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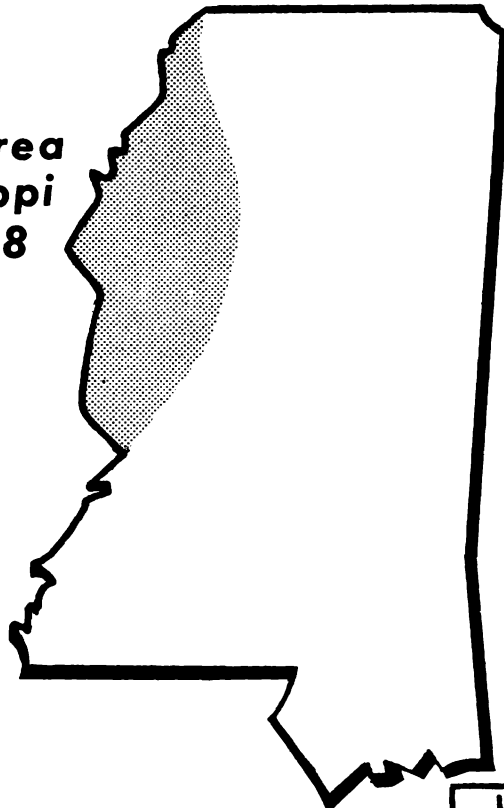
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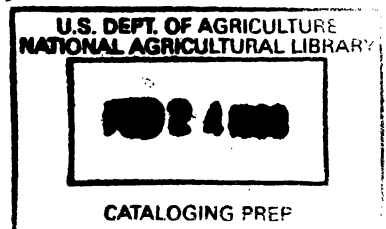
CROP PRODUCTION PRACTICES AND COSTS BY SIZE OF FARM

**Delta Area
Mississippi
1957-58**



**Agricultural
Economic
Report No. 21**

**U.S. DEPARTMENT OF AGRICULTURE
Farm Economics Division
Economic Research Service**



CONTENTS

	<u>Page</u>
SUMMARY	iv
INTRODUCTION.....	1
Purpose.....	1
Use of Cost Data	1
Description of Area	2
Procedure.....	2
DESCRIPTION OF FARMS	3
Land Use	3
Land Tenure.....	4
Livestock.....	5
Equipment.....	7
Characteristics of Operators.....	7
COTTON PRODUCTION PRACTICES AND COSTS	7
Preharvest Operations and Materials.....	7
Use of Labor	19
Tractor Use	20
Cotton Harvest Practices and Costs.....	21
Direct Costs Per Acre and Per Unit of Output	27
Net Returns Per Acre	29
Costs and Returns with Normal Yields	31
SOYBEAN PRODUCTION PRACTICES AND COSTS.....	32
Preharvest Operations and Materials.....	32
Labor and Power Use.....	35
Soybean Harvest Practices.....	35
Direct Costs Per Acre and Per Unit of Output	36
Net Returns Per Acre	38
CORN PRODUCTION PRACTICES AND COSTS	39
Preharvest Operations and Materials.....	39
Labor and Tractor Use.....	39
Corn Harvest Practices.....	39
Direct Costs Per Acre and Per Unit of Output	39
Net Returns Per Acre	45
OAT PRODUCTION PRACTICES AND COSTS	48
Preharvest Operations and Materials.....	48
Labor and Power Use.....	52
Oat Harvest Practices.....	52
Direct Costs Per Acre and Per Unit of Output	54
Net Returns Per Acre	54
WHEAT PRODUCTION PRACTICES AND COSTS.....	57
Preharvest Operations and Materials.....	57
Labor and Power Use.....	57
Wheat Harvest Practices	57
Direct Costs Per Acre and Per Unit of Output	57
Net Returns Per Acre	63
COST OF OWNING AND OPERATING GRAIN COMBINES.....	64
Small and Medium-sized Combines.....	64
Twelve- and 14-foot Self-Propelled Combines.....	64
Comparative Costs of Alternative Methods of Combining	65
Comparative Costs of Owning and Operating New and Used Combines	67
APPENDIX-- TABLES	68

SUMMARY

This report presents the results of a study of crop production practices, direct costs, and estimated net returns to unpaid labor, land, and management for five crops--cotton, soybeans, corn, oats, and wheat--by size of farm in the Delta area of Mississippi. The basic data were obtained by taking a survey of 163 farm operating units for the crop year 1957 and 160 operating units for the crop year 1958. Of these farm units 126 were in both surveys. Four sizes of farms were selected for analysis, as follows: (1) Less than 60 acres, (2) 60 to 399 acres, (3) 400 to 999 acres, and (4) 1,000 or more acres of cropland per farm.

The hypothesis of this study was that lower direct costs per acre and per unit of output are obtained on large farms. The comparative analysis was restricted to direct costs in conjunction with estimates of gross returns per acre. In calculating per acre returns to land and unpaid labor and management, these estimates provided an indication of the relative returns from the various crop alternatives under existing management practices.

Those farms having more than 400 acres of cropland generally obtained lower direct costs per unit of production and greater returns per acre to land and management than smaller farms. This analysis indicates, however, that cotton farms in the Delta with more than 1,000 acres of cropland have little or no direct cost advantage over farms having between 400 and 1,000 acres of cropland. The greatest reductions in direct cost per acre and per unit of output were those between the small and intermediate size groups. It is probable that internal economies are largely exhausted as a farm operating unit in the Delta expands in size to 1,000 acres of cropland.

The analysis of highly mechanized enterprises--soybeans, oats, and wheat--showed a fairly consistent relationship between size of farm and net returns to productive factors on farms having less than 1,000 acres of cropland, but the results varied for cotton. The net return per acre to unpaid labor, land, and management from cotton production was relatively favorable on small farms since unpaid labor constitutes a significant proportion of total inputs. But with limited command of resources it is obvious that most full-time farmers with less than 60 acres of cropland in the Delta can attain little more than a subsistence level of living.

CROP PRODUCTION PRACTICES AND COSTS BY SIZE OF FARM

Delta Area, Mississippi, 1957-58

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INTRODUCTION

Significant changes have taken place since the early thirties in the economic and institutional forces affecting the production of cotton and other farm products in the Mississippi Delta. Supply and demand inequalities in the cotton fiber market brought about in 1933 the adoption of Government price support and acreage allotment programs for cotton. Price support programs have continued to date, with periodic acreage allotment and production payment programs in effect. These programs have resulted in a more favorable balance between supply and demand and have sustained farm prices at a higher level than could be expected without them. Reductions in cotton acreages, however, have not been accompanied by proportionate reductions in output. Improved practices and better land selection have led to an upward trend in yields. For example, in 1954 the Mississippi Delta (census economic region IV) produced 28 percent more cotton from 29 percent fewer acres than the 5-year average of 1928-32.¹

Changes in technology in cotton production, greater nonfarm employment opportunities, and more emphasis on highly mechanized soybean and small grain production have resulted in an accelerated trend toward capital-intensive farming methods. Productivity has increased while labor requirements have been reduced. New technologies have brought about an increase in output per farm and more efficient production. However, the impact of technology differs from farm to farm, more particularly between farms of different sizes and resource situations. Innovations requiring substantial investments--mechanical cotton pickers, flame

cultivators, herbicide equipment, and the like--often force adjustments in farm size, organization, or practices. Generally, those producers who benefit most from technological improvements are those who already enjoy a competitive advantage.

Farming has become increasingly complex, with greater reliance on the nonfarm sector of the economy for goods and services. Cash costs are rising, resulting in greater reliance on credit institutions and greater risks of financial loss in years of low yield or poor quality of product. Farm operators and those serving farmers have become increasingly aware of the need for current information on production practices and costs. The narrowing margin between cash costs and unit prices has spurred a widespread effort to reduce costs in farming by increasing the size of business, adopting mechanized practices, and improving efficiency.

Purpose

The purpose of this report is to present information on crop production practices, direct costs, and returns to unpaid labor, land, and management for major crops on farms of different sizes in the Delta area of Mississippi. The hypothesis of this investigation is that lower direct costs per unit of production are obtained as size of farm increases. The study was designed to show which elements of cost differ by size of farm and the extent of that difference. The data obtained are also useful in indicating relative returns to land, labor, and management for the five crops involved--cotton, soybeans, corn, oats, and wheat.

Use of Cost Data

Enterprise cost data seldom provides the information necessary for all the purposes that such data may serve. Many persons want enterprise costs to compare

¹U.S. Bureau of the Census, U.S. Census of Agriculture: 1954, Vol. III, Special Reports Part 9, Farmers and Farm Production in the United States, Chapter II, "Cotton Producers and Cotton Production." 53 pp., illus.

with prices. Such a comparison requires knowledge of "total" costs of producing a crop or livestock product. The measurement of cash costs presents few problems, but difficulties arise in attempting to measure and allocate to enterprises the noncash and overhead costs--unpaid labor, land, buildings, and management--in a conceptually sound and universally acceptable manner.² Two or more concepts may be equally valid, depending on the use to be made of the data. Personal judgment enters any computation of total costs per acre or per unit of output. But despite various conceptual problems, enterprise cost data are frequently obtained and used for individual farm planning, in studies of interregional competition, in appraising the relative advantages of farms of different sizes, and in developing and appraising farm programs.

The enterprise cost items presented in this report comprise partial costs of production since no allocations were made of such "overhead" costs as management and supervision, land, buildings and storage facilities, interest on operating capital, and perquisites furnished to workers. They were excluded because it is difficult to allocate overhead costs on farms having more than one enterprise. In effect, the cost items presented are "direct" costs and include materials, labor, power and equipment, and custom-hired work and services. The power and equipment costs used here are presented in detail in a separate report.³

Description of Area

The alluvial valley area in Mississippi, better known as the Delta, is primarily an agricultural area. It contains about 4 million acres of land and some of the most productive agricultural soils in the country. The soils were formed from sediments deposited by overflows of the Mississippi River or its tributaries. The well-drained sandy and silt loam soils are the most

productive in the Delta, whereas the heavy clay, or "buckshot," soils are limited in productivity because of poor internal drainage. Cotton is given preference as the principal cash crop on the best land in the Delta. Although most crops, with the exception of rice, also grow best on good cotton soils, they are usually planted on land not needed for cotton production.

Procedure

An enumerative survey was conducted of 163 operating units for the year 1957 and 160 operating units for the year 1958; the latter year includes 126 farms in the 1957 sample.

Interviews were conducted in two phases because of the amount of detail involved. The first phase of enumeration was conducted in the spring of 1958, when pre-harvest practice, input, and cost data were obtained. The second phase of enumeration was completed in the spring of 1959 to cover the 1958 crop harvest. Enterprise cost summaries were prepared to represent the levels of cost associated with 1958 actual yields and, for cotton, with estimated normal yields.

The sampling method used was adopted from a study of farm organization and practices conducted in the Delta in 1948.⁴ It consisted of the delineation of 14 farming areas within seven counties of the Delta, with complete enumeration of operating units within areas. Sampling areas were located in the following counties: Tunica, Coahoma, Bolivar, Sunflower, Tallahatchie, Washington, and Humphreys.

The farm operating unit, which was defined for this study as all farm resources under common management and equipment use, comprised the basic sampling unit. This restriction resulted in the exclusion of sharecropper units as single operating units although they were included in the study as integral parts of operating units. Resources under control of share tenants were considered as operating units if the tenants provided the management, labor, and equipment for their respective operations. All operating units with headquarters within the sampling areas were contacted.

² For a discussion of cost concepts and the difficulties involved in estimating total costs of production, see:

Hole, E. and Vermeer, J. Estimating Cost of Production on Tobacco-Cotton Farms in the Coastal Plain of North Carolina. U.S. Dept. Agr., Prod. Res. Rpt. 47, 20 pp., illus. Oct. 1960.

Jones, R.W. Production Costs as Criteria of Resource Allocation and Policy. Jour. Farm Econ. 30:443-466, Aug. 1948.

Cooper, M.R. Production Costs and Returns. U.S. Bur. Agr. Econ. 38 pp., illus. June 1939.

³ Starbird, I.R. and Vermeer, James. Tractors and Preharvest Equipment, Delta Area, Mississippi--Costs of Owning and Operating, by Size of Farm, 1957, U.S. Dept. Agr., Agr. Econ. Rpt. 2, 49 pp., illus. Dec. 1961.

⁴ Saville, R.J., Gaines, J.P., and Crowe, Grady B. Cotton Production Practices in the Delta Area of Mississippi, 1947, Miss. Agr. Expt. Sta. M.R. 2, 61 pp., Dec. 1950. (U.S. Bur. Agr. Econ. coop.)

The size-of-farm intervals selected were as follows: (1) Less than 60 acres, (2) 60 to 399 acres, (3) 400 to 999 acres, and (4) 1,000 or more acres of cropland per farm.⁵ Wide intervals should adequately demonstrate differences in costs between farms of various sizes.

Direct cost data are presented by operations, or processes, for each enterprise involved. The costs of operating equipment on cotton, for example, were analyzed for each operation, such as disking and middle-breaking.⁶ Similarly, each kind of material applied--seed, fertilizer, poison--is indicated in this report. These details are useful when complete information on current practices and inputs is needed. Cost items are presented in a form that permits the addition or deletion of items to meet varying needs. For example, the charge for family labor, which was valued at prevailing hired wage rates, may be deleted. If desired, the most common practices or inputs may be selected from the appropriate tables. Summaries of direct costs per unit of production and estimated costs

and returns per acre are contained in Appendix tables 60 and 61, respectively.

DESCRIPTION OF FARMS

Land Use

Table 1 shows the use of land on sample farms. Rented land played an important part in enlarging the farm business. It comprised 21 percent of all land in sample farms and ranged from slightly more than 7 percent on farms with 1,000 or more acres of cropland to over 45 percent on farms having between 60 and 399 acres of cropland. About 5 percent of land owned was rented out, varying from 1 percent on farms with less than 60 acres of cropland to 13 percent on farms having between 400 and 999 acres of cropland. Total cropland as a percent of all land in farms ranged from 64 percent on small farms to 80 percent on farms having between 400 and 999 acres of cropland.

TABLE 1.--Land use, by size of farm, Delta area, Mississippi, 1957

Item	Cropland per farm				All sizes of farms
	Less than 60 acres	60 to 399 acres	400 to 999 acres	1,000 acres or more	
	<u>Farms</u>	<u>Farms</u>	<u>Farms</u>	<u>Farms</u>	<u>Farms</u>
Number of farms reported....	66	58	28	11	163
	<u>Acres</u>	<u>Acres</u>	<u>Acres</u>	<u>Acres</u>	<u>Acres</u>
All land in farm.....	55.6	216.1	793.3	2,363.7	395.3
Land controlled by operator:					
Owned.....	46.0	118.8	696.0	2,199.4	329.0
Rented in	10.2	98.3	186.8	175.1	83.0
Rented out.....	.6	1.0	89.5	10.8	16.7
Use of land in farm:					
Cropland.....	35.5	161.3	635.4	1,831.6	304.6
Permanent pasture.....	6.9	23.3	47.1	93.6	25.5
Woods not pastured.....	8.8	15.6	63.3	370.0	45.0
Other land.....	4.4	15.9	47.5	68.5	20.2

⁵ These intervals are consistent with those selected in the analysis of costs and returns by type and size of farm, which includes small cotton farms having less than 60 acres of cropland and large-scale cotton farms having between 400 and 999 acres of cropland. (Farm Economics Division, Econ. Res. Serv., Farm Costs and Returns, Commercial Farms by Type, Size and Location, U.S. Dept. Agr., Agr. Inform. Bul. 230, [85] pp., illus. Rev. June 1961.)

⁶ See separate report cited in footnote 3, p. 2.

The acreage in cotton varied from 49 percent of all crops on farms with less than 60 acres of cropland to 30 percent on farms containing 1,000 or more acres of cropland, as compared with the average for all farms of 33 percent (table 2). In contrast, cotton comprised 84 percent of the total acreage in crops on all farms in the same seven counties in 1930. In 1957

TABLE 2.--Organization of cropland, by size of farm, Delta area, Mississippi, 1957

Item	Cropland per farm				All sizes of farms
	Less than 60 acres	60 to 399 acres	400 to 999 acres	1,000 acres or more	
Number of farms reported....	<u>Farms</u> 66	<u>Farms</u> 58	<u>Farms</u> 28	<u>Farms</u> 11	<u>Farms</u> 163
Crops per farm:	<u>Acres</u>	<u>Acres</u>	<u>Acres</u>	<u>Acres</u>	<u>Acres</u>
Cotton.....	14.7	46.7	189.3	477.2	87.3
Soybeans.....	6.6	41.8	169.3	520.0	81.7
Corn.....	4.1	6.3	15.9	121.3	14.8
Oats.....	2.2	31.6	113.5	111.5	39.2
Wheat.....	1.3	6.8	53.7	207.6	26.2
Rice.....	0	3.3	21.1	140.8	14.3
Sorghum.....	.2	1.6	6.1	7.3	2.2
Other.....	1.0	.6	7.2	10.9	2.6
Total crops.....	30.1	138.7	576.1	1,596.6	268.3
Acreage reserve.....	1.7	8.8	23.3	50.9	11.3
Conservation reserve.....	.3	2.8	0	0	1.1
Idle cropland.....	2.4	9.9	25.3	173.6	20.5
Cropland pastured.....	1.0	1.1	10.7	10.5	3.4
Total cropland.....	35.5	161.3	635.4	1,831.6	304.6

the acreage planted to soybeans varied from 22 percent of all crops on the small farms to 33 percent on the large farms. An insignificant acreage of soybeans for oil was harvested prior to World War II. Since then, production has been stimulated by the demand for vegetable oils and proteins.

Other crops were of lesser importance than cotton and soybeans in all size groups. Oats were harvested from 15 percent of the harvested cropland in 1957 and wheat from 10 percent. Insignificant acreages of these two grain crops in the Delta were reported by the 1930 U.S. Census of Agriculture. Only 6 percent of the harvested acreage in 1957 was devoted to corn production, as compared with 11 percent in 1930.

A relatively new crop in the Delta--rice--was grown on 5 percent of the harvested acreage on sample farms. Rice production practices and costs are not included in this report.⁷

⁷ For information on rice production practices and costs in the Delta, see Mullins, Troy, Production Practices and Costs and Returns for Major Enterprises on Rice Farms in the Delta Area of Mississippi. Miss. Agr. Expt. Sta. Bul. 595, 24 pp., illus. May 1960. (In coop. with U.S. Agr. Res. Serv., Farm Econ. Res. Div.)

Land Tenure

Sixty percent of all operating units were fully owned by present operators. Operators of units of less than 60 acres were more frequently full-owners. Table 3 indicates that a smaller proportion of full-owners were found in the 60 to 399 acre size group than in any other size group. Twenty-six percent of these operators were full-tenants who either cash-rented all their land or who operated under a share-tenant arrangement by giving the landlord a share of cotton or other crop in lieu of cash rent. Thirty-three percent of all operators in the 60 to 399 acre size group enlarged their own holdings by renting additional land. There were no full-tenants of operating units in the 1,000 or more acre group.

Twenty-nine percent of all operating units reported sharecroppers, with an average of 4.6 sharecropper families per unit reporting (table 4). They worked 33 percent of the total acreage of cotton. Only 5 percent of the total cotton acreage on small farms was operated on shares, as compared with 51 percent on farms having 1,000 or more acres of cropland.

TABLE 3.--Land tenure on farms, by size of farm, Delta area, Mississippi, 1957

Cropland per farm	Farms	Operators reporting as--		
		Full owners	Part owners	Full tenants ¹
	<u>Number</u>	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>
Less than 60 acres.....	66	76	6	18
60 to 399 acres.....	58	41	33	26
400 to 999 acres.....	28	61	29	10
1,000 or more acres.....	11	64	36	0
Total or average.....	163	60	22	18

¹ Only those tenants who provide their own equipment, labor, and management are included here.

TABLE 4.--Use of sharecroppers by size of farm, Delta area, Mississippi, 1957

Cropland per farm	Operators reporting sharecroppers	Sharecropper families per farm reported	Cotton acreage worked on shares
	<u>Percent</u>	<u>Number</u>	<u>Percent</u>
Less than 60 acres.....	9.1	1.2	5.2
60 to 399 acres.....	29.3	2.4	25.4
400 to 999 acres.....	60.7	7.6	25.2
1,000 or more acres.....	72.7	30.4	51.1
Average.....	29.4	4.6	33.4

The sharecropper's role in cotton production has diminished with the adoption of tractor power and equipment and will further diminish with the adoption of effective mechanical weed control practices and mechanical harvesting. Sharecroppers are traditionally responsible for hand chopping, hoeing, and picking their allotment, but this work, as well as the machine work, on cropper cotton differs little from that carried out on wage cotton. For this reason, no distinction is made here between wage and cropper cotton.

Livestock

Livestock enterprises on most Delta farms are small in size and are supplementary to crop enterprises. Horses and mules have rapidly diminished in importance as workstock (table 5). They were

found on only 36 percent of the sample farms, averaging 3.3 head of workstock per farm reporting. Most of these have been displaced in crop production by tractors. In a similar study made in 1947, 91 percent of the sample farms had workstock, with an average of 6.8 head per farm reporting.

Fifty-eight percent of all farms reported milk cows, with an average of 3.3 cows per farm. Of the 95 farms reporting milk cows, only 12 kept herds with 10 or more cows, the largest being 20 cows. Milk cows were kept on 77 percent of the small farms, with an average of 2.7 cows per farm reporting. Only 4 of the 51 farms reporting cows in this group kept more than 10 cows. Many of these farms produced milk only for home consumption. Average herd size increased with size of farm. Units with more than 1,000 acres of cropland averaged 10.6 milk cows per farm.

TABLE 5.--Livestock on farms: Percentage of farms reported and number of animals per farm, by size of farm, Delta area, Mississippi, January 1, 1958

Class of livestock	Cropland per farm								All sizes of farms	
	Less than 60 acres		60 to 399 acres		400 to 999 acres		1,000 acres or more			
	Farms	Animals per farm	Farms	Animals per farm	Farms	Animals per farm	Farms	Animals per farm	Farms	Animals per farm
	<u>Percent</u>	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>	<u>Number</u>
Milk cows, 2 years and over.....	77	2.7	50	2.4	36	5.3	45	10.6	58	3.3
Other cows, 2 years and over.....	18	2.8	34	15.7	22	64.5	45	24.6	26	19.9
Heifers, 1 and 2 years	32	1.9	27	23.7	32	9.8	36	11.0	31	11.0
Other cattle.....	41	2.5	22	13.2	39	31.7	55	79.5	35	18.7
All cattle.....	79	5.3	66	24.6	58	54.8	64	99.6	69	24.6
Horses and mules.....	24	1.6	27	1.6	61	3.2	82	9.6	36	3.3
Sows and gilts.....	50	2.4	38	4.3	21	8.5	28	33.3	39	5.1
Other hogs.....	50	5.2	29	10.5	28	34.3	36	25.0	38	11.7
Hens and pullets.....	94	29.2	76	29.5	32	51.3	55	102.0	74	34.6

Equipment

A separate report presents an analysis of the use and cost of preharvest equipment and tractors by size of farm.⁸ All farms having more than 60 acres of cropland were equipped with tractor power and related equipment. Eight operators, or 12 percent of those on farms with less than 60 acres of cropland, owned no tractors. The number and size of tractors and equipment were closely associated with the size of farm. Not only were there more items of a given kind of equipment on large farms, but also a greater variety, such as anhydrous ammonia applicators, herbicide equipment, flame cultivators, high-clearance sprayers, mechanical cotton pickers, and self-propelled combines. Operators having less than 400 acres of cropland commonly used 2-row equipment, while those having more than 400 acres used

4-row equipment. Some operators of small farms own machines too large to be operated at low unit costs unless custom work is performed.

