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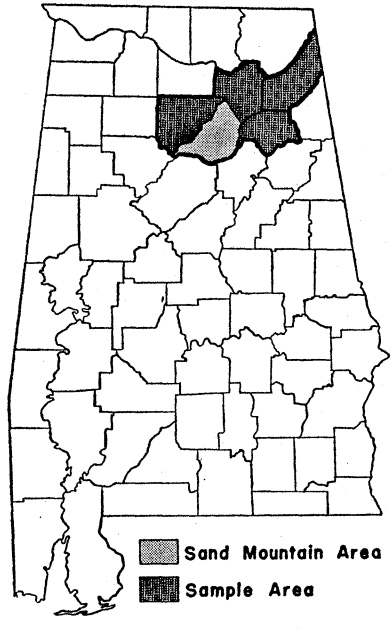
COTTON PRODUCTION PRACTICES *in the* SAND MOUNTAIN AREA *of Alabama*



AGRICULTURAL EXPERIMENT STATION
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CONTENTS

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COTTON PRODUCTION PRACTICES *in the* SAND MOUNTAIN AREA *of Alabama*[*]

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THE SAND MOUNTAIN AREA includes most of the Appalachian Mountain areas in Alabama. This area is one of the State's leading cotton-producing areas; it has produced a consistently higher average lint yield per acre than have other areas of the State. While cotton for many years has been the main cash crop of farmers in this area, poultry and poultry products have become important sources of farm income.

Cotton acreage harvested in the Sand Mountain Area has been reduced about a fourth during the last two decades. In 1944, however, four out of five farms in the area were growing cotton.[1] The effects of a 25 per cent reduction in acreage have been more than offset by an increase in lint yield per acre; total production during the last two decades has increased slightly, Appendix Table 1.

Major problems that cotton producers in the Sand Mountain Area are facing include high production costs, high labor requirements, maintenance of satisfactory farm incomes, and maintenance and improvement of soil resources. Farmers, therefore, must seriously consider (1) all possible ways of increasing cotton yields, increasing production efficiency, and lowering costs of production; and (2) the addition or expansion of enterprises to supplement cotton and/or a shift to alternative enterprises that may completely exclude cotton from individual farm programs.

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**The author is indebted to the farmers who furnished the information upon which this study is based. For helpful suggestions throughout the study, special acknowledgment is due D. G. Sturkie, Agronomist; H. B. Tisdale, Plant Breeder; F. S. Arant, Entomologist; staff members of the Department of Agricultural Economics of the Alabama Agricultural Experiment Station; and E. L. Langsford, Agricultural Economist, Bureau of Agricultural Economics, U.S.D.A.

[1] "United States Census of Agriculture, 1945, Alabama—Statistics for Counties," Vol. I, Part 21, Bureau of the Census: County Tables I and II, pp. 18-78.

In view of these considerations and of the present importance of cotton in this area, a study of cotton production practices in the Sand Mountain Area was started in the summer of 1948 with a field survey being made in four counties – Cullman, DeKalb, Etowah, and Marshall (cover).[2] These four counties were selected as being representative of the Sand Mountain Area. Major objectives of the study were:

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

(2) To determine variations in current cotton 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 current cotton production practices in the Sand Mountain Area, indicates variations in these practices, and compares present practices with recommendations of the Alabama Agricultural Experiment Station.

Current production practices as described in this report are based on an analysis of farm records obtained by personal interview with 103 farmers who produced cotton in the Sand Mountain Area in 1947. Approximately the same number of farms with small, medium, and large cotton enterprises were selected as representative of cotton enterprises of this area. For purposes of this study, the range in cotton acreage for each of the three groups was: small, less than 10 acres; medium, 10 to 29 acres; and large, 30 acres or more per farm, Appendix Table 2. Farms having small cotton enterprises were predominant in this area. Seven out of 10 farms producing cotton in 1944 had less than 10 acres, Table 1. Farms with these small enterprises accounted for 48 per cent of the area's total cotton acreage and 50 per cent of its total production. Farmers who produced 30 acres or more per farm made up only 1 per cent of the total cotton producers in the area; these farms accounted for 7 per cent of the area's total acreage of cotton, and 6 per cent of its total production.

[2] This study is a part of a larger over-all study that 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, SAND MOUNTAIN 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)	14,307	69	88,322	48	78,710	50	426
Medium (10-29 acres)	6,100	30	82,489	45	69,289	44	402
Large (30 acres or more)	270	1	11,839	7	9,641	6	389
TOTAL (All farms)	20,677	100	182,650	100	157,640	100	406

[1] "Cotton Farms Classified by Acreage Harvested." (A special report prepared by the Bureau of the Census) National Cotton Council of America. Table 2, pp. 28-29. 1945.

The relationship between the size of cotton enterprise and average lint yield per acre was different in this area than in other areas of the State. In 1944, farms with small cotton enterprises had the highest average yield, those with medium-sized enterprises the next highest, and those with large enterprises the lowest average yield.

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 49 acres in size, only 26 of which were cropland. Of the 26 acres of cropland, 6.5 acres were in cotton.

Farms with medium-sized cotton enterprises averaged 83 acres in size, 44 of which were cropland. Cotton on these farms occupied 13 acres, or twice the acreage on farms with small enterprises.

Farms with large cotton enterprises, all of which were relatively large units and which relied heavily on share cropper and/or tenant labor, averaged more than 200 acres in size. Approximately one half of the acreage on these farms was cropland, averaging 98 acres per farm. Cropland devoted to cotton averaged approximately one-third of the total on these farms.

