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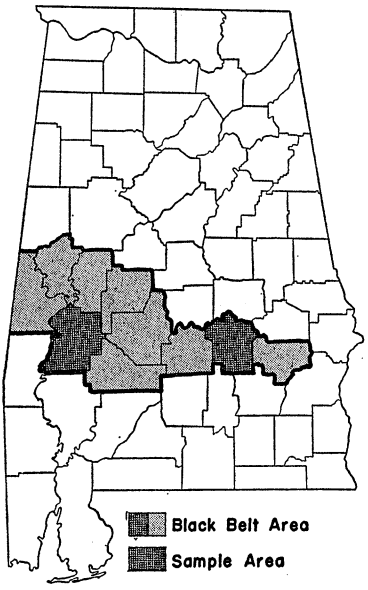
COTTON PRODUCTION PRACTICES *in the* BLACK BELT AREA *of Alabama*



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CONTENTS

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COTTON PRODUCTION PRACTICES *in the* BLACK BELT AREA *of Alabama* *

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THE BLACK PRAIRIE BELT of Alabama, more commonly known as the "Black Belt," developed rapidly as a major cotton-producing area following the introduction of the crop into the area prior to the Civil War. During that period, the area was characterized by large plantation-type holdings organized principally for extensive cotton production with slave labor. During the War between the States, this area was called the granary of the Confederacy because of its large production of corn during that period. Later in the nineteenth century, and prior to the coming of the cotton boll weevil, this area was considered the best cotton-producing area in the State. During the past three decades, cotton production in the Black Belt Area has been sharply curtailed both in terms of acreage planted and amount produced. As a result of the changes that have taken place in this area in recent years, the Black Belt Area today is one of the State's major beef cattle and milk producing areas. Cotton, however, is still an important enterprise on many Black Belt farms.

Black Belt soils range from lime lands to extremely acid soils.[1]

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[1] For purposes of this study, area delineations follow county lines. As a result, both heavy black prairie soils (limestone) and sandy coastal plain soils (acid) are included in the "Black Belt Area" as discussed in this report.

Interspersed throughout the area are large acreages of sandy soils; consequently, soil management and farm management problems are both complex and numerous. The heavy, black clay land in this area was formerly used primarily for cotton production. But following the early ravages of the cotton boll weevil, the encroachment of Bermuda and Johnson grass, and the continued difficulty of getting cotton started early in the spring on these heavy soils, there occurred a tremendous reduction in the acreage devoted to cotton and a corresponding increase in the acreage devoted to pasture and hay production.

Many Black Belt farmers still grow a limited acreage of cotton on heavy clay soils because it fits well into their cropping and labor systems. Most of the cotton now grown in the Black Belt, however, is produced on the sandy soils interspersed throughout the area. These sandy coastal plain soils are better adapted to cotton production, and produce higher per acre yields of cotton than do the heavy clay soils of the area.

All references in this report to cotton production practices in the Black Belt Area, therefore, refer in general to cotton produced on the sandy coastal plain soils within the area.

Despite the fact that the total acreage of cotton harvested in the Black Belt Area was reduced nearly 70 per cent during the two decades between 1928 and 1947, cotton still occupies an important place in the over-all agricultural economy of the Black Belt Area. In 1944, 77 per cent of the farmers in the area planted some cotton.[2] Most of this acreage was planted on upland sandy soils. Decreased cotton acreages in recent years have been partly offset by some increase in average yield per acre; total production, therefore, has not declined as much as has the acreage harvested, Appendix Table 1.

Major problems that face cotton producers in the Black Belt Area are high labor requirements for cotton, maintenance of adequate farm incomes, and maintenance and improvement of soil resources. Cotton producers in this area should consider all possible means of increasing cotton yields, increasing production efficiency, and lowering costs of production. The addition or expansion of enterprises to supplement cotton and/or shifts to alternative enterprises that may exclude cotton from individual farm programs may be necessary on some farms.

In view of these considerations and the technological changes

[2] "United States Census of Agriculture, 1945, Alabama—Statistics for Counties," Vol. I, Part 21. Bureau of the Census, U.S. Department of Commerce, Washington, D. C. County Tables I and II, pp. 18-78.

that are taking place in the Black Belt Area, a study of cotton production practices in the area was started in the summer of 1948.[3] Two counties, Montgomery and Marengo, were selected as being representative of the area, and a field survey was made in these counties (cover). Major objectives of the study were:

(1) To obtain current information on cotton production practices,

(2) To ascertain variations in current production practices with respect to type of power and equipment used, by size of cotton enterprises,

(3) To interpret and evaluate the economic significance of current cotton production practices, and techniques, and

(4) To compare current cotton production practices with Experiment Station recommendations, and to emphasize points where improvement is needed.

This report describes the practices used in producing cotton in the Black Belt Area in 1947, indicates variations in these practices, and compares these practices with recommendations of the Alabama Agricultural Experiment Station. Unless otherwise stated, all recommendations shown in this report were the same in 1951 as in 1947.

The description of current production practices presented in this report is based on an analysis of farm records obtained by personal interview with 101 farmers who produced cotton in the Black Belt Area in 1947. Approximately the same number of farms with small, medium, and large cotton enterprises were selected as representative of cotton enterprises in the area. The range in acreage of cotton for each of the three enterprise groups was: small, less than 10 acres; medium, 10 to 29 acres; and large, 30 acres or more per farm, Appendix Table 2. Approximately two-thirds of the cotton producers in the Black Belt Area produced less than 10 acres of cotton per farm in 1944, Table 1. Farms with these small cotton enterprises accounted for 24 per cent of the area's total cotton acreage and 20 per cent of its total production. Farmers who produced 30 acres or more of cotton per farm made up only 8 per cent of the total cotton producers in the area; however, these farms accounted for 48 per cent of the area's total acreage of cotton, and 54 per cent of the total production.

The average yield of lint cotton per acre for the three size

[3] This study is part of a larger over-all study which includes all of the major cotton-producing areas of Alabama. These areas include—Limestone Valleys, Sand Mountain, Upper Coastal Plain, Piedmont, Black Belt, and Lower Coastal Plain.

TABLE 1. DISTRIBUTION OF FARMS GROWING COTTON, ACREAGE HARVESTED, BALES PRODUCED, AND PRODUCTION PER ACRE, BY SIZE OF COTTON ENTERPRISE, BLACK BELT AREA OF ALABAMA, 1944[1]

Size of cotton enterprise (Acres in cotton)	Farms reporting cotton		Acreage harvested		Bales produced		Lint cotton produced per acre
	Total number	Per cent of total	Total number	Per cent of total	Total number	Per cent of total	
	No.	*Per cent*	*No.*	*Per cent*	*No.*	*Per cent*	*Pounds*
Small (Less than 10 acres)	9,773	64	54,566	24	24,889	20	218
Medium (10-29 acres)	4,364	28	62,167	28	32,660	26	251
Large (30 acres or more)	1,177	8	106,512	48	68,134	54	306
TOTAL (All farms)	15,314	100	223,245	100	125,683	100	269

[1] "Cotton Farms Classified by Acreage Harvested." (A special report prepared by the Bureau of the Census) National Cotton Council of America. Table 2, p. 30. 1945.

groups indicated that farms with large cotton enterprises had highest yields and that those with small-sized cotton enterprises had lowest yields, Table 1. There was a difference of 88 pounds of lint cotton per acre between the average yields for these two groups. Variations in yield between the three size groups were associated with differences in production practices.

