saved 12.37 man hours per acre, or 71 percent, of usual harvest labor requirements. The use of a two-row cotton stripper to harvest all cotton apparently would reduce harvest labor needs to about 1.0 hour of man labor and 0.5 hour of tractor power. Therefore, if all cotton were stripped, labor and power requirements per acre with 4-row equipment would be reduced to 11.2 man hours and 4.1 tractor hours.

In examining the profitability of substituting mechanical stripping for hand snapping, results from custom hiring or ownership should be considered. In 1947, labor costs usually were reduced by substituting stripping for snapping after frost whenever the cost of stripping per hundredweight was 75 percent or less of the cost of hand snapping.* For ownership of strippers to be as profitable as hand snapping or custom hiring of stripping, based on 1947 conditions and assuming 20 percent of the cotton stripped, at least 60 acres or 4½ bales had to be stripped.** Three of the six strippers reported in this survey met these conditions of profitability and three did not. The above includes evaluation of differences in grades and gin turnout of hand snapped and machine stripped cotton, but some farmers may find it desirable to substitute stripping for snapping on less favorable terms because of labor shortages or high wage rates for hand harvesting. The profitability of waiting until frost and harvesting all cotton by stripping remains to be determined. The decline in grade due to weather damage the longer cotton stays in the field has been a major disadvantage. A combination of development of improved stormproof varieties, successful defoliation, and improved stripper operation would solve many of the present problems related to machine harvesting. Until many of these problems are solved, farmers in southwestern Oklahoma are likely to use mechanical strippers mainly in salvage operations near the end of harvest.

Time of Operation.—Timeliness of operation is important in the successful production of cotton. In a year with no great amount of adverse weather conditions, the average cotton grower in southwestern Oklahoma has ample leeway in the possible time of operation to produce a cotton crop successfully (Figure 2). Difficulties in cotton production result principally from adverse weather conditions in combination with

* In 1947, hand snapping rates were about $2.00 per hundredweight. Custom rates for stripping ranged from $1.00 to $2.00, with an average of about $1.50 per hundredweight. Other wage rates were: for chopping and hoeing, 60 cents per hour; and for tractor driving, 75 cents per hour.

** Calculations based on estimates of cost of stripper operation reported by J. D. Campbell. See Okla. Agri. Exp. Station Bul. No. B-324. "Farmers Experiences with Cotton Strippers" and *Current Farm Economics*, October, 1949, pp. 144-148, "Oklahoma Farmers Find Cotton Stripping is Profitable."

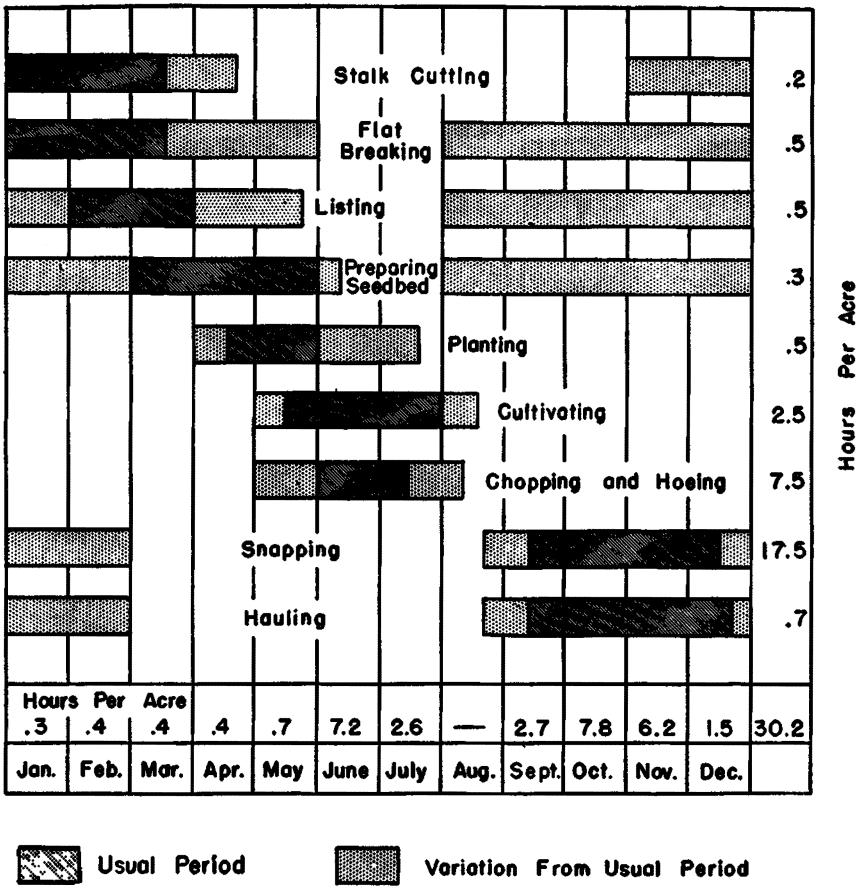

Fig. 2.—Periods in which cotton production operations are usually performed on farms with 2-row tractor power, Southwestern Oklahoma.