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

Item	Size of cotton enterprise		
	Small	Medium	Large
	Number	*Number*	*Number*
Number of farms	37	33	33
	Acres	*Acres*	*Acres*
Land use:			
All land in farms	49.2	82.6	203.9
Owned	37.2	40.0	165.9
Rented in	12.0	42.6	38.0
Total cropland	25.6	44.1	98.1
Permanent pasture	8.5	8.4	20.7
Cropland organization:			
Cotton	6.5	13.1	31.6
Corn	12.8	16.9	30.0
Small grain	.0	.1	.8
Lespedeza hay	.6	.3	2.6
Truck crops	.7	.1	.2
Other crops	4.8	9.9	8.5
	Number	*Number*	*Number*
Livestock organization:[1]			
Workstock	1.7	2.2	3.5
Milk cows	1.2	1.6	2.1
Other cattle	1.4	2.9	6.5
Brood sows	.2	.2	1.8
Other hogs	1.7	2.0	6.4
Hens and pullets	27.6	53.4	263.9
Tractors per farm, *av. no.*	.2	.2	1.2
Labor organization:			
Families:			
Operator	1.0	.9	.7
Cropper	.1	.1	1.2
Wage hand	.0	.1	.3
Workers:			
Operator	2.4	2.8	2.0
Cropper	.2	.4	3.9
Wage hand	.0	.2	.6

[1] Operator's livestock only.

In 1947, tractors were reported on 19 per cent of the farms with small cotton enterprises, on 15 per cent of those with medium-sized cotton enterprises, and on 73 per cent of those with large cotton enterprises. In the two smaller enterprise groups, tractors were used only for breaking and preparing land for planting. In the large enterprise group, tractors, in some cases, were used to perform all cotton production operations except chopping, hoeing, and harvesting.

Farms with small- and medium-sized cotton enterprises were mostly family farms and were operated largely with workstock power and with family labor. Farms with large cotton enter-

prises depended heavily on share cropper labor and, in many cases, tractors were the principal source of power. Therefore, on farms with small- and medium-sized cotton enterprises, corn was relatively more important than any other crop, while on farms with large cotton enterprises cotton and corn were of approximately equal importance from the standpoint of acreage.

All major livestock enterprises handled by operators increased in size as the size of cotton enterprises increased. Chickens were relatively important, but cotton remained the principal enterprise for all groups studied.

With respect to land ownership, there was no consistent pattern between the three groups studied. Generally, farmers on farms with large cotton enterprises owned a larger percentage of the land they operated than did farmers on farms with medium- and small-sized enterprises. Farmers with large cotton enterprises owned 81 per cent of the land they operated, farmers with small cotton enterprises owned 76 per cent, and farmers with medium-sized cotton enterprises owned only 48 per cent.

Operators were not necessarily "owner operators." The proportion of farms that was operated without cropper or tenant labor averaged 97 per cent on small-sized enterprise farms, 86 per cent on medium-sized enterprise farms, and 61 per cent on large-sized enterprise farms. On the remainder of the farms, croppers and tenants alone or various combinations of operators, croppers, tenants, and wage hands supplied the labor for cotton production.

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. While 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 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.

On farms operated with workstock, land should be prepared by cutting stalks with a rolling stalk cutter or a disk harrow, and breaking 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 prior to 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, and early enough to allow the ground to be settled by rain before planting is started. Flat-broken land should be harrowed with a disk harrow just prior to planting.

When a cover crop precedes cotton, care should be taken in timing the planting with respect to the time of turning the cover crop. Since germination of cotton planting 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 the cottonseed may germinate before fermentation begins.

Present Practices. On farms operated with workstock as the principal source of power, the usual procedure in preparing land in 1947 was to cut stalks with a one- or two-row stalk cutter, followed by flat-breaking with a moldboard plow. The flat-broken land was harrowed one time over with a section harrow. Generally the rows were laid off with a Georgia stock.

On farms using tractors as the principal source of power, the usual procedure for preparing land was to cut stalks with a two-row stalk cutter, and to flat-break with a two-disk plow followed by harrowing with a disk harrow. Laying off rows was done with a two-row cultivator or a Georgia stock, Appendix Tables 5, 6, and 7.

In most cases, the equipment used in preparing land was the type recommended for such operations. However, since most of

the cotton land normally was prepared in April, many farmers probably did not allow sufficient time for seedbeds to settle between the time land preparation was completed and the crop was planted. Such a practice often results in a loose seedbed, and may seriously affect the stand and yield of cotton.

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. Some of the varieties that are recommended for this area and that have most of these qualities are Stoneville, Miller 610, Coker 100-Wilt, Empire, and Plains. To insure a reliable source of seed, farmers should consider purchasing 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 where proper precautions can be taken to preserve quality.

The recommended planting rate for the Sand Mountain 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. The recommended planting rate for acid-delinted seed is about one-half bushel per acre. All cotton planting seed should be treated, but whether planting seed is delinted or not delinted is optional. Spacing recommendations are 12 to 18 inches between hills 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 in the drill or hill dropped with one- or two-row planters. No yield difference has been observed between hill-dropped cotton and cotton planted solid in the drill if uniform stands have been obtained in both plantings. Cotton should be planted in the Sand Mountain Area between April 15 and 25.

Present Practices. Planting rates varied somewhat between farms with small, medium, and large cotton enterprises, depending on the method of planting (solid in the drill or hill dropped) and according to the type of planting seed used (delinted or non-delinted). The pounds of delinted and non-delinted seed planted per acre solid in the drill and hill dropped in 1947 are shown in Table 3.