DESCRIPTION of SAMPLE FARMS

Some of the more important characteristics of sample farms that should be examined before evaluating cotton production practices include cropland organization and use, tenure of operators, labor organization, livestock organization, and degree of farm mechanization in existence, Table 2.

Farms with small cotton enterprises were small in terms of both cotton acreage and total farm acreage in 1947. These farms averaged 58 acres in size, but had only 23 acres in cropland. Approximately 6 of the 23 acres of cropland were planted in cotton.

Farms with medium-sized cotton enterprises in 1947 had an average of 290 acres per farm, with 51 acres of cropland and 13 acres of cotton.

Farms with large cotton enterprises were relatively large units and relied heavily on share cropper and/or wage labor in 1947. These farms averaged 1,620 acres in size, and had 241 acres of cropland. Cotton occupied 82 acres, or 34 per cent of the cropland.

The proportion of total farm acreage devoted to permanent pasture in 1947 was relatively high in the Black Belt Area. It amounted to approximately one-third of the total on farms with

TABLE 2. LAND USE, AND CROPLAND, LIVESTOCK, AND FARM LABOR ORGANIZATION PER FARM, BY SIZE OF COTTON ENTERPRISE, BLACK BELT AREA OF ALABAMA, 1947

Item	Size of cotton enterprise		
	Small	Medium	Large
	Number	*Number*	*Number*
Number of farms	34	34	33
	Acres	*Acres*	*Acres*
Land use:			
All land in farms	58	290	1,620
Owned	29	235	1,502
Rented in	29	55	118
Total cropland	23	51	241
Permanent pasture	19	141	550
Cropland organization:			
Cotton	5.5	12.7	82.3
Corn	11.4	15.9	100.3
Small grain	.1	4.4	12.2
Truck crops	.8	2.4	2.0
Peanuts	.1	2.5	3.0
Other crops	5.4	13.3	40.8
	Number	*Number*	*Number*
Livestock organization:[1]			
Workstock	2.1	2.3	8.6
Milk cows	3.8	2.7	6.6
Other cows	1.1	12.1	43.6
All other cattle	2.4	15.9	58.7
Brood sows	1.0	1.1	1.5
Other hogs	3.5	4.8	6.0
Hens and pullets	30.6	37.4	94.1
Tractors per farm, *av. no.*	[2]	.2	.7
Labor organization:			
Families:			
Operator	1.0	1.0	1.0
Cropper	.1	.5	4.5
Wage hand	.0	.0	.4
Workers:			
Operator	3.4	3.5	2.2
Cropper	.2	1.8	16.6
Wage hand	.0	.0	.6

[1] Operator's livestock only.
[2] Less than 0.05 per farm.

small and large cotton enterprises, and approximately one-half on farms with medium-sized cotton enterprises. Major livestock enterprises handled by operators increased in size as the size of the cotton enterprises increased. The sale of livestock and livestock products was one of the major sources of cash income for farmers with medium- and large-sized cotton enterprises.

In 1947, tractors were reported on 3 per cent of the farms with small cotton enterprises, on 12 per cent of those with medium-sized cotton enterprises, and on 48 per cent of those with large cotton enterprises. On farms with small- and medium-sized enterprises, tractors were used only for breaking and preparing land

for planting. Operators of 12 per cent of the farms with large cotton enterprises used tractors as the only source of power in producing cotton in 1947.

There was a definite pattern between the three size groups studied with respect to land ownership in 1947. Farmers on farms with small cotton enterprises owned approximately 50 per cent of the land they operated, farmers with medium-sized cotton enterprises owned 81 per cent, and farmers with large cotton enterprises owned 93 per cent.

In 1947, share cropper labor was used on only 3 per cent of the farms with small cotton enterprises, on 32 per cent of the farms with medium-sized cotton enterprises, and on 76 per cent of the farms with large cotton enterprises. In addition to share cropper labor, 18 per cent of the farms in the group with large cotton enterprises used some wage hand labor.

COTTON PRODUCTION PRACTICES

Based on the results of many years of research work and of field testing and observation, the Alabama Agricultural Experiment Station has developed a series of recommendations for producing cotton both economically and efficiently. Although some recommendations are specific and others are general, most of them must be adapted to individual farms, to individual farm resources, and to the capabilities of individual farm operators.

To facilitate an understanding and appraisal of the economic significance of current cotton practices and techniques, both present and recommended practices are given in this report for comparison and for determining needed practice adjustments. Present practices are based on the crop year 1947. Recommended practices as shown in this report, unless otherwise stated, were the same in 1951 as in 1947. Present and recommended practices are discussed by major operations including land preparation, seed and seeding rate, planting and spacing, fertilization, cultivation and weed control, insect control, and harvesting.

Land Preparation

Recommendations. The operations recommended for land preparation are those that will result in a good seedbed, good weed and grass control, conservation of moisture, and a good stand of cotton.

On farms operated with workstock, land should be prepared by cutting stalks with a rolling stalk cutter or a disk harrow, and broken with a moldboard or a disk plow to a depth of 6 to 8

inches. Planting beds should then be laid off with a middlebuster early enough to allow them to be settled by rain. Just before planting, beds should be cultivated with a section harrow or drag.

On tractor farms, crop residues may be leveled by use of a rolling stalk cutter or a disk harrow. After cutting stalks, the land should be broken with a moldboard or disk plow to a depth of 6 to 8 inches early enough to allow the ground to be settled by rain before planting begins. Flat-broken land should be harrowed with a disk harrow just before planting.

When a cover crop precedes cotton, care should be taken in timing the planting of cotton with respect to the time of turning the cover crop. Since germination of the seed may be seriously impaired or destroyed by coming into contact with fermenting material, cover crops should be turned 2 weeks or longer before planting to allow for completion of the fermentation process. An alternative is to plant immediately after turning the cover crop in order that cottonseed may germinate before fermentation begins.

Present Practices. On farms operated with workstock as the principal source of power in 1947, the usual procedure for destroying stalks varied from cutting by hand on farms with small cotton enterprises, to cutting with a two-row stalk cutter on farms with large cotton enterprises. One-row stalk cutters were usually used on farms with medium-sized cotton enterprises. Following the destruction of stalks, land was usually bedded with half-row equipment, which required four furrows to the row or bed. These beds were harrowed with a section harrow immediately before planting.

On farms that used a combination of workstock and tractor power, the usual procedure in preparing land in 1947 was to cut stalks with a two-row stalk cutter or a disk harrow, flat-break with a two-disk plow, and harrow with a disk harrow. Land was then bedded with one-row equipment.

Except for omitting the operation of bedding land after flat-breaking, farmers that used tractor power only followed the same practices in preparing land in 1947 as did those that used both tractor and workstock power.

In most cases, the equipment used in preparing land in 1947 was the type recommended for such operations. On farms that used workstock power, however, farmers followed the practice of bedding with four furrows to the row instead of following the recommended practice of flat-breaking and laying off beds with a middlebuster. Considerable variation was found in the time

that elapsed between land preparation and planting. Farmers with large cotton enterprises were more nearly following recommendations than were those with small- and medium-sized cotton enterprises.

Seed, Seeding Rate, Planting, *and* Spacing

Recommendations. A good variety of cotton should be a high yielder, and should have a good lint turnout, a staple length that is in demand, good strength, and character. A relatively large boll facilitates hand picking and an early-maturing variety is desirable in the presence of insect infestation. The varieties that were recommended for this area in 1947 and that have most of these characteristics were Stoneville 2B, Coker 100 Wilt, Deltapine, White Gold, Cook 144, Stonewilt, and Miller 610. Since 1947, White Gold and Cook 144 have been deleted from the list of recommended varieties and Plains has been added. To insure a reliable source of seed, farmers should consider buying seed of certified quality or better. The use of home-grown seed usually involves a greater possibility of contamination and mixing. Farmers, however, should not hesitate to save home-grown seed of high quality when proper precautions can be taken to preserve quality.