Characteristics of Operators

Personal characteristics of the operators of farms are important among the many factors that explain some of the differences in farm organization and operation between farms of various sizes. Operators of large units were younger and had obtained more formal education than operators of small units (table 6). The average operator of a farm having less than 60 acres of cropland was 55 years of age and had 6.6 years of formal education. Operators of farms having more than 1,000 acres of cropland averaged 37 years of age and had 15.3 years of schooling. The age and education of operators' wives tended to parallel those of their husbands.

TABLE 6.--Average age and years of education completed by farm operators and their wives, by size of farm, Delta area, Mississippi, 1957

Item	Cropland per farm				All sizes of farms
	Less than 60 acres	60 to 399 acres	400 to 999 acres	1,000 acres or more	
Number of farms reported....	66	58	28	11	163
Farm operator:					
Years of age.....	55.1	48.0	42.8	36.6	49.2
Years of education.....	6.6	9.0	12.7	15.3	9.1
Operator's wife:					
Years of age.....	49.6	45.1	37.4	37.6	45.7
Years of education.....	7.5	10.2	13.3	13.8	9.6

COTTON PRODUCTION PRACTICES AND COSTS

Preharvest Operations and Materials

Preharvest Operations

A summary of preharvest operations performed on cotton is shown in table 7. Most of these operations are well-established practices in cotton production, but it is only in recent years that such practices as flame cultivation, chemical weed control, poisoning, and defoliation have become important. In a study made in 1948, no flaming or chemical weed control practices were found and poisoning and defoliation were

reported on a very small proportion of the total acreage.⁹

As the size of farms increased a greater proportion of total acreage was covered, or the acreage was covered more frequently, for several important preharvest operations, including stalk cutting, cultivation, poisoning, and defoliation. Pre-emergence and post-emergence herbicides were also used more frequently on the larger farms. These two practices are included with the planting and cultivating operations, respectively. Table 8 indicates the extent of their application. Irrigation is increasing in importance in the Delta, particularly on plantations, but very little irrigation of cotton was performed on sample farms in 1957.

⁸ See footnote 3, p. 2.

⁹ Saville, Gaines, and Crowe. See footnote 4, p. 2.

TABLE 7.--Preharvest operations on cotton: Percentage of farms that reported, acreage covered, and number of times over, by size of farm Delta area, Mississippi, 1957¹

Operation	Cropland per farm											
	Less than 60 acres			60 to 399 acres			400 to 999 acres			1,000 acres or more		
	Farms re-reported	Acre-age covered	Times over, acreage covered	Farms re-reported	Acre-age covered	Times over, acreage covered	Farms re-reported	Acre-age covered	Times over, acreage covered	Farms re-reported	Acre-age covered	Times over, acreage covered
	<u>Per-cent</u>	<u>Per-cent</u>	<u>Number</u>	<u>Per-cent</u>	<u>Per-cent</u>	<u>Number</u>	<u>Per-cent</u>	<u>Per-cent</u>	<u>Number</u>	<u>Per-cent</u>	<u>Per-cent</u>	<u>Number</u>
Cut stalks.....	76.3	67.6	1.1	88.2	89.7	1.1	96.0	95.5	1.1	100.0	100.0	1.1
Plow.....	--	--	--	11.8	16.1	1.0	12.0	7.6	1.0	22.2	15.9	1.0
Disc.....	78.0	75.8	1.7	92.2	93.9	2.2	100.0	100.0	1.7	88.9	91.1	1.4
Bed.....	94.9	93.8	1.4	96.1	91.9	1.4	80.0	83.9	1.3	77.8	72.4	1.4
Fertilize.....	100.0	100.0	1.1	98.0	99.6	1.1	100.0	100.0	1.3	100.0	100.0	1.3
Harrow.....	94.9	93.8	1.4	90.2	87.4	1.3	80.0	83.3	1.3	67.7	69.9	1.6
Plant.....	100.0	100.0	1.0	100.0	100.0	1.0	100.0	100.0	1.0	100.0	100.0	1.0
Replant.....	20.3	10.4	1.2	21.6	21.1	1.0	28.0	17.5	1.1	11.1	8.5	1.0
Cultivate.....	98.3	97.8	8.0	100.0	100.0	8.5	100.0	100.0	8.8	100.0	100.0	9.5
Flame cultivate	--	--	--	--	--	--	12.0	7.6	2.2	33.3	18.4	2.5
Hoe, rotary....	--	--	--	1.7	3.3	3.0	8.0	5.0	1.0	--	--	--
Hoe and chop, hand.....	100.0	99.6	3.5	100.0	100.0	3.7	100.0	100.0	3.6	100.0	100.0	3.8
Poison.....	59.3	61.1	7.1	74.5	80.7	9.8	92.0	92.1	12.1	100.0	99.4	11.0
Defoliate.....	8.5	12.3	1.0	51.0	56.7	1.1	84.0	70.4	1.1	77.8	60.5	1.0
Irrigate.....	--	--	--	--	--	--	--	--	--	11.1	6.7	2.0

¹ Includes custom-hired operations.

TABLE 8.--Preharvest operations on cotton: Percentage of acreage covered and number of times over, by size of equipment and size of farm, Delta area, Mississippi, 1957

Operation and size of equipment	Cropland per farm							
	Less than 60 acres		60 to 399 acres		400 to 999 acres		1,000 acres or more	
	Acreage covered	Times over, acreage covered	Acreage covered	Times over, acreage covered	Acreage covered	Times over, acreage covered	Acreage covered	Times over, acreage covered
	<u>Percent</u>	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>	<u>Number</u>
Cut stalks:								
1-row.....	5.3	1.0	--	--	--	--	--	--
2-row.....	62.3	1.1	89.7	1.1	86.6	1.1	100.0	1.1
4-row.....	--	--	--	--	8.9	1.0	--	--
Plow:								
2-bottom.....	--	--	3.4	1.0	1.0	1.0	2.7	1.0
3-bottom.....	--	--	11.3	1.0	6.6	1.0	13.2	1.0
4-bottom.....	--	--	1.5	1.0	--	--	--	--
Disc:								
2-row.....	75.8	1.7	93.9	1.9	54.9	1.7	23.6	1.8
3-row.....	--	--	13.9	1.7	39.0	1.4	31.8	1.4
4-row.....	--	--	9.4	1.4	18.1	1.4	35.7	1.2
Bed:								
1-row.....	5.7	1.8	--	--	--	--	--	--
2-row.....	84.5	1.4	41.4	1.4	6.0	1.4	3.3	1.8
3-row.....	5.5	1.6	50.5	1.4	69.9	1.3	60.8	1.4
4-row.....	--	--	--	--	8.0	1.6	9.7	2.0
Fertilize:								
2-row.....	89.2	1.1	33.2	1.1	3.3	1.0	23.5	1.0
3-row.....	6.1	1.1	13.4	1.3	24.4	1.2	20.7	1.0
4-row.....	4.7	1.0	53.0	1.1	72.3	1.4	64.7	1.4
Harrow:								
2-row.....	71.4	1.3	18.4	1.6	5.5	1.5	--	--
3-row.....	3.9	1.0	2.2	1.0	6.0	1.0	--	--
4-row.....	18.6	1.7	66.9	1.2	71.7	1.4	69.9	1.6
Plant:								
1-row.....	4.6	1.0	1.1	1.0	--	--	--	--
2-row.....	92.0	1.0	40.6	1.0	--	--	--	--
4-row.....	3.4	1.0	58.3	1.0	100.0	1.0	100.0	1.0

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TABLE 8.--Preharvest operations on cotton: Percentage of acreage covered and number of times over, by size of equipment and size of farm, Delta area, Mississippi, 1957--Continued

Operation and size of equipment	Cropland per farm							
	Less than 60 acres		60 to 399 acres		400 to 999 acres		1,000 acres or more	
	Acreage covered	Times over, acreage covered	Acreage covered	Times over, acreage covered	Acreage covered	Times over, acreage covered	Acreage covered	Times over, acreage covered
	<u>Percent</u>	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>	<u>Number</u>
Premerge, with planting:								
4-row.....	--	--	1.0	1.0	18.8	1.0	8.6	1.0
Replant:								
2-row.....	10.4	1.2	8.8	1.0	--	--	--	--
4-row.....	--	--	12.3	1.0	17.5	1.1	8.5	1.0
Cultivate:								
1-row.....	5.6	7.4	--	--	--	--	--	--
2-row.....	92.3	8.0	47.3	7.8	4.2	10.2	--	--
4-row.....	--	--	52.7	9.0	95.8	8.8	100.0	9.5
Postmerge, with cultivation:								
4-row.....	--	--	--	--	--	--	18.1	1.0
Flame cultivate:								
4-row.....	--	--	--	--	7.6	2.2	18.4	2.5
Hoe, rotary:								
4-row.....	--	--	3.3	3.0	5.0	1.0	--	--
Hoe and chop by hand:	99.6	3.5	100.0	3.7	100.0	3.6	100.0	3.8
Poison:								
2-row.....	2.6	4.1	--	--	--	--	--	--
4-row.....	18.9	4.9	25.4	6.6	40.2	6.2	72.7	5.8
6-row.....	32.1	6.1	31.0	7.5	11.9	7.1	--	--
8-row.....	10.1	6.5	5.5	8.2	50.1	11.8	78.7	7.6
Airplane.....	12.5	4.0	54.9	6.1	43.4	6.2	19.6	3.7
Defoliate:								
Plane.....	12.3	1.0	56.7	1.1	70.4	1.1	60.5	1.0

Table 8 also indicates the size of equipment used to perform the various preharvest machine operations on cotton. Mules were used with one-row equipment, whereas large equipment was tractor-powered. Mules have been largely displaced by tractors on all sizes of farm.

The various sizes of equipment other than plows were classified in terms of row coverage in order to make the analysis manageable. For example, equipment that covered a ground width of from 5 to 7 feet, inclusive, was classified as 2-row equipment, 8 through 10 feet as 3-row equipment, and so on. The heavy items of tractor equipment usually were found on farms having more than 400 acres of cropland. The majority of tractors on these farms had drawbar horsepower ratings of 25 or more. Some small farms, however, had large sizes of equipment that were used on small acreages of cropland. Custom-hired airplanes were used for all of the defoliation and a substantial proportion of the poisoning.

Preharvest Materials

Table 9 presents in detail the kinds and amounts of preharvest materials used in cotton production, as well as calculations of average costs per acre based on prices paid by Delta farmers in 1957. The materials most commonly used are given in the "acreage covered" column. For example, on farms having less than 60 acres of cropland, ammonium nitrate was used on 82 percent of the total acreage of cotton, whereas farms having more than 1,000 acres of cropland used it on 32 percent of the total acreage of cotton.

Planting Methods

Cotton planting in the Delta usually begins in mid-April and continues to mid-May. The 1957 planting, however, extended into June because of frequent and heavy rainfall in the spring. Replanting was more common than usual.

The most common method of planting cotton on all farms was drilling in rows 38 inches apart. On farms having more than 400 acres of cropland about 11 percent of the cotton acreage was planted by the hill-drop method (table 10). The advantages of hill-dropping over drilling include at least a 50-percent reduction in seed required and no hand thinning. Combined with chemical and flame weed control, hill-dropping can greatly reduce labor requirements in a year of heavy weed infestation.

As indicated by the high seeding rate per acre, most operators of large farms who planted solid in drill planned to cross cultivate at least part of their acreage. On small farms, the seeding rate conformed more closely to recommendations for hand thinning than for cross cultivation.

Homegrown seed was more commonly used than purchased seed on all sizes of farms other than the largest. This indicates that operators of large farms renew their planting seed from new seed stocks more frequently than do operators of small farms. Most of the purchased seed was both treated and delinted. No information was obtained on treatment of homegrown seed. Deltapine was the leading variety planted. Approximately 84 percent of the cotton acreage in the seven sample counties was planted to this variety.¹⁰

Kinds and Amounts of Fertilizers Used

Nearly all of the acreage planted was fertilized once before planting. Fertilizer was applied as a side dressing on 10 percent of the acreage on farms having less than 400 acres of cropland and 30 percent of the acreage on larger farms.

Nitrogen was the predominant plant nutrient applied. As indicated in table 11, more nitrogen was used per acre as size of farm increased, varying from 81 pounds N per acre on small farms to 134 pounds N per acre on large farms.¹¹ Anhydrous ammonia and ammonium nitrate were the most common materials used.¹² The use of anhydrous ammonia increased and ammonium nitrate decreased as size of farm increased. Anhydrous ammonia was the source of most of the nitrogen applied on sample farms. In terms of 1957 prices for fertilizer materials, nitrogen from anhydrous ammonia cost 3 cents per pound less than from ammonium nitrate. With an application rate of 100 pounds of nitrogen, this is an advantage of \$3.00 per acre in favor of

¹⁰ U.S. Agricultural Marketing Service, Cotton Varieties Planted, 1954-58. Unnumbered. 27 pp., illus. Cotton Div., Memphis, Tenn., Aug. 1958.

¹¹ Mississippi Experiment Station recommendations for nitrogen application were as follows: Sandy loam and silt loam soils, 90 to 100 pounds N before planting; clay and silty clay soils, 100 pounds N before planting; sandy loam soils, 45 to 50 pounds N before planting and 45 to 50 pounds as a side dressing.

¹² For an analysis of the use of anhydrous ammonia in the Delta, see:

Gaines, J. P., and Crowe, G. B., An Economic Appraisal of Anhydrous Ammonia as a Nitrogenous Fertilizer, Miss. Agr. Expt. Sta. Cir. 152, 16 pp., illus., June 1950 (U.S. Bur. Agr. Econ. coop.)

TABLE 9.--Cotton production: Costs per acre for preharvest materials, by size of farm, Delta area, Mississippi, 1957

Material	Quantity per acre covered	Price per unit	Cost per acre covered	Percentage of total acreage covered	Cost per acre, total acreage
LESS THAN 60 ACRES OF CROPLAND					
Seed:					
First planting:		<u>Dollars</u>	<u>Dollars</u>	<u>Percent</u>	<u>Dollars</u>
Homegrown.....	48.0 lb.	0.0635	3.05	56.5	1.72
Purchased-treated.....	40.8 lb.	.0635	2.59	10.2	.26
Delinted.....	33.0 lb.	.0665	2.19	3.5	.08
Delinted and treated	44.7 lb.	.0675	3.02	29.8	.90
Replanting.....	47.8 lb.	.0635	3.04	10.4	.32
Fertilizer:					
Ammonium nitrate.....	246.4 lb.	.036	8.87	81.6	7.24
Anhydrous ammonia.....	100.2 lb.	.06	6.01	6.3	.38
Cyanamide.....	263.4 lb.	.0395	10.40	3.3	.34
Nitrate of soda.....	210.8 lb.	.03	6.32	6.8	.43
Ammonium sulfate.....	258.0 lb.	.026	6.71	3.1	.21
Nitrate of lime.....	400.0 lb.	.0285	11.40	2.1	.24
Urea.....	200.0 lb.	.0575	11.50	2.1	.24
0-20-20.....	100.0 lb.	.0315	3.15	2.5	.08
Muriate of potash.....	100.0 lb.	.024	2.40	2.1	.05
Poison:					
Spray:					
Malathion.....	.520 gal.	6.20	3.22	15.8	.51
Toxaphene.....	.700 gal.	2.00	1.40	2.6	.04
Methyl parathion.....	.500 gal.	5.50	2.75	1.7	.05
DDT.....	1.021 gal.	1.35	1.38	5.3	.07
3-10-0.....	1.000 gal.	3.00	3.00	1.9	.06
Dust:					
Malathion.....	56.0 lb.	.145	8.12	37.2	3.02
3-5-0.....	21.3 lb.	.065	1.38	12.5	.17
Toxaphene.....	24.6 lb.	.08	1.97	8.3	.16
Calcium arsenate.....	68.2 lb.	.07	4.77	3.6	.17
3-10-0.....	19.9 lb.	.075	1.49	3.6	.05
Dynatox.....	60.0 lb.	.11	6.60	1.7	.11
3-10-5.....	10.0 lb.	.13	1.30	2.0	.03
Aldrin.....	100.0 lb.	.075	7.50	.7	.05
Defoliant:					
Calcium cyanamide.....	32.5 lb.	.046	1.50	10.3	.15
DEF.....	.250 gal.	6.00	1.50	2.0	.03
Total cost per acre..		--	--	--	17.16

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TABLE 9.--Cotton production: Costs per acre for preharvest materials, by size of farm,
Delta area, Mississippi, 1957--Continued

Material	Quantity per acre covered	Price per unit	Cost per acre covered	Percentage of total acreage covered	Cost per acre, total acreage
60 TO 399 ACRES OF CROPLAND					
Seed:		Dollars	Dollars	Percent	Dollars
First planting:					
Homegrown.....	53.6 lb.	0.0635	3.40	76.8	2.61
Purchased-treated.....	80.0 lb.	.0635	5.08	1.7	.09
Delinted.....	50.0 lb.	.0665	3.32	1.4	.05
Delinted and treated..	47.5 lb.	.0675	3.21	20.1	.64
Re-planting.....	46.0 lb.	.0635	2.92	21.1	.62
Fertilizer:					
Ammonium nitrate.....	262.4 lb.	.036	9.45	36.9	3.49
Anhydrous ammonia.....	111.3 lb.	.06	6.68	51.0	3.41
Muriate of potash.....	95.7 lb.	.024	2.30	4.9	.11
Nitrate of soda.....	252.1 lb.	.03	7.56	3.2	.24
Chilean nitrate.....	163.4 lb.	.028	4.58	3.8	.17
Nitrate of lime.....	222.2 lb.	.0285	6.33	5.8	.37
Aqua ammonia.....	110.0 lb.	.01875	2.06	2.9	.06
Cyanamide.....	171.4 lb.	.0395	6.77	3.7	.25
Ammonium sulfate.....	200.0 lb.	.026	5.20	1.7	.09
Poison:					
Spray:					
Malathion.....	1.189 gal.	6.20	7.37	38.8	2.86
Methyl parathion.....	.762 gal.	5.50	4.19	20.7	.87
Toxaphene.....	.467 gal.	2.00	.93	8.5	.08
Dynatox.....	.877 gal.	6.50	5.70	17.2	.98
Guthion.....	.878 gal.	15.00	13.17	9.3	1.22
Endrin.....	.376 gal.	6.90	2.59	5.7	.15
Parathion.....	.059 gal.	5.50	.32	2.4	.01
Malathion-endrin:					
Malathion.....	.300 gal.	6.20	1.86	1.4	.03
Endrin.....	.376 gal.	6.90	2.59	1.4	.04
Malathion-DDT:					
Malathion.....	.753 gal.	6.20	4.67	5.3	.25
DDT.....	1.880 gal.	1.35	2.54	5.3	.13
Malathion-parathion:					
Malathion.....	.200 gal.	6.20	1.24	1.6	.02
Parathion.....	.118 gal.	5.50	.65	1.6	.01
Malathion-toxaphene:					
Malathion.....	1.000 gal.	6.20	6.20	3.6	.22
Toxaphene.....	4.169 gal.	2.00	8.34	3.6	.30
Endrin-toxaphene:					
Endrin.....	.750 gal.	6.90	5.18	2.5	.13
Toxaphene.....	1.660 gal.	2.00	3.32	2.5	.08
Dieldrin-DDT:					
Dieldrin.....	.300 gal.	4.20	1.26	1.5	.02
DDT.....	.750 gal.	1.35	1.01	1.5	.02
Dust:					
Malathion.....	54.6 lb.	.145	7.92	34.5	2.73
3-5-0.....	91.8 lb.	.065	5.97	4.5	.27

TABLE 9.--Cotton production: Costs per acre for preharvest materials, by size of farm,
Delta area, Mississippi, 1957--Continued

Material	Quantity per acre covered	Price per unit	Cost per acre covered	Percentage of total acreage covered	Cost per acre, total acreage
60 TO 399 ACRES OF CROPLAND					
Poison:		<u>Dollars</u>	<u>Dollars</u>	<u>Percent</u>	<u>Dollars</u>
Dust:					
3-10-0.....	35.5 lb.	0.075	2.66	3.9	0.10
Toxaphene.....	45.0 lb.	.08	3.60	1.0	.04
Calcium arsenate.....	45.0 lb.	.07	3.15	1.0	.03
Malathion-DDT:					
Malathion.....	30.0 lb.	.09	2.70	6.7	.18
DDT.....	30.0 lb.	.065	1.95	6.7	.13
Toxaphene-sulfur:					
Toxaphene.....	13.0 lb.	.08	1.04	.7	.01
Sulfur.....	24.0 lb.	.03	.72	.7	.01
Defoliant:					
Calcium cyanamide.....	27.3 lb.	.046	1.26	42.6	.54
Sodium chlorate.....	15.0 lb.	.10	1.50	1.1	.02
Sodium chlorate.....	1.500 gal.	1.35	2.02	17.6	.36
Pentachlorophenol.....	1.000 gal.	3.00	3.00	3.5	.10
Premerge herbicide:					
CIPC.....	.500 gal.	7.00	3.50	1.0	.04
Total cost per acre					24.18
400 TO 999 ACRES OF CROPLAND					
Seed:					
First planting:					
Homegrown.....	59.1 lb.	.0635	3.75	79.6	2.98
Purchased-treated.....	73.8 lb.	.0635	4.69	4.7	.22
Delinted and treated...	62.3 lb.	.0675	4.21	15.7	.66
Replanting.....	68.7 lb.	.0635	4.36	17.5	.76
Fertilizer:					
Anhydrous ammonia.....	135.1 lb.	.06	8.11	49.6	4.02
Ammonium nitrate.....	320.0 lb.	.036	11.52	35.4	4.08
Uran.....	243.6 lb.	.036	8.77	16.6	1.46
Aqua ammonia.....	150.0 lb.	.01875	2.81	7.4	.21
Poison:					
Spray:					
Malathion.....	1.940 gal.	6.20	12.03	61.8	7.44
Toxaphene.....	1.142 gal.	2.00	2.28	40.7	.93
Methyl parathion.....	.950 gal.	5.50	5.22	35.6	1.86
Endrin.....	.600 gal.	6.90	4.14	19.7	.82
Dieldrin.....	.690 gal.	4.20	2.90	12.2	.35
Malathion-DDT:					
Malathion.....	.490 gal.	6.20	3.04	2.7	.08
DDT.....	.820 gal.	1.35	1.11	2.7	.03
Malathion-endrin:					
Malathion.....	.211 gal.	6.20	1.31	8.0	.10
Endrin.....	.247 gal.	6.90	1.70	8.0	.14
Dynatox.....	1.000 gal.	6.50	6.50	4.9	.32