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

Item	Unit	Size of cotton enterprise		
		Small	Medium	Large
Number of farms	*Number*	37	33	33
Cotton planted	*Acres*	242	472	1,391
Purchased seed:				
Proportion of farmers using	*Per cent*	54	48	39
Proportion of acreage planted	*Per cent*	46	41	29
Proportion of purchased seed:				
Delinted	*Per cent*	78	89	78
Treated	*Per cent*	76	92	78
Proportion of home-grown seed:				
Delinted	*Per cent*	24	47	46
Treated	*Per cent*	30	43	45
Delinted seed:				
Proportion of farmers using	*Per cent*	57	64	76
Proportion of acreage planted	*Per cent*	52	67	56
Proportion of acreage planted with delinted seed:				
Solid in the drill	*Per cent*	73	69	87
Hill dropped	*Per cent*	27	31	13
Proportion of acreage planted with non-delinted seed:				
Solid in the drill	*Per cent*	71	92	84
Hill dropped	*Per cent*	29	8	16
Pounds of seed per acre:				
Delinted:				
Solid in the drill	*Pounds*	26	27	29
Hill dropped	*Pounds*	23	26	17
Non-delinted seed:				
Solid in the drill	*Pounds*	34	27	32
Hill dropped	*Pounds*	24	32	30

There was no apparent difference between the amounts of delinted and non-delinted seed planted per acre solid in the drill in 1947 except on farms with small enterprises; nor was there any apparent relationship between size of farm and the amount of cottonseed planted per acre. When planting delinted seed, farmers with large cotton enterprises used 12 pounds more seed per acre when planting solid in the drill than when hill dropping. Farmers with small cotton enterprises used about 10 pounds less non-delinted seed per acre when hill dropping. Less than half of the cotton acreage was planted with purchased seed; there was a relationship between the size of enterprise and the proportion of acreage planted with purchased seed. Farmers with small cotton enterprises planted the highest percentage of their cotton acreage with purchased seed, while farmers with large cotton enterprises planted the lowest percentage.

Approximately four-fifths of the purchased seed used in 1947 had been delinted and treated when bought. About two-fifths of the home-grown seed was delinted. Farmers with small enterprises treated about 30 per cent of the home-grown seed used, while farmers with medium-sized and large cotton enterprises treated about 45 per cent.

The most popular variety of cotton planted in 1947 was Stoneville. Other important varieties were Coker 100-Wilt and Deltapine 14.[3] Most of the home-grown seed was 2 years or more from the breeder. The major portion of purchased seed was 1 year from breeder seed. Generally, the quality of cotton-planting seed was satisfactory in that about two-thirds of the planting seed purchased by farmers was 2 years or less from the breeder, Appendix Table 3.

More than 80 per cent of the cotton in the Sand Mountain Area was planted solid in the drill, and all of it was hand chopped to a stand. Most of the cotton planted solid in the drill on workstock farms was planted in 40- to 43-inch rows and spaced 11 to 13 inches in rows. On tractor farms, cotton was planted in 42-inch rows and spaced 11 to 14 inches in rows. Hill-dropped cotton was planted in 38- to 42-inch rows with 13- to 18-inch spacing between hills in the rows. Workstock power and workstock equipment were usually used for all seeding operations in this area.

Most farmers in the Sand Mountain Area were within the range of recommendations for planting, rate of seeding, variety, and method of planting and spacing. As a whole, farmers were planting from the last week of April to the middle of May, with the majority planting in early May. This was later than the area recommendation of April 15 through April 25. Late planting may affect attaining a stand, and particularly may affect yields when insect infestation is a problem.

Fertilization

Recommendations. About 600 pounds per acre of 4-10-7 fertilizer should be used at planting time on the more productive soils in the Sand Mountain Area. Fertilizer applied at planting time should be placed 2 inches below and to the side of the seed. On workstock farms, either a distributor or a planter attachment should be used, while on tractor farms the fertilizer should be applied with a fertilizer attachment on the planter. The appli-

[3] This variety is not recommended for the Sand Mountain Area of Alabama.

cation of a side-dressing should be at the rate of 48 pounds of nitrogen per acre. This may be applied with fertilizer attachments on cultivating equipment or with a distributor at about the time of the first or second cultivation after chopping.

Present Practices. All farmers interviewed in the Sand Mountain Area used some type of commercial fertilizer on all cotton planted. The average rate of application per acre when only complete fertilizer was used varied from 628 pounds on farms with small cotton enterprises, to 666 pounds on farms with large cotton enterprises. Where both complete fertilizer and side-dressing were used, the average rate per acre varied from 600 pounds on farms with small cotton enterprises to 1,151 pounds on farms with medium-sized cotton enterprises; the rate of side-dressing varied from 111 pounds per acre on farms with medium-sized cotton enterprises to 154 pounds on farms with large cotton enterprises. Approximately three-fourths of the cotton acreage received complete fertilizer only; the other one-fourth received both complete fertilizer and side-dressing.

The most commonly used grade of fertilizer in 1947 was 6-8-4, although a considerable proportion of the acreage was fertilized with 4-10-7, Table 4.

On workstock farms, one-row distributors were used in applying fertilizer, while on tractor farms both one- and two-row distributors were used.

In the three enterprise-size groups, the amount of plant food in the fertilizer used ranged from 36 to 46 pounds per acre of N, from 56 to 78 pounds of P_2O_5, and from 32 to 50 pounds of K_2O. The average per acre was about 41 pounds of N, 64 pounds of P_2O_5, and 39 pounds of K_2O, Table 4.

Sand Mountain farmers were using the recommended rate of 600 pounds of complete fertilizer at planting time, though a majority were using 6-8-4 instead of 4-10-7. They were considerably under the recommendation on the rate of side-dressing. The over-all rate of fertilizer application indicates that Sand Mountain farmers were under the recommended rate of N, a little above the recommended rate for P_2O_5, and slightly under the recommended rate for K_2O.

Some farmers in the Sand Mountain Area can increase yields by using more fertilizer, and many of them can reduce labor requirements by using distributor attachments on planting and cultivating equipment for applying fertilizers.