The recommended planting rate for the Black Belt Area is three-fourths to one bushel of non-delinted cottonseed per acre. The planting rate for mechanically delinted seed is one-half to one bushel per acre. When using acid-delinted seed, approximately one-half bushel of cottonseed per acre is recommended. All cotton planting seed should be treated, but whether or not it is delinted is optional. Spacing recommendations are 12 to 18 inches between hills with two to three stalks per hill regardless of whether spaced by hill dropping or by hand chopping. A row width of 36 to 48 inches is recommended. Cotton may be planted solid in the drill or hill dropped with one- or two-row planters. No difference in yield has been observed between hill-dropped cotton and cotton planted solid in the drill, provided a uniform stand was obtained with both plantings. Cotton should be planted between March 25 and April 10 in the Black Belt Area.

Present Practices. Data on seeding practices in 1947 are shown in Table 3. Farmers with medium- and large-sized cotton enterprises used purchased seed to plant approximately three-fifths of their acreage, while those with small cotton enterprises used purchased seed to plant less than two-fifths of their acreage. All of the seed purchased by farmers that had large cotton enterprises

TABLE 3. SOURCE, TREATMENT, AND METHOD AND RATE OF PLANTING COTTONSEED, BY SIZE OF COTTON ENTERPRISE, BLACK BELT AREA OF ALABAMA, 1947

Item	Unit	Size of cotton enterprise		
		Small	Medium	Large
Number of farms	*Number*	34	34	33
Cotton planted	*Acres*	187	431	2,715
Purchased seed:				
Proportion of farmers using	*Per cent*	38	62	54
Proportion of acreage planted	*Per cent*	38	59	61
Proportion of purchased seed:				
Delinted	*Per cent*	70	64	100
Treated	*Per cent*	70	73	100
Proportion of home-grown seed:				
Delinted	*Per cent*	3	48	16
Treated	*Per cent*	8	54	16
Delinted seed:				
Proportion of farmers using	*Per cent*	29	65	88
Proportion of acreage planted	*Per cent*	34	66	83
Proportion of acreage planted with delinted seed:				
Solid in the drill	*Per cent*	86	78	48
Hill dropped	*Per cent*	14	22	52
Proportion of acreage planted with non-delinted seed:				
Solid in the drill	*Per cent*	88	73	70
Hill dropped	*Per cent*	12	27	30
Pounds of seed per acre:				
Delinted:				
Solid in the drill	*Pounds*	21	28	27
Hill dropped	*Pounds*	15	27	24
Non-delinted:				
Solid in the drill	*Pounds*	28	24	23
Hill dropped	*Pounds*	23	20	21

was delinted and treated. Approximately two-thirds of the seed purchased by farmers with small- and medium-sized cotton enterprises was delinted and treated. When home-grown seed was used, farmers with medium-sized cotton enterprises used a higher proportion of delinted and treated seed than did farmers with small or large cotton enterprises. Farmers with small cotton enterprises treated 8 per cent of their home-grown seed, those with medium-sized cotton enterprises treated 54 per cent, and those with large enterprises treated 16 per cent.

The most common method of planting cotton on farms with small- and medium-sized cotton enterprises in 1947 was to plant solid in the drill. Farmers with large cotton enterprises hill dropped slightly more than half of the acreage planted with delinted seed, but they planted more than two-thirds of the acreage solid in the drill when non-delinted seed was used.

In 1947, farmers in all size groups planted more seed per acre when planting solid in the drill than when hill dropping, and

farmers with medium- and large-sized cotton enterprises planted more pounds of delinted than non-delinted seed per acre.

The most popular variety of cotton planted in this area in 1947 was Deltapine. The next most popular varieties were Coker 100 Wilt when purchased seed was used, and Cook 144 when home-grown seed was used. The major portion of home-grown seed was 2 years or more from the breeder; the major portion of purchased seed was 1 year or less from the breeder, Appendix Table 3.

Row width varied somewhat on farms with different sized cotton enterprises in 1947. On farms with small cotton enterprises, cotton was planted in 36-inch rows, while on farms with medium- and large-sized cotton enterprises cotton was planted in 40-inch rows. On farms operated with tractor power only, cotton was planted in 42-inch rows.

All cotton planted solid in the drill was spaced 11 inches in the row in 1947. Hill-dropped cotton was spaced 15 inches in the row on farms with small- and medium-sized enterprises, and 12 inches in the row on farms with large cotton enterprises.

Farmers in the Black Belt Area in 1947 were usually within the range of recommendations for planting, rate of seeding, and variety. Some farmers used narrower spacings than were recommended and planted from 1 to 2 weeks later than was recommended. On many farms the time that elapsed between final preparation and planting was not sufficient to permit the seedbed to properly settle.

Fertilization

Recommendations. In the Black Belt Area it was recommended in 1947 that cotton be fertilized with 36 to 48 pounds of nitrogen, 48 to 64 pounds of phosphoric acid, and 24 to 48 pounds of potash at planting time. This could be supplied by using 400 to 800 pounds of 6-8-4 or 4-10-7. In 1947, it was recommended that enough nitrogen be applied as a side-dressing to bring the total nitrogen application up to recommended rates. In 1951, all fertilizer recommendations were the same as in 1947 except that somewhat heavier applications of nitrogen were recommended.

Where tractors are used, fertilizer may be applied with a fertilizer attachment on the planter. On workstock farms, either a distributor or a planter attachment may be used. When applying fertilizer at planting time, it should be placed 2 inches below and to the side of the seed. Side-dressing may be applied with fertilizer attachments on cultivating equipment, or with a distributor at the time of the first or second cultivation after chopping.

Present Practices. Only 5 of the 101 farmers interviewed in the Black Belt Area reported that they did not use any commercial fertilizer on the cotton acreage planted in 1947. Of these, four were in the small cotton enterprise group, and one was in the medium-sized enterprise group.

The average rate per acre when complete fertilizer only was used varied from 318 pounds on farms with small cotton enterprises to 451 pounds on farms with large cotton enterprises in 1947, Table 4. The average rate per acre for complete fertilizer

TABLE 4. FERTILIZER PRACTICES, BY SIZE OF COTTON ENTERPRISE, BLACK BELT AREA OF ALABAMA, 1947

Item	Unit	Size of cotton enterprise		
		Small	Medium	Large
Number of farms	*Number*	34	34	33
Cotton planted	*Acres*	187	431	2,715
Proportion using complete fertilizer:[1]				
Farms	*Per cent*	56	46	43
Acreage	*Per cent*	67	50	59
Proportion using complete fertilizer and side-dressing:[1]				
Farms	*Per cent*	30	48	63
Acreage	*Per cent*	20	40	41
Rate of application where used:				
Complete only	*Pounds*	318	351	451
Complete and side-dressing:				
Complete	*Pounds*	323	501	433
Side-dressing	*Pounds*	108	113	110
Rate of application per planted acre:				
Complete	*Pounds*	269	377	439
Side-dressing	*Pounds*	28	36	45
Analysis of complete fertilizer:				
Proportion of acreage receiving:[2]				
4-10-7	*Per cent*	16	23	54
6-8-4	*Per cent*	52	67	50
Other	*Per cent*	16	7	1
Analysis of side-dressing:				
Proportion of acreage receiving:				
Ammonium nitrate	*Per cent*	4	5	2
Sodium nitrate	*Per cent*	16	37	38
Potash	*Per cent*	0	5	1
Summary of fertilizer elements:				
N per fertilized acre of cotton	*Pounds*	23	32	29
P_2O_5 per fertilized acre of cotton	*Pounds*	28	36	35
K_2O per fertilized acre of cotton	*Pounds*	15	23	31

[1] Farm totals do not add to 100 because some farmers applied complete fertilizer only, some applied both complete and side-dressing, and some applied side-dressing only.