TABLE 9.--Cotton production: Costs per acre for preharvest materials, by size of farm,
Delta area, Mississippi, 1957--Continued

Material	Quantity per acre covered	Price per unit	Cost per acre covered	Percentage of total acreage covered	Cost per acre, total acreage
400 TO 999 ACRES OF CROPLAND					
Poison:		<u>Dollars</u>	<u>Dollars</u>	<u>Percent</u>	<u>Dollars</u>
Spray:					
Parathion.....	.118 gal.	5.50	0.65	3.4	0.02
DDT.....	1.000 gal.	1.35	1.35	4.5	.06
Dust:					
Malathion.....	30.1 lb.	.145	4.36	12.3	.54
Malathion-DDT:					
Malathion.....	40.0 lb.	.09	3.60	4.9	.18
DDT.....	20.0 lb.	.065	1.30	4.9	.06
Toxaphene.....	30.0 lb.	.08	2.40	1.6	.04
3-5-0.....	60.0 lb.	.065	3.90	1.6	.06
Defolient:					
Calcium cyanamide.....	22.8 lb.	.046	1.05	50.5	.53
Sodium chlorate.....	1.500 gal.	1.35	2.02	33.4	.67
Pentachlorophenol.....	.500 gal.	3.00	1.50	3.4	.05
Weed control:					
Premerge:					
Karmex.....	.113 gal.	19.50	2.20	18.1	.40
CIPC.....	.500 gal.	7.00	3.50	.7	.02
Postmerge:					
Butane for flaming.....	10.0 gal.	.126	1.26	7.6	.10
Total cost per acre....					29.19
1,000 OR MORE ACRES OF CROPLAND					
Seed:					
First planting:					
Homegrown.....	65.6 lb.	.0635	4.17	25.6	1.07
Purchased-treated.....	53.5 lb.	.0635	3.40	31.4	1.07
Delinted and treated...	44.2 lb.	.0675	2.98	43.0	1.28
Re-planting.....	51.1 lb.	.0675	3.45	8.5	.29
Fertilizer:					
Ammonium nitrate.....	274.4 lb.	.036	9.88	31.6	3.12
Anhydrous ammonia.....	141.4 lb.	.06	8.48	90.8	7.70
Muriate of potash.....	159.4 lb.	.024	3.83	26.2	1.00
Poison:					
Spray:					
Malathion.....	.736 gal.	6.20	4.56	76.9	3.51
Toxaphene.....	1.340 gal.	2.00	2.68	60.1	1.61
Endrin.....	.420 gal.	6.90	2.90	63.1	1.83
Methyl parathion.....	1.510 gal.	5.50	8.30	16.4	1.36
Guthion.....	.332 gal.	15.00	4.98	43.0	2.14
Parathion.....	.177 gal.	5.50	.97	18.2	.18

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TABLE 9.--Cotton production: Costs per acre for preharvest materials, by size of farm, Delta area, Mississippi, 1957--Continued

Material	Quantity per acre covered	Price per unit	Cost per acre covered	Percentage of total acreage covered	Cost per acre, total acreage
1,000 OR MORE ACRES OF CROPLAND					
Poison: (Cont'd)		<u>Dollars</u>	<u>Dollars</u>	<u>Percent</u>	<u>Dollars</u>
Dust:					
Malathion-aldrin:					
Malathion.....	10.0 lb.	0.09	0.90	4.1	0.04
Aldrin.....	10.0 lb.	.075	.75	4.1	.03
3-5-0.....	75.0 lb.	.065	4.88	10.7	.52
Malathion.....	12.0 lb.	.145	1.74	24.8	.43
Defoliant:					
Calcium cyanamide.....	25.4 lb.	.046	1.17	60.5	.71
Weed control:					
Premerge:					
Karmex.....	.125 gal.	19.50	2.44	6.2	.15
CIPC.....	.500 gal.	7.00	3.50	2.4	.08
Postmerge:					
Herbicidal oil.....	5.000 gal.	.25	1.25	18.1	.23
Butane for flaming....	12.585 gal.	.126	1.59	18.4	.29
Total cost per acre...					28.64

TABLE 10.--Cotton production: Planting methods and kind of seed, by size of farm, Delta area, Mississippi, 1957

Item	Cropland per farm				All sizes of farms
	Less than 60 acres	60 to 399 acres	400 to 999 acres	1,000 acres or more	
Percentage of acres:	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>
Drilled.....	100.0	96.8	88.9	88.4	91.0
Hill-dropped.....	--	3.2	11.1	11.6	9.0
Percentage of acres planted with--					
Homegrown seed.....	56.5	76.8	79.6	25.6	57.6
Purchased seed.....	43.5	23.2	20.4	74.4	42.4
Treated only.....	10.2	1.7	4.7	31.4	14.4
Delinted only.....	3.5	1.4	--	--	.4
Delinted and treated...	29.8	20.1	15.7	43.0	27.6
	<u>Pounds</u>	<u>Pounds</u>	<u>Pounds</u>	<u>Pounds</u>	<u>Pounds</u>
Seeding rate per acre ¹	46	62	65	62	62
Seed used per acre, including replanting.....	52	75	77	67	71

¹ Width of row was 38 inches on 73 percent of farms, 36 inches on 19 percent, and 40 inches on 6 percent.

TABLE 11.--Cotton production: Fertilizer use, by size of farm, Delta area, Mississippi, 1957

Item	Unit	Cropland per farm				All sizes of farms
		Less than 60 acres	60 to 399 acres	400 to 999 acres	1,000 acres or more	
Acreage fertilized.....	Percent	100.0	99.6	100.0	100.0	99.9
Number of times fertilized..	Number	1.1	1.1	1.3	1.3	1.2
Quantity per acre fertilized	Pound	255.7	199.7	231.8	256.8	236.5
Nitrogen per acre fertilized	do.	81.1	86.9	107.2	133.9	111.4
Percentage of nitrogen applied as:						
Anhydrous ammonia.....	Percent	6.4	53.9	51.3	78.6	57.7
Ammonium nitrate.....	do.	81.9	37.0	34.8	21.3	34.1
Other.....	do.	11.7	9.1	13.9	.1	8.2
Total.....	do.	100.0	100.0	100.0	100.0	100.0

anhydrous ammonia. Factors affecting the investment decisions of small farmers, however, may include the generally higher cost of anhydrous equipment and storage tanks and the greater skill required in its application.

Insect Control Methods

The proportion of total cotton acreage poisoned varied from 61 percent on small farms having less than 60 acres of cropland to 99 percent on large farms having more than 1,000 acres of cropland (table 12). Large farms also made more frequent applications. The 1948 study¹³ reported very little poisoning during the decade 1937 to 1947. Calcium arsenate was the material most commonly used during that time. It has been replaced by various other materials, most important of which are malathion and toxaphene.

Dusting was the most common method of applying poison on farms having less than 60 acres of cropland. On the three larger size groups spraying accounted for 77 percent or more of the acreage treated, the remaining acres being dusted. Farm labor applied 74 percent of the poison and custom operators applied the other 26 percent. There was no consistent relationship between size-of-farm and the method of application. Operators on farms of 60 to 399 acres hired more custom spraying and dusting operations than those on the other size groups; these operators had not in-

vested in high-clearance equipment to the extent needed for mid-season through late-season application.

As indicated previously in table 9, malathion was the most commonly used material. It was used in both the spray and dust forms to control boll weevils, aphids, spider mites, and leafworms. Toxaphene was most commonly used to provide additional control of cutworms, thrips, bollworms, and fleahoppers.

Weed Control Methods

Weed control is one of the most serious obstacles impeding the progress of complete mechanization of cotton production in the humid South. Much research, both private and public, has been conducted and has resulted in the development of mechanical devices and improved techniques and materials for control of weeds and grasses. The most promising developments to date include use of pre-emergence and post-emergence herbicides and flame cultivators, all of which are now being used with varying degrees of success. But these innovations have not yet displaced conventional practices of hand hoeing and sweep cultivation. Virtually all of the acreage studied was cultivated, with frequencies of coverage ranging from 8.0 times over on small farms to 9.5 times over on large farms. Hand hoeing was reported on 100 percent of the cotton acreage in 1957 with frequencies of coverage ranging from 3.5 times over on small farms to 3.8 times over on large farms (table 13). Because of heavy rains

¹³ Saville, Gaines, and Crowe. See footnote 4, p. 2.

TABLE 12.--Cotton production: Percentage of acreage poisoned by method and size of farm, Delta area, Mississippi, 1957

Item	Cropland per farm				All sizes of farms
	Less than 60 acres	60 to 399 acres	400 to 999 acres	1,000 acres or more	
	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>
Acreage poisoned.....	61.1	80.7	92.1	99.4	90.5
Percentage poisoned by--					
Dusting.....	71.5	23.1	5.9	10.8	12.4
Spraying.....	28.5	76.9	94.1	89.2	87.6
Percentage applied by--					
Farm operator, ground machine.....	76.2	51.2	75.8	82.5	74.1
Custom operator.....	23.8	48.8	24.2	17.5	25.9
Ground machine.....	12.4	6.9	--	10.9	6.5
Plane.....	11.4	41.9	24.2	6.6	19.4
	<u>Number</u>	<u>Number</u>	<u>Number</u>	<u>Number</u>	<u>Number</u>
Number of times covered.....	7.1	9.8	12.1	11.0	10.9

TABLE 13.--Cotton production: Percentage of farms that reported weed control methods, specified acreage covered, and number of times over, by size of farm, Delta area, Mississippi, 1957

Item	Unit	Cropland per farm				All sizes of farms
		Less than 60 acres	60 to 399 acres	400 to 999 acres	1,000 acres or more	
Cultivate:						
Farms reported.....	Percent	98.3	100.0	100.0	100.0	99.3
Acreage covered.....	Percent	97.8	100.0	100.0	100.0	99.8
Times over, acreage covered	Number	8.0	8.5	8.8	9.5	8.9
Herbicides:						
Farms reported.....	Percent	--	2.0	20.0	33.3	6.3
Acreage covered.....	Percent	--	1.0	18.8	26.7	17.0
Times over, acreage covered	Number	--	1.0	1.0	1.0	1.0
Flame:						
Farms reported.....	Percent	--	--	12.0	33.3	4.2
Acreage covered.....	Percent	--	--	7.6	18.4	9.6
Times over, acreage covered	Number	--	--	2.2	2.5	2.4
Hand-hoeing:						
Farms reported.....	Percent	100.0	100.0	100.0	100.0	100.0
Acreage covered.....	Percent	99.6	100.0	100.0	100.0	100.0
Times over, acreage covered	Number	3.5	3.7	3.6	3.8	3.7

during the growing season, weed control problems were greater than usual and many operators hand-hoed once more than normal. In years of heavy infestations, chemical treatment and flame cultivation, if used as recommended, could greatly reduce the labor required in weed control.¹⁴ In 1957, however, very few chemical applicators or flame cultivators were owned by farmers having less than 1,000 acres of cropland. None of these items were owned by farmers having less than 60 acres of cropland. Herbicide applicators were found on only three of the 58 farms having between 60 and 399 acres of cropland, on 11 of the 28 farms having between 400 and 999 acres of cropland, and on eight of the 11 farms having 1,000 or more acres of cropland. Flame cultivators were owned by 5 percent of farmers having 60 to 399 acres of cropland, 40 percent of farmers having 400 to 999 acres of cropland, and 81 percent of farmers having 1,000 or more acres of cropland. These machines were used on only a small proportion of the total acreage, as shown in table 13. There were no combinations of pre-emergence and post-emergence herbicide treatments on sample farms in 1957. Complete mechanization under present technology would require the combination of these treatments with flame cultivation.

The number of observations was too small to compare labor requirements for all of the various combinations of weed control practices used. On the acreage treated by conventional practices--hand hoeing and sweep cultivation--a total of 48 hours of hoe labor per acre was required. On 14 farms using hand hoeing in combination with cross cultivation, a total of 39 hours of hoe labor per acre covered was required. Five farms contained acreage covered by a combination of pre-emergence

application, hand hoeing, and sweep cultivation, with hoe labor requirements of 33 hours per acre covered. Three farms used flame cultivation in combination with hand hoeing and sweep cultivation, with hoe labor requirements of 40 hours per acre. These observations suggest that despite the success that some farmers have had with new mechanical and chemical weed control devices, complete mechanization of cotton production in the Delta is still faced with obstacles difficult to overcome. These obstacles include: Variable weather conditions, ineffectiveness of herbicides on some perennial weeds, variable results on certain soil types, initial cost of application devices, skill required to apply flame and herbicides, availability of relatively cheap labor for weed control, and tradition. These problems, however, are being overcome and in each successive year since 1957 there have been reports of increasing use of herbicides, flame cultivation, and cross cultivation in the Delta.

Use of Labor

Table 14 contains a summary of direct labor use per acre of cotton. Direct labor includes only the operational requirements for labor and therefore excludes time spent in management and supervision. Labor furnished by custom operators is not included here; it is included with power and equipment costs in custom rate quotations.

There was less variability than expected in preharvest labor requirements per acre between size-of-farm groups. The labor required for more intensive application of materials and preharvest practices as size of farm increased largely offset the labor economies associated with the use of larger items of equipment and greater investment in labor-saving equipment on larger farms. However, a significant reduction in harvest labor on large farms was associated with the use of mechanical pickers on part of the acreage. Since lint yields per acre ranged from 360 pounds per acre on small farms to 477 pounds per acre on large farms, labor requirements on large farms, in the absence of mechanical pickers, would have been substantially greater than those amounts shown in table 14. Harvest labor requirements since the 1958 season have been reduced by the further adoption of mechanical picking and favorable weather during the harvest season. No reliable estimates of the differential adoption of mechanical picking by size of farm are

¹⁴ For general weed control recommendations see:

Bingham, S. W., Easley, Tildon, Edward, F. E., and others, *Chemical Weed Control Recommendations for Mississippi*, Miss. Agr. Expt. Sta. Bul. 556, 35 pp., illus., Feb. 1958 (U.S. Dept. Agr. cooperating).

For reports of research on weed control see:

Neely, J. W., and Brain, S. G., *Control of Weeds and Grasses in Cotton by Flaming*, Miss. Agr. Expt. Sta. Cir. 118, 6 pp., illus., Mar. 1944.

Crowe, G. B. and Holstun, J. T., Jr., *The Economics of Weed Control in Cotton*, Miss. Agr. Expt. Sta. Cir. 179, 14 pp., illus., Mar. 1953 (U.S. Dept. Agr. cooperating).

McWhorter, C. G., Wooten, O. B., and Crowe, G. B., *An Economic Evaluation of Weed Control Practices in the Delta*, Miss. Agr. Expt. Sta. Cir. 203, 7 pp., Mar. 1956.

Williamson, E. B., Wooten, O. B., and Fulgham, F. E., *Flame Cultivation*, Miss. Agr. Expt. Sta. Bul. 545, 11 pp., illus., July 1956.

TABLE 14.--Cotton production: Hours of direct labor per acre, and percentage of hired and unpaid labor by size of farm, Delta area, Mississippi, 1957-58¹

Item	Cropland per farm				All sizes of farms
	Less than 60 acres	60 to 399 acres	400 to 999 acres	1,000 acres or more	
	<u>Hours</u>	<u>Hours</u>	<u>Hours</u>	<u>Hours</u>	<u>Hours</u>
Preharvest labor.....	52.1	59.8	59.4	58.5	58.6
Chop and hoe.....	41.8	49.7	48.6	47.4	47.9
Machine operations ²	10.3	10.1	10.8	11.1	10.7
Harvest labor.....	61.2	51.2	47.1	54.6	51.6
Picking by hand.....	57.3	46.4	42.3	51.9	47.7
Picking by machine ²	--	1.6	2.5	1.1	1.6
Other labor.....	3.9	3.2	2.3	1.6	2.3
Total, labor per acre.....	113.3	111.0	106.5	113.1	110.2
Kind of labor used:					
Preharvest labor:	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>
Hired.....	34	85	98	100.0	92
Unpaid.....	66	15	2	--	8
Harvest labor:					
Hired.....	52	81	94	100.0	91
Unpaid.....	48	19	6	--	9
All labor:					
Hired.....	44	83	96	100.0	92
Unpaid.....	56	17	4	--	8

¹ Includes only direct labor requirements, excluding supervision and management.

² Excludes labor furnished by custom operators, the cost of which is included in the "custom-hire" category.

available for the years since 1958. Since approximately 48 percent of harvest labor on small farms was unpaid family or operator labor, it is likely that complete mechanization of cotton harvest on small farms will await either the enlargement or consolidation of those farms into economic-sized units, or the development of a less costly mechanical device for picking.

The average wage rate paid tractor drivers during preharvest operations was \$4.60 per day. The average rate paid for hand chopping and hoeing was \$3.50 per day. The most common rates for tractor drivers and choppers were \$5.00 and \$3.00 per day, respectively. There was no significant difference in wage rates by size of farm. Average and modal rates for hand picking were \$2.66 and \$2.50, respectively, per hundredweight of seed cotton. The average wage rate for mechanical picker operators was \$6.04 per day, as compared with a modal rate of \$5.00 per day.

Tractor Use

Tractor power and equipment were used almost exclusively for operations other than chopping, hoeing, and hand picking. An insignificant acreage of cotton was worked with mules and most of this was light work on small farms. The power requirements shown in table 15 reflect the various combinations of power, equipment, and practices employed within each of the four size-of-farm groups. A more detailed analysis of preharvest tractor use and costs was presented in a previous publication.¹⁵

As size of farm increased there was a tendency toward the use of larger items of power and equipment, with associated reductions in performance time per acre covered once-over. However, more complete coverage of acreage for some operations on larger farms, as well as more frequent coverage, partly offset the reduc-

¹⁵ See footnote 3, p. 2.

TABLE 15.--Cotton production: Hours of tractor use per acre, by size of farm, Delta area, Mississippi, 1957-58

Cropland per farm	Operations ¹		
	Preharvest	Harvest	Total
	<u>Hours</u>	<u>Hours</u>	<u>Hours</u>
Less than 60 acres.....	8.5	1.5	10.0
60 to 399 acres.....	8.7	1.9	10.6
400 to 999 acres.....	8.1	2.5	10.6
1,000 acres or more.....	8.3	1.8	10.1
All sizes of farms.....	8.3	2.1	10.4

¹ Excludes power furnished by custom operators.

TABLE 16.--Cotton production: Lint yields and harvesting practices by size of farm, Delta area, Mississippi, 1958

Item	Unit	Cropland per farm				All sizes of farms
		Less than 60 acres	60 to 399 acres	400 to 999 acres	1,000 acres or more	
Lint yield per acre, 1958....	Pound	360	375	444	477	437
Farmers estimate of normal yield.....	Pound	502	552	570	588	569
Percentage picked by machine.	Percent	5.0	26.7	43.8	35.0	35.3
Own machine.....	Percent	--	21.5	40.1	31.1	31.3
Hired machine.....	Percent	5.0	5.2	3.7	3.9	4.0
Percentage picked by hand....	Percent	95.0	73.3	56.2	65.0	64.7
Family labor.....	Percent	45.6	13.6	3.2	--	6.1
Hired labor.....	Percent	49.4	59.7	53.0	65.0	58.6
Machine-picked cotton picked by:						
1-row picker.....	Percent	100.0	98.2	94.3	68.4	77.3
2-row picker.....	Percent	--	1.8	5.7	31.6	22.7
Acreage defoliated before harvest.....	Percent	12.3	56.7	70.4	60.5	60.2

tion in performance time. Total hours of tractor use per acre on small farms did not differ significantly from that on large farms. Total tractor costs per acre declined on large farms since hourly cost rates were lower.

Cotton Harvest Practices and Costs

Yield

The 1958 yield of cotton ranged from 360 pounds of lint per acre on farms having less than 60 acres of cropland to 477 pounds

per acre on farms having more than 1,000 acres of cropland (table 16). These yields were considerably below those considered normal by Delta producers. Their responses indicated normal yields varying from 502 pounds per acre on small farms to 588 pounds per acre on large farms. The average 1958 yield per acre was about 77 percent of expected yields under normal conditions.

Weather conditions during the 1958 harvest season were not ideal for cotton. Late August and early September weather was favorable for fruiting, and little boll rot or weevil infestation was evident. Heavy and

continuous rains in mid- and late September, however, delayed maturity and caused considerable damage to open cotton. The October 1 stage of harvest in some localities was three to four weeks later than usual, with few machines in use.

Harvest Methods

On sample farms, 35 percent of the 1958 cotton crop was picked by machine, as compared with an official estimate of 30 percent for the Delta as a whole.¹⁶ About 33 percent of the Delta crop was picked by machine in each of the years 1955 and 1956, 23 percent in 1957, and 50 percent in 1959. Although the number of days in 1958 suitable for mechanical harvesting was less than normal, machines were used generally throughout the Delta in October and early November and for scrapping operations in late November and December.

Had the weather been favorable during the 1960 harvest season, most of the cotton crop in the Delta could have been harvested with available machines, assuming adequate distribution and acceptance of machines.¹⁷ Various factors delay the complete displacement of handpicking. Among them are risks associated with weather variability, field loss, and loss in grade because of foreign matter content, leaf stain or discoloration of machine-picked cotton, which, according to recent research, persist despite improved weed control practices, defoliation of plants before picking, and lint-cleaning equipment on gins. Since hoeing labor is needed many operators, in order to keep their hired help, provide an opportunity for handpicking. Insufficient capital and small acreages of cotton also limit some farmers, many of whom depend largely on unpaid family labor.

Quality

Cotton quality data were obtained on 6,718 bales harvested on 75 farms in 1958, of which 2,223 bales were machine picked and 4,495 handpicked. The date of ginning was obtained for each bale as a close

¹⁶ Mississippi Employment Security Commission, Miss. Farm Labor Letter 12(1):1, Miss. State Employment Serv., Farm Placement Dept., Jackson, Miss., Jan. 5, 1959.