TABLE 4. FERTILIZER PRACTICES, BY SIZE OF COTTON ENTERPRISE, SAND MOUNTAIN AREA OF ALABAMA, 1947

Item	Unit	Size of cotton enterprise		
		Small	Medium	Large
Number of farms	*Number*	37	33	33
Cotton planted	*Acres*	242	472	1,391
Proportion using complete fertilizer only:				
Farms[1]	*Per cent*	86	67	73
Acreage	*Per cent*	83	66	74
Proportion using complete fertilizer and side-dressing:				
Farms[1]	*Per cent*	19	36	39
Acreage	*Per cent*	17	34	26
Rate of application where used:				
Complete only	*Pounds*	628	638	666
Complete and side-dressing:				
Complete	*Pounds*	600	1,151	839
Side-dressing	*Pounds*	124	111	154
Rate of application per planted acre:				
Complete	*Pounds*	631	829	677
Side-dressing	*Pounds*	22	39	35
Analysis of complete fertilizer:				
Proportion of acreage receiving:[2]				
6-8-4	*Per cent*	71	57	68
4-10-7	*Per cent*	38	58	51
4-10-4	*Per cent*	6	5	6
Other	*Per cent*	1	2	3
Analysis of side-dressing:				
Proportion of acreage receiving:				
Sodium nitrate	*Per cent*	17	25	20
Ammonia	*Per cent*	0	10	3
Summary of fertilizer elements:				
N per fertilized acre of cotton	*Pounds*	36	46	40
P_2O_5 per fertilized acre of cotton	*Pounds*	56	78	61
K_2O per fertilized acre of cotton	*Pounds*	32	50	37

[1] Farm totals add to more than 100 per cent because some farmers applied complete fertilizer and side-dressing to part of their acreage and complete fertilizer only to the remaining acreage.

[2] Summed percentages fail to agree with sum of proportions of acreages using complete fertilizer only and complete fertilizer with side-dressing, because some farmers used two complete fertilizers on the same acreage.

Cultivation *and* Weed Control

Recommendations. Cultivation should begin just before cotton comes up or just after cotton 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 the permanent leaves are present. Chopping should allow a spacing of 12 to 18 inches between hills with two to three stalks per hill. Hoeing may be necessary if grass and weeds cannot be controlled by cultivation.

Present Practices. On workstock farms in 1947, cultivation usually was accomplished with half and one-row equipment; both one- and two-row cultivators were used on tractor farms. Cotton, on the average, was cultivated five or six times. Cotton was chopped, and hoed once.

By using one-row cultivating equipment instead of half-row equipment, farmers may be able to materially reduce both labor requirements and costs of production. It is doubtful that labor requirements for chopping and hoeing can be reduced substantially, since the majority of farmers in the area are now going over the cotton only twice (once for chopping and once for hoeing). As a whole, farmers in 1947 were using recommended types of cultivating equipment, Appendix Table 7.

Insect Control

Recommendations. The following materials were recommended for general use in the 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 3 per cent gamma BHC-5 per cent DDT, or	7 — 10	Same as above.
	10 — 15	Same as above.
Calcium arsenate alternated with calcium arsenate containing 2 per cent nicotine	7 — 10	Same as above.
	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 Alabama tests. They are recommended only for tractor or airplane spraying.

For boll worm 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, boll worms are not likely to become numerous.

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

Spray can be applied by tractor or airplane, but row spacing must be taken into consideration where tractor poisoning equipment is used, since this equipment is usually designed for specific row spacings. The amount of diluted spray used to cover an acre may vary from 2 to 10 gallons. The right amount of poison to use per acre for each application (regardless of the 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 effective applications should be enough; more applications may be needed during seasons of heavy infestation and/or frequent rainfall.

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

Present Practices. Present practices are based on the crop year 1947. On the basis of the sample taken, less than 1 per cent of the cotton acreage in the Sand Mountain Area received an application of poison in 1947. Calcium arsenate and sulphur arsenate were the poisons used. The per-acre rate of application was 5 pounds of calcium arsenate and 7.5 pounds of sulphur arsenate. More than 7 farmers out of 10 had done no poisoning during the last 10 years.

Method *and* Time *of* Harvesting

Recommendations. Cotton, if hand harvested, should be picked immediately after the bolls are open and dry; precautions should be taken to prevent picking wet or green cotton. It should be picked as clean as possible, and usually it will require three pickings during the harvest season. Harvesting dates in the Sand Mountain Area are usually from about October 1 to December 30.

Present Practices. All of the cotton harvested on the farms surveyed was hand picked. In 1947, farmers averaged picking over their fields three times. More than three-fourths of the cotton was harvested by family labor on all farms except large operator farms, where slightly more than half of the cotton was harvested by hired labor. Seed cotton required to make a 500-pound bale was about 1,350 pounds, Appendix Table 4.

Farmers were following harvesting recommendations in 1947. Cotton was picked from two to four times; picking began the latter part of September in 1947 and extended to mid-December.

More than 60 per cent of the total hours of man labor required to produce an acre of cotton was required for harvesting. Harvesting requirements may be reduced by picking thoroughly a minimum number of times.

LABOR *and* POWER REQUIREMENTS

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

The following estimates indicate the relative importance of usual labor and power costs to total costs of producing cotton. On workstock farms power costs amount to approximately 14 per cent of 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 cost 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 costs make up roughly one-half of the cost of producing cotton. Power requirements are greatest for land preparation, planting, and cultivating; labor requirements are greatest during the chopping, hoeing, and harvesting seasons.

With power and labor costs making up from one-half to over

two-thirds of the cost of producing cotton, any sizeable reduction in power and labor requirements, should both increase efficiency and decrease the cost of producing cotton.

Use of Power

The use of different kinds and combinations of power varied greatly among the farms surveyed. Sixty-eight of the 103 farms studied used workstock only, 28 used both workstock and tractors (combination farms), and 7 used tractors only, Table 5. All but two of the farms using tractors only were farms with large cotton enterprises.