[2] Summed percentages do not total the sum of percentages of acreage receiving complete fertilizer only and complete fertilizer with side-dressing because some farmers used two complete fertilizers on the same acreage.

when both complete fertilizer and side-dressing were used varied from 323 pounds on farms with small cotton enterprises to 501 pounds on farms with medium-sized cotton enterprises, and the rate for side-dressing varied from 108 pounds per acre on farms with small cotton enterprises to 113 pounds on farms with medium-sized cotton enterprises. Forty per cent of the cotton acreage was covered with a complete fertilizer and side-dressing; most of the remainder received complete fertilizer only. About 40 per cent of the cotton acreage on the farms studied was fertilized with 4-10-7. The most popular analysis used on farms with large cotton enterprises was 4-10-7; on farms with small- and medium-sized cotton enterprises, 6-8-4 was the most popular analysis. This was reflected in the side-dressing operation in that only 20 per cent of the acreage on farms with small cotton enterprises received side-dressing, while 41 per cent of the acreage on farms with large cotton enterprises received side-dressing.

On farms that used workstock and various combinations of workstock and tractor power in 1947, one-row animal-drawn distributors were used in fertilizing cotton; on farms that used tractor power, two-row tractor-drawn distributors were used.

The amount of plant food in the fertilizer used in 1947 ranged from 23 to 32 pounds of N per acre, from 28 to 36 pounds of P_2O_5 per acre, and from 15 to 31 pounds of K_2O per acre. The approximate average per acre was: 29 pounds of N, 35 pounds of P_2O_5, and 29 pounds of K_2O, Table 4.

The over-all average rate of fertilizer application in 1947 indicates that Black Belt Area farmers were under the minimum recommended rate of 36 pounds of N, and 48 pounds of P_2O_5 for the soils of this area. They were within the range of recommendations for K_2O. Farmers with small- and medium-sized enterprises were using more 6-8-4 than 4-10-7. There was no definite relationship between the size of the cotton enterprise and the rate of fertilization. Farmers with medium- and large-sized cotton enterprises used considerably more of all fertilizer elements than did farmers with small enterprises, and farmers with large enterprises used much more K_2O than did farmers in either of the other groups.

Many farmers in the Black Belt Area of Alabama need to increase their cotton fertilization rates to the amounts recommended. Farmers may increase yields by using more fertilizer, and may reduce labor requirements by using fertilizer attachments on planting and cultivating equipment for applying fertilizers.

Cultivation *and* Weed Control

Recommendations. Cultivation should begin just before cotton comes up or just after it is up to a good stand. Cotton should be cultivated to a depth of 1 to 3 inches with one- or two-row cultivators with sweeps. Cultivation should be continued throughout the crop's normal growing season as often as is necessary to control weeds and grass. Cotton should be chopped when it is up to a stand and after permanent leaves are present. Chopping should allow a spacing of 12 to 18 inches between hills with two to three stalks per hill. If grass and weeds cannot be controlled by cultivation, hoeing may be necessary.

Present Practices. In 1947, cultivation usually was accomplished with half-row equipment on workstock farms and with one- or two-row equipment on tractor farms. On the average, cotton was cultivated about six times. It was chopped once, and on an average, hoed twice.

Farmers may be able to reduce materially both labor requirements and costs of production by using one-row cultivating equipment instead of half-row equipment. As a whole, farmers used recommended types of cultivating equipment in 1947, Appendix Table 7.

Insect Control

Recommendations. The following materials were recommended for general use in control of cotton insects in 1951:

Insecticide	Lb. per acre	Application
3 per cent gamma BHC-5 per cent DDT, or	10 — 15	When 25 per cent infestation at 5-day intervals until top bolls are mature; during migration at 4-day intervals.
20 per cent toxaphene, or	10 — 15	Same as above.
Calcium arsenate alternated with	7 — 10	Same as above.
3 per cent gamma BHC-5 per cent DDT, or	10 — 15	Same as above.
Calcium arsenate	7 — 10	Same as above.
alternated with calcium arsenate containing 2 per cent nicotine	10 — 15	Same as above.

With added precautions, these materials may be used: (1) A mixture of 2.5 per cent aldrin – 5 per cent DDT, or (2) 1.5 per cent dieldrin – 5 per cent DDT. These materials have not been tested as long as have other cotton poisons, but they have given good results for 2 years in experimental tests. They are recommended only for tractor or airplane spraying.

For bollworm control, apply 10 per cent DDT or 20 per cent

toxaphene at the rate of 15 pounds per acre. If a good boll weevil control program is followed, bollworms are not likely to become numerous.

Except where stated, cotton poisons may be applied as a dust or as a spray. Dust may be put on with hand, mule-drawn, tractor, or airplane equipment. Dusting should be done when the air is still and when cotton plants are dry.

Spray may be applied by tractor or airplane, but row widths must be taken into consideration when tractor poisoning equipment is used since this equipment is usually designed for specific row widths. The amount of diluted spray used to cover an acre may vary from 2 to 10 gallons. The correct amount of poison to use per acre for each application (regardless of volume of spray) is as follows:

⅓ to ½ pound of gamma isomer BHC plus ½ or more pounds of DDT.

2 to 2½ pounds of technical toxaphene.

1/4 pound aldrin plus ½ pound of DDT.

1/5 pound dieldrin plus ½ pound of DDT.

Calcium arsenate is effective only as a dust.

Insecticides should be applied while the plants are setting and maturing the crop, and when the number of squares punctured indicates 25 per cent or more infestation. After starting, poisoning should be repeated at 5-day intervals until the top bolls are mature. During a normal year, six to seven applications should be enough, but during a season of heavy infestation and/or frequent rainfall more applications may be needed.

The recommendation for boll weevil control in 1947 was calcium arsenate at the rate of 8 to 10 pounds per acre. The recommended time and frequency of application in 1947 was the same as that shown for other poisons in 1951. The difference between 1947 and 1951 cotton poisoning recommendations was due to the fact that in 1947 the newer insecticides that were recommended in 1951 had not undergone the extensive testing necessary to obtain conclusive evidence of their effectiveness.

Present Practices. In 1947, approximately one-sixth of the cotton acreage received at least one application of poison, but only a very small proportion received three or more applications. During the last 10 years, poisoning occurred for the most part only on farms with large cotton enterprises. In this large size group, about 25 per cent of the farms were poisoned as many as 5 years

during the period from 1938 to 1947. The rate per application varied between 7 and 12 pounds of calcium arsenate per acre.

Method and Time of Harvesting

Recommendations. If cotton is hand picked, it should be picked immediately after the bolls are open and dry. Precautions should be taken to prevent picking wet or green cotton. Cotton should be picked as clean as possible. Usually cotton requires about three pickings during the harvest season. Harvesting dates in the Black Belt Area are usually from about August 15 to November 1.