labor requirements for harvesting, chopping, and hoeing, which are usually greater than the farm family can furnish. In addition, farms must be prepared to adjust both type and time of operations to variations in yearly weather conditions. Peak labor requirements are concentrated in June, when cotton must be chopped and hoed, and in October and November, the major months of cotton harvest. The usual monthly distribution of labor requirements on cotton indicates that the farm family can plant and cultivate a much larger acreage than they can hoe and harvest. Preparation of land usually begins in January and ends with preparation of the seedbed in April or May. May is usually the planting month in the area, although some planting is general in April. Chopping and hoeing was most common in June and the first half of July. Harvesting began in late September and lasted usually through December 15. Interesting variations included farmers who began onewaying, breaking, and listing operations as early as August 1 (after small grain crops) and others who con-

tinued these operations as late as May 30. The long period of seedbed preparation shown in Figure 2 includes cultivation of fields to keep down grass and weeds after listing.

Competition of Wheat and Grain Sorghums with Cotton for Labor and Power.—The importance of wheat and grain sorghums as cash crops on cotton farms in southwestern Oklahoma has been discussed under the section, "Production Resources on Sample Farms", and indicated in Tables 4 and 5 on pages 11 and 13. For individual farmers to properly evaluate production opportunities on their farms, labor requirements for these major competing cash crops have been considered (Table 7). These estimates not only give indications of how these crops may be fitted together in a cropping system, but also emphasize the relative competitive position of cotton, wheat, and grain sorghums with respect to labor. With usual 2-row cotton and grain sorghum operations and complementary wheat tillage, an acre of wheat requires only about one-tenth as as many man hours as cotton; and an acre of grain sorghums, one-seventh as many as cotton. Wheat can be produced, assuming usual operations reported by farmers, with 3.2 man hours per acre and grain sorghums with 4.3 man hours.

Production operations required on grain sorghums are similar to cotton, although oneweying was rarely practiced before planting and the hoeing operation was not required. Wheat production included the use of a tandem disc harrow for seedbed preparation in most instan-

Table 7.—Usual Operations, Labor and Power Requirements, for an Acre of Wheat and Grain Sorghums, 1947.

Item	Size of Equipment	Acres per 10 hr. day	Times Over	Hours per acre	
				Man	Tractor
	WHEAT				
Oneweying or)	6-ft.	20.0	2.0	(1.00	1.00
Flat breaking)	2-14"	10.0	1.0	(	
Disking	7' tand.	25.0	2.0	.80	.80
Harrowing	4 sect.	55.0	1.0	.18	.18
Drilling	10 ft.	30.0	1.0	.33	.33
Total pre-harvest				2.31	2.31
Combine	12 ft.	35.0	1.0	.56	.28
Haul	1½ T.	35.0	1.0	.28	.28*
Total (usual)				3.15	2.87
	GRAIN SORGHUMS				
Cut Stalks	2-row	33.0	.5	.15	.15
Flat breaking	2-14"	10.0	.5	.50	.50
Listing (bedding)	2-row	20.0	1.0	.50	.50
Cultivate beds	**	33.0	1.0	.30	.30
Plant	2-row	20.0	1.0	.50	.50
Cultivate	2-row	20.0	3.0	1.50	1.50
Total pre-harvest				3.45	3.45
Combine	12 ft.	35.0	1.0	.56	.28
Haul	1½ T.	35.0	1.0	.28	.28*
Total (usual)				4.29	4.01

* Truck.

** No particular size and type of equipment predominates for cultivating beds.

ces. The 12-foot combine was used by more farmers in harvest of wheat and grain sorghums than any other size, although width of cut ranged from 5 to 14 feet. About 50 percent of the wheat and 60 percent of the grain sorghum harvesting was hired.* Also, a part (10 percent of total) of the grain-sorghum harvest not hired was headed by hand.