TABLE 5. DISTRIBUTION OF FARMS, BY SIZE OF COTTON ENTERPRISE, AND BY TYPE OF POWER USED, SAND MOUNTAIN 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	81	29	88	9	27
Combination farms[1]	6	16	3	9	19	58
Tractor farms	1	3	1	3	5	15
TOTAL	37	100	33	100	33	100

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

Usual Labor Requirements

The usual amounts of man labor used varied from 101 hours per acre on tractor (cropper) farms with large cotton enterprises to 161 hours per acre on workstock (operator) farms with large cotton enterprises. Approximately 42 hours of animal power or 11 hours of mechanical power (tractor and truck or car) were required to produce an acre of cotton, Appendix Tables 5 and 6.

In comparing labor requirements for various operations among different size and tenure groups, chopping and hoeing, and harvesting were considered separately, since these operations required a relatively large amount of labor and varied widely between size and tenure groups. Chopping and hoeing required about 12 per cent of the total man labor needed to produce an acre of cotton; harvesting required about two-thirds of the total. Labor required for harvesting formed a larger proportion of the total labor required in the Sand Mountain Area than in some other areas of the State because of higher yields in this area.

Where a significant difference occurred between labor requirements on operator and cropper farms, this difference was in the amount of labor used in chopping, hoeing, and harvesting. The

TABLE 6. USUAL TOTAL POWER AND LABOR REQUIREMENTS PER ACRE FOR PRODUCING COTTON, BY SIZE OF COTTON ENTERPRISE, AND BY TYPE OF POWER USED, SAND MOUNTAIN AREA OF ALABAMA, 1947.

Type of power and size of enterprise	Requirements per acre		
	Man	Workstock	Tractor
	Hours	*Hours*	*Hours*
Workstock			
Small	142	37	--
Medium	139	42	--
Large	153	44	--
Combination[1]			
Small	147	27	3.4
Medium	136	34	1.9
Large	132	22	4.4
Tractor			
Large	103	--	10.8

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

differences that occurred in these operations were, for the most part, due to additional times over.

More hours of man labor were used on workstock farms with large cotton enterprises than on workstock farms with small and medium enterprises, Table 6. This was because cotton was hoed an additional time, and more time was required for harvesting. On farms using a combination of workstock and tractor power, labor requirements were greater on farms with small cotton enterprises and least on farms with large cotton enterprises. Here the difference was due in part to the greater use of tractor power in cultivation on the farms with large enterprises. In the case of workstock farms, power requirements were least on farms with small cotton enterprises and most on farms with large cotton enterprises. On farms with large cotton enterprises, the hours of workstock power required were reduced from 45 when no tractor power was used to 21 when tractor power was used 4.4 hours.

The operators of farms with large cotton enterprises were able to make better use of machinery and equipment and thus substantially reduce man labor requirements. Assuming that all cotton is hand picked, usual labor requirements indicate that tractor power can reduce total man labor requirements about 24 per cent, but can reduce pre-harvest labor requirements approximately 36 per cent.

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 will have no difficulty in timing production operations to produce a crop. However, when adverse weather conditions occur, those farmers that are equipped to cover large acreages in a short time have a great advantage. Land preparation usually begins in March with stalk cutting and seedbed preparation. Cotton is planted during the last of April and the first part of May. In the Sand Mountain Area, peak labor requirements occur normally during June largely because of the requirements for chopping and hoeing, and during October and November, which are the peak harvest months.

Variation *from* Usual Operations

A wide variety of machinery and equipment of varying sizes was used in producing cotton in 1947. The greatest variation was found in the types of equipment used for land preparation and cultivation operations, Appendix Table 7.

Variations *in* Time Required *to* Perform Usual Operations

The most labor-saving methods of performing usual operations were selected for comparison with the most common methods of performing them. The greatest labor-saving methods on workstock farms required 135 hours of man labor and 42 hours of workstock labor to produce and harvest an acre of cotton yielding 506 pounds of lint, Table 7. This represented a saving of 10 man hours or about 7 per cent of usual requirements.

Large tractor-powered farms were using two-row equipment for the most part. The saving in total man labor by using larger equipment was only 4 per cent in 1947, but the saving in tractor hours was 37 per cent. Man labor required to produce an acre of cotton primarily with one-row tractor-drawn equipment was 112 hours compared to 107 hours with two-row equipment. Particular attention should be given to labor requirements of chopping, hoeing, and harvesting, which together accounted for 99 of these hours with either type of equipment.

Savings in man and tractor hours through use of larger equipment and by shifting to use of more tractor power are of major importance in reducing both labor and power costs of producing cotton. However, size of the farming unit must be large enough to justify use of tractor power and large equipment if these savings are to be realized.

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

Item	Size of equipment	Times over	Hours per acre[1]	
			Man	Animal
Cut stalks	2-horse stalk cutter	1	.9	1.8
Flat-break	2-horse moldboard plow	1	3.9	7.8
Bed	1 time per row	1	1.8	3.6
Cultivate beds	Section harrow	1	.6	1.2
Plant	2-row planter	1	1.4	1.4
Fertilize	2-row distributor	1	3.4	1.7
Cultivate	2-horse cultivator	5	9.0	18.0
Chop and hoe	Hand	2	18.2	.0
TOTAL PRE-HARVEST			39.2	35.5
Harvest	Hand		91.8	.0
Haul	Wagon		3.6	7.0
TOTAL			134.6	42.5
Comparison (usual total)			144.5	40.9
Labor and power saved			9.9	–1.6
Per cent labor and power saved			6.8	–3.9

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

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

The Sand Mountain Area will probably continue to be one of the major cotton-producing areas of Alabama. A considerable proportion of the area's cotton land is of a topography that will permit use of mechanical equipment and tractor power, but present size of fields and farms are major limiting factors. Well planned field layouts will aid in reducing both labor and power requirements of many operations that may be performed with machines.