Present Practices. All of the cotton harvested on the farms surveyed in 1947 was hand picked. Farmers averaged picking their cotton fields three times in 1947. Approximately 80 per cent of the cotton was harvested with family labor. Farmers with large cotton enterprises were the only ones who used hired labor extensively for harvesting. The seed cotton required to make a 500-pound gross-weight bale of cotton was about 1,360 pounds, Appendix Table 4.

Farmers followed harvesting recommendations in 1947. Cotton fields were picked over two to four times with an average of three times. Picking began in August, and in most cases was completed in November.

Between 50 and 55 per cent of the total labor required to produce an acre of cotton was required for harvesting. Harvesting requirements on some farms may be reduced by picking thoroughly a minimum of times.

LABOR and POWER REQUIREMENTS

High labor and power requirements for cotton production are important factors that limit the most efficient and profitable production of cotton in this area.

The following estimates indicate the relative importance of labor and power costs to total costs of producing cotton in the Black Belt Area. On farms operated with workstock only, power costs amount to approximately 14 per cent of total production costs and labor costs amount to approximately 54 per cent of the total. Thus, power and labor costs make up more than two-thirds of the costs of producing cotton on workstock farms.

On tractor farms, power costs are about 10 per cent of total production costs, and labor costs amount to about 38 per cent of the total. Therefore, on tractor farms power and labor make up roughly one-half of the cost of producing cotton. Power require-

ments are greatest for land preparation, planting and cultivating; labor costs are greatest during the chopping, hoeing, and harvesting season.

With power and labor requirements making up from one-half to more than two-thirds of the cost of producing cotton, any sizeable reduction in power and labor requirements should both increase efficiency and decrease costs of producing cotton.

Use of Power

In 1947, eighty-four of the 101 farms studied used workstock power only, while 14 used a combination of workstock and tractor power (combination farms), and 3 used tractor power alone, Table 5. Within these groups, no wide variations were found in the kind and combinations of power and equipment used among the farmers surveyed. The largest proportion of tractors were found on farms with large cotton enterprises. Some tractor power was used on approximately 44 per cent of the acreage of all farms in 1947.

TABLE 5. DISTRIBUTION OF FARMS, BY SIZE OF COTTON ENTERPRISE, AND BY TYPE OF POWER USED, BLACK BELT AREA OF ALABAMA, 1947

Type of power group	Size of cotton enterprise					
	Small		Medium		Large	
	Number	*Per cent*	*Number*	*Per cent*	*Number*	*Per cent*
Workstock farms	30	88	32	94	22	67
Combination farms[1]	4	12	2	6	8	24
Tractor farms	0	0	0	0	3	9
TOTAL	34	100	34	100	33	100

[1] Farms on which both workstock and tractors were used as sources of power.

Usual Labor Requirements

The amount of man labor used in 1947 varied from 90 hours per acre on workstock farms with large cotton enterprises to 105 hours per acre on workstock farms with small cotton enterprises. Approximately 51 hours of animal power or 6 hours of tractor power were required to produce an acre of cotton, Appendix Tables 5 and 6. When tractor power was used for flat-breaking and cultivating after flat-breaking, approximately 1 hour of tractor power was required per acre.

In comparing labor requirements for various operations among different size and tenure groups in 1947, chopping and hoeing, and harvesting were considered separately, since these operations required a relatively large amount of labor. Chopping and hoeing

required 15 to 20 per cent of the total man labor needed to produce an acre of cotton; harvesting required 35 to 40 per cent of the total on farms with small- and medium-sized enterprises, and about 65 per cent of the total on farms with large cotton enterprises.

Time of Operation

Proper timing of production operations may mean the difference between success and failure in cotton production. During a year in which normal weather conditions prevail, a cotton grower usually has little difficulty in timing production operations to produce a crop. However, when adverse weather conditions occur, those farmers who are equipped to cover large acreages in a short time have a great advantage. Land preparation in the Black Belt Area usually begins in March with preparation of the seedbed. Cotton is usually planted between mid-April and the first part of May. In the Black Belt Area, peak labor requirements occur normally during May mainly because of requirements for chopping and hoeing, and during August and September, which are peak harvest months.

Variation from Usual Operations

Machinery and equipment of varying sizes were used in producing cotton in 1947. The greatest variation was found in the types of equipment used for land preparation and for cultivation, Appendix Table 7. However, these variations are important chiefly from the standpoint of saving labor rather than from quality of work.

Variations in Time Required to Perform Usual Operations

The methods of performing usual operations that saved the greatest amount of labor in 1947 were selected for comparison with the more common methods used in performing the same operations. These greater labor-saving methods on workstock farms required 89 hours of man labor and 51 hours of animal work to produce and harvest an acre of cotton yielding 180 pounds of lint in 1947, Table 6. This represents a saving of 7 man hours or about 8 per cent of usual requirements.

With tractor power and using primarily two-row equipment, approximately 67 hours of man labor and 6 hours of tractor work were required to produce an acre of cotton in 1947, Table 7. This represents a saving of 27 man hours or 29 per cent of usual requirements. The saving in tractor hours was .3, or about 5 per cent of usual requirements.

TABLE 6. SELECTED VARIATIONS FROM USUAL IN PER ACRE LABOR REQUIREMENTS FOR PRODUCING COTTON USING ANIMAL-DRAWN EQUIPMENT, WITH COMPARISONS, BLACK BELT AREA OF ALABAMA, 1947

Item	Size of equipment	Times over	Hours per acre[1]		
			Man	Animal	Truck
		No.	*Hr.*	*Hr.*	*Hr.*
Cut stalks	2-horse stalk cutter	1	.9	1.8	0.0
Flat-break	2-horse moldboard plow	1	4.1	8.2	.0
Bed	2-horse middlebuster	1	1.6	3.2	.0
Cultivate beds	Section harrow	1	1.5	3.0	.0
Plant	2-row planter	1	2.4	4.4	.0
Fertilize	1-row distributor	1	3.2	2.2	.0
Side-dress	1-row distributor	1	2.7	2.4	.0
Cultivate	2-horse cultivator	6	12.0	24.0	.0
Chop and hoe	Hoe	2	25.6	.0	.0
TOTAL PRE-HARVEST			54.0	51.2	.0
Harvest	Hand	3	33.0	.0	.0
Haul	Truck or trailer	--	1.8	.0	1.8
TOTAL			88.8	51.2	1.8
Comparison (usual total)			96.1	50.7	.0
Labor and power saved			7.3	-.5	.0
Per cent labor and power saved			7.6	-.9	.0

[1] Poisoning was not considered; it would add a small amount of time to the total requirements.

TABLE 7. SELECTED VARIATIONS FROM USUAL IN PER ACRE LABOR REQUIREMENTS FOR PRODUCING COTTON USING TRACTOR-DRAWN EQUIPMENT, WITH COMPARISONS, BLACK BELT AREA OF ALABAMA, 1947

Item	Size of equipment	Times over	Hours per acre[1]		
			Man	Tractor	Truck
		No.	*Hr.*	*Hr.*	*Hr.*
Cut stalks	2-row stalk cutter	1	.3	.3	0.0
Flat-break	2-disk plow	1	1.0	1.0	.0
Cultivate flat-broken land	Disk harrow	1	.3	.3	.0
Plant	2-row planter	1	.6	.3	.0
Fertilize	2-row distributor	1	.5	.2	.0
Side-dress	2-row distributor	1	.5	.2	.0
Cultivate	2-row cultivator	6	3.6	3.6	.0
Chop and hoe	Hoe	2	25.6	.0	.0
TOTAL PRE-HARVEST			32.4	5.9	.0
Harvest	Hand	3	33.0	.0	.0
Haul	Truck or trailer	--	1.8	.0	1.8
TOTAL			67.2	5.9	1.8
Comparison (usual total)			94.3	6.2	.0
Labor and power saved			27.1	.3	.0
Per cent labor and power saved			28.7	4.8	.0

[1] Poisoning was not considered; it would add a small amount of time to the total requirements.