The comparison of monthly or seasonal labor requirements for cotton, wheat, and grain sorghums are probably of greater importance to farmers than total requirements, because seasonal requirements indicate points of greatest labor competition (Figure 3). Greatest conflicts occur during the month of June when cotton must be chopped and cultivated, wheat combined, and grain sorghums plowed. The least competition between the three cash crops occurs in December, when usually only the last of the cotton harvest remains. Based on this competition for labor in June (and if we assume that the farm operator acts as a farm manager only, no labor provided by himself or by his family), for each 100 hours of labor hired in June and available as needed in other months, a farmer could produce approximately 13 acres of *cotton*, 102 acres of *wheat*, and 114 acres of *grain sorghums*. In the case of cotton, 100 must be divided by 7.8 hours to get acres possible, because greatest per acre labor requirements occur in October. Total yearly labor required for the above acreages would be 393 hours for cotton, 321 hours for wheat, and 489 hours for grain sorghums.

If we assume that the farm operator is to supply all tractor-driving labor and hire the remaining labor needed (or furnished by his family), labor competition between the three crops is also greatest in June. For each 100 hours of operator's labor available in June or other peak labor months (September in the case of wheat) for tractor driving, 75 acres of *cotton*, 149 acres of *wheat*, and 113 acres of *grain sorghums* could be produced. Total yearly operator labor required for these acreages would be: for cotton, 388 hours; for wheat, 407 hours; and for grain sorghums, 436 hours. In addition, the farm operator would need to hire 1,877 hours for cotton, 63 hours for wheat, and 49 hours for grain sorghums —the hired labor on wheat and grain sorghums for assistance in harvesting. Since custom harvesting and hauling of wheat and grain sorghums is an established practice in southwestern Oklahoma, labor competition is considered on the basis of all tractor driving furnished by the operator for cotton and up to harvest for wheat and grain sorghums. On this basis, for each 100 hours of operator labor available in June or other peak labor months, the same acreages of the three crops could be handled, 75 acres of *cotton*, 149 acres of *wheat*, and 113 acres of *grain sorghums*; but total operator's labor required would be reduced to 317 hours for wheat and 389 hours for grain sorghums, the rest being hired on a custom harvesting basis.

These estimates point out a major reason for wheat acreage increases in the area during recent years. They also indicate the relatively weak competitive position of cotton in recent years, with no acreage restrictions, lack of general harvest mechanization, and a relatively high price for wheat. The average farmer can expect to handle twice the acreage of wheat as cotton with the same amount of his own labor and increase this advantage several times by hiring only a small total of additional labor. In addition, the trouble and expense of the relatively enormous quantity of hired labor required for cotton chopping and harvest is avoided.

* Usual rate for combining was $3.00 per acre for wheat and grain sorghums. Usual rate for hired hauling was 5 to 10 cents per bushel, depending on distance from elevator.