It is essential that cotton stalks be well shredded or broken up if efficient use is to be obtained from mechanical equipment during subsequent operations. The use of either horizontal or vertical type cutters is satisfactory for this operation, but when green stalks are cut, the power-driven, rotary-type cutter is more efficient. 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.

Since the type of seedbed preparation influences subsequent mechanized operations, a well prepared seedbed is of utmost im-

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

portance. 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 spacing 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 use of rotary hoes and mechanical choppers. Also they will 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 5 to 7 per cent. To maintain a good stand, a heavier rate of seeding is required in order to allow for reduction of stand resulting from use of the rotary hoe and mechanical chopper.

Insect control has become increasingly important in this area due to increases in insect infestation during recent years. Sprayers and dusters are equally effective 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 is used to apply the defoliant, which is put on at recommended rates per acre. Defoliation is done when most of the cotton bolls are mature. The defoliant should be applied either in late evening or early morning, since contact with moisture is essential for its 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 animal-drawn equipment are shown in Table 7. Proper use of the rotary hoe and mechanical chopper can reduce labor require-

ments 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 using latest methods of insect control and defoliation, total power and labor requirements would not be seriously affected. Considerable savings in labor requirements of cotton production for this area can be attained if further improvements are made in mechanical harvesters and in ginning facilities. These developments must be made, however, before mechanical harvesting can be recommended in this area.

Saving man labor does 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 how much machinery to substitute for labor and workstock power.

SUMMARY *and* CONCLUSIONS

The Sand Mountain Area is one of the leading cotton-producing areas of Alabama; it has produced a consistently higher average lint yield per acre than have other areas of the State. In view of high production costs, high labor requirements, and other major problems facing cotton producers, and the importance of cotton in this area, a survey was undertaken in 1948 in four counties selected as being representative of the Sand Mountain Area of Alabama 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 improvements are needed.

On most farms, the equipment used in preparing land was the equipment recommended. However, there is a possibility that costs can be decreased and efficiency increased through use of larger equipment on some farms, particularly on workstock farms. Most of the land was prepared during April. Indications are that the period between the time of land preparation and planting was too short to allow proper settling of the seedbed.

The most popular varieties of cotton were Stoneville, Coker 100-Wilt, and Deltapine 14. Farmers were generally within the range of recommendations for seeding rates. No relationship was observed between size of enterprise and seeding rates, but a slightly smaller amount of seed was used when hill dropping than when planting solid in the drill. Between one-third and one-half of the acreage was planted with purchased seed. More than half of all seed was treated. Improvement in quality of planting seed, and further treatment of seed may help to increase cotton yields. Some cotton was hill dropped, but all cotton was hand chopped and hoed. Improved cultivation practices may decrease the number of times that hoeing is necessary and reduce hoe labor costs accordingly.

All cotton was fertilized with some type of commercial fertilizer. Approximately 75 per cent of the acreage planted received complete fertilizer only; the average rate of application was slightly above the recommended 600-pound rate. The most popular grade used was 6-8-4; the recommended grade is 4-10-7. Where a side-dressing was used, the rate of application was less than half the recommended rate of 48 pounds of nitrogen per acre. Soils of the Sand Mountain Area respond to heavy rates of fertilization, and cotton farmers in the area can increase the per-acre

yield by side-dressing at the recommended rate. The cost of fertilizer applications can be decreased by using fertilizer attachments on planting and cultivating equipment.

The equipment used for cultivation and weed control in most cases was the equipment recommended. There is a possibility that costs of performing these operations can be reduced by using larger equipment where practicable, and cultivating earlier and more frequently to decrease hand-labor requirements for hoeing.

On the basis of the sample taken, less than 1 per cent of the cotton acreage in the Sand Mountain Area received an application of poison in 1947. Since that time, boll insect infestation has become a serious problem for the cotton producers in the area. If cotton yields are to be maintained or increased, current recommendations for insect control must be followed.

Farmers were following recommended cotton harvesting practices. The majority picked over their cotton fields an average of three times. On some farms, harvest labor can 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 can become 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 cotton are relatively high. Some farmers in the area can reduce requirements through increased and efficient utilization of equipment already available. The small size of the farming unit and the layout of fields are two important factors limiting economic justification for use of more mechanical equipment in producing cotton in this area. Before shifting to more mechanization, operators of the larger units should take into consideration such factors as topography of cotton land, future government-control programs, relative costs of machinery and labor, and future possibilities of alternative enterprises.

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

Year	Acreage	Yield per acre	Production
	1,000 acres	*Pounds*	*1,000 bales*
1928	350.5	233	171.0
1929	346.1	267	193.4
1930	353.1	261	192.9
1931	324.4	278	189.0
1932	315.4	192	126.9
1933	323.8	223	151.3
1934	210.3	272	119.8
1935	209.1	278	121.6
1936	219.2	300	137.7
1937	256.9	394	211.5
1938	201.4	364	153.2
1939	205.9	372	160.4
1940	210.1	302	132.8
1941	194.3	384	155.9
1942	197.0	445	183.6
1943	204.3	392	167.6
1944	185.4	416	161.3
1945	195.8	437	178.8
1946	223.5	394	184.1
1947	240.6	398	200.1

[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, SAND MOUNTAIN 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
Small (37)[1]:						
Operator	25	162	9	60	1	2
Cropper	1	9	1	8	0	0
Tenant	0	0	0	0	0	0
Medium (33)[1]:						
Operator	20	274	9	108	1	25
Cropper	1	11	4	48	0	0
Tenant	0	0	1	5	0	0
Large (33)[1]:						
Operator	6	144	14	395	5	117
Cropper	3	102	11	450	4	171
Tenant	0	0	0	0	1	12

[1] Number of schedules included in survey.