Savings in man and power hours through use of larger equipment and by shifting to the use of more tractor power are of major importance in reducing both labor and power costs of producing cotton.

Limitations and Effects of Mechanization, and Possibilities of Further Changes[4]

The downward trend in the relative importance of cotton as a major farm enterprise in the Black Belt Area of Alabama is likely to continue. The predominant types of soil and native vegetation in the area favor an expansion of the production of pastures and hay crops; these crops can best be utilized by an increase in dairying and/or beef cattle production in the area. In the past, cotton in the Black Belt Area was produced primarily on large units and with share cropper labor, but it is becoming increasingly difficult for such a system of production to successfully compete with modern mechanized methods of production. Labor is relatively plentiful in the area, but it is unskilled and inexperienced in the use of mechanized equipment. Labor required to operate mechanical equipment used in the production of row crops such as cotton and corn should be more skilled than that required in establishing and maintaining hay and pasture crops.

On the other hand, the general topography of much of the area is such that it does not seriously limit the use of mechanical equipment. The use of tractors and large equipment, if used, may enable cotton producers to cover more acres in a given period during land preparation, planting, and cultivation. Shifts to mechanical means of producing cotton, however, must be accompanied by adjustments in other production practices. Larger, better-planned field layouts may help reduce both labor and power requirements of many operations performed with machines. This may call for the elimination of hedge rows and the construction of broad drainage channels which can be crossed with a tractor and equipment.

In preparing land for cotton that is to be produced with mechanical equipment, it is essential that cotton stalks be well shredded or broken up so that efficient use of planting and cultivating equipment can be obtained during subsequent operations. The use of either horizontal- or vertical-type cutters is satisfactory for this operation. However, when green stalks are

[4] Prepared on the basis of information furnished by the Agricultural Engineering Department, Alabama Agricultural Experiment Station.

present, the power-driven, rotary-type cutter is more efficient in the handling of this material. By performing this operation as soon after harvesting as possible, a protective covering for the soil may be obtained, and decay of stalks and insect control may be aided. The soil should be thoroughly broken to a depth of at least 6 inches, using a moldboard or disk plow well in advance of planting time. After breaking, a firm seedbed may be formed with harrows and/or cultipackers.

The planting operation will be of particular importance if mechanical harvesting is to be practiced, because some mechanical cotton harvester manufacturers have designed their equipment to operate best at a standard row width of 40 inches. Cotton that is to be mechanically harvested, therefore, should be planted in 40-inch rows. It should also be planted on the flat, and solid in the drill to obtain efficient use of mechanical harvesting equipment. Thick stands are necessary for the use of rotary hoes and mechanical choppers. Also, they result in more suitable plants for mechanical harvesting. The rotary hoe is effective in early weed and grass control, and may be used three to five times beginning with cotton emergence. Each time the rotary hoe is used, the cotton stand may be reduced from 5 to 7 per cent. To maintain a good stand, a heavier rate of seeding is required in order to allow for a reduction of the stand resulting from use of the rotary hoe and mechanical chopper.

Insect control has become increasingly important in this area. Sprayers and dusters are equally effective equipment for applying insect control materials. Tractor fenders may be necessary to reduce damage to rank cotton.

Defoliation is becoming an important phase in cotton production in many areas. Defoliation is essential for machine harvesting, and in addition, it has been found to reduce boll rot and to facilitate hand picking. The conventional cotton duster may be used to apply defoliants, which are put on at recommended rates per acre. Defoliation is done when most of the cotton bolls are mature. Defoliants should be applied either in late evening or early morning since contact with moisture is essential for maximum effectiveness.

Although use of mechanical equipment now available requires some adjustments in cotton production practices, the labor-saving aspects of mechanization make a further shift to mechanization appear more desirable in a period of short labor supply, high prices, and good demand for cotton.

The more labor-saving methods of producing cotton with tractor power are shown in Table 7. Proper use of the rotary hoe and mechanical chopper can reduce the labor requirements of chopping and hoeing approximately 50 per cent. The use of mechanical harvesters can reduce harvest labor requirements to about 2 man hours per acre. By substituting this equipment for that shown in Table 7, total man labor requirements for producing an acre of cotton can be reduced to about 23 hours, a saving of 78 per cent of the labor usually required. By using latest methods of insect control and defoliation, total power and labor requirements would not be seriously affected. This indicates that considerable savings in labor requirements of cotton production can be attained by mechanization. Before mechanical harvesting can be recommended in this area, however, further improvements must be made in mechanical harvesters and in ginning facilities.

Saving man labor will not necessarily mean that cotton can be produced more profitably. The relative costs of labor and machinery together with the possible effects of mechanical harvesting on cotton quality and price will determine for individual producers the amount of machinery to substitute for labor and workstock.

SUMMARY *and* CONCLUSIONS

The Black Belt Area of Alabama is no longer one of the principal cotton-producing sections of the State, but cotton is still a major source of cash income for many farmers in the area. In view of the changes now being made in the area and of other major problems facing cotton producers, a study was begun in the summer of 1948 with a field survey in two counties selected as representative of the Black Belt Area to (1) obtain current information on cotton production practices, and (2) to compare current cotton production practices with Experiment Station recommendations in order to point out where improvement is needed.

In 1947, the equipment used in preparing land on farms in all size groups was generally the type of equipment recommended, except that farmers using workstock power followed the practice of bedding with four furrows to the row instead of following the recommended practice of flat-breaking and laying off beds with a middlebuster. There is a possibility that costs can be decreased and efficiency increased through use of larger equipment on some farms, particularly on farms that use workstock

power. Most of the land was prepared between the middle of March and the middle of April. Farmers usually cultivated the beds or flat-broken land before planting.

The most popular varieties of cotton in 1947 were Deltapine, Coker 100 Wilt, and Cook 144. Farmers were within the range of recommendations for seeding rates and variety. No relationship was observed between size of cotton enterprise and seeding rates, but a slightly smaller quantity of seed was used when hill dropped than when planted solid in the drill. Some farmers planted later than the recommended dates of March 25 to April 10. Approximately 60 per cent of the acreage was planted with purchased seed. Approximately 65 per cent of all seed was treated. Improvement in the quality of planting seed, further seed treatment, and earlier planting may help to increase cotton yields.

Although some hill dropping was done, all cotton was hand chopped and hoed in 1947. More frequent and thorough cultivation may decrease the number of times that hoeing is necessary and reduce hoe-labor costs accordingly.

Five of the 101 farmers interviewed reported that they did not use any commercial fertilizer on cotton in 1947. On other farms, per-acre applications of commercial fertilizer, except for K_2O, were much below recommended rates. The yield of cotton per acre may be raised by increasing fertilizer applications up to recommended rates. The costs of fertilizer applications may be decreased by using fertilizer attachments on planting and cultivating equipment.

In 1947, farmers who used workstock power used principally half-row equipment for cultivation. There is a possibility that costs of performing these operations may be reduced by using larger equipment, and by cultivating earlier and more frequently to decrease hand-labor requirements for hoeing.