¹⁷ A recent survey indicated that over 3,000 mechanical cotton pickers were available within the Delta area for the 1960 harvest season. (Mississippi Employment Security Commission, Miss. Cotton Bul. 13(34):1 Miss. State Employment Serv., Farm Placement Dept., Jackson, Miss. Aug. 22, 1960.)

approximation of the date of picking. Analysis of cotton quality by date and method of picking indicated that handpicked cotton graded higher than machine-picked cotton. Based on middling white cotton with a grade index of 100, the weighted average grade index for handpicked cotton during the period October 5-18 was 98 as compared with 93 for machine-picked cotton during the same period (table 17). Quality differentials were still greater in late October and November, then narrowed as the season progressed through December and into January. The season average grade index of handpicked cotton was 97, or equivalent to White Strict Low Middling plus, as compared with 91, or slightly better than White Low Middling plus, for machine-picked cotton. The overall average index was 95, or slightly higher than White Strict Low Middling.

An analysis of cotton quality by size of farm indicated that in 1958 the highest grades were obtained by operators of small farms having less than 60 acres of cropland (table 18). There was little difference in the average grades of cotton produced on farms in the three larger size groups. Since the 1958 grades of machine-picked cotton were substantially below those of handpicked cotton, it seems likely that the large proportion of handpicked cotton on small farms was a major factor affecting quality. No data are available that would indicate the relative timeliness of picking and the differential effects of unfavorable weather on farms of different sizes. Operators of small farms may be less affected by adverse weather since they can utilize unpaid family labor for selective picking earlier than hired crews would be willing to enter the fields at prevailing wage rates.

Costs of Owning and Operating Mechanical Cotton Pickers

Cost and performance data on the 1958 operation of 83 spindle-type pickers were obtained from Delta farmers. Seventy pickers were one-row units and 13 were two-row units. The one-row units were grouped by size of farm for comparison of annual use and operating costs.

Annual Use and Cost of Operating One-Row Pickers

One-row machines harvested an average of 68 bales per machine, including custom work, from 149 acres, once-over equivalent, in 233 hours. The average age of these pickers was 5 years and their estimated

TABLE 17.--Cotton quality: Average grade indexes by date of ginning and picking method, Delta area, Mississippi, 1958

Date of ginning	Method of picking					
	Hand		Machine		Hand and machine	
	Bales	Grade index ¹	Bales	Grade index ¹	Bales	Grade index ¹
	<u>Number</u>		<u>Number</u>		<u>Number</u>	
August 26-September 20.....	179	99	--	--	179	99
September 21-October 4.....	321	94	--	--	321	94
October 5-18.....	657	98	437	93	1,094	96
October 19-November 1.....	518	98	358	91	876	95
November 2-15.....	333	99	307	89	640	94
November 16-29.....	135	97	135	90	270	93
November 30-December 13.....	184	95	88	90	272	93
December 14-27.....	73	92	32	89	105	91
December 28-January 26.....	60	85	30	82	90	84
Date not obtained.....	2,035	97	836	91	2,871	95
Total or Average.....	4,495	97	2,223	91	6,718	95

¹ Weighted average indexes of quality, based on grade constants furnished by the Cotton Division, Agricultural Marketing Service, U.S.D.A. Grade constants for white grades are as follows: Good Middling, 105; Strict Middling, 104; Middling Plus, 102; Middling, 100; Strict Low Middling Plus, 97; Strict Low Middling, 94; Low Middling Plus, 90; Low Middling, 85; Strict Good Ordinary Plus, 81; Strict Good Ordinary, 76.

TABLE 18.--Cotton quality: Season average grade index, by method of picking and size of farm, Delta area, Mississippi, 1958

Cropland per farm	Method of picking				Average grade index, both methods
	Hand		Machine		
	Bales	Grade index ¹	Bales	Grade index ¹	
	<u>Number</u>		<u>Number</u>		
Less than 60 acres.....	187	99	8	85	98
60 to 399 acres.....	505	97	177	90	95
400 to 999 acres.....	787	98	430	90	95
1,000 acres or more.....	3,016	96	1,608	91	94
All sizes of farms.....	4,495	97	2,223	91	95

¹ Season weighted average indexes of quality based on grade constants furnished by the Cotton Division, Agricultural Marketing Service, USDA. Grade constants for white grades are indicated in the footnote, table 17, above.

present value was \$2,920 per machine. Forty-nine percent were powered by LP gas tractors having an average fuel consumption of 30 gallons per 10-hour day. Two and one-half hours of labor per acre were required, including the machine operator and a helper.

Annual use per machine increased and unit costs decreased as farms became larger (table 19). There was no fundamental relationship between annual use per machine and size of farm, as custom work was available. But data in table 19 indicate the cost advantages of large farms under the most

TABLE 19.--Average annual fixed, variable, and unit costs of operating mechanical cotton pickers, by size of farm, Delta area, Mississippi, 1958

Item	One-row pickers				All two-row pickers
	Cropland per farm			All sizes of farms	
	60 to 399 acres	400 to 999 acres	1,000 acres or more		
Number of machines.....	10	25	35	70	13
Average age, years.....	5.0	4.5	5.5	5.1	2.9
Acres covered, once-over...	96.5	146.5	165.0	148.6	240.4
Number of bales picked per machine.....	36.3	67.3	77.8	68.1	115.4
Hours of picker use per machine.....	172.6	254.2	235.4	233.1	188.5
Annual fixed costs per machine:	<u>Dollars</u>	<u>Dollars</u>	<u>Dollars</u>	<u>Dollars</u>	<u>Dollars</u>
Depreciation ¹	468	778	476	583	1,707
Interest ²	126	144	154	146	354
Insurance.....	11	31	29	27	50
Total fixed.....	605	953	659	756	2,111
Annual variable costs per machine:					
Repairs.....	385	414	442	424	459
Fuel.....	81	113	127	115	110
Grease and oil.....	19	28	26	25	38
Mount and dismount.....	20	44	38	37	--
Tractor use ³	52	141	115	115	--
Labor-machine operator...	95	161	139	141	113
-helper.....	45	72	64	64	58
Total variable.....	697	973	951	921	778
Total annual cost per machine.....	1,302	1,926	1,610	1,677	2,889
Total cost per acre, once-over.....	13.49	13.15	9.76	11.29	12.02
Total cost per bale.....	35.87	28.62	20.69	24.63	25.03

¹ Annual depreciation is the difference between the purchase price and present value divided by the number of years owned by the present operator.

² Interest at 5 percent of present value.

³ Includes a share of fixed costs and repairs on tractors not used exclusively with pickers.

common patterns of machine ownership and operation.

Average total machine costs per acre covered ranged from \$13.49 on small farms to \$9.76 on large farms, with an average of \$11.29 per acre. Of the \$13.49 total cost per acre on small farms, \$4.85 was depreciation and \$3.99 was repairs. On large farms, depreciation and repair costs per acre once-over averaged \$2.88 and \$2.68, respectively. The observed difference in repair costs per acre suggests that certain repair and maintenance jobs on cotton pickers are performed periodically and are not directly related to amount of annual use. Further investigation of this relationship is needed.

Machine costs ranged from \$35.87 per bale of lint on small farms to \$20.69 per bale on larger farms, as compared with a weighted average of \$24.63 per bale. The items of cost included are those operating and fixed costs directly associated with machine operation, including tractor and labor. Any loss in grade or yield associated with machine picking is not included but should be considered when comparing the relative costs of hand and machine picking.

Annual Use and Cost of Operating Two-Row Pickers

Two-row pickers harvested an average of 240 acres, once-over equivalent, from which 115 bales of cotton were picked by machine. The total cost per acre covered was \$12.02, while the cost per bale of lint was \$25.03 (table 19). Repair and depreciation costs per acre were \$1.91 and \$7.10, respectively. The small number of two-row machines in the sample did not justify cost comparisons by size of farm.

Two-row machines picked about 12½ acres per 10-hour day with an average labor requirement of 1½ hours per acre, including the machine operator and a helper. The average age of two-row machines was about 3 years and the estimated present value was \$7,077 per machine. Sixty-two percent of the two-row pickers were powered by LP gas tractors which consumed 39 gallons of fuel per 10-hour day.

Comparative Costs of Operating One- and Two-Row Cotton Pickers

A substantial acreage of cotton is necessary for economic utilization of mechanical cotton pickers (fig. 1). Per-acre costs diminish rapidly as annual use of machines increases, then decrease gradually and

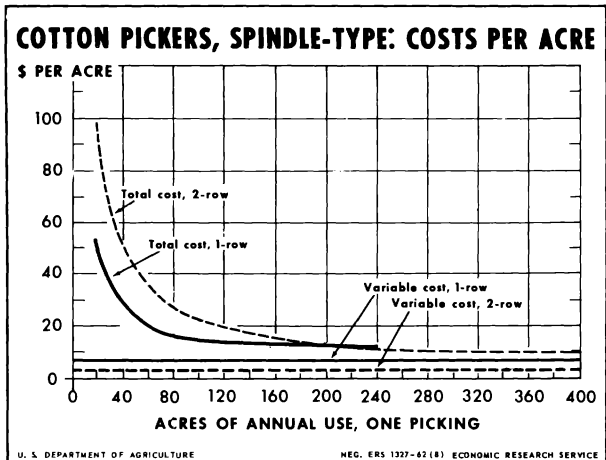


Figure 1

level off as fixed costs are spread over a greater acreage. Variable costs per acre are assumed to be constant within the range of annual use on these farms. Grade and yield losses are not included.

Direct costs are about the same with either size of machine when annual use per machine approximates 200 acres, once over, or 100 acres, twice over. Other factors, such as timeliness of operation, may cause two-row machines to be selected for smaller acreages. But figure 1 indicates that the average one-row machine is less costly to operate over the normal range in acreage.

Comparative Gross Returns, Machine and Handpicking

The season average price received for machine-picked cotton, based on Memphis spot cotton prices for 1-1/16-inch staple length, was 2.89 cents per pound of lint below that of handpicked cotton.¹⁸ Table 20 compares per-acre gross returns with hand- and machine-picking methods. Field loss in machine picking was assumed to be 9 percent of the lint yield of hand-picked cotton.¹⁹ The budget in table 20 reflects the differences in yield, grade, and ginning charges by method of picking. The reduction in gross return per acre associated

¹⁸ Cotton Price Statistics, 1958-59 season, Vol. 40, No. 13, Cotton Division, U.S. Agr. Mktg. Serv.

¹⁹ Based on research conducted in the Delta area of Arkansas in 1958 and reported in the following bulletin: Capstick, D. F., Economics of Mechanical Cotton Harvesting, Ark. Agr. Expt. Sta. Bul. 622, p. 8, Mar. 1960.

TABLE 20.--Cotton production: Estimated gross returns per acre, by method of picking, Delta area, Mississippi, 1958

Item	Method of Picking					
	Hand			Machine		
	Quantity per acre	Price	Value	Quantity per acre	Price	Value
	<u>Pounds</u>	<u>Dollar</u>	<u>Dollar</u>	<u>Pounds</u>	<u>Dollar</u>	<u>Dollar</u>
Lint ¹	452	0.3522	159.19	411	0.3233	132.88
Seed.....	723	.02515	18.18	658	.02515	16.55
Trash ²	108	--	--	175	--	--
Total.....	1,283	--	177.37	1,244	--	149.43
Less: Ginning.....	1,283	.0075	9.62	1,244	.0075	9.33
Bagging and ties.....	452	.009	4.07	411	.009	3.70
Total return per acre.....	--	--	163.68	--	--	136.40
Difference in gross return ³	--	--	--	--	--	27.28
Difference per 500 pound bale.....	--	--	--	--	--	31.86

¹ Based on survey average yield of 437 pounds of lint and field loss in machine picking of 9 percent, twice over.

² Assumed trash content of 8.4 percent of total weight of handpicked cotton and 14.1 percent of machine picked cotton.

³ Represents a reduction in gross returns per acre in machine picking because of losses in grade and yield.

with machine picking was \$27.28 in 1958, or the equivalent of \$31.86 per 500-pound bale. No allowance has been made in this table for differences in picking costs. It must be emphasized that these calculations are based on harvest conditions in 1958, a year of high rainfall during the harvest season. Analysis of harvest methods for the 1959 or 1960 season may show smaller losses for machine picking.

Comparative Costs, Machine and Hand-picking

Figure 2 illustrates the differences in machine and handpicking costs at varying levels of annual use per machine. Yield estimates used in this illustration--452 pounds of lint per acre picked by hand and 411 pounds per acre by machine--are based on an average survey yield of 437 pounds in 1958 and a relative mechanical picker efficiency of 91 percent. The average loss in yield and grade of \$27.28 per acre is included with both machine operating costs and custom charges. Fixed costs are based

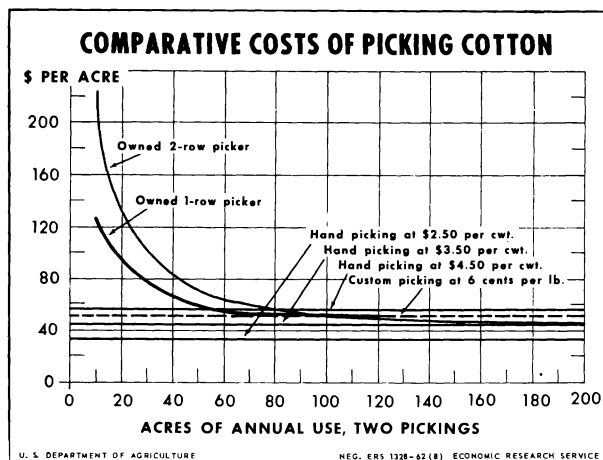


Figure 2

on original prices of \$7,000 for one-row machines and \$15,000 for two-row machines, each depreciated over a period of 10 years or 2,000 hours of useful life. Variable costs are based on 1958 survey data.

Costs of machine picking, including estimated losses in yield and grade, were higher in 1958 than costs of handpicking at the rate of \$3.50 or less per hundredweight of seed cotton. With handpicking rates of \$3.75 per hundredweight, only those two-row machines used on 150 acres or more, twice over, resulted in lower costs per acre than handpicking. A handpicking rate of \$4.05 per hundredweight was equivalent to a custom-machine rate of 6 cents per pound of lint plus associated machine losses of \$27.28 per acre. With a custom rate of 5 cents per pound and the machine loss assumed above, lower per-acre costs would result from handpicking if wage rates were below \$3.75 per hundredweight of seed cotton.

With 1958 yields, about 100 acres, twice over, of annual use of either one-row or two-row pickers are necessary for equating owner operating costs with custom-hire charges. From a cost standpoint, custom-hired machine services can offer substantial savings in machine-operating and overhead costs on small farms.

The cost estimates presented here are not strictly comparable in that many items of cost commonly associated with the use of labor are not included in the handpicking category. These costs may include perquisites for resident laborers, transportation, supervision and management, and picking sacks. Furthermore, individual machine costs may differ substantially from those presented in this report since differences exist in picker efficiency, purchase prices, machine-operating skills, and the like. Quality and yield levels also affect the cost differential between hand and machine methods. Machine picking becomes more favorable as quality and yield losses are reduced or as handpicking rates are increased. The data used in figure 2 indicate that if the field and grade losses associated with machine picking were reduced to handpicking levels, machines would compete favorably on a cost basis with currently prevailing picking rates. One-row picker costs per acre based on annual use of 45 acres or more per machine would be less than the cost of handpicking cotton at a rate of \$2.50 per hundredweight of seed cotton and a yield of 452 pounds of lint per acre. One-row pickers with annual use of about 30 acres could be justified over a wage rate of \$3.50 per hundredweight of seed cotton and yields of 452 pounds of lint, if there were no differential in yield and quality by method of picking. A farmer's decisions,

however, should be made on the basis of his own particular circumstances and experience and not on the above generalizations.

Direct Costs Per Acre and Per Unit of Output

A comparison of direct costs of producing cotton by size of farm is contained in table 21. (See also fig. 3.) The cost items presented do not comprise the total cost of producing cotton since some elements of cost are omitted. These omissions include the costs of management and supervision, farm buildings, land, interest on operating capital, perquisites furnished labor, and miscellaneous items, such as picking sacks and hoes. Only those cost items directly allocable to the cotton enterprise are included. The physical counterparts of the various cost items in table 21 are presented in previous tables. A summary of materials used may be found in table 9. Tractor and equipment use, as well as labor use, in preharvest machine operations are summarized in detail in a previous publication.²⁰ Labor requirements for hand chopping and hoeing are indicated in table 14. Irrigation costs were based on previous research in the Delta and were assumed to total \$8.00 per acre, once-over.²¹ On large farms, 6.7 percent of

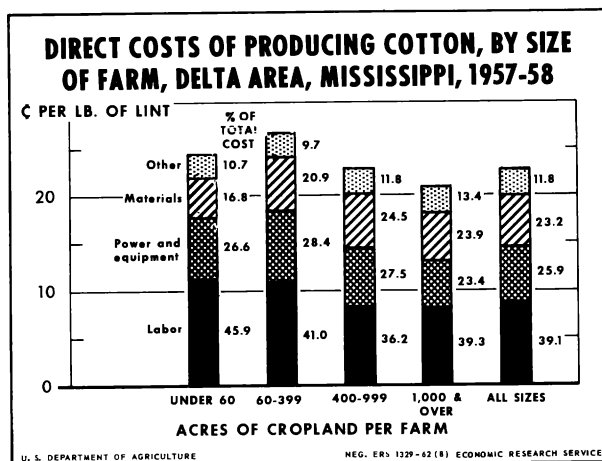


Figure 3

²⁰ See footnote 3, p. 2.

²¹ Tramel, T. E., Crowe, G. B., and Abel, J. F., Jr., Supplemental Irrigation, Investment and Operating Costs in the Delta Area of Mississippi. A Progress Report, Miss. Agr. Expt. Sta. Bul. 559, 27 pp., illus. May 1958. (U.S. Agr. Res. Serv. cooperating.)

TABLE 21.--Cotton production: Direct costs per acre and per pound of lint, by size of farm, Delta area, Mississippi, 1957-58

Item	Cropland per farm				All sizes of farms
	Less than 60 acres	60 to 399 acres	400 to 999 acres	1,000 acres or more	
Number of farms reporting...	59	51	25	9	144
Total acreage of cotton.....	968.2	2,707.2	5,300.7	5,249.3	14,225.4
Average per farm reporting..	16.4	53.1	212.0	583.2	98.8
Pounds lint produced per acre.....	360	375	444	477	437
Percentage picked by machine	5.0	26.7	43.8	35.0	35.3
Percentage picked by hand...	95.0	73.3	56.2	65.0	64.7
Preharvest costs per acre:					
Materials:	<u>Dollars</u>	<u>Dollars</u>	<u>Dollars</u>	<u>Dollars</u>	<u>Dollars</u>
Purchased.....	15.26	21.09	25.61	27.50	24.74
Farm origin.....	1.90	3.09	3.58	1.14	2.47
Tractor use.....	12.85	12.71	10.51	10.61	11.12
Mule use.....	.27	--	--	--	.02
Equipment use.....	8.04	7.12	6.59	5.26	6.30
Machine operator's labor:					
Unpaid.....	4.49	1.99	.38	--	.83
Hired.....	.23	2.67	4.60	5.09	4.12
Chopping labor:					
Unpaid.....	8.37	1.21	--	--	.80
Hired.....	6.26	16.18	17.02	16.59	15.96
Irrigation, labor, and equipment.....	--	--	--	1.07	.39
Custom work.....	2.06	4.18	3.74	1.91	3.03
Total preharvest.....	59.73	70.24	72.03	69.17	69.78
Harvest costs per acre:					
Mechanical picking: ¹					
Own machine.....	--	5.66	9.53	5.85	6.79
Custom picking.....	.95	1.02	.81	.93	.90
Labor with own machine..	--	.76	1.39	.73	.93
Hand picking:					
Unpaid labor.....	12.41	4.31	1.09	--	2.07
Hired labor ²	13.57	18.86	18.13	23.37	19.90
Weighing and hauling labor:					
Wage basis.....	1.30	.96	.55	.56	.68
Bale or hundredweight basis.....	.33	.38	.42	.12	.30
Labor transportation ³....	.15	.38	--	1.59	.67
Tractor use in hauling cotton.....	2.26	1.32	1.08	1.12	1.22
Trailer use ⁴.....	.59	.56	.52	.52	.53
Ginning, bagging, and ties	10.90	11.29	14.13	14.91	13.66
Total harvest.....	42.46	45.50	47.65	49.70	47.65
Total direct costs per acre ⁵	102.19	115.74	119.68	118.87	117.43

See footnotes at end of table.

--continued

TABLE 21.--Cotton production: Direct costs per acre and per pound of lint, by size of farm, Delta area, Mississippi, 1957-58--Continued

Item	Cropland per farm				All sizes of farms
	Less than 60 acres	60 to 399 acres	400 to 999 acres	1,000 acres or more	
Less value of cottonseed used.....	<u>Dollars</u> 14.49	<u>Dollars</u> 15.09	<u>Dollars</u> 17.86	<u>Dollars</u> 19.19	<u>Dollars</u> 17.58
Direct costs per acre.....	87.70	100.65	101.82	99.68	99.85
Direct costs per pound of lint.....	.244	.268	.229	.209	.228

¹ Includes power used with own machine. Custom costs include labor, power, and equipment furnished.

² Includes cropper labor valued at hired wage rates as well as other hired labor.

³ Most common rate of payment was 50 cents per hundredweight of seed cotton.

⁴ Estimates based on 6 hours of trailer use per acre with hand picking 3 hours per acre with 2-row picker and 4 hours per acre with 1-row picker, all with an average cost of 10 cents per hour of use.

⁵ These are only partial costs and should not be used as total costs of producing cotton since no allowance has been made for such costs as management, supervision, land, building, and storage.

the acreage was irrigated twice. Custom costs include the labor, power, and equipment furnished by custom operators.

Direct costs of producing lint and seed per acre totaled \$102 per acre on small farms having an average of 16 acres of cotton, and \$119 per acre on farms having an average of 583 acres of cotton. There was little difference in average per-acre costs for the three larger size groups. The major difference in costs between the very small farms and other sizes consisted of more intensive applications of preharvest materials on the larger farms, which resulted in materials costs up to 70 percent greater than on the average small farm. Preharvest materials comprised 17 percent of total direct costs per acre on small farms as compared with 24 percent on large farms. Labor, including unpaid family labor but excluding that furnished by custom operators, comprised 46 percent and 39 percent of total direct costs per acre on small and large farms, respectively. Tractor and equipment use, including custom work, comprised 27 percent and 23 percent of total direct costs per acre on small and large farms, respectively (fig. 3).

In order to obtain an estimate of the cost of producing lint, the per-acre value of cottonseed was deducted from total costs per acre. As 1958 average yields were much higher on farms in the two larger size groups, the respective costs per pound of lint were appreciably lower than those experienced on smaller farms. The highest average cost per pound was experienced by farmers with 60 to 399 acres of cropland. Their practices and costs more nearly resembled those of larger farms, yet the 1958 yields were only slightly above those of small farms. As compared with farms with less than 60 acres of cropland, the per-acre cost of producing lint was 15 percent higher while the yield per acre was only 4 percent higher. Per-acre costs of producing lint on the largest farms were 14 percent higher but yields were about 32 percent greater than on the smallest farms.