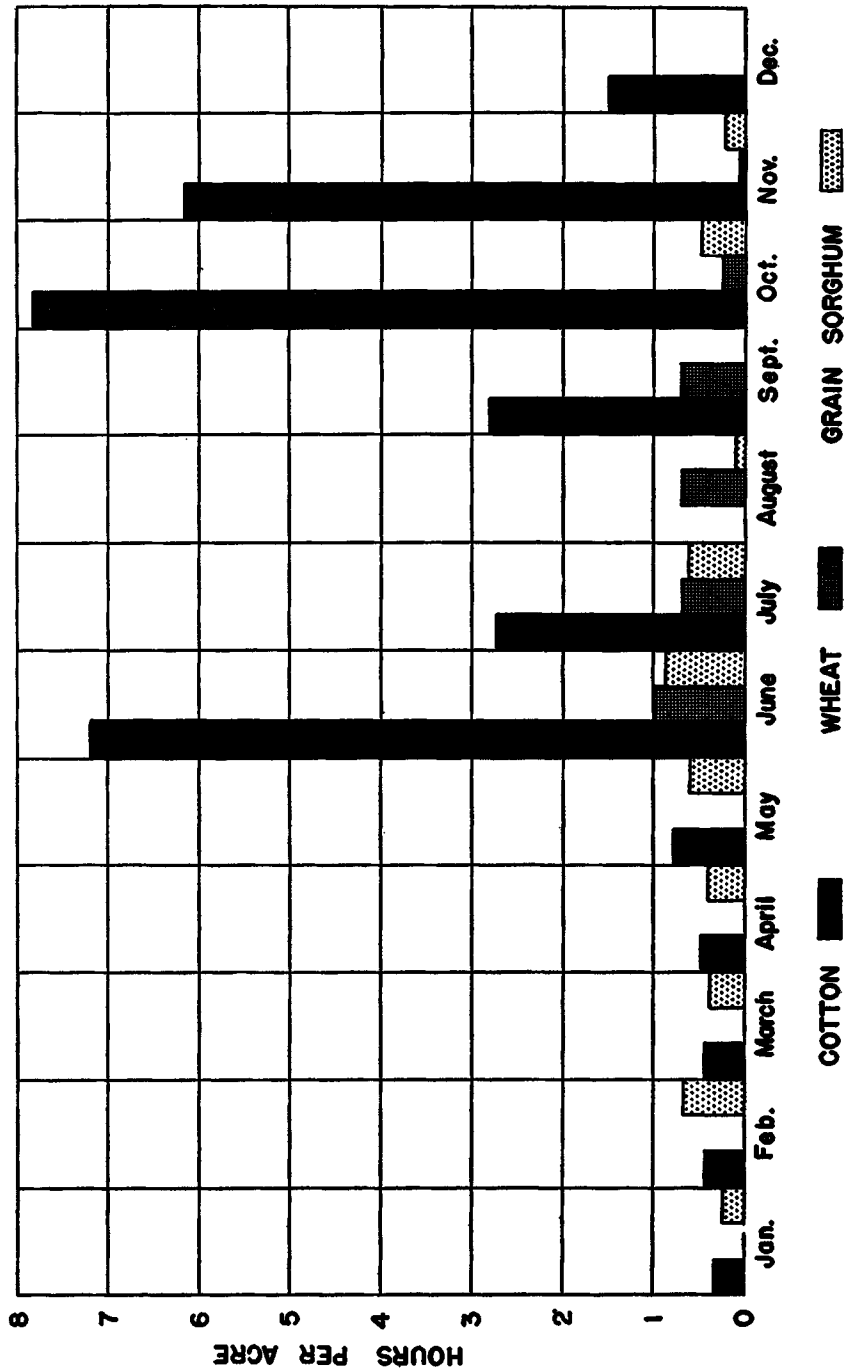

Fig. 3.—Monthly distribution of usual labor requirements for cotton, wheat, and grain sorghums.

Table 8.—Method for Rating Labor Requirements for an Acre of Cotton, 1947.

Size of farm	Av. lbs. lint per acre	Av. man hours per acre	Lowest probable hours per acre	Percent av. labor requirements are of lowest probable	Rating
Small	163	29.45	26.41	112	14
Medium	175	30.46	27.66	111	14
Large	164	29.05	26.52	110	15

Finally, *labor is not the only farm resource for which cotton must compete* with wheat and grain sorghums or any other farm enterprise. Per acre gross income and cash expenses other than labor are also highly important considerations. Land adaptation for the three crops and managerial aptitudes (likes and dislikes) need also to be weighed.

Rating Labor Requirements (20 points)

How Standards Were Determined.—The reports of farmers with low labor requirements per acre were used as a guide in determining a desirable standard. The probable labor requirements using 4-row tractor-drawn equipment as reported in Table 6 on page 20 was decided upon as the standard for comparison. Average man labor requirements per acre of cotton for each size group in 1947 were compared with this standard (adjusted to average yields reported). For each 2 percent or fraction thereof that average man labor requirements were above lowest probable using 4-row tractor equipment, 1 point was subtracted (Table 8). These comparisons resulted in a rating of 14 points for small and medium farms and 15 for large farms.

Method of Scoring Individual Farms.—The score for an individual farm is based on how the labor requirements on that farm compare with the lowest probable requirements as shown by the experience of farmers interviewed. The standard to be used would be hours required with 4-row tractor-drawn equipment and would be made in the same manner as the comparisons for the three size groups illustrated in Table 8.

Appendix Table 1.—Planting Seed, Seed Treatment and Rate of Seeding, 1947. (Percent, except where indicated.)

	Small Farms	Medium Farms	Large Farms
Number of farms	[illegible]	[illegible]	[illegible]
Acres of cotton planted	801	3,589	11,617
Pounds seed used per acre for planting and replanting	21	20	17
Seed per acre for planting (seeding rate)			
Pounds delinted seed	9	8	9
Pounds non-delinted seed	17	16	15
Purchased seed:			
Proportion of farmers using	76	71	70
Proportion of acreage planted	74	66	61
Proportion of purchased seed:			
Delinted	12	16	25
Treated	76	70	74
Proportion of home-grown seed:			
Delinted	0	2	7
Treated	0	12	24
Proportion of purchased seed by varieties:			
Half and Half and Hi-Bred*	28	26	41
Northern Star	29	21	15
Mebane 140 (Lockett 140 and Marv-L-S-Cluster)	8	21	16
Deltapine	23	15	11
Lankart 57	8	6	12
All other**	4	11	5
Proportion of home-grown seed by varieties:			
Half and Half and Hi-Bred*	14	25	43
Northern Star	29	18	16
Mebane 140 (Lockett 140 and Marv-L-S-Cluster)	22	18	23
Acala	4	16	7
Lankart 57	14	0	2
All other***	17	23	9
Years from breeder:			
Purchased seed			
Proportion 1 year (direct breeder)	90	92	85
2 years from breeder	2	2	0
3 years from breeder	0	2	0
Not known	8	4	15
Home-grown seed			
Proportion 2 years (increased seed)	84	76	56
3 years from breeder	0	16	11
Over 3 years from breeder	8	4	11
Not known	8	4	22