Farmers who poisoned in 1947 used calcium arsenate at approximately recommended rates. In 1947, almost one-sixth of the total acreage received at least one application of poison. Recommendations as to frequency of poisoning were not closely adhered to. Improvements have been made in cotton insecticides since 1947, and if cotton yields are to be maintained or increased, current poisoning recommendations should be followed when insect infestation is a problem.

Farmers followed recommended harvesting practices in 1947; the majority picked their cotton an average of three times. On some farms, harvest labor may be reduced by picking thoroughly

a minimum number of times. Experimental results have shown that there are possibilities of reducing harvest-labor requirements with mechanical strippers. Before this practice becomes economical, however, mechanical strippers, and cleaning and ginning equipment will have to be improved to prevent or offset the loss in grade of machine-stripped cotton.

Power and labor requirements for producing cotton in the area were relatively high in 1947. Many farmers in this area may reduce requirements through increased and more efficient utilization of the equipment already available on farms. When conditions permit a shift to the use of more mechanical power, additional savings in power and labor requirements may be achieved. The use of two-row equipment instead of smaller equipment on workstock farms may lower production costs and raise efficiency.

Cotton producers in the area are faced with the problems of (1) the extent to which they should substitute machinery for man labor under existing economic conditions, and (2) the possibility of turning to alternative enterprises which have greater natural advantages over cotton production. The extent to which shifts should be made on individual farms depends on the types of soil and topography of the land on these farms, the relative costs of machinery and labor, capabilities of available labor, and future government-control programs.

APPENDIX TABLE 1. ESTIMATED ACREAGE, YIELD, AND PRODUCTION OF COTTON, BLACK BELT AREA OF ALABAMA, 1928-47[1]

Year	Acreage	Yield per acre	Production
	1,000 acres	*Pounds*	*1,000 bales*
1928	628.6	96	126.7
1929	639.5	133	178.1
1930	637.0	153	203.6
1931	578.2	157	189.4
1932	549.1	108	124.4
1933	515.6	100	108.2
1934	366.9	156	119.5
1935	390.6	199	162.4
1936	404.0	193	163.2
1937	459.7	232	223.4
1938	362.3	173	130.8
1939	357.8	105	78.6
1940	333.8	95	66.1
1941	283.7	145	86.4
1942	279.5	175	102.4
1943	259.7	226	122.7
1944	226.7	283	134.3
1945	220.7	245	112.9
1946	235.5	136	66.9
1947	195.5	219	89.6

[1] Source: "Alabama Cotton, Estimated Acreage, Yield, and Production, 1928-1947." Bureau of Agricultural Economics, U.S.D.A., cooperating with Division of Agricultural Statistics, Alabama Department of Agriculture and Industries.

APPENDIX TABLE 2. NUMBER OF FARMS AND ACRES OF COTTON, BY TYPE OF POWER USED, AND BY SIZE OF COTTON ENTERPRISE, BLACK BELT AREA OF ALABAMA, 1947

Size of cotton enterprise	Type of power used					
	Workstock		Combination		Tractor	
	Number farms	Acres cotton	Number farms	Acres cotton	Number farms	Acres cotton
	Number	*Acres*	*Number*	*Acres*	*Number*	*Acres*
Small (34)[1]:						
Operator	30	165	3	14	0	0
Cropper	0	0	1	8	0	0
Medium (34):[1]						
Operator	25	269	1	12	0	0
Cropper	9	140	1	10	0	0
Large (33)[1]:						
Operator	9	258	6	372	3	214
Cropper	17	1,023	7	802	1	46

[1] Number of schedules included in survey.

APPENDIX TABLE 3. VARIETIES AND QUALITIES OF COTTONSEED PLANTED, BY SIZE OF COTTON ENTERPRISE, BLACK BELT AREA OF ALABAMA, 1947

Item	Unit	Size of cotton enterprise		
		Small	Medium	Large
Number of farms	*Number*	34	34	33
Cotton planted	*Acres*	187	431	2,715
Proportion of purchased seed by varieties:[1]				
Stoneville 2B	*Per cent*	11	5	7
Deltapine	*Per cent*	53	23	59
Coker 100 Wilt	*Per cent*	0	29	9
All other	*Per cent*	6	20	25
Not known	*Per cent*	30	23	0
Proportion of home-grown seed by varieties:[1]				
Stoneville 2B	*Per cent*	0	23	12
Deltapine	*Per cent*	12	19	36
Cook 144	*Per cent*	27	20	36
All other	*Per cent*	17	29	16
Not known	*Per cent*	44	9	0
Years from breeder:				
Home-grown seed				
1 year	*Per cent*	0	6	18
2 years	*Per cent*	55	54	46
3 years and over	*Per cent*	27	23	30
Not known	*Per cent*	18	17	6
Purchased seed				
Direct from breeder	*Per cent*	7	15	24
1 year	*Per cent*	66	48	66
2 years	*Per cent*	12	13	4
3 years and over	*Per cent*	0	0	0
Not known	*Per cent*	15	24	6

[1] Varieties listed are those most commonly used.

APPENDIX TABLE 4. COTTON HARVESTING PRACTICES, YIELD OF LINT COTTON PER ACRE, AND SEED COTTON PER 500-POUND BALE, BY SIZE OF COTTON ENTERPRISE, BLACK BELT AREA OF ALABAMA, 1947

Item	Unit	Size of cotton enterprise		
		Small	Medium	Large
Number of farms	*Number*	34	34	33
Acres harvested	*Acres*	187	431	2,715
Proportion of cotton: Hand picked	*Per cent*	100	100	100
Proportion of cotton hand picked by:				
Family labor	*Per cent*	92	86	64
Hired labor	*Per cent*	8	14	36
Bales produced	*Number*	67	152	1,100
Lint yield per acre	*Pounds*	178	176	203
Seed cotton per 500-lb. bale	*Pounds*	1,362	1,386	1,363

APPENDIX TABLE 5. MAN LABOR REQUIREMENTS PER ACRE FOR PRODUCING COTTON, BY USUAL OPERATIONS PERFORMED, BY SIZE OF COTTON ENTERPRISE, AND BY TYPE OF POWER USED, BLACK BELT AREA OF ALABAMA, 1947

Size of cotton enterprise by power groups	Number of records	Man labor used per acre by specified operations												
		Land preparation												
		Cut stalks	Flat-break	Cultivate after flat-breaking	Bed only	Cultivate beds	Plant	Fertilize	Side-dress	Cultivate	Chop and hoe	Harvest	Haul	Total
	(No.)	*(Man hours per acre)*												
WORKSTOCK FARMS:														
Small:														
Operator	(30)	3.2	--	--	7.5	1.5	2.7	3.2	--	22.4	25.6	36.3	2.6	105.0
Medium:														
Operator	(25)	1.4	--	--	7.5	1.5	2.7	3.2	2.7	22.4	12.8	34.6	2.6	91.4
Cropper	(9)	1.4	--	--	7.5	--	2.7	3.2	2.7	19.2	12.8	33.5	1.8	84.8
Large:														
Operator	(9)	0.9	--	--	7.5	--	2.7	3.2	2.5	19.2	12.8	39.1	2.6	90.5
Cropper	(17)	1.4	--	--	7.5	--	2.7	3.2	2.7	19.2	12.8	35.7	1.8	87.0
TRACTOR FARMS:														
Large:														
Operator[1]	(4)	--	1.0	0.3	--	--	.6	1.0	.8	3.6	25.6	58.8	2.6	94.3

[1] Croppers were combined with operators.