Net Returns Per Acre

Estimates of net returns per acre of cotton by size of farm in 1958 are presented in table 22. Gross return per acre was based on 1958 per-acre yields and prices of lint corresponding with those for

average quality of cotton within each size group. Two measures of net returns were then calculated. One measure--net returns per acre to land and management--was obtained by deducting all direct costs, including the value of operator and family labor, from gross returns. This measure indicates the residual available to cover such costs as land, buildings, and management. Another measure--net returns per acre to operator and family labor, land and management--is obtained by excluding operator and family labor as a direct cost. It is a better measure of the net contribution of an acre of cotton to cover such unallocated costs as taxes, insurance, building materials, perquisites furnished hired laborers, supervisory expenditures, hired labor used in overhead work such as land drainage and building repair, and necessary living expenses of the farm operator and his family.

Net returns per acre to operator and family labor, land, and management were about the same for the very small and very large farms. Net returns were substantially less for the 60-to-399 acre size group. When operator and family labor are valued at hired wage rates and included as costs, the average net return to land and management is higher in the two larger size groups since unpaid labor in those two size groups is a relatively insignificant factor.

The two measures of net returns per acre are useful in analyzing the cropping alternatives available to farms. Other crops are considered in later sections of this report. However, they are not useful as indicators of farm financial success since the amount of resources controlled is of equal or greater importance. The last line in table 22--total return per farm to unpaid labor, land, and management--indicates roughly the total contribution of the cotton

TABLE 22.--Cotton production: Summary of direct costs and returns per acre, by size of farm, Delta area, Mississippi, 1957-58

Item	Unit	Cropland per farm				All sizes of farms
		Less than 60 acres	60 to 399 acres	400 to 999 acres	1,000 or more acres	
Lint yield per acre, 1958....	Pound	360	375	444	477	437
Average price received per pound ¹	Cent	35.71	34.25	34.25	33.77	34.25
Return per acre from lint....	Dollar	128.56	128.44	152.07	161.08	149.67
Direct costs per acre of producing lint ²	Dollar	87.70	100.65	101.82	99.68	99.85
Return per acre to land and management ³	Dollar	40.86	27.79	50.25	61.40	49.82
Unpaid labor cost per acre...	Dollar	22.57	6.99	1.48	--	3.10
Return per acre to unpaid labor, land, and management ⁴	Dollar	63.43	34.78	51.73	61.40	52.92
Total return per farm to unpaid labor, land, and management ⁴	Dollar	1,040.25	1,846.82	10,966.76	35,808.48	5,228.50

¹Memphis spot cotton prices for specified grades of 1 1/16 inch staple length cotton. Grade indexes ranged from an average of 98 on small farms to 94 on large farms. See table 18. ²Direct costs of producing lint and seed less the value of seed. These costs do not include charges for land, buildings, and management. ³These amounts are available to cover the costs of land, buildings, and management used in cotton production. ⁴These amounts are available to cover the costs of family and operator labor, land, buildings, and management used in cotton production.

enterprise by size of farm to the indicated factors of production. These amounts were obtained by multiplying the return per-acre to unpaid labor, land, and management by the average acreage of cotton in each size group. With 1957-58 cost rates and commodity prices, operators of large farms have the possibility of meeting all direct and overhead costs connected with cotton production and of providing their families with an adequate level of living. Since cotton is the major source of income on these farms, it is obvious that small farms, as presently organized and operated, can provide a full-time farmer with only a subsistence level of living in the absence of off-farm work. It must be emphasized that these calculations represent the returns from cotton production for the 1958 season

and are not intended to represent net farm income from all productive work.

Costs and Returns with Normal Yields

Since cotton yields vary considerably from year to year, cotton enterprise costs were budgeted to represent cost levels expected with normal yields (table 23). Preharvest costs per acre were assumed to be the same for both actual and normal yields, since no data were available to indicate likely differences. Harvest costs with normal yields were greater than with actual yields since the same harvest practices were used to harvest a greater yield of cotton. The resulting estimates of costs associated with normal yields by size of farm are probably more reliable as relative magnitudes than in an absolute sense.

TABLE 23.--Cotton production: Direct costs per acre and per pound of lint with normal yields, by size of farm, Delta area, Mississippi, 1957-58

Item	Cropland per farm				All sizes of farms
	Less than 60 acres	60 to 399 acres	400 to 999 acres	1,000 acres or more	
	<u>Dollars</u>	<u>Dollars</u>	<u>Dollars</u>	<u>Dollars</u>	<u>Dollars</u>
Preharvest costs per acre.....	59.73	70.24	72.03	69.17	69.78
Harvest costs per acre:					
Mechanical picking: ¹					
Own machine.....	--	5.66	9.53	5.85	6.79
Custom machine.....	1.33	1.51	1.03	1.15	1.19
Labor with own machine.....	--	.76	1.39	.73	.93
Hand picking:					
Unpaid labor.....	17.29	6.35	1.39	--	2.90
Hired labor ²	18.89	27.80	23.47	28.60	25.88
Weighing and hauling labor:					
Wage basis.....	1.81	1.41	.71	.69	.89
Bale or hundredweight basis	.46	.56	.54	.15	.39
Labor transportation.....	.21	.56	--	1.96	.87
Tractor use in hauling cotton...	3.15	1.94	1.39	1.38	1.59
Trailer use.....	.59	.56	.52	.52	.53
Ginning, bagging, and ties.....	15.19	16.62	18.14	18.38	17.79
Total harvest.....	58.92	63.73	58.11	59.41	59.75
Total direct costs per acre ³	118.65	133.97	130.14	128.58	129.53
Less value of seed sold.....	20.20	22.21	22.94	23.67	22.89
Adjusted direct costs per acre..	98.45	111.76	107.20	104.91	106.64
Direct cost per pound of lint...	.196	.202	.188	.178	.187

¹ Own machine includes power used with picker. Custom costs include labor, power, and equipment. ²Includes cropper labor valued at hired wage rates, as well as other hired labor. ³These are partial costs, not total costs, of producing cotton since no charges have been made for such items as management, supervision, land, buildings, and storage facilities.

The resulting costs per pound of lint are lower than actual 1958 costs since direct costs under normal yield assumptions increased less than yields. There was also less variability by size of farm in unit costs, although the same patterns prevailed.

A summary of estimated net returns per acre with normal yields is presented in

table 24. Since normal yield estimates were much higher than actual yields, the net returns per acre to unpaid labor, land, and management were also higher than with actual yields. The size group of farms having 60 to 399 acres of cropland showed returns with normal yields more than double those with actual yields.

TABLE 24.--Cotton production: Summary of direct costs and returns per acre with normal yields, by size of farm, Delta area, Mississippi, 1958¹

Item	Unit	Cropland per farm				All sizes of farms
		Less than 60 acres	60 to 399 acres	400 to 999 acres	1,000 or more acres	
Normal lint yield per acre..	Pound	502	552	570	588	569
Average price received per pound ²	Cent	35.71	34.25	34.25	33.77	34.25
Return per acre from lint...	Dollar	179.26	189.06	195.22	198.57	194.88
Direct cost per acre ³	Dollar	98.45	111.76	107.20	104.91	106.64
Per acre return to land and management ⁴	Dollar	80.81	77.30	88.02	93.66	88.24
Family labor cost per acre..	Dollar	31.39	10.02	1.88	--	4.74
Per acre return to unpaid labor, land, and management ⁵	Dollar	112.20	87.32	89.90	93.66	92.98

¹ Assuming normal yields of lint as estimated by farmers in sample.

² Memphis spot cotton prices for specified grades of 1 1/16 inch staple length cotton.

³ Direct costs of producing lint and seed less the value of seed. These costs do not include charges for land, buildings, and management.

⁴ These amounts are available to cover the costs of land, buildings, and management.

⁵ These amounts are available to cover the costs of family and operator labor, management, land, and buildings.

SOYBEAN PRODUCTION PRACTICES AND COSTS

Acreage used for soybean production on sample farms nearly equaled that used for cotton production. It ranged from 45 percent of the cotton acreage on small farms to 109 percent on large farms. Soybeans are generally considered the best cropping alternative, under current cost-price relationships, for land diverted from cotton production. Since World War II, land also has been diverted from corn and oat production to soybeans; domestic and foreign demand for vegetable oils has stimulated soybean production. Increases in soybean production in the Delta States were larger

than in the rest of the United States. The Delta states now account for about 15 percent of the total U.S. acreage of soybeans.²²

Preharvest Operations and Materials

Tables 25 and 26 contain summaries of preharvest operations performed and the sizes of equipment used in soybean production. These operations were performed almost exclusively with tractors and tractor equipment. For the most common preharvest operations there appeared to be

²² U.S. Agricultural Marketing Service, Crop Reporting Board. Crop Production, 1960, Annual Summary, Acreage, Yield, Production by States. CRPR2-1(60). 108 pp., Dec. 16, 1960.

TABLE 25.--Preharvest operations on soybeans: Percentage of farms that reported, acreage covered, and number of times over, by size of farm Delta area, Mississippi, 1957¹

Operation	Cropland per farm											
	Less than 60 acres			60 to 399 acres			400 to 999 acres			1,000 acres or more		
	Farms re-reported	Acre-age covered	Times over, acreage covered	Farms re-reported	Acre-age covered	Times over, acreage covered	Farms re-reported	Acre-age covered	Times over, acreage covered	Farms re-reported	Acre-age covered	Times over, acreage covered
	<u>Per-cent</u>	<u>Per-cent</u>	<u>Number</u>	<u>Per-cent</u>	<u>Per-cent</u>	<u>Number</u>	<u>Per-cent</u>	<u>Per-cent</u>	<u>Number</u>	<u>Per-cent</u>	<u>Per-cent</u>	<u>Number</u>
Cut stalks.....	5.3	3.2	1.0	4.3	3.2	1.0	8.0	7.2	1.0	--	--	--
Disc.....	86.8	84.8	1.7	91.5	93.3	2.2	100.0	96.8	2.2	100.0	100.0	1.9
Bed.....	73.7	72.1	1.4	83.0	80.6	1.2	60.0	45.3	1.1	63.6	80.0	1.2
Harrow.....	73.7	64.6	1.4	95.7	96.6	1.6	72.0	66.8	1.4	81.8	71.9	1.3
Plant.....	100.0	100.0	1.0	100.0	100.0	1.0	100.0	100.0	1.0	100.0	100.0	1.0
Replant.....	5.3	3.0	1.0	2.1	2.0	1.0	4.0	4.4	1.0	--	--	--
Cultivate.....	76.3	76.8	2.8	93.6	93.5	3.7	88.0	89.5	3.0	100.0	100.0	2.9
Hoe by hand....	5.3	6.1	1.0	4.3	2.1	1.0	16.0	18.9	1.6	9.1	8.4	1.0

¹ Includes custom-hired operations.

TABLE 26.--Preharvest operations on soybeans: Percentage of acreage covered and number of times over, by size of equipment and size of farm, Delta area, Mississippi, 1957

Operation and size of equipment	Cropland per farm							
	Less than 60 acres		60 to 399 acres		400 to 999 acres		1,000 acres or more	
	Acreage covered	Times over, acreage covered	Acreage covered	Times over, acreage covered	Acreage covered	Times over, acreage covered	Acreage covered	Times over, acreage covered
	<u>Percent</u>	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>	<u>Number</u>
Cut stalks:								
2-row.....	3.2	1.0	3.2	1.0	7.2	1.0	--	--
Disc:								
2-row.....	82.1	1.7	85.7	2.2	60.5	2.3	34.1	1.6
3-row.....	--	--	5.6	3.0	21.2	2.3	48.4	2.3
4-row.....	2.7	1.0	2.0	1.0	15.1	1.8	17.5	1.3
Bed:								
1-row.....	7.3	1.2	--	--	--	--	--	--
2-row.....	59.3	1.4	47.2	1.2	2.1	2.0	--	--
3-row.....	5.5	1.5	33.4	1.3	31.6	1.1	66.5	1.3
4-row.....	--	--	--	--	11.6	1.0	13.5	1.0
Harrow:								
2-row.....	53.2	1.4	13.0	2.1	--	--	--	--
4-row.....	11.4	1.2	83.6	1.5	66.8	1.4	71.9	1.3
Plant:								
1-row.....	5.9	1.0	1.4	1.0	--	--	--	--
2-row.....	80.6	1.0	29.5	1.0	2.1	1.0	--	--
4-row.....	3.1	1.0	69.1	1.0	97.9	1.0	100.0	1.0
Hand.....	10.4	1.0	--	--	--	--	--	--
Replant:								
1-row.....	2.1	1.0	--	--	--	--	--	--
2-row.....	.9	1.0	2.0	1.0	--	--	--	--
4-row.....	--	--	--	--	4.4	1.0	--	--
Cultivate:								
1-row.....	7.3	2.2	--	--	--	--	--	--
2-row.....	66.8	2.9	33.6	3.3	4.2	4.0	--	--
4-row.....	2.7	3.0	59.9	3.9	85.3	3.0	100.0	2.9
Hoe by hand.....	6.1	1.0	2.1	1.0	18.9	1.6	8.4	1.0

no consistent differences by size of farm in the proportion of total acreage covered and the number of times covered. The most common operations on all farms were disking, bedding, harrowing, planting, and cultivating. No specialized items of equipment are needed in soybean production.

Seed was the only material used in soybean production. Fertilizer is seldom used on soybeans in the Delta since research results show no response to fertilization. The larger farms used more homegrown seed than small farms. The average seeding rate was 62 pounds per acre and varied little by size of farm (table 27). Soybeans usually follow cotton in the spring planting sequence. Depending on the weather and soil conditions, soybean planting may start about May 1 and extend through June on land from which small grains were harvested. However, very little land was double cropped in either 1957 or 1958 because of the excessive rainfall during the planting and harvesting seasons.

Labor and Power Use

Preharvest labor requirements ranged from 4.3 hours of labor per acre on small farms to 3.0 hours per acre on large farms (table 28). A major factor associated with the reduction in requirements per acre as size of farm increased was the more prevalent use of larger items of equipment.

The labor requirements for harvesting shown in table 28, as in all summaries of labor use in this report, include only the labor furnished or hired by the farm

operators and excludes labor furnished by custom operators. Since a substantial proportion of the soybean acreage on farms having less than 400 acres of cropland was harvested by custom operators, the harvest labor estimates reflect dissimilar harvest patterns.

With respect to labor furnished by farm operators, 88 percent was unpaid labor on small farms, whereas 100 percent was hired on large farms. As in the case of cotton, this is operational labor and excludes time involved in management and supervisory functions.

Nearly all of the tractor use on soybeans was preharvest operations (table 28). Self-propelled combines were more commonly used than tractor-drawn combines. The more prevalent use of larger tractors and equipment on farms having 400 or more acres generally reduced the tractor-hour requirement per acre. Most of the hauling of beans to storage was accomplished with trucks, averaging about 3 miles per acre harvested.

Soybean Harvest Practices

Seventy-nine percent of the soybean acreage on farms having less than 60 acres of cropland was combined by custom-hired operators, as compared with only 12 percent on farms having more than 1,000 acres of cropland (table 29). Eighteen percent of the total soybean acreage on sample farms was harvested by custom operators. The most common custom rate was one-fourth of the soybean yield, including hauling to storage. On the remaining

TABLE 27.--Soybean production: Kinds and quantities of seed used, by size of farm, Delta area, Mississippi, 1957

Item	Cropland per farm				All sizes of farms
	Less than 60 acres	60 to 399 acres	400 to 999 acres	1,000 acres or more	
Percentage of acres planted with--	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>
Homegrown seed.....	23.0	37.0	60.9	68.9	58.8
Purchased seed.....	77.0	63.0	39.1	31.1	41.2
	<u>Pounds</u>	<u>Pounds</u>	<u>Pounds</u>	<u>Pounds</u>	<u>Pounds</u>
Seeding rate per acre.....	63.2	61.1	60.5	63.0	61.8
Seed used per acre, including replanting.....	65.2	62.3	63.2	63.0	63.0

TABLE 28.--Soybean production: Hours of labor, tractor, and truck use per acre, and percentage of hired and unpaid labor, by size of farm, Delta area, Mississippi, 1957-58¹

Item	Cropland per farm				All sizes of farms
	Less than 60 acres	60 to 399 acres	400 to 999 acres	1,000 acres or more	
	<u>Hours</u>	<u>Hours</u>	<u>Hours</u>	<u>Hours</u>	<u>Hours</u>
Preharvest labor.....	4.3	4.4	3.9	3.0	3.6
Machine operations.....	4.1	4.3	3.1	3.0	3.3
Hoeing by hand.....	.2	.1	.8	--	.3
Harvest labor.....	.4	.6	.9	.9	.8
Total labor per acre...	4.7	5.0	4.8	3.9	4.4
	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>
Percentage of all labor--					
Hired.....	12.1	58.0	90.6	100.0	84.8
Unpaid.....	87.9	42.0	9.4	--	15.2
	<u>Hours</u>	<u>Hours</u>	<u>Hours</u>	<u>Hours</u>	<u>Hours</u>
Tractor hours per acre.....	3.8	4.2	2.9	2.7	3.1
Preharvest operations....	3.6	4.1	2.9	2.7	3.1
Harvest operations.....	.2	.1	--	--	(²)
	<u>Miles</u>	<u>Miles</u>	<u>Miles</u>	<u>Miles</u>	<u>Miles</u>
Truck miles per acre.....	--	2.2	3.4	3.5	3.1

¹ Power, equipment, and labor furnished by custom operators are not included here. Labor excludes management and supervisory functions.

² Less than one-tenth hour.

TABLE 29.--Soybean production: Percentage of acreage harvested by specified method and size of farm, Delta area, Mississippi, 1958

Item	Cropland per farm				All sizes of farms
	Less than 60 acres	60 to 399 acres	400 to 999 acres	1,000 acres or more	
	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>
Acreage harvested by--					
Custom-hired operator.....	78.9	44.3	14.6	12.4	17.8
Owned machine.....	21.1	55.7	85.4	87.6	82.2
5 - 7 foot PTO combine..	13.7	7.3	--	4.5	3.8
9 - 10 foot SP combine..	7.4	7.2	2.1	2.2	2.8
12 foot SP combine.....	--	41.2	83.3	80.9	75.6

acreage harvested with owned machines, 12-foot self-propelled combines were used most often on farms in the larger three size groups. A summary of the costs of owning and operating small-grain combines is included in a later section of this report.

Direct Costs Per Acre and Per Unit of Output

Preharvest costs averaged about \$15 per acre of soybeans on small farms and \$10 per acre on large farms (table 30). Greater

TABLE 30.--Soybean production: Direct costs per acre, by size of farm,
Delta area, Mississippi, 1957-58

Item	Cropland per farm				All sizes of farms
	Less than 60 acres	60 to 399 acres	400 to 999 acres	1,000 acres or more	
Number of farms reported....	39	47	25	11	122
Percentage of farms reported	59	81	89	100	75
Total acreage of soybeans...	435.5	2,426.0	4,741.0	5,720.0	13,322.0
Acreage per farm reported...	11.2	51.6	189.6	520.0	109.2
Bushels harvested per acre..	21.0	22.4	23.4	21.4	22.3
Preharvest costs per acre:					
Seed:	<u>Dollars</u>	<u>Dollars</u>	<u>Dollars</u>	<u>Dollars</u>	<u>Dollars</u>
Purchased.....	2.92	2.19	1.35	1.12	1.46
Farm origin.....	.87	1.29	2.10	2.48	2.08
Tractor use.....	5.44	6.10	3.61	3.57	4.11
Equipment use.....	4.03	2.97	1.71	1.63	1.98
Machine operators labor: ¹					
Unpaid.....	1.66	.83	--	--	.21
Hired.....	.22	1.17	1.41	1.36	1.32
Hoeing labor:					
Unpaid.....	.05	--	--	--	(¹)
Hired.....	.04	.03	.42	--	.16
Custom work ².....	.20	.04	--	--	.01
Total preharvest.....	15.43	14.62	10.60	10.16	11.33
Harvest costs per acre:					
Custom combining ²	8.08	4.84	1.65	1.31	2.30
Own combine use.....	2.06	4.41	4.43	3.75	4.06
Tractor use.....	.33	.10	--	--	.03
Truck use.....	--	.22	.34	.35	.31
Trailer use.....	.02	.03	.08	.09	.07
Labor:					
Unpaid.....	.19	.16	.21	--	.11
Hired.....	--	.19	.26	.45	.32
Total harvest.....	10.68	9.95	6.97	5.95	7.20
Total direct costs per acre ³	26.11	24.57	17.57	16.11	18.53
Direct costs per bushel harvested.....	1.24	1.10	.75	.75	.83

¹ Excludes custom labor.

² Includes labor, power and equipment furnished by custom operators for combining and hauling.

³ These are partial costs and should not be used as total costs of producing soybeans since no charges have been made for management, supervision, land, buildings, and storage.

efficiencies in use of power on large farms were largely responsible for the lower per-acre costs. Power and equipment costs per acre totaled \$9.47 per acre on small farms and \$5.20 per acre on large

farms. Seed costs varied little by size of farm.

Harvest costs per acre on large farms were lower than on small farms, but the difference was lessened by the use of

custom-hired combines on the small farms, where insufficient acreages of soybeans and grain crops do not justify combine ownership.

Direct costs of producing soybeans ranged from \$26 per acre on small farms having 11 acres of soybeans per farm to \$16 per acre on large farms having 520 acres of soybeans per farm. As indicated in table 30, yields varied little by size of farm. Consequently, small farms experienced higher costs per bushel harvested. Unit costs on the largest farms were about the same as those on the 400-to-999-acre farms.

Net Returns Per Acre

Table 31 presents estimated net returns per acre of soybeans by size of farm. Yields in 1958 were multiplied by the 1958 season average price received by Mississippi farmers to obtain an estimate of gross returns per acre. Returns per acre to land and manage-

ment were calculated by deducting all direct costs, including unpaid labor, from gross returns. This measurement of net returns indicates the contribution of soybeans to meet various overhead costs, including land, supervision and management, buildings, and storage facilities.

A second measurement of net returns--net returns to family labor, land, and management--was obtained by excluding operator and family labor as a direct cost. It is a better measure of net returns on farms that utilize substantial amounts of unpaid labor. The two measures give similar results when applied to large farms that utilize very little unpaid labor.

Returns per acre of soybeans to family labor, land, and management varied from \$17 per acre on farms having less than 60 acres of cropland to \$28 per acre on farms having 400 to 999 acres of cropland. The 1958 yield on farms having more than 1,000 acres of cropland was slightly lower than average. Farmers' estimates of normal yields on large farms were also slightly lower than in other size groups.