* The amount of Half and Half and Hi-Bred cotton planted in southwestern Oklahoma varies widely from year to year; and the inclusion of Tillman county in the survey may have resulted in area figures for these varieties that are higher than would have been the case had all counties been sampled.

** All other purchased seed: Small farms, Stoneville—2 percent, Paymaster—1 percent, Acala—1 percent; Medium farms, Mebane—7 percent, Wacona—3 percent, Acala—1 percent; Large farms, Mebane—3 percent, Stoneville—1 percent, Acala—1 percent.

*** All other home-grown seed: Small farms, Western Wonder—14 percent, Mebane—3 percent; Medium farms, Deltapine—11 percent, Summerours—4 percent, Unknown—8 percent; Large farms, Rowden—5 percent, Deltapine—1 percent, Unknown—3 percent.

Appendix Table 2.—Method of Planting and Spacing Cotton, 1947. (Percent, except where indicated.)

Item	Size Group		
	Small Farms	Medium Farms	Large Farms
Number of farms	50	65	64
Acres of cotton planted	801	3,589	11,617
Method of planting:			
Solid in drill			
Proportion of farms	94	97	86
Proportion of acreage	92	97	87
Hill dropped			
Proportion of farms	6	3	14
Proportion of acreage	8	3	13
Method of spacing cotton planted solid in drill:			
None			
Proportion of farms	22	16	34
Proportion of acreage	25	16	30
Hand chopped			
Proportion of farms	78	84	64
Proportion of acreage	75	84	68
Machine chopped			
Proportion of farms	0	0	2
Proportion of acreage	0	0	2

Appendix Table 3.—Number of Years During Last 10 that Poison Was Used, 1947.

(Percent)

Number of years poison used during last ten	Small farms	Medium farms	Large farms
0	86	74	66
1	6	14	11
2	2	3	9
3	6	1	3
4	0	5	3
5	0	1	6
6	0	0	2
10	0	2	0

Appendix Table 4.—Poison Practices, 1947.
(Percent, except where indicated.)

Item	No. or Percent
Farms (Number interviewed)	179
Cotton planted on these farms (acres)	16,007
Proportion of acreage poisoned with	(8.5)*
Calcium arsenate	3.7
Arsenate and sulfur	3.3
Sulfur	2.1
DDT and sulfur	.1
Proportion of farmers using poison	(10.6)*
Calcium arsenate	5.6
Arsenate and sulfur	2.8
Sulfur	2.2
DDT and sulfur	1.1
Application per acre once over (pounds)	
Calcium arsenate	7.8
Arsenate and sulfur	6.8
Sulfur	12.1
DDT and sulfur	9.7
Proportion of acreage poisoned	(8.5)
1 time	2.3
2 times	3.6
3 times	1.0
4 times	1.1
5 times	.5

* Two farmers with 0.7% of total cotton acreage reported the use of calcium arsenate only and also calcium arsenate mixed with sulfur.

Appendix Table 5.—Cotton Harvesting Practices, 1947.

Item	Small farms	Medium farms	Large farms
Number of farms	50	65	64
Acres harvested	801	3,589	11,297
Bales produced	273	1,316	3,974
Pounds lint yield per acre	163	175	168
Percent of cotton:			
Hand picked	1	0	0
Hand snapped	99	99	98
Machine stripped	0	1	2
Percent of cotton hand snapped by:			
Family labor	25	9	2
Hired labor	75	91	98
Pounds seed cotton and trash per bale:			
Hand picked	1,415	0	0
Hand snapped	1,928	1,913	1,834
Machine stripped*	0	2,467	2,300
Pounds cotton seed per bale:			
Hand picked	837	0	0
Hand snapped	843	836	784
Machine stripped	0	817	733

* One farmer in each group reported abnormally high weights to raise the averages. The usual figure reported was about 2,200 pounds.