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

Item	Unit	Size of cotton enterprise		
		Small	Medium	Large
Number of farms	*Number*	37	33	33
Cotton planted	*Acres*	242	472	1,391
Proportion of purchased seed by varieties:[1]				
Stoneville	*Per cent*	34	32	72
Coker 100-Wilt	*Per cent*	17	0	14
Deltapine 14	*Per cent*	27	5	7
All other	*Per cent*	22	25	0
Mixed	*Per cent*	0	38	7
Proportion of home-grown seed by varieties:[1]				
Stoneville	*Per cent*	55	48	69
Coker 100-Wilt	*Per cent*	13	26	6
Deltapine 14	*Per cent*	11	0	3
All other	*Per cent*	21	19	13
Mixed	*Per cent*	0	7	9
Years from breeder:				
Home-grown seed:				
1 year	*Per cent*	0	8	12
2 years	*Per cent*	56	61	58
3 years	*Per cent*	36	31	28
Not known	*Per cent*	8	0	2
Purchased seed:				
Direct from breeder	*Per cent*	0	0	12
1 year	*Per cent*	69	76	75
2 years	*Per cent*	20	24	6
Not known	*Per cent*	11	0	7

[1] Varieties listed are those most commonly used.

APPENDIX TABLE 4. COTTON HARVESTING PRACTICES, YIELD OF LINT COTTON PER ACRE, AND GIN TURNOUT, BY SIZE OF COTTON ENTERPRISE, SAND MOUNTAIN AREA OF ALABAMA, 1947

Item	Unit	Size of cotton enterprise		
		Small	Medium	Large
Number of farms	*Number*	37	33	33
Acres harvested	*Acres*	242	472	1,391
Proportion of cotton: Hand picked	*Per cent*	100	100	100
Proportion of cotton hand picked by:				
Family labor	*Per cent*	81	77	66
Hired labor	*Per cent*	19	23	34
Bales produced	*Number*	254	481	1,287
Lint yield per acre	*Pounds*	526	509	462
Seed cotton per 500-lb. bale	*Pounds*	1,322	1,346	1,387

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, SAND MOUNTAIN AREA OF ALABAMA, 1947

Size of cotton enterprise by power groups	Number of records[1]	Man labor used per acre by specified operations												
		Land preparation												
		Cut stalks	Flat breaking	Cultivate after flat breaking	Bed after flat breaking	Cultivate beds	Lay off rows; open furrows	Planting	Fertilize	Cultivate	Chop and hoe	Harvesting	Hauling	Total
	(No.)	*Man hours per acre*												
WORKSTOCK FARMS:														
Small:														
Operator	(25)	1.2	5.5	1.1	--	--	1.8	2.5	3.0	14.0	18.2	91.0	3.6	141.9
Medium:														
Operator	(20)	1.2	3.9	1.1	--	--	1.5	2.5	3.0	14.1	18.2	90.3	3.6	139.4
Large:														
Operator	(6)	1.2	3.9	1.1	--	--	1.8	2.5	3.0	18.9	26.4	99.0	3.6	161.4
Cropper[2]	(3)	.9	3.9	1.1	--	--	1.8	2.5	3.0	14.7	18.2	86.7	3.6	136.4
COMBINATION FARMS:														
Small:														
Operator	(9)	1.2	1.5	1.2	--	--	1.8	2.5	3.0	14.7	18.2	101.0	1.9[3]	147.0
Medium:														
Operator	(9)	1.2	.7	1.1	1.8	1.4	--	2.5	3.0	18.0	18.2	92.0	3.6	143.5
Cropper[2]	(5)	1.2	1.5	.7	1.8	--	--	2.5	3.0	15.5	10.0	83.1	1.9[3]	121.2
Large:														
Operator	(14)	.5	1.5	1.1	--	--	--	2.5	3.0	3.0	18.2	86.2	3.6	119.6
Cropper[2]	(11)	1.2	1.5	.7	--	--	1.8	2.5	3.0	18.0	26.4	85.6	3.6	144.3
TRACTOR FARMS:														
Large:														
Operator	(5)	.5	1.5	.7	--	--	--	1.1	1.3	5.8	18.2	73.6	1.9[3]	104.6
Cropper[2]	(5)	.5	1.5	.7	--	--	--	.6	.7	4.6	10.0	80.1	1.9[3]	100.6

[1] Number of records does not equal number of schedules because some schedules contained records of operators and tenants.
[2] Tenants were combined with croppers.
[3] Truck or car power.

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, SAND MOUNTAIN AREA OF ALABAMA, 1947

Size of cotton enterprise by power groups	Number of records[1]	Power used per acre by specified operations											
		Land preparation										Total	
		Cut stalks	Flat breaking	Cultivate after flat breaking	Bed after flat breaking	Cultivate beds	Lay off rows; open furrows	Planting	Fertilize	Cultivate	Hauling	Mule	Tractor
	(No.)	(Power requirements [hrs.] per acre)											
WORKSTOCK FARMS:													
Small:													
Operator	(25)	2.4	5.5	2.2	--	--	1.8	2.0	1.9	14.0	7.0	36.8	--
Medium:													
Operator	(20)	2.4	7.8	2.2	--	--	3.0	2.0	1.9	15.4	7.0	41.7	--
Large:													
Operator	(6)	2.4	7.8	2.2	--	--	1.8	2.0	1.9	20.7	7.0	45.8	--
Cropper[2]	(3)	1.8	7.8	2.2	--	--	1.8	2.0	1.9	16.1	7.0	40.6	--
COMBINATION FARMS:													
Small:													
Operator	(9)	2.4	1.5	2.4	--	--	1.8	2.0	1.9	16.1	1.9[3]	26.6	3.4
Medium:													
Operator	(9)	2.4	.7	2.2	3.6	1.4	--	2.0	1.9	18.0	7.0	38.5	.7
Cropper[2]	(5)	2.4	1.5	.7	3.6	--	--	2.0	1.9	15.5	1.9[3]	25.4	4.1
Large:													
Operator	(14)	.5	1.5	1.1	--	--	--	2.0	1.9	3.0	7.0	10.9	6.1
Cropper[2]	(11)	2.4	1.5	.7	--	--	1.8	2.0	1.9	18.0	7.0	33.1	2.2
TRACTOR FARMS:													
Large:													
Operator	(5)	.5	1.5	.7	--	--	--	.6	.6	5.8	1.9[3]	--	11.6
Cropper[2]	(5)	.5	1.5	.7	--	--	--	.4	.4	4.6	1.9[3]	--	10.0