TABLE 31.--Soybean production: Summary of direct costs and returns per acre, by size of farm, Delta area, Mississippi, 1957-58

Item	Unit	Cropland per farm				All sizes of farms
		Less than 60 acres	60 to 399 acres	400 to 999 acres	1,000 acres or more	
Yield per acre.....	Bushel	21.0	22.4	23.4	21.4	22.3
Average price received per bushel.....	Dollar	1.95	1.95	1.95	1.95	1.95
Return per acre.....	Dollar	40.95	43.68	45.63	41.73	43.48
Direct cost per acre ²	Dollar	26.11	24.57	17.57	16.11	18.53
Per acre return to land and management ³	Dollar	14.84	19.11	28.06	25.62	24.95
Family labor cost per acre...	Dollar	1.90	.99	.21	--	.32
Per acre return to unpaid labor, land, and management ⁴	Dollar	16.74	20.10	28.27	25.62	25.27

¹ 1958 season average price received by Mississippi farmers. Source: Agricultural Statistics, 1960.

² Land, buildings, supervision, and management costs are not included here.

³ These per-acre amounts are available to cover the costs of land, buildings, supervision, and management.

⁴ These per-acre amounts are available to cover the costs of unpaid labor, land, buildings, supervision, and management.

CORN PRODUCTION PRACTICES AND COSTS

Preharvest Operations and Materials

A summary of preharvest operations performed on corn is presented in table 32. Similar preharvest practices were carried out on all sizes of farms, although a lesser proportion of total acreage on small farms was disked, fertilized, and plowed. The seven most common operations performed were disking, bedding, fertilizing, harrowing, planting, cultivating, and hand hoeing.

Two-row equipment was used most commonly on farms having less than 400 acres of cropland, whereas 4-row equipment was used more on the larger farms (table 33). All equipment operations were tractor-powered with the exception of those performed with 1-row equipment.

Preharvest operations on corn were performed largely with farm-owned equipment. Custom operators were hired only on small farms, but no more than 4 percent of the total acreage for any single operation was performed by custom operators.

The kinds and amounts of materials used per acre and costs of materials are shown in table 34. Costs are based on average prices paid by Delta farmers in 1957. Seed and fertilizer are the major components of materials cost. The average seeding rate was about 12 pounds per acre (table 35).

Ninety-seven percent of the total corn acreage was fertilized, ranging from 87 percent on small farms to 100 percent on large farms (table 36). Nearly all of the fertilizer was applied before planting. Rates of application varied greatly by size of farm, progressing from an average of 43 pounds of nitrogen per acre on small farms to 125 pounds of nitrogen per acre on large farms. The chief source of nitrogen on farms having less than 400 acres of cropland was ammonium nitrate since equipment for applying anhydrous ammonia and tanks for storing it represent a sizable initial investment. On farms having more than 400 acres of cropland, about 92 percent used anhydrous ammonia.

Labor and Tractor Use

The amount of preharvest labor used on corn on farms having 400 to 999 acres of cropland was an exception to the general decline in hours of labor as size of farm increased (table 37). A greater proportion

of corn acreage on these farms was hand hoed, resulting in a much greater labor requirement. Yields were also higher on these farms than in the other size groups. The reliability of these observations remains in question since only 13 farms having 400 to 999 acres of cropland reported corn production.

Harvest labor use reflects the varying proportions of acreage picked by hand and by machine on farms of different sizes. Labor furnished by custom operators is not included in table 37. Custom-hired picking ranged from 3 percent of the crop on small farms to 29 percent of the crop on farms having 400 to 999 acres of cropland. Hand picking ranged from 97 percent of the corn on small farms to about 12 percent on farms having 400 to 999 acres of cropland (table 38).

Seventy-eight percent of all direct labor on corn was hired, ranging from 16 percent on small farms to 100 percent on large farms. In this analysis, sharecropper labor is considered as hired labor, but it was insignificant in amount.

Tractor use varied from about 8 hours per acre on small farms to 4 hours on large farms. About two-thirds of all tractor use was on preharvest operations. Greater efficiencies of tractor use and more machine picking on large farms were major factors associated with the decline in tractor-hour requirements.

Corn Harvest Practices

Corn for grain was harvested largely by hand on farms having less than 400 acres of cropland (table 38). The remaining acreage on these farms was harvested largely by custom-hired machines. On the large farms owned machines were more prevalent and were used on 59 percent or more of the corn acreage. One farm in the 400 to 999 acre group had 250 acres of corn, all of which was picked with a small-grain combine with a picker-sheller attachment.

Direct Costs Per Acre and Per Unit of Output

Preharvest costs per acre of corn averaged \$26 on small farms and \$20 on large farms (table 39). Although large farms used more fertilizer than small farms, this cost was more than offset by lower power and equipment costs. Materials costs ranged from \$7 per acre on small farms to \$11

TABLE 32.--Preharvest operations on corn: Percentage of farms that reported, acreage covered, and number of times over, by size of farm, Delta area, Mississippi, 1957¹

Operation	Cropland per farm											
	Less than 60 acres			60 to 399 acres			400 to 999 acres			1,000 acres or more		
	Farms re-ported	Acre-age covered	Times over, acreage covered	Farms re-ported	Acre-age covered	Times over, acreage covered	Farms re-ported	Acre-age covered	Times over, acreage covered	Farms re-ported	Acre-age covered	Times over, acreage covered
	<u>Per-cent</u>	<u>Per-cent</u>	<u>Number</u>	<u>Per-cent</u>	<u>Per-cent</u>	<u>Number</u>	<u>Per-cent</u>	<u>Per-cent</u>	<u>Number</u>	<u>Per-cent</u>	<u>Per-cent</u>	<u>Number</u>
Cut stalks.....	16.3	15.1	1.1	11.5	9.2	1.0	50.0	81.1	1.0	14.3	4.0	1.0
Disk.....	86.0	86.2	1.9	100.0	100.0	2.0	100.0	100.0	1.6	100.0	100.0	1.7
Bed.....	90.7	90.9	1.4	76.9	78.8	1.1	87.5	78.6	1.1	85.7	72.4	1.2
Fertilize.....	81.4	86.7	1.0	84.6	90.4	1.0	100.0	100.0	1.1	100.0	100.0	1.0
Harrow.....	86.0	87.0	1.3	91.9	92.3	1.3	87.5	68.0	1.0	71.4	84.4	1.0
Plant.....	100.0	100.0	1.0	100.0	100.0	1.0	100.0	100.0	1.0	100.0	100.0	1.0
Replant.....	25.6	25.9	1.1	7.7	7.2	1.0	12.5	8.2	1.0	--	--	--
Cultivate.....	88.4	91.1	3.5	96.2	97.1	3.4	75.0	91.8	2.0	100.0	86.2	1.8
Hoe.....	37.2	41.5	1.2	26.9	20.1	1.2	50.0	62.5	1.5	28.6	25.3	1.5
Plow-moldboard.	--	--	--	11.5	11.1	1.0	37.5	42.9	1.0	14.3	9.2	1.0

¹ Includes custom-hired operations.

TABLE 33.--Preharvest operations on corn: Percentage of acreage covered and number of times over, by size of equipment and size of farm, Delta area, Mississippi, 1957

Operation and size of equipment	Cropland per farm							
	Less than 60 acres		60 to 399 acres		400 to 999 acres		1,000 acres or more	
	Acreage covered	Times over, acreage covered	Acreage covered	Times over, acreage covered	Acreage covered	Times over, acreage covered	Acreage covered	Times over, acreage covered
	<u>Percent</u>	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>	<u>Number</u>
Cut stalks:								
1-row.....	3.9	1.0	--	--	--	--	--	--
2-row.....	11.2	1.2	9.2	1.0	81.1	1.0	4.0	1.0
Disc:								
1-row.....	--	--	--	--	--	--	--	--
2-row.....	86.2	1.9	96.0	2.0	88.5	1.7	22.5	1.2
3-row.....	--	--	4.0	2.0	11.5	1.0	31.6	1.5
4-row.....	--	--	--	--	--	--	45.9	2.0
Bed:								
1-row.....	5.5	1.7	--	--	--	--	--	--
2-row.....	82.6	1.4	36.3	1.2	3.3	1.0	--	--
3-row.....	2.8	2.0	42.5	1.0	43.4	1.2	66.0	1.2
4-row.....	--	--	--	--	31.9	1.0	6.4	1.0
Fertilize:								
2-row.....	81.5	1.0	55.8	1.0	--	--	--	--
3-row.....	2.4	1.0	8.6	1.0	8.0	1.0	34.4	1.0
4-row.....	2.8	1.0	26.0	1.0	92.0	1.1	65.6	1.0
Harrow:								
2-row.....	74.8	1.3	20.1	1.4	--	--	--	--
3-row.....	--	--	--	--	21.3	1.0	--	--
4-row.....	12.2	1.2	72.2	1.3	46.7	1.0	84.4	1.0
Plant:								
1-row.....	5.1	1.0	--	--	--	--	--	--
2-row.....	94.9	1.0	66.4	1.0	--	--	27.5	1.0
4-row.....	--	--	33.6	1.0	100.0	1.0	72.5	1.0

--continued

TABLE 33.--Preharvest operations on corn: Percentage of acreage covered and number of times over, by size of equipment and size of farm, Delta area, Mississippi, 1957--Continued

Operation and size of equipment	Cropland per farm							
	Less than 60 acres		60 to 399 acres		400 to 999 acres		1,000 acres or more	
	Acreage covered	Times over, acreage covered	Acreage covered	Times over, acreage covered	Acreage covered	Times over, acreage covered	Acreage covered	Times over, acreage covered
	<u>Percent</u>	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>	<u>Number</u>
Replant:								
1-row.....	1.6	1.0	--	--	--	--	--	--
2-row.....	24.3	1.1	2.9	1.0	--	--	--	--
4-row.....	--	--	4.3	1.0	8.2	1.0	--	--
Cultivate:								
1-row.....	5.1	1.9	--	--	--	--	--	--
2-row.....	86.0	3.6	63.2	3.8	--	--	13.8	1.0
4-row.....	--	--	33.9	2.8	91.8	2.0	72.4	2.0
Hoe:								
Hand.....	41.5	1.2	20.1	1.2	62.5	1.5	25.3	1.5

TABLE 34.--Corn production: Costs per acre for preharvest materials, by size of farm, Delta area, Mississippi, 1957

Material	Quantity per acre covered	Price per unit	Cost per acre covered	Percentage of total acreage covered	Cost per acre, total acreage
LESS THAN 60 ACRES OF CROPLAND					
Seed:		<u>Dollars</u>	<u>Dollars</u>	<u>Percent</u>	<u>Dollars</u>
Homegrown.....	13.4 lb.	0.165	2.21	53.0	1.17
Purchased.....	12.7 lb.	.165	2.10	49.4	1.04
Fertilizer:					
Ammonium nitrate.....	170.3 lb.	.036	6.13	69.3	4.25
Anhydrous ammonia.....	75.0 lb.	.06	4.50	1.6	.07
Nitrate of soda.....	108.5 lb.	.03	3.26	9.4	.31
Ammonium sulfate.....	138.5 lb.	.026	3.60	5.1	.18
Uran.....	75.0 lb.	.036	2.70	1.2	.03
Total cost per acre..	--	--	--	--	7.05
60 TO 399 ACRES OF CROPLAND					
Seed:					
Homegrown.....	12.7 lb.	.165	2.10	28.0	.59
Purchased.....	11.8 lb.	.165	1.95	72.0	1.40
Fertilizer:					
Ammonium nitrate.....	266.0 lb.	.036	9.58	62.9	6.03
Anhydrous ammonia.....	105.6 lb.	.06	6.34	20.3	1.29
Aqua ammonia.....	182.5 lb.	.01875	3.42	2.9	.10
Nitrate of soda.....	400.0 lb.	.03	12.00	4.3	.52
Lime.....	300.0 lb.	.003	.90	1.1	.01
Total cost per acre..	--	--	--	--	9.94
400 to 999 ACRES OF CROPLAND					
Seed:					
Homegrown.....	12.7 lb.	.165	2.00	5.9	.12
Purchased.....	15.7 lb.	.165	2.59	94.1	2.44
Fertilizer:					
Anhydrous ammonia.....	136.4 lb.	.06	8.18	75.5	6.18
Ammonium nitrate.....	90.0 lb.	.036	3.24	24.5	.79
Total cost per acre..	--	--	--	--	9.53

--continued

TABLE 34.--Corn production: Costs per acre for preharvest materials, by size of farm, Delta area, Mississippi, 1957--Continued

Material	Quantity per acre covered	Price per unit	Cost per acre covered	Percentage of total acreage covered	Cost per acre, total acreage
1,000 OR MORE ACRES OF CROPLAND					
Seed:		<u>Dollars</u>	<u>Dollars</u>	<u>Percent</u>	<u>Dollars</u>
Homegrown.....	14.0 lb.	0.165	2.31	9.2	0.21
Purchased.....	11.1 lb.	.165	1.83	90.8	1.66
Fertilizer:					
Anhydrous ammonia.....	161.1 lb.	.06	9.67	86.8	8.39
Ammonia nitrate.....	239.1 lb.	.036	8.61	13.2	1.14
Total cost per acre..	--	--	--	--	11.40

TABLE 35.--Corn production: Kinds and quantities of seed used, by size of farm, Delta area, Mississippi, 1957

Item	Cropland per farm				All farms
	Less than 60 acres	60 to 399 acres	400 to 999 acres	1,000 acres or more	
Percentage of acreage planted with--	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>
Homegrown seed.....	53.0	31.5	4.8	11.4	18.5
Purchased seed.....	47.0	68.5	95.2	88.6	81.5
	<u>Pounds</u>	<u>Pounds</u>	<u>Pounds</u>	<u>Pounds</u>	<u>Pounds</u>
Seeding rate per acre.....	10.4	11.3	14.4	11.3	11.6
Seed used per acre, including replanting.....	13.3	12.1	15.6	11.3	12.3

TABLE 36.--Corn production: Fertilizer use, by size of farm, Delta area, Mississippi, 1957

Item	Unit	Cropland per farm				All sizes of farms
		Less than 60 acres	60 to 399 acres	400 to 999 acres	1,000 acres or more	
Acreage fertilized.....	Percent	86.7	90.4	100.0	100.0	97.1
Times fertilized.....	Number	1.0	1.0	1.1	1.0	1.0
Quantity per acre fertilized.	Pound	137.4	214.5	121.4	171.4	165.5
Pounds N per acre fertilized.	do	43.3	76.8	88.7	125.1	100.3
Percentage of N applied as--						
Anhydrous ammonia.....	Percent	2.2	22.8	91.8	91.7	78.0
Ammonium nitrate.....	do	89.9	71.9	8.2	8.3	20.9
Other.....	do	7.9	5.3	--	--	1.1
Total.....	do	100.0	100.0	100.0	100.0	100.0

TABLE 37.--Corn production: Hours of labor and tractor use per acre, and percentage of hired and unpaid labor, by size of farm, Delta area, Mississippi, 1957-58¹

Item	Cropland per farm				All sizes of farms
	Less than 60 acres	60 to 399 acres	400 to 999 acres	1,000 acres or more	
	<u>Hours</u>	<u>Hours</u>	<u>Hours</u>	<u>Hours</u>	<u>Hours</u>
Preharvest labor.....	12.6	8.2	15.6	7.7	9.8
Hoeing by hand.....	6.6	3.2	12.5	5.1	6.4
Machine operations.....	6.0	5.0	3.1	2.6	3.4
Harvest labor.....	7.9	6.0	1.9	3.9	4.3
Picking by hand.....	7.9	6.0	.8	2.4	3.3
Picking by machine.....	--	(²)	1.1	1.5	1.0
Total labor per acre.....	20.5	14.2	17.5	11.6	14.1
	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>
Kind of labor used:					
Preharvest labor:					
Hired.....	17.2	39.1	97.2	100.0	78.8
Unpaid.....	82.8	60.9	2.8	--	21.2
Harvest labor:					
Hired.....	13.5	62.6	72.8	100.0	76.0
Unpaid.....	86.5	37.4	27.2	--	24.0
All labor:					
Hired.....	16.0	48.2	94.6	100.0	78.0
Unpaid.....	84.0	51.8	5.4	--	22.0
	<u>Hours</u>	<u>Hours</u>	<u>Hours</u>	<u>Hours</u>	<u>Hours</u>
Tractor hours per acre.....	8.3	6.5	3.5	4.0	4.8
Preharvest operations.....	5.4	4.8	2.9	2.4	3.2
Harvest operation.....	2.9	1.7	³ .6	1.6	1.6

¹ Excludes labor and tractors furnished by custom-hired operators.

² Less than one-tenth hour.

³ In addition, truck use averaged 1.8 miles per acre.

per acre on large farms, while power and equipment costs ranged from \$14 per acre to \$5 per acre on small and large farms, respectively.

Harvest costs per acre were the highest on farms having less than 60 acres of cropland because of relatively high tractor and labor costs.

Direct costs in corn production totaled \$34 per acre on small farms having 6 acres of corn per farm and \$26 per acre on large farms having 148 acres of corn per farm. Power and equipment costs were the major variants by size of farm.

Higher yields were obtained on farms in the two larger size groups, but most

farmers experienced yields far below those in the major commercial corn-producing areas. Direct costs per bushel ranged from an average of \$1.65 per bushel on small farms to \$0.69 per bushel on farms having 400 to 999 acres of cropland.

Net Returns Per Acre

Per-acre returns to family labor, land, and management varied from a loss on small farms to a \$20 return per acre on farms having 400 to 999 acres of cropland (table 40). A 20-bushel yield on small farms was not sufficient to offset direct costs

TABLE 38.--Corn production: Percentage of acreage harvested by specified method and size of farm, Delta area, Mississippi, 1958

Item	Cropland per farm				All sizes of farms
	Less than 60 acres	60 to 399 acres	400 to 999 acres	1,000 acres or more	
	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>
Acreage picked by machine...	2.6	16.0	88.5	78.2	62.3
Custom hired.....	2.6	13.2	29.1	12.2	14.4
Owned machines.....	--	2.8	59.4	66.0	47.9
1-row picker.....	--	--	14.8	20.0	13.8
2-row picker.....	--	--	--	42.4	23.4
SP grain combine.....	--	2.8	44.6	3.6	10.7
Acreage picked by hand.....	97.4	84.0	11.5	21.8	37.7
Hired labor.....	13.1	52.6	8.4	21.8	23.0
Unpaid labor.....	84.3	31.4	3.1	--	14.7

per acre at a prevailing average price received of \$1.18 per bushel. Since no information was obtained on possible quality and price differentials by size of farm, the 1958 season average price received by Mississippi farmers was used to calculate gross returns per acre.

Net returns from the corn enterprise in 1958 did not approach those obtained from cotton or soybean production. With 1958 cost rates and prices received, an average corn yield of about 45 bushels would be required to equate average net returns gained from soybeans yielding 22 bushels per acre.

TABLE 39.--Corn production: Direct costs per acre, by size of farm, Delta area, Mississippi, 1957-58

Item	Cropland per farm				All sizes of farms
	Less than 60 acres	60 to 399 acres	400 to 999 acres	1,000 acres or more	
Number of farms reported....	49	32	13	9	103
Percentage of farms reported	74	55	46	82	63
Total acreage of corn.....	269.0	362.9	446.3	1,334.5	2,412.7
Acreage per farm reported...	5.5	11.3	34.3	148.3	23.4
Bushels harvested per acre..	20.3	25.3	39.5	30.6	31.9
Preharvest costs per acre:					
Materials:	<u>Dollars</u>	<u>Dollars</u>	<u>Dollars</u>	<u>Dollars</u>	<u>Dollars</u>
Purchased.....	5.88	9.35	9.41	11.19	10.00
Farm origin.....	1.17	.59	.12	.21	.36
Tractor use.....	8.20	6.60	3.65	3.12	4.31
Mule use.....	.10	--	--	--	.01
Equipment use.....	5.53	3.16	1.95	2.19	2.66
Machine operator's labor:					
Unpaid.....	2.51	1.38	.16	--	.52
Hired.....	.23	.94	1.28	1.20	1.07
Hoeing labor:					
Unpaid.....	1.68	.72	--	--	.30
Hired.....	.64	.41	4.38	1.77	1.92
Custom work ¹.....	.21	--	--	--	.02
Total preharvest.....	26.15	23.15	20.95	19.68	21.17
Harvest costs per acre:					
Custom picking ¹.....	.17	.86	1.89	.79	.93
Own mechanical picker use.	--	.13	2.65	1.71	1.46
Tractor use.....	4.44	2.20	.61	1.84	2.05
Truck use.....	--	.01	.18	.01	.04
Trailer use.....	.29	.17	.10	.16	.16
Labor:					
Unpaid.....	2.18	1.01	.20	--	.43
Hired.....	.34	1.19	.58	1.54	1.18
Total harvest.....	7.42	5.57	6.21	6.05	6.25
Total direct costs per acre ²	33.57	28.72	27.16	25.73	27.42
Direct costs per bushel harvested.....	1.65	1.14	.69	.84	.86

¹ Includes labor, power, and equipment furnished by custom operators.

² Excludes charges for management, supervision, land, buildings, and storage.

TABLE 40.--Corn production: Summary of direct costs and returns per acre, by size of farm, Delta area, Mississippi, 1957-58

Item	Unit	Cropland per farm				All sizes of farms
		Less than 60 acres	60 to 399 acres	400 to 999 acres	1,000 acres or more	
Yield per acre.....	Bushel	20.3	25.3	39.5	30.6	31.9
Average price received per bushel ¹	Dollar	1.18	1.18	1.18	1.18	1.18
Return per acre.....	Dollar	23.95	29.85	46.61	36.11	37.64
Direct costs per acre ²	Dollar	33.57	28.72	27.16	25.73	27.42
Per-acre return to land and management ³	Dollar	-9.62	1.13	19.45	10.38	10.22
Family labor cost per acre...	Dollar	6.37	2.92	.35	--	1.22
Per-acre return to family labor, land, and management ⁴	Dollar	-3.25	4.05	19.80	10.38	11.44

¹ 1958 season average price received by Mississippi farmers. Source: Agricultural Statistics, 1960.

² Land, buildings, supervision, and management costs are not included here.

³ These per-acre amounts are available to cover the costs of land, buildings, supervision, and management.

⁴ These per-acre amounts are available to cover the costs of unpaid labor, land, buildings, supervision, and management.

OAT PRODUCTION PRACTICES AND COSTS

Preharvest Operations and Materials

The most common preharvest operations in oat production consist of disking, harrowing, drilling, fertilizing, and poisoning (tables 41 and 42). Less harrowing and poisoning were carried out on small farms, but the other major operations were quite similar with respect to acreage covered. All operations were performed with tractor power except for aerial applications of poisoning and the small proportion of acreage on small farms fertilized by hand.