APPENDIX TABLE 6. POWER REQUIREMENTS PER ACRE FOR PRODUCING COTTON, BY USUAL OPERATIONS PERFORMED, BY SIZE OF COTTON ENTERPRISE, AND BY TYPE OF POWER USED, BLACK BELT AREA OF ALABAMA, 1947

Size of cotton enterprise by power groups	Number of records	Power used per acre by specified operations											
		Land preparation										Total	
		Cut stalks	Flat-break	Cultivate after flat-breaking	Bed only	Cultivate beds	Plant	Fertilize	Side-dress	Cultivate	Haul	Workstock	Tractor
	(*No.*)	(*Power requirements [hrs.] per acre*)											
WORKSTOCK FARMS:													
Small:													
Operator	(30)	--	--	--	15.0	3.0	2.2	2.2	--	22.4	5.2	50.0	--
Medium:													
Operator	(25)	2.8	--	--	15.0	3.0	2.2	2.2	2.4	22.4	5.2	55.2	--
Cropper	(9)	2.8	--	--	15.0	--	2.2	2.2	2.4	19.2	1.8[1]	43.8	1.8[1]
Large:													
Operator	(9)	1.8	--	--	15.0	--	2.2	2.2	--	19.2	5.2	45.6	--
Cropper	(17)	2.8	--	--	15.0	--	2.2	2.2	2.4	19.2	1.8[1]	43.8	1.8[1]
TRACTOR FARMS:													
Large:													
Operator[2]	(4)	--	1.0	0.3	--	--	.3	.4	.6	3.6	5.2[3]	5.2	6.2

[1] Truck or car power.
[2] Croppers were combined with operators.
[3] Workstock power.

APPENDIX TABLE 7. AVERAGE ANNUAL USE AND RATES OF PERFORMANCE FOR SPECIFIED OPERATIONS IN PRODUCING COTTON, BY TYPE OF EQUIPMENT USED, BLACK BELT AREA OF ALABAMA, 1947[1]

Operations performed by size of equipment used	Farms using	Times over	Annual use		Acres per 10-hour day	One time over		
			Acres cov'd	Hours used		Man hours per acre	Mule hours per acre	Tractor hours per acre
	Number	*Number*	*Acres*	*Hours*	*Acres*	*Hours*	*Hours*	*Hours*
Cut stalks:								
Hand	25	1.0	12.6	40.3	3.1	3.2	--	--
1-row cutter (mule)	35	1.0	39.1	54.7	7.1	1.4	2.8	--
2-row cutter (mule)	13	1.0	40.0	36.0	11.1	.9	1.8	--
2-row cutter (tractor)	3	1.0	25.0	7.5	33.3	.3	--	.3
Flat-break:								
Moldboard:								
1-bottom (1-mule)	6	1.0	9.7	75.7	1.3	7.8	7.8	--
1-bottom (2-mule)	13	1.0	25.0	102.5	2.4	4.1	8.2	--
Disk plow (tractor):								
2-disk	4	1.3	63.7	63.7	10.0	1.0	--	1.0
Disk harrow (tractor)	9	2.1	54.3	43.4	12.5	.8	--	.8
Cultivate flat-broken land:								
Section harrow (mule)	3	1.3	10.0	14.0	7.1	1.4	2.8	--
Section harrow (tractor)	3	1.0	36.7	11.0	33.3	.3	--	.3
Disk harrow (tractor)	7	1.6	71.6	21.5	33.3	.3	--	.3
2-row cultivator (tractor)	4	1.5	49.5	19.8	2.5	.4	--	.4
Bed after flat-break:								
1 time to row (mule)	13	1.3	18.8	30.1	6.3	1.6	3.2	--
2 times to row (mule)	3	1.3	7.2	5.9	2.8	3.6	7.2	--
Bed only (mule):								
2 times to row	7	1.0	16.9	54.1	3.1	3.2	6.4	--
3 times to row	17	1.0	14.2	73.8	1.9	5.2	10.4	--
4 times to row	47	1.0	34.4	258.0	1.3	7.5	15.0	--

(*Continued*)

APPENDIX TABLE 7 *(Continued).* AVERAGE ANNUAL USE AND RATES OF PERFORMANCE FOR SPECIFIED OPERATIONS IN PRODUCING COTTON, BY TYPE OF EQUIPMENT USED, BLACK BELT AREA OF ALABAMA, 1947[1]

Operations performed by size of equipment used	Farms using	Times over	Annual use		Acres per 10-hour day	One time over		
			Acres cov'd	Hours used		Man hours per acre	Mule hours per acre	Tractor hours per acre
	Number	*Number*	*Acres*	*Hours*	*Acres*	*Hours*	*Hours*	*Hours*
Cultivate after bedding:								
Section harrow (mule)	46	1.1	15.1	22.6	6.7	1.5	3.0	--
Lay off rows and open furrows:								
Georgia stock (mule)	8	1.0	13.6	27.2	5.0	2.0	2.0	--
Plant:								
1-row planter (mule)	97	1.0	26.9	59.2	4.5	2.7	2.2	--
2-row planter (mule)	5	1.0	33.4	73.5	4.2	2.4	4.4	--
2-row planter (tractor)	5	1.0	60.4	18.1	33.3	.6	--	.3
Fertilize:								
Mule and wagon (mule)	3	1.0	5.3	25.4	2.1	4.8	9.6	--
1-row distributor (mule)	90	1.0	29.9	65.8	4.5	3.2	2.2	--
1-row distributor (tractor)	8	1.1	60.9	24.4	25.0	1.0	--	.4
2-row distributor (tractor)	3	1.0	66.7	13.3	50.0	.5	--	.2
Side-dress:								
Hand	27	1.1	27.2	65.3	4.2	2.5	--	--
1-row distributor (mule)	26	1.0	36.8	88.3	4.2	2.7	2.4	--
1-row distributor (tractor)	4	1.8	48.7	53.6	16.7	.8	--	.6
Cultivate:								
½-row (mule)	78	6.5	27.9	580.3	3.1	3.2	3.2	--
½-row and 1-row (mule)	18	7.3	13.0	247.0	3.8	2.6	3.2	--
1-row (mule)	4	6.5	22.5	292.5	5.0	2.0	4.0	--
2-row (tractor)	8	6.8	74.1	303.8	16.7	.6	--	.6

(Continued)

APPENDIX TABLE 7 *(Continued).* AVERAGE ANNUAL USE AND RATES OF PERFORMANCE FOR SPECIFIED OPERATIONS IN PRODUCING COTTON, BY TYPE OF EQUIPMENT USED, BLACK BELT AREA OF ALABAMA, 1947[1]

Operations performed by size of equipment used	Farms using	Times over	Annual use		Acres per 10-hour day	One time over		
			Acres cov'd	Hours used		Man hours per acre	Mule hours per acre	Tractor hours per acre
	Number	*Number*	*Acres*	*Hours*	*Acres*	*Hours*	*Hours*	*Hours*
Chop and hoe:								
1 time over	60	1.0	24.0	307.2	.8	12.8	--	--
2 times over	44	2.0	21.3	545.3	.8	12.8	--	--
3 times over	9	3.0	18.1	624.4	.9	11.5	--	--
Poison:								
Hand	13	2.5	22.7	62.4	9.1	1.1	--	--
4-row duster (tractor)	4	3.8	64.4	24.5	100.0	.1	--	.1
Haul:								
Mule and wagon	43	--	49.5	128.7	3.8	2.6	5.2	--
Truck and/or car and trailer	73	--	23.4	42.1	5.9	1.8	--	1.8[2]

[1] Comparable types of equipment in all size and power groups were averaged to obtain rates of performance by type of equipment and specific operations.

[2] Truck or car hours.