Appendix Table 6.—Operations Performed, Labor and Power Used Per Acre of Cotton, 1947; Major Source of Power—Tractor, 171 farms.

Operation and size of equipment	Proportion of farmers reporting†	Proportion planted acres covered†	Times over	Labor and Power					
				Per acre covered			Per acre planted		
				Man	Horse	Tractor	Man	Horse	Tractor
	Percent	Percent		Hours	Hours	Hours	Hours	Hours	Hours
Cutting or dragging stalks:	(38)	(47)							
2-row cutter	20	19	1.00	.30		.30	.06		.06
3-row cutter	13	18	1.00	.25		.25	.04		.04
4-row cutter	2	3	1.00	.20		.20	.01		.01
5-row cutter	2	7	1.00	.15		.15	.01		.01
4-sect. harow	1	*	1.00	.25		.25	--		--
Disc Harrowing	(29)	(29)							
5-foot disc	2	1	1.15	.60		.60	.01		.01
6-foot disc	4	3	1.36	.55		.55	.02		.02
7-foot disc	15	15	1.54	.50		.50	.12		.12
8-foot disc	4	8	1.43	.45		.45	.05		.05
9-foot disc	1	*	1.00	.39		.39			
10-foot disc	2	1	1.82	.33		.33	.01		.01
-foot (cat. drawn)	1	1	1.00	.12		.12	--		--
One waying	(12)	(8)							
4-foot	1	*	1.00	1.00		1.00	--		--
foot	2	*	1.00	.85		.85	--		--
oot	4	3	1.06	.67		.67	.02		.02
-foot	2	2	1.07	.55		.55	.01		.01
8-foot	1	1	1.78	.45		.45	.01		.01
9-foot	2	2	1.00	.40		.40	.01		.01
Flat Breaking	(55)	(51)							
1-plow	6	3	1.04	1.70		1.70	.05		.05
2-plow	(46)	(44)							
12"	6(1)	3	1.00	1.25		1.25	.04		.04
14", 16"	40	41	1.00	1.00		1.00	.41		.41
18"	(1)	*	1.00	1.00		1.00	--		--
3-plow, 14"	2(1)	2	1.00	.75		.75	.02		.02
4-plow, 16"	(1)	1	1.00	.40		.40	.01		.01
4-disc	1	1	1.00	.75		.75	.01		.01
Bedding	(68)	(68)							
1-row lister	2	1	2.43	1.00		1.00	.02		.02
2-row lister	59	49	1.39	.50		.50	.34		.34
3-row lister	2	4	1.05	.37		.37	.02		.02
4-row lister	5	14	1.49	.25		.25	.05		.05
2-row cult.	(1)	(1)	1.00	.33		.33	.01		.01
Harrow or cultivate before planting	(54)	(60)							
ect. harrow	25	14	1.23	.30		.30	.05		.05
ect. harrow	8	6	1.32	.22		.22	.02		.02
-sect. harrow	5	8	1.17	.18		.18	.02		.02
2-row cult.	1(1)	1(*)	1.00	.50		.50	.01		.01
2-row stalk cutter	1(1)	1(1)	2.83	.30		.30	.02		.02
3-row stalk cutter	4	8	2.58	.25		.25	.05		.05
5-row stalk cutter	1	6	3.10	.15		.15	.03		.03

* Less than 1 percent.

† Numerals in parentheses within the column are totals. Numerals in parentheses to right of a figure in the column indicate two or more machines used for same operation.

Appendix Table 6 (Continued)