Oats for grain are usually seeded in mid-October, fertilized about the first of

March, and harvested in late May or early June. With favorable spring weather, some land from which early varieties of oats are harvested may be double-cropped with soybeans. This practice was generally unsuccessful in 1957 and 1958 because of excessive rainfall and late harvest of small grains.

The quantities and costs of preharvest materials used in oat production are indicated in table 43. The average seeding rate was 82 pounds per acre and varied from 90 pounds per acre on small farms to 71 pounds per acre on large farms.

Ninety-six percent of the total acreage of oats was fertilized (table 44). Ammonium nitrate was the major source of nitrogen on all sizes of farms. An average of 47 pounds of nitrogen was applied per acre.

TABLE 41.--Preharvest operations on oats: Percentage of farms that reported, acreage covered, and number of times over, by size of farm, Delta area, Mississippi, 1957¹

Operation	Cropland per farm											
	Less than 60 acres			60 to 399 acres			400 to 999 acres			1,000 acres or more		
	Farms re-reported	Acre-age covered	Times over, acreage covered	Farms re-reported	Acre-age covered	Times over, acreage covered	Farms re-reported	Acre-age covered	Times over, acreage covered	Farms re-reported	Acre-age covered	Times over, acreage covered
	<u>Per-cent</u>	<u>Per-cent</u>	<u>Number</u>	<u>Per-cent</u>	<u>Per-cent</u>	<u>Number</u>	<u>Per-cent</u>	<u>Per-cent</u>	<u>Number</u>	<u>Per-cent</u>	<u>Per-cent</u>	<u>Number</u>
Disk.....	100.0	100.0	2.1	100.0	100.0	2.2	100.0	100.0	2.3	100.0	100.0	1.7
Harrow.....	42.9	36.9	1.2	80.6	88.3	1.1	83.3	92.9	1.0	75.0	81.7	1.1
Drill.....	100.0	100.0	1.0	100.0	100.0	1.0	100.0	100.0	1.0	100.0	100.0	1.0
Cultipack.....	14.3	12.3	1.0	2.8	1.9	1.0	5.6	.8	1.0	25.0	41.7	1.0
Fertilize.....	92.8	95.8	1.0	97.2	99.5	1.0	94.4	92.3	1.0	100.0	100.0	1.0
Poison.....	14.3	10.2	1.0	50.0	66.7	1.0	50.0	76.8	1.0	37.5	49.9	1.0

¹ Includes custom-hired operations.

TABLE 42.--Preharvest operation on oats: Percentage of acreage covered and number of times over, by size of equipment and size of farm, Delta area, Mississippi, 1957

Operation and size of equipment	Cropland per farm							
	Less than 60 acres		60 to 399 acres		400 to 999 acres		1,000 acres or more	
	Acreage covered	Times over, acreage covered	Acreage covered	Times over, acreage covered	Acreage covered	Times over, acreage covered	Acreage covered	Times over, acreage covered
	<u>Percent</u>	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>	<u>Number</u>
Disc:								
2-row.....	100.0	2.1	94.5	2.2	50.7	2.1	69.4	1.9
3-row.....	--	--	5.5	2.0	42.7	2.7	30.6	1.4
4-row.....	--	--	--	--	6.6	1.9	--	--
Harrow:								
2-row.....	29.7	1.3	10.2	1.2	9.4	1.4	--	--
3-row.....	--	--	--	--	12.2	1.0	--	--
4-row.....	7.2	1.0	78.1	1.1	71.3	1.0	81.7	1.1
Drill:								
2-row.....	50.0	1.0	9.6	1.0	.7	1.0	--	--
3-row.....	44.9	1.0	48.4	1.0	53.2	1.0	48.9	1.0
4-row.....	5.1	1.0	42.0	1.0	46.1	1.0	51.1	1.0
Cultipack:								
2-row.....	12.3	1.0	1.9	1.0	--	--	--	--
3-row.....	--	--	--	--	.8	1.0	--	--
4-row.....	--	--	--	--	--	--	41.7	1.0
Fertilize:								
2-row.....	45.7	1.0	16.6	1.0	--	--	--	--
3-row.....	5.1	1.0	18.7	1.0	39.7	1.0	19.6	1.0
4-row.....	14.5	1.0	48.9	1.0	16.0	1.0	80.4	1.0
Plane.....	19.6	1.0	15.3	1.0	36.6	1.0	--	--
Hand.....	10.9	1.0	--	--	--	--	--	--
Poison:								
Spray:								
Plane.....	5.1	1.0	31.6	1.0	19.6	1.0	--	--
Dust:								
6-row.....	5.1	1.0	--	--	--	--	--	--
Plane.....	--	--	35.1	1.0	57.2	1.0	49.9	1.0

TABLE 43.--Oat production: Costs per acre for preharvest materials used, by size of farm,
Delta area, Mississippi, 1957

Material	Quantity per acre covered	Price per unit	Cost per acre covered	Percentage of total acreage covered	Cost per acre, total acreage
LESS THAN 60 ACRES OF CROPLAND					
Seed:		<u>Dollars</u>	<u>Dollars</u>	<u>Percent</u>	<u>Dollars</u>
Homegrown.....	65.8 lb.	0.042	2.76	28.4	0.78
Purchased.....	99.3 lb.	.042	4.17	71.6	2.99
Fertilizer:					
Ammonium nitrate.....	150.1 lb.	.036	5.40	70.1	3.79
5-10-5.....	400.0 lb.	.0205	8.20	3.4	.28
Ammonium sulfate.....	200.0 lb.	.026	5.20	5.4	.28
Nitrate of soda.....	100.0 lb.	.03	3.00	16.9	.51
Poison:					
Spray:					
DDT.....	.5 gal.	1.35	.68	5.1	.03
Dust:					
Malathion.....	9.0 lb.	.145	1.30	5.1	.07
Total cost per acre	--	--	--	--	8.73
60 to 399 ACRES OF CROPLAND					
Seed:					
Homegrown.....	80.6 lb.	.042	3.39	80.7	2.74
Purchased.....	88.1 lb.	.042	3.70	19.3	.71
Fertilizer:					
Ammonium nitrate.....	133.1 lb.	.036	4.79	84.0	4.02
Anhydrous ammonia.....	171.4 lb.	.06	10.28	7.7	.79
Nitrate of soda.....	150.0 lb.	.03	4.50	2.9	.13
Ammonium sulfate.....	200.0 lb.	.026	5.20	4.9	.25
Poison:					
Spray:					
Toxaphene.....	.25 gal.	2.00	.50	29.2	.15
Malathion.....	.50 gal.	6.20	3.10	2.4	.07
Dust:					
Toxaphene.....	17.1 lb.	.08	1.37	35.1	.48
Total cost per acre	--	--	--	--	9.34
400 to 999 ACRES OF CROPLAND					
Seed:					
Homegrown.....	84.7 lb.	.042	3.56	75.6	2.69
Purchased.....	93.0 lb.	.042	3.91	24.4	.95

--Continued

TABLE 43.--Oat production: Costs per acre for preharvest materials used, by size of farm, Delta Area, Mississippi, 1957--Continued

Material	Quantity per acre covered	Price per unit	Cost per acre covered	Percentage of total acreage covered	Cost per acre, total acreage
400 to 999 ACRES OF CROPLAND--Cont.					
Fertilizer:		<u>Dollars</u>	<u>Dollars</u>	<u>Percent</u>	<u>Dollars</u>
Ammonium nitrate.....	141.0 lb.	0.036	5.08	69.5	3.53
Anhydrous ammonia.....	60.0 lb.	.06	3.60	6.1	.22
Uran.....	145.8 lb.	.036	5.25	15.9	.83
Nitrate of soda.....	160.0 lb.	.03	4.80	.8	.04
Poison:					
Spray:					
Toxaphene.....	.25 gal.	2.00	.50	21.6	.11
Dieldrin.....	.25 gal.	4.20	1.05	3.4	.04
Dust:					
Toxaphene.....	17.5 lb.	.08	1.40	51.8	.73
Total cost per acre	--	--	--	--	9.14
1,000 OR MORE ACRES OF CROPLAND					
Seed:					
Homegrown.....	70.9 lb.	.042	2.98	67.4	2.01
Purchased.....	72.0 lb.	.042	3.02	32.6	.98
Fertilizer:					
Ammonium nitrate.....	154.8 lb.	.036	5.57	83.7	4.66
Chilean nitrate.....	150.0 lb.	.028	4.20	16.3	.68
Poison:					
Dust:					
Toxaphene.....	14.0 lb.	.08	1.12	49.9	.56
Total cost per acre	--	--	--	--	8.89

Only 10 percent of the oat acreage on small farms was treated with insecticides as compared with an average of 67 percent for all farms. Toxaphene was the insecticide most commonly used to control cutworms and armyworms. Nearly all of the poisoning was by aerial application in either the spray or dust form, although the latter was most prevalent.

Labor and Power Use

Total farm labor requirements per acre of oats varied from an average of 3.1 hours per acre on small farms to 2.7 per acre on large farms (table 45). Preharvest labor

requirements were influenced largely by the sizes of equipment used, while harvest labor use varied not only with size of equipment but with differences in the proportion of acreage custom-harvested (see table 46).

The use of farm tractors on oats ranged from 2.8 hours per acre on small farms to 1.9 hours per acre on large farms. With the exception of small farms, hauling of grain to storage was done largely by truck.

Oat Harvest Practices

Custom-hired operators combined 100 percent of the oat acreage on small farms as compared with 19 percent on farms

TABLE 44.--Oat production: Fertilizer use and insect control practices, by size of farm, Delta area, Mississippi, 1957

Item	Unit	Cropland per farm				All sizes of farms
		Less than 60 acres	60 to 399 acres	400 to 999 acres	1,000 acres or more	
Acreage fertilized.....	Percent	95.8	99.5	92.3	100.0	95.9
Number of times fertilized....	Number	1.0	1.0	1.0	1.0	1.0
Quantity per acre fertilized..	Pound	153.0	139.8	136.6	154.0	141.3
Nitrogen per acre fertilized..	do	42.0	50.7	46.0	46.8	47.4
Percentage of nitrogen applied as--						
Ammonium nitrate.....	Percent	85.6	73.1	76.2	91.4	78.4
Anhydrous ammonia.....	do	--	21.4	7.1	--	10.0
Acreage poisoned.....	do	10.2	66.7	76.8	49.9	67.2
Percentage poisoned by--						
Dusting.....	do	50.0	52.6	74.5	100.0	67.9
Spraying.....	do	50.0	47.4	25.5	--	32.1
Percentage applied by--						
Ground machine.....	do	50.0	--	--	--	.2
Custom aerial application.	do	50.0	100.0	100.0	100.0	99.8

TABLE 45.--Oat production: Hours of labor, tractor, and truck use per acre, and percentage of hired and unpaid labor, by size of farm, Delta area, Mississippi, 1957-58¹

Item	Cropland per farm				All sizes of farms
	Less than 60 acres	60 to 399 acres	400 to 999 acres	1,000 acres or more	
	<u>Hours</u>	<u>Hours</u>	<u>Hours</u>	<u>Hours</u>	<u>Hours</u>
Preharvest labor.....	2.5	2.2	1.9	1.9	2.0
Harvest labor.....	.6	.9	1.0	.8	.9
Total labor per acre....	3.1	3.1	2.9	2.7	2.9
	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>
Percentage of all labor--					
Hired.....	--	69.3	82.8	100.0	79.8
Unpaid.....	100.0	30.7	17.2	--	20.2
	<u>Hours</u>	<u>Hours</u>	<u>Hours</u>	<u>Hours</u>	<u>Hours</u>
Tractor hours per acre.....	2.8	2.4	2.1	1.9	2.2
Preharvest operations.....	2.4	2.2	1.9	1.9	2.0
Harvest operations.....	.4	.2	.2	--	.2
	<u>Miles</u>	<u>Miles</u>	<u>Miles</u>	<u>Miles</u>	<u>Miles</u>
Truck miles per acre.....	--	2.4	3.3	3.2	2.9

¹ Power, equipment, and labor furnished by custom operators are not included here. Labor excludes supervision and management functions.

Table 46.--Oat production: Percentage of acreage harvested by equipment used and size of farm, Delta area, Mississippi, 1958

Item	Cropland per farm				All sizes of farms
	Less than 60 acres	60 to 399 acres	400 to 999 acres	1,000 acres or more	
Acreage harvested by--	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>
Custom-hired operator.....	100.0	40.8	17.3	19.1	26.3
Owned machines.....	--	59.2	82.7	80.9	73.7
5-7 foot PTO combines...	--	20.7	19.2	--	15.5
9-10 foot SP combines...	--	22.3	12.0	--	12.4
12-foot SP combines.....	--	16.2	51.5	80.9	45.8

having 1,000 or more acres of cropland (table 46). Twenty-six percent of the total oat acreage on farms was harvested by custom operators. The remaining 74 percent was harvested with farmer-owned combines, of which more than 60 percent was harvested with 12-foot self-propelled combines. A summary of the costs of owning and operating small-grain combines is shown in a later section of this report.

Direct Costs Per Acre and Per Unit of Output

Preharvest costs per acre of oats averaged about \$20 on small farms and \$13 on large farms (table 47). Greater efficiencies of power and equipment use on large farms were largely responsible for the lower costs.

Harvest costs per acre varied less by size of farm than preharvest costs as the cost of hiring custom combines on small farms did not differ greatly from the cost of owning and hiring combines on the larger farms. Farms with less than 60 acres of cropland did not have sufficient small-grain acreage to justify owning combines.

Total direct costs of producing oats varied from an average of about \$26 per acre on small farms to \$19 per acre on large farms. Although yields varied inconsistently from one size group to another,

direct costs per unit of output were successively lower as size of farm increased. A similar pattern of unit costs would have prevailed had yields been the same over all sizes of farms.

Net Returns Per Acre

Calculations of net returns per acre of oats, by size of farm, are shown in table 48. The 1958 season average price received by Mississippi farmers was used in calculating gross returns per acre; the value of straw is excluded. Both measures of net returns indicate substantially higher returns on large farms than on small. This conclusion also applies when yields are held constant over all size groups.

The 1958 average yield of oats was about 72 percent of the average normal yield reported by farmers. Since per-acre costs under normal yield assumptions would approximate those with actual yields, the expected "normal" unit cost, or the cost exclusive of land, management, and storage, expected with normal yields would have averaged about 40 cents per bushel for all sizes of farms. In terms of net returns per acre of oats, a "normal" yield would have brought an average net return to family labor, land, and management of about \$19 per acre.

TABLE 47.--Oat production: Direct costs per acre, by size of farm, Delta area, Mississippi, 1957-58

Item	Cropland per farm				All sizes of farms
	Less than 60 acres	60 to 399 acres	400 to 999 acres	1,000 acres or more	
Number of farms reported....	17	38	18	8	81
Percentage of farms reported.....	26	66	64	73	50
Total acreage of oats.....	144.1	1,834.0	3,178.0	1,227.0	6,383.1
Acreage per farm reported...	8.5	48.3	176.6	153.3	78.8
Bushels harvested per acre..	40.0	36.1	36.9	44.7	38.2
Preharvest costs per acre:					
Materials:	<u>Dollars</u>	<u>Dollars</u>	<u>Dollars</u>	<u>Dollars</u>	<u>Dollars</u>
Purchased.....	7.95	6.60	6.45	6.88	6.61
Farm origin.....	.78	2.74	2.69	2.01	2.53
Tractor use.....	3.58	3.22	2.48	2.31	2.68
Equipment use.....	6.11	2.24	1.14	1.38	1.61
Machine operator's labor:					
Unpaid.....	1.18	.23	--	--	.09
Hired.....	--	.78	.88	.82	.82
Custom work ¹.....	.12	.51	.79	--	.54
Total preharvest.....	19.72	16.32	14.43	13.40	14.88
Harvest costs per acre:					
Custom combining ¹	5.00	2.04	.86	.96	1.31
Own combine use.....	--	3.28	3.88	3.57	3.56
Tractor use.....	.60	.27	.20	--	.19
Truck use.....	--	.24	.33	.32	.29
Trailer use.....	.10	.04	.10	.08	.08
Labor:					
Unpaid.....	.36	.25	.31	--	.24
Hired.....	--	.20	.25	.39	.26
Total harvest.....	6.06	6.32	5.93	5.32	5.93
Total direct costs per acre ²	25.78	22.64	20.36	18.72	20.81
Direct costs per bushel harvested.....	.64	.63	.55	.42	.54

¹ Includes labor, power and equipment furnished by custom operators.

² These are partial costs since no charges have been made for management, land, and buildings costs.

TABLE 48.--Oat production: Summary of direct costs and returns per acre, by size of farm, Delta area, Mississippi, 1957-58

Item	Unit	Cropland per farm				All sizes of farms
		Less than 60 acres	60 to 399 acres	400 to 999 acres	1,000 acres or more	
Yield per acre.....	Bushel	40.0	36.1	36.9	44.7	38.2
Average price received per bushel ¹	Dollar	.75	.75	.75	.75	.75
Return per acre ²	Dollar	30.00	27.08	27.68	33.52	28.65
Direct cost per acre ³	Dollar	25.78	22.64	20.36	18.72	20.81
Per-acre return to land and management ⁴	Dollar	4.22	4.44	7.32	14.80	7.84
Family labor cost per acre...	Dollar	1.44	.48	.31	--	.33
Per-acre return to family labor, land, and management ⁵	Dollar	5.66	4.92	7.63	14.80	8.17

¹ 1958 season average price received by Mississippi farmers. Source: Agricultural Statistics, 1960.

² Value of straw not included.

³ Land, buildings, supervision, and management costs are not included.

⁴ These per-acre amounts are available to cover the costs of land, buildings, supervision, and management.

⁵ These per-acre amounts are available to cover the costs of unpaid labor, land, buildings, supervision, and management.

WHEAT PRODUCTION PRACTICES AND COSTS

Preharvest Operations and Materials

The most common preharvest operations in wheat production were the same as those in oat production--disking, harrowing, drilling, fertilizing, and poisoning (table 49). The variability indicated for some operations by size of farm may be due to an insufficient number of observations in the sample. Only 34 percent of all farmers produced wheat, ranging from 23 percent of the small farms to 82 percent of the large farms.

The various sizes of equipment used in preharvest operations are shown in table 50. All operations on farms having more than 60 acres of cropland were completely mechanized, whereas 44 percent of the fertilization and 9 percent of the planting on small farms were performed by hand. On farms having more than 60 acres of cropland all poisoning was performed by custom operators. Dates of planting, fertilization, and harvest correspond roughly with those of oats.

The quantities and costs of preharvest materials used in wheat production are indicated in table 51. The average seeding rate was 109 pounds per acre. This relatively high seeding rate was apparently the result of heavy rainfall and late fall seeding.

Eighty percent of the total wheat acreage was fertilized (table 52). The proportion of acreage fertilized ranged from 87 percent on small farms to 100 percent on farms having 400 to 999 acres, then dropped to 64 percent on farms in the 1,000-or-more acre group. Fertilization rates varied inconsistently from one size group to another. The average rate was 44 pounds of nitrogen per acre. Only nitrogenous materials were used, the most common being ammonium nitrate.

Only about 12 percent of the total wheat acreage was treated with insecticides. Poison was applied in dust form on 48 percent of the acreage and in spray form on 52 percent. Aerial applications accounted for 99 percent of the acreage poisoned. The small number of observations limits a comparison by size of farm.

Labor and Power Use

The use of farm labor on wheat varied from an average of 4.0 hours per acre on small farms to 2.9 hours per acre on large

farms (table 53). The more common use of small items of preharvest equipment and more hand labor in planting and fertilizing on small farms resulted in comparatively high labor requirements during preharvest operations. Harvest labor use on small farms was relatively low since all of the acreage on those farms was custom-combined. Eighty-eight percent of all direct labor was performed by hired laborers.

The use of farm tractors on wheat averaged 2.8 hours per acre on small farms and 2.0 hours per acre on large farms. Preharvest tractor use per acre varied with the size of power unit and equipment used while tractor use during harvest reflects the different types of combine used--pull-type or self-propelled--and the predominant use of trucks in hauling wheat to storage.

Wheat Harvest Practices

Custom operators combines all of the wheat acreage on small farms as compared with 8 percent on large farms and 9 percent on all farms (table 54). About 72 percent of the total acreage was combined with farmer-owned 12-foot self-propelled combines. A summary of the cost of owning and operating small-grain combines is found on page 112.

Direct Costs Per Acre and Per Unit of Output

Preharvest costs per acre of wheat diminished as size of farm increased, ranging from about \$20 per acre on small farms to \$15 per acre on large farms (table 55). Most of this difference is explained by greater efficiencies of power and equipment use on large farms. Tractor and equipment costs represented 42 percent of all preharvest costs on small farms as compared with 23 percent of all preharvest costs on large farms.

Harvest costs per acre varied little by size of farm. The use of custom-hired combining on small farms resulted in lower harvest costs than would have resulted with combine ownership.

Direct costs of producing wheat totaled about \$26 per acre on small farms and \$20 per acre on large farms. Since only a small number of farms reported wheat, the unit costs presented in table 55 are questionable as an indication of absolute differences between the various size groups.

TABLE 49.--Preharvest operations on wheat: Percentage of farms that reported, acreage covered, and number of times over, by size of farm, Delta area, Mississippi, 1957¹

Operation	Cropland per farm											
	Less than 60 acres			60 to 399 acres			400 to 999 acres			1,000 acres or more		
	Farms re-ported	Acre-age covered	Times over, acreage covered	Farms re-ported	Acre-age covered	Times over, acreage covered	Farms re-ported	Acre-age covered	Times over, acreage covered	Farms re-ported	Acre-age covered	Times over, acreage covered
	<u>Per-cent</u>	<u>Per-cent</u>	<u>Number</u>	<u>Per-cent</u>	<u>Per-cent</u>	<u>Number</u>	<u>Per-cent</u>	<u>Per-cent</u>	<u>Number</u>	<u>Per-cent</u>	<u>Per-cent</u>	<u>Number</u>
Disk.....	100.0	100.0	2.4	100.0	100.0	2.5	100.0	100.0	1.8	100.0	100.0	2.1
Harrow.....	53.8	43.0	1.3	92.8	95.2	1.1	92.8	93.3	1.0	71.4	91.5	1.8
Drill.....	100.0	² 100.0	1.0	100.0	100.0	1.0	100.0	100.0	1.0	100.0	100.0	1.0
Cultipack.....	7.7	8.1	1.0	--	--	--	7.1	6.7	1.0	--	--	--
Fertilize.....	92.3	87.2	1.0	85.7	92.2	1.0	100.0	100.0	1.0	85.7	64.1	1.0
Poison.....	7.7	5.8	1.0	35.7	45.9	1.0	42.9	20.4	1.0	--	--	--
Weed control...	--	--	--	--	--	--	7.1	1.3	1.0	14.3	31.4	1.0

¹ Includes custom-hired operations.