[1] Number of records does not equal number of schedules because some schedules contained records of operators and tenants.
[2] Tenants were combined with croppers.
[3] Truck or car power.

APPENDIX TABLE 7. AVERAGE ANNUAL USE AND RATES OF PERFORMANCE FOR SPECIFIED OPERATIONS, BY TYPE OF EQUIPMENT USED, SAND MOUNTAIN 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								
1-row (mule)	59	1.0	15.5	18.6	8.3	1.2	2.4	--
2-row (mule)	23	1.0	18.2	16.4	11.1	.9	1.8	--
Disk harrow (mule)	2	1.0	10.5	22.0	4.8	2.1	4.2	--
2-row (tractor)	14	1.0	28.3	14.2	20.0	.5	--	.5
Disk harrow (tractor)	3	1.0	26.7	13.4	20.0	.5	--	.5
Flat-break:								
Moldboard:								
1-bottom (1-mule)	33	1.0	11.1	61.0	1.8	5.5	5.5	--
1-bottom (2-mule)	35	1.0	15.7	61.2	2.6	3.9	7.8	--
Disk harrow (tractor)	16	1.1	10.8	8.3	14.3	.7	--	.7
Disk plows (tractor):								
2-disk	31	1.0	21.4	32.1	6.7	1.5	--	1.5
3-disk	3	1.0	38.3	42.1	9.1	1.1	--	1.1
4-disk	4	1.0	19.2	13.4	14.3	.7	--	.7
Cultivate flat-broken land:								
Section harrow (mule)	49	1.0	13.3	14.6	9.1	1.1	2.2	--
Drag (mule)	21	1.0	15.8	19.0	8.3	1.2	2.4	--
Section harrow (tractor)	10	1.0	24.3	9.7	25.0	.4	--	.4
Disk harrow (tractor)	29	1.2	25.8	21.7	14.3	.7	--	.7
Drag (tractor)	7	1.0	26.3	13.2	20.0	.5	--	.5

(Continued)

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

APPENDIX TABLE 7 (*Continued*). AVERAGE ANNUAL USE AND RATES OF PERFORMANCE FOR SPECIFIED OPERATIONS, BY TYPE OF EQUIPMENT USED, SAND MOUNTAIN 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*
Bed after flat-break:								
1 time to row (mule)	26	1.0	11.4	20.5	5.6	1.8	3.6	--
Cultivate beds:								
Section harrow (mule)	4	1.0	11.2	6.7	16.7	.6	1.2	--
Scratcher (mule)	6	1.0	10.0	14.0	7.1	1.4	1.4	--
Lay off rows and open furrows:								
Georgia stock (mule)	41	1.0	17.7	31.9	5.6	1.8	1.8	--
1-row cultivator (mule)	19	1.0	12.0	18.0	6.7	1.5	3.0	--
Plant:								
1-row planter (mule)	98	1.0	15.2	30.4	5.0	2.5	2.0	--
1-row planter (tractor)	5	1.0	27.8	16.7	16.7	1.1	--	.6
2-row planter (tractor)	14	1.0	29.4	11.8	25.0	.6	--	.4
Fertilize:								
1-row distributor (mule)	98	1.0	15.4	29.3	5.3	3.0	1.9	--
1-row distributor (tractor)	5	1.0	27.8	16.7	16.7	1.3	--	.6
2-row distributor (tractor)	15	1.0	28.6	11.4	25.0	.7	--	.4
Side-dress:								
1-row distributor (mule)	37	1.0	17.1	30.8	5.6	1.9	1.8	--
2-row distributor (tractor)	5	1.0	26.2	21.0	12.5	.8	--	.8
Hand	4	1.0	21.2	31.8	6.7	1.5	--	--

(Continued)

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

APPENDIX TABLE 7 (*Continued*). AVERAGE ANNUAL USE AND RATES OF PERFORMANCE FOR SPECIFIED OPERATIONS, BY TYPE OF EQUIPMENT USED, SAND MOUNTAIN 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:								
½-row (mule)	48	5.1	13.7	216.8	3.2	3.1	3.1	--
½-row and 1-row (mule)	32	6.9	18.2	263.6	4.8	2.1	2.3	--
1-row (mule)	18	5.2	13.2	123.6	5.6	1.8	3.6	--
1-row (tractor)	5	5.2	27.4	156.7	9.1	1.1	--	1.1
2-row (tractor)	16	5.4	32.4	122.5	14.3	.7	--	.7
Chop and hoe:								
1 time over	39	1.0	17.1	165.9	1.0	10.0	--	--
2 times over	48	2.0	17.3	283.7	1.2	8.2	--	--
3 times over	26	3.0	20.0	492.0	1.2	8.2	--	--
4 times over	4	4.0	21.5	593.4	1.4	7.1	--	--
Haul:								
Mule and wagon	74	--	18.5	66.6	2.8	3.6	7.0	--
Truck and/or car and trailer	41	--	14.5	27.6	5.3	1.9	--	1.9[2]

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

[2] Truck or car hours.