Operation and size of equipment	Proportion of farmers reporting†	Proportion planted acres covered†	Times over	Labor and Power					
				Per acre covered			Per acre planted		
					Man	Tractor	Man	Horse	Tractor
	Percent	Percent	Horse	Hours	Hours	Hours	Hours	Hours	Hours
2-row Go-Devil	2(1)	3(1)	1.31	.37		.37	.02		.02
4-row Go-Devil	1	2	1.00	.20		.20	.01		.01
7-foot Chisel	1(1)	2(*)	1.06	.50		.50	.01		.01
10-foot Chisel	3(2)	7(3)	1.11	.35		.35	.04		.04
Rotary Hoe	(1)	(2)	1.00	.20		.20	.01		.01
Spring tooth harrow	2(1)	2(1)	1.44	.40		.40	.02		.02
Fertilizing	(3)	(3)							
2-row	1	*	1.00	.50		.50	--		--
2-row with planter	2	3	1.00	(Combined with planting)					
Planting:	(100)	(100)							
1-row	2	1	1.00	1.00		1.00	.01		.01
2-row	89	78	1.00	.50		.50	.39		.39
4-row	8	20	1.00	.25		.25	.05		.05
2-row (horse drawn)	1(1)	1	1.00	.80	3.20		.01	.04	
Replanting	(38)	(26)							
1-row	1	*	2.00	1.00		1.00	--		--
2-row	35	24	1.29	.50		.50	.16		.16
4-row	1	2	1.00	.25		.25	.01		.01
2-row (horse drawn)	1	*	1.00	.80	3.20		--	--	
Cultivating	(100)	(100)							
1-row cult.	4	1	4.01	1.00		1.00	.04		.04
2-row cult.	89	81	3.89	.50		.50	1.58		1.58
4-row cult.	5(1)	17(1)	4.16	.25		.25	.19		.19
1-row Go-Devil	(1)	*	1.00	1.00		1.00	--		--
2-row Go-Devil	1(26)	1(27)	1.65	.50		.50	.23		.23
4-row Go-Devil	(2)	(9)	2.00	.25		.25	.05		.05
2-row stalk cutter	(2)	(2)	1.41	.50		.50	.01		.01
3-row stalk cutter	(4)	(6)	1.81	.40		.40	.04		.04
4-row stalk cutter	(1)	(1)	1.00	.33		.33	.01		.01
5-row stalk cutter	(2)	(7)	1.66	.25		.25	.03		.03
2-sect. harrow	(23)	(11)	1.30	.30		.30	.04		.04
3-sect. harrow	(9)	(11)	1.10	.25		.25	.03		.03
10-foot disc. har.	(1)	(1)	2.00	.31		.31	.01		.01
1-row cult. (horse drawn)	1	*	1.00	1.25	2.50		--		--
Chopping and Hoeing	(98)	(98)							
Hand	98	98	1.54	5.00			7.55		
2-row machine	(1)	(2)	1.00	.29		.29	.01		.01
4-row machine	(1)	(1)	1.00	.13		.13	--		--
Poisoning	(11)	(9)							
Hand	1	*	2.00	1.00		--			
6-row	7	7	1.66	.15		.15	.02		.02
8-row	2	1	3.44	.10		.10	.01		.01
Plane	1(1)	1(1)	2.62	.01					
Total Preharvest							12.15	.04	4.59

* Less than 1 percent.

† Numerals in parentheses within the column are totals. Numerals in parentheses to right of figure in the column indicate two or more machines used for same operation.

Appendix Table 6 (Continued)

Operation and size of equipment	Proportion of farmers reporting†	Proportion planted acres covered†	Times over	Labor and Power					
				Per acre covered			Per acre planted		
				Man	Horse	Tractor	Man	Horse	Tractor
	Percent	Percent		Hours	Hours	Hours	Hours	Hours	Hours
Harvesting	(100)	(98)							
Hand snapped, (169 lbs. lint per acre)	99	96		16.90			16.22		
Hand picked (212 lbs. lint per acre)	1 (1)	*		36.34			.02		
2-row stripper (179 lbs. lint per acre)	(5)	2		1.04		.52	.02		.01
Hauling	(100)	(98)							
Tractor-trailer (1-bale)	29	20		.93		.93	.19		.19
Tractor-trailer (2-bales)	27	36		.71		.71	.26		.26
Tractor-trailer (3-bales)	1(1)	4		.73		.73	.03		.03
Tractor-trailer 4-bales)	1	1		.52		.52	.01		.01
Tractor-trailer (6-bales)	1	1		.60		.60	.01		.01
Truck (1-bale)	10(2)	8		1.17		1.17	.09		.09
Truck (2-bales)	4(1)	8		.54		.54	.04		.04
Truck (3-bales)	2	3		.31		.31	.01		.01
Truck-trailer (1-bale)	1	1		1.34		1.34	.01		.01
Truck-trailer (2-bales)	1	3		.42		.42	.01		.01
Truck-trailer (3-bales)	1	1		.33		.33	.01		.01
Auto-trailer (1-bale)	17	9		1.87		1.87	.17		.17
Horse and wagon (1-bale)	1	1		2.24	4.48		.02	.04	
Custom (Truck, 1 bale)	3	2		.95		.95	.02		.02
Custom (Truck, 2 bales)	1	*		.10		.10	--		
Total							29.29	.08	5.46**

* Less than 1 percent.

** Includes .19 truck hours and .17 auto hours.

† Numerals in parentheses within the column are totals. Numerals in parentheses to right of figure in the column indicate two or more machines used for same operation.

Appendix Table 7.—Operations Performed, Labor and Power Used Per Acre of Cotton, 1947; Major Source of Power—Horses, 8 Farms.

Operation and size of equipment	Proportion of farmers reporting†	Proportion planted acres covered†	Times Over	Labor and Power					
				Per acre covered			Per acre planted		
				Man	Horse	Tractor	Man	Horse	Tractor
	Percent	Percent		Hours	Hours	Hours	Hours	Hours	Hours
Cutting stalks:	(12)	(17)							
2-row cutter	12	17	1.00	.80	1.60	---	.14	.28	
Disc Harrowing:	(25)	(28)							
6-foot tandem (4-H)	13	19	2.00	1.00	4.00	---	.38	1.52	
7-foot tandem (4-H)	12	9	2.00	1.00	4.00	---	.18	.72	
Flat Breaking:	(38)	(33)							
2-Horse plow	13	9	1.00	4.55	9.10	---	.41	.82	---
3-Horse plow	13	19	1.00	4.00	12.00	---	.76	2.28	---
Tractor, 1 plow*	12	5	1.00	2.00	---	2.00	.10	---	.10
Bedding:	(88)	(81)							
2-Horse lister (1-row)	63	48	1.26	1.67	3.34	---	1.01	2.02	---
5-Horse lister (2-row)	13	16	1.00	1.20	6.00	---	.19	.95	---
Tractor, 2 row*	12	17	1.00	.50	---	.50	.08	---	.08
Harrow or cultivate before planting:	(88)	(83)							
2-section harrow	(75)	(74)							
With 2 horses	25	8	1.00	.80	1.60	---	.06	.12	---
With 3 horses	38	47	1.00	.65	1.95	---	.31	.93	---
With 4 horses	12	19	1.00	.50	2.00	---	.09	.36	---
Log drag, 2-H	13	9	1.00	1.00	2.00	---	.09	.18	---
Planting:	(100)	(100)							
1-Horse (1-row)	12	5	1.00	1.50	1.50	---	.08	.08	---
2-Horses (1-row)	38	34	1.00	1.43	2.86	---	.49	.98	---
3-Horses (2-row)	13	16	1.00	1.20	3.60	---	.19	.57	---
4-Horses (2-row)	25	28	1.00	.80	3.20	---	.22	.88	---
Tractor, 2 row*	12	17	1.00	.50	---	.50	.08	---	.08

* Custom hired.
** Includes .05 auto hours.
† Numerals in parentheses within the column are totals. Numerals in parentheses to right of a figure in the column indicate two or more machines used for same operation

Appendix Table 7 (Continued)

Operation and size of equipment	Proportion of farmers reporting†	Proportion planted acres covered†	Times Over	Labor and Power					
				Per acre covered			Per acre planted		
				Man	Horse	Tractor	Man	Horse	Tractor
	Percent	Percent		Hours	Hours	Hours	Hours	Hours	Hours
Replanting:	(25)	(27)							
1-Horse (1-row)	12	5	1.00	1.50	1.50	---	.08	.08	---
2-Horses (1-row)	13	22	2.00	1.43	2.86	---	.63	1.26	---
Cultivate:	(100)	(100)							
1-row cultivator (2-H)	62	58	3.83	1.25	2.50	---	2.78	5.56	---
2-row cultivator (4-H)	38	42	2.25	.65	2.60	---	.61	2.44	---
2-section harrow	(62)	(60)							
With 2 horses	(25)	(8)	1.00	.83	1.66	---	.07	.14	---
With 3 horses	(12)	(16)	1.00	.65	1.95	---	.10	.30	---
With 4 horses	(25)	(36)	1.00	.50	2.00	---	.18	.72	---
1-row lister (2-H)	(12)	(5)	1.00	1.30	2.60	---	.06	.12	---
2-row Go-Devil (4-H)	(12)	(16)	1.00	.65	2.60	---	.10	.40	---
Chopping and hoeing:	(100)	(100)							
Hand	100	100	1.41	5.00	---	---	7.05	---	---
Total Preharvest							16.52	23.71	.26
Harvesting:	(100)	(100)							
Hand snapped	100	100		16.30			16.30		
Hauling:	(100)	(100)							
Auto-trailer	13	22		.21		.21	.05		.05
Wagon and team	75	73		2.10	4.20		1.53	3.06	
Custom (1-bale tractor-trailer)*	12	5		3.30		3.30	.16		.16
Total							34.56	26.77	.47**

* Custom hired.
** Includes .05 auto hours.
† Numerals in parentheses within the column are totals. Numerals in parentheses to right of a figure in the column indicate two or more machines used for same operation.