² 9.3 percent broadcasted by hand.

TABLE 50.--Preharvest operations on wheat: Percentage of acreage covered and number of times over, by size of equipment and size of farm, Delta area, Mississippi, 1957

Operation and size of equipment	Cropland per farm							
	Less than 60 acres		60 to 399 acres		400 to 999 acres		1,000 acres or more	
	Acreage covered	Times over, acreage covered	Acreage covered	Times over, acreage covered	Acreage covered	Times over, acreage covered	Acreage covered	Times over, acreage covered
	<u>Percent</u>	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>	<u>Number</u>
Disc:								
2-row.....	100.0	2.4	100.0	2.5	67.0	1.8	20.6	1.4
3-row.....	--	--	--	--	8.9	2.7	37.7	1.9
4-row.....	--	--	--	--	24.1	1.4	41.7	2.7
Harrow:								
2-row.....	25.6	1.4	12.6	1.0	--	--	--	--
3-row.....	--	--	--	--	6.7	1.0	--	--
4-row.....	17.4	1.0	82.6	1.1	86.6	1.0	91.5	1.8
Drill:								
2-row.....	22.7	1.0	15.6	1.0	21.1	1.0	--	--
3-row.....	59.9	1.0	55.6	1.0	28.7	1.0	46.7	1.0
4-row.....	8.1	1.0	28.8	1.0	50.2	1.0	53.3	1.0
Hand.....	9.3	1.0	--	--	--	--	--	--
Cultipack:								
2-row.....	8.1	1.0	--	--	6.7	1.0	--	--
Fertilize:								
2-row.....	21.5	1.0	6.8	1.0	6.7	1.0	--	--
3-row.....	14.0	1.0	7.0	1.0	32.6	1.0	20.6	1.0
4-row.....	8.1	1.0	24.6	1.0	33.4	1.0	43.5	1.0
Plane.....	--	--	53.8	1.0	27.3	1.0	--	--
Hand.....	43.6	1.0	--	--	--	--	--	--
Poison:								
Spray:								
4-row.....	--	--	--	--	--	--	--	--
Plane.....	--	--	36.8	1.0	7.8	1.0	--	--
Dust:								
4-row.....	5.8	1.0	--	--	--	--	--	--
Plane.....	--	--	9.1	1.0	12.6	1.0	--	--
Weed control:								
Plane.....	--	--	--	--	1.3	1.0	--	--
8-row.....	--	--	--	--	--	--	31.4	1.0

TABLE 51.--Wheat production: Costs per acre for preharvest materials used, by size of farm, Delta area, Mississippi, 1957

Material	Quantity per acre covered	Price per unit	Cost per acre covered	Percentage of total acreage covered	Cost per acre, total acreage
LESS THAN 60 ACRES OF CROPLAND					
Seed:		<u>Dollars</u>	<u>Dollars</u>	<u>Percent</u>	<u>Dollars</u>
Homegrown.....	57.2 lb.	0.06	3.43	18.6	0.64
Purchased.....	104.9 lb.	.06	6.29	81.4	5.12
Fertilizer:					
Ammonium nitrate.....	125.0 lb.	.036	4.50	81.4	3.66
Anhydrous ammonia.....	150.0 lb.	.06	9.00	5.8	.52
Poison:					
Dust:					
Malathion.....	9.0 lb.	.145	1.30	5.8	.08
Total cost per acre	--	--	--	--	10.02
60 TO 399 ACRES OF CROPLAND					
Seed:					
Homegrown.....	90.0 lb.	.06	5.40	1.3	.07
Purchased.....	105.3 lb.	.06	6.32	98.7	6.24
Fertilizer:					
Ammonium nitrate.....	128.1 lb.	.036	4.61	75.2	3.47
Anhydrous ammonia.....	100.0 lb.	.06	6.00	17.0	1.02
Poison:					
Spray:					
Toxaphene.....	.38 gal.	2.00	.76	21.2	.16
Malathion.....	.50 gal.	6.20	3.10	15.6	.48
Dust:					
Toxaphene.....	12.0 lb.	.08	.96	9.1	.09
Total cost per acre	--	--	--	--	11.53
400 TO 999 ACRES OF CROPLAND					
Seed:					
Homegrown.....	97.4 lb.	.06	5.84	43.5	2.54
Purchased.....	100.8 lb.	.06	6.05	56.5	3.42
Fertilizer:					
Ammonium nitrate.....	125.9 lb.	.036	4.53	73.7	3.34
Uran.....	140.5 lb.	.036	5.06	26.3	1.33
Poison:					
Spray:					
Toxaphene.....	.38 gal	2.00	.76	7.8	.06
Dust:					
Toxaphene.....	15.0 lb.	.08	1.20	12.6	.15
Weed control:					
2-4D.....	.25 gal.	3.20	.80	1.3	.01
Total cost per acre	--	--	--	--	10.85

TABLE 51.--Wheat production: Costs per acre for preharvest materials used, by size of farm, Delta area, Mississippi, 1957--Continued

Material	Quantity per acre covered	Price per unit	Cost per acre covered	Percentage of total acreage covered	Cost per acre, total acreage
1,000 OR MORE ACRES OF CROPLAND					
Seed:		<u>Dollars</u>	<u>Dollars</u>	<u>Percent</u>	<u>Dollars</u>
Homegrown.....	150.0 lb.	0.06	9.00	40.8	3.67
Purchased.....	91.8 lb.	.06	5.51	59.2	3.26
Fertilizer:					
Ammonium nitrate.....	139.8 lb.	.036	5.03	59.2	2.98
Chilean nitrate.....	150.0 lb.	.028	4.20	4.9	.21
Weed control:					
2-4D.....	.25 gal.	3.20	.80	31.4	.25
Total cost per acre	--	--	--	--	10.37

TABLE 52.--Wheat production: Fertilizer use and insect control practices, by size of farm, Delta area, Mississippi, 1957

Item	Unit	Cropland per farm				All sizes of farms
		Less than 60 acres	60 to 399 acres	400 to 999 acres	1,000 acres or more	
Acreage fertilized.....	Percent	87.2	92.2	100.0	64.1	79.8
Number of times fertilized...	Number	1.0	1.0	1.0	1.0	1.0
Quantity per acre fertilized.	Pound	126.7	122.9	129.7	140.6	133.7
Nitrogen per acre fertilized.	do.	46.7	49.6	41.7	44.5	43.8
Percentage of nitrogen applied as:						
Ammonium nitrate.....	Percent	82.4	69.6	73.4	95.7	83.0
Anhydrous ammonia.....	do.	17.6	30.4	--	--	3.8
Uran.....	do.	--	--	26.6	--	11.4
Acreage poisoned.....	do.	5.8	45.9	20.4	--	11.5
Percentage poisoned by.....						
Dusting.....	do.	100.0	19.8	61.8	--	47.7
Spraying.....	do.	--	80.2	38.2	--	52.3
Percentage applied by						
Ground machine.....	do.	100.0	--	--	--	1.1
Custom aerial application	do.	--	100.0	100.0	--	98.9

TABLE 53.--Wheat production: Hours of labor, tractor, and truck use per acre, and percentage of hired and unpaid labor, by size of farm, Delta area Mississippi, 1957-58¹

Item	Cropland per farm				All sizes of farms
	Less than 60 acres	60 to 399 acres	400 to 999 acres	1,000 acres or more	
	<u>Hours</u>	<u>Hours</u>	<u>Hours</u>	<u>Hours</u>	<u>Hours</u>
Preharvest labor.....	3.4	2.3	1.8	1.9	1.9
Harvest labor.....	.6	1.1	1.1	1.0	1.0
Total labor.....	4.0	3.4	2.9	2.9	2.9
	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>
Percentage of all labor--					
Hired.....	0.8	69.2	81.0	100.0	88.4
Unpaid.....	99.2	30.8	19.0	--	11.6
	<u>Hours</u>	<u>Hours</u>	<u>Hours</u>	<u>Hours</u>	<u>Hours</u>
Tractor hours per acre.....	2.8	2.8	1.8	2.0	2.0
Preharvest operations....	2.4	2.3	1.8	1.9	1.9
Harvest operations.....	.4	.5	--	.1	.1
	<u>Miles</u>	<u>Miles</u>	<u>Miles</u>	<u>Miles</u>	<u>Miles</u>
Truck miles per acre.....	--	2.7	4.0	3.7	3.6

¹ Power, equipment, and labor furnished by custom operators are not included. Labor excludes supervision and management functions.

TABLE 54.--Wheat production: Percentage of acreage harvested by equipment used and size of farm, Delta area, Mississippi, 1958

Item	Cropland per farm				All sizes of farms
	Less than 60 acres	60 to 399 acres	400 to 999 acres	1,000 acres or more	
	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>
Acreage harvested by--					
Custom-hired machines....	100.0	32.2	--	8.1	9.4
Owned machines.....	--	67.7	100.0	91.1	90.6
5-7 foot PTO combines..	--	46.2	--	11.6	10.4
9-10 foot SP combines..	--	--	24.4	--	8.6
12-foot SP combines....	--	21.5	75.6	80.3	71.6

Net Returns Per Acre

A summary of net returns per acre is shown in table 56. The unexplained and relatively low yield on farms having 1,000 or more acres of cropland resulted in an unexpectedly low return on those farms. If similar yields had been realized on all sizes

of farm, then net returns would have been progressively larger as size of farm increased, largely because of greater efficiencies in equipment and power operation.

The 1958 average yield of wheat was about 60 percent of the average normal yield reported by farmers. Since per-acre costs vary little with yields, the average

TABLE 55.--Wheat production: Direct costs per acre, by size of farm, Delta area, Mississippi, 1957-58

Item	Cropland per farm				All sizes of farms
	Less than 60 acres	60 to 399 acres	400 to 999 acres	1,000 acres or more	
Number of farms reported....	15	16	15	9	55
Percentage of farms reported	23	28	54	82	34
Total acreage of wheat.....	88.2	391.5	1503.0	2284.0	4266.7
Acreage per farm reported...	5.9	24.5	100.2	253.8	77.6
Bushels harvested per acre..	15.0	20.9	21.4	14.1	17.3
Preharvest costs per acre:					
Materials:	<u>Dollars</u>	<u>Dollars</u>	<u>Dollars</u>	<u>Dollars</u>	<u>Dollars</u>
Purchased.....	9.38	11.46	8.31	6.70	7.76
Farm origin.....	.64	.07	2.54	3.67	2.88
Tractor use.....	3.79	3.32	2.21	2.36	2.42
Equipment use.....	4.63	2.28	1.14	1.05	1.27
Labor:					
Unpaid.....	1.52	.23	--	--	.05
Hired.....	.01	.83	.81	.88	.83
Custom work ¹	--	1.14	.53	--	.29
Total preharvest.....	19.97	19.33	15.54	14.66	15.50
Harvest costs per acre:					
Custom combining ¹	5.00	1.62	--	.40	.47
Own combine use.....	--	3.61	5.09	3.75	4.13
Tractor use.....	.60	.61	--	.13	.13
Truck use.....	--	.27	.40	.37	.36
Trailer use.....	.10	.06	.09	.10	.09
Labor:					
Unpaid.....	.30	.34	.31	--	.15
Hired.....	--	.27	.26	.51	.39
Total harvest.....	6.00	6.78	6.15	5.26	5.72
Total direct costs per acre ²	25.97	26.11	21.69	19.92	21.22
Direct costs per bushel harvested.....	1.73	1.25	1.01	1.41	1.23

¹ Includes labor, power and equipment furnished by custom operators.

² These are partial costs since no allowance has been made for management, land and buildings.

direct cost per acre of \$21.22, when divided by a normal yield of 28.7 bushels per acre, results in a "normal" cost per bushel of 74 cents, exclusive of land, management, and storage costs. In terms of net returns per

acre of wheat, a "normal" yield would have brought an average net return to family labor, land, and management of about \$30 per acre.

TABLE 56.--Wheat production: Summary of direct costs and returns per acre, by size of farm, Delta area, Mississippi, 1957-58

Item	Unit	Cropland per farm				All sizes of farms
		Less than 60 acres	60 to 399 acres	400 to 999 acres	1,000 acres or more	
Yield per acre.....	Bushel	15.0	20.9	21.4	14.1	17.3
Average price received per bushel ¹	Dollar	1.79	1.79	1.79	1.79	1.79
Return per acre.....	Dollar	26.85	37.41	38.31	25.24	30.97
Direct cost per acre ²	Dollar	25.97	26.11	21.69	19.92	21.22
Per-acre return to land and management ³	Dollar	.88	11.30	16.62	5.32	9.75
Family labor cost per acre...	Dollar	1.33	.57	.31	--	.19
Per acre return to family labor, land, and management ⁴	Dollar	2.21	11.87	16.93	5.32	9.94

¹ 1958 season average price received by Mississippi farmers. Source: Agricultural Statistics, 1960.

² Land, buildings supervision, and management costs are not included here.

³ These per-acre amounts are available to cover the costs of land, building, supervision, and management.

⁴ These per-acre amounts are available to cover the costs of unpaid labor, land, buildings, supervision, and management.

COST OF OPERATING GRAIN COMBINES

Data were obtained from farmers on the cost of owning and operating 120 grain combines. Ninety-six of these combines were self-propelled, with 12- or 14-foot cutter bars. An additional 8 combines were self-propelled, with 9- or 10-foot cutter bars. The remaining 16 were tractor-drawn, with 5-, 6-, or 7-foot cutter bars. Although time requirements are generally greater for soybeans than for small grains, this analysis is based on the total annual use of combines. Comparisons of annual use and costs on farms of different sizes were made for only the large self-propelled combines.

Small and Medium-sized Combines

Data on annual use and costs of operating 5- to 7-foot power-take off combines and

9- and 10-foot self-propelled combines are shown in table 57. Annual depreciation is the difference between the purchase price and estimated present value divided by the number of years owned by the present owner.

Two men, two tractors, and two trailers were commonly used with the pull-type combine. With self-propelled combines the additional labor and equipment usually consisted of two men, one truck, and two trailers.

12- and 14- foot Self-propelled Combines

The average annual use of 12- and 14-foot self-propelled combines was 265 acres, or 132 hours per machine (table 58). The average purchase price to present owners was \$5,832 and the average present value was \$3,219. The mean age of these combines was 4.1 years, of which 3.4 years were under present ownership. Operating

TABLE 57.--Average costs of operating 5- to 7-foot power-takeoff combines and 9- and 10-foot self-propelled combines, Delta area, Mississippi, 1958

Item	Unit	5- to 7-foot PTO combines	9- and 10-foot SP combines
Number of combines.....	Number	16	8
Purchase price.....	Dollar	985	3,132
Present value.....	do.	552	1,643
Age of combine.....	Year	6.2	4.4
Years owned by present operator.....	do.	4.1	3.3
Acres of use per machine.....	Acre	119.2	161.1
Hours of use per machine.....	Hour	119.2	100.7
Annual cost per machine:			
Depreciation.....	Dollar	105.60	451.21
Interest.....	do.	27.60	82.15
Insurance.....	do.	4.42	13.14
Repairs.....	do.	135.00	112.02
Fuel, grease, oil.....	do.	11.92	67.67
Total machine cost.....	do.	284.54	726.19
Cost per acre.....	do.	2.39	4.51
Cost per hour.....	do.	2.39	7.21
Labor.....	do.	126.35	106.74
Truck.....	do.	--	64.44
Tractor.....	do.	195.82	--
Trailer.....	do.	23.84	20.14
Total operation.....	do.	630.55	917.51
Cost per acre.....	do.	5.29	5.70
Cost per hour.....	do.	5.29	9.11

costs per machine totaled slightly over \$1,300, 58 percent of which consisted of depreciation and another 20 percent of repairs. An average machine cost of \$5.01 per acre, or \$10.02 per hour, was associated with 265 acres of annual use, a level of use considerably less than capacity. The cost of the entire combining operation, including labor, power, and equipment, was \$6.03 per acre, or \$12.06 per hour.

Large differences were found in annual machine use and costs on farms of different sizes. Combines on farms having between 60 and 399 acres of cropland harvested an average of 105 acres per machine, as compared with 269 acres per machine on farms having between 400 and 1,000 acres, and 312 acres per machine on farms having more than 1,000 acres of cropland. Average machine costs per acre (excluding labor, other power, and equipment) ranged from \$9.27 per acre on small farms to \$4.41 per acre on large farms.

Comparative Costs of Alternative Methods of Combining

Figure 4 illustrates costs of using the three sizes of combines on increasing annual acreages as compared with the alternative cost of custom combining. In this illustration, per-acre costs include the variable and fixed costs of the combine as well as associated costs of the most common items of power and equipment and labor used in harvesting small grains and hauling to storage. Depreciation was based on the original price spread over an expected useful life of 10 years or 2,000 hours, whichever occurred first. An estimate of the useful life of combines was needed since depreciation represents the average annual depreciation over the life of the combine. In the foregoing analysis (tables 57 and 58) no estimate of total useful life was needed since that analysis involved only the costs realized by present

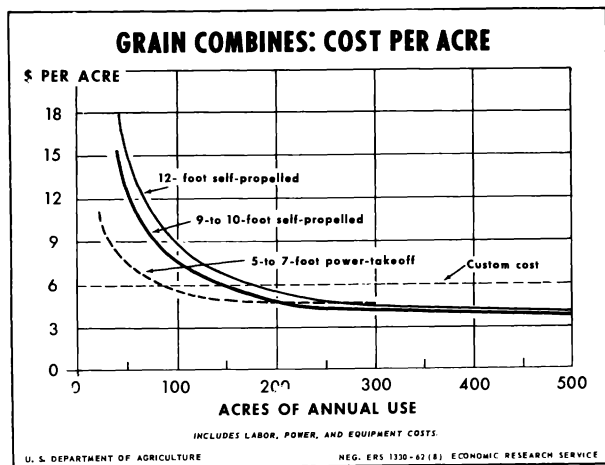


Figure 4

owners. Depreciation was considered as a constant cost per acre at levels of annual use greater than 200, 320, and 400 acres

for small, intermediate, and large combines, respectively, since depreciation from use (wear and tear) exceeds time depreciation (obsolescence and inadequacy) at these levels of annual use. Other fixed costs, including interest, taxes, housing, and insurance, were assumed to be $3\frac{1}{2}$ percent annually of the original price. Variable costs per acre were based on hourly rates as determined from survey data and were held constant as annual use varied.

Self-propelled combines require large acreages of annual use in order to justify ownership. Per-acre costs diminish rapidly as annual use increases to about 150 acres, diminish gradually from 150 to 400 acres, then tend to level off at greater acreages. The small tractor-drawn combines were more economical to operate than the self-propelled machines when annual use per machine was less than 200 acres. However, this conclusion may be conditioned by other factors, including timeliness and alternative uses of labor and equipment, which tend

TABLE 58.--Average costs of operating 12- and 14-foot self-propelled combines, by size of farm, Delta area, Mississippi, 1958

Item	Unit	Cropland per farm			All sizes of farms
		60 to 399 acres	400 to 999 acres	1,000 acres or more	
Number of combines.....	Number	16	29	51	96
Purchase price.....	Dollar	4,440	6,419	5,934	5,832
Present value.....	do.	3,007	3,107	3,350	3,219
Age of combine.....	Year	4.7	3.8	4.1	4.1
Years owned, present owner.....	do.	2.8	3.7	3.4	3.4
Acres of use.....	Acre	104.8	269.0	312.5	264.7
Hours of use.....	Hour	52.4	134.5	156.2	132.4
Annual costs per machine:					
Depreciation.....	Dollar	511.78	895.13	760.00	768.52
Interest.....	do.	150.35	155.35	167.50	160.95
Insurance.....	do.	24.06	24.86	27.00	25.75
Repairs.....	do.	249.50	224.50	288.00	262.40
Fuel, greese, oil.....	do.	36.16	99.05	134.84	109.20
Total machine cost.....	do.	971.85	1,398.89	1,377.34	1,326.82
Cost per acre.....	do.	9.27	5.20	4.41	5.01
Cost per hour.....	do.	18.54	10.40	8.82	10.02
Labor, combine operator.....	do.	31.44	82.04	86.69	77.19
Labor, helper.....	do.	25.83	67.25	64.82	60.90
Truck use.....	do.	41.92	107.60	125.00	105.88
Trailers.....	do.	5.24	26.90	31.24	26.48
Total operation.....	do.	1,076.28	1,682.68	1,685.09	1,597.27
Cost per acre.....	do.	10.27	6.26	5.39	6.03
Cost per hour.....	do.	20.54	12.52	10.78	12.06

to favor the use of self-propelled machines.

Custom harvesting is often an alternative for farmers who cannot justify owning a combine. As indicated in figure 4, it would require about 80 acres of annual use per machine to justify ownership of a small combine when the total custom cost, including cost of hauling, is \$6 per acre. For 9- and 12-foot combines, an annual use of 145 and 170 acres, respectively, are required for ownership costs to approximate custom costs. The custom cost of \$6 per acre used in this illustration represents a custom rate of \$5 per acre of small grains and an estimated additional cost of \$1 per acre for labor, power, and equipment furnished by the farm operator for hauling grain to storage. Custom combining rates for soybeans were typically on a crop-share basis, with a most common rate of one-fourth of the beans harvested, including hauling to storage.

Comparative Costs of Owning and Operating New and Used Combines

The cost data for 12-foot combines were summarized according to method of purchase by present owners (table 59). Only 18 of the 96 large combines were purchased as used machines by present owners. The average cost per acre for operating combines purchased as used machines was \$3.95 per acre as compared with \$5.04 per acre for machines purchased new. Depreciation on new machines was much greater than on used machines. Used machines required greater expenditures for repairs and replacement parts, but these expenses did not offset the greater amount of depreciation on new machines.

Repair costs on used machines averaged \$2.69 per hour of use, as compared with \$1.82 per hour of use of new machines. Depreciation costs per hour of use averaged \$3.30 and \$6.00 on used and new machines, respectively. Cost factors alone can seldom be used as a basis for investment decisions. Factors favoring new machines may include dependability during periods of peak use, ease of operation, and technical improvements. Some farmers, however, especially those with small acreages of grain and little likelihood of custom work, could benefit from the lower fixed costs usually associated with the purchase of used machines.

TABLE 59.--Average costs of operating 12-foot self-propelled combines, by method of purchase, Delta area, Mississippi, 1958

Item	Unit	Method of purchase	
		New	Used
Acres of use per machine.....	Acre	283	209
Hours of use per machine.....	Hour	142	104
Age when purchased.....	Year	0.	4.3
Present age.....	do.	3.7	6.4
Purchase price.....	Dollar	6,589	2,705
Present value.....	do.	3,436	1,983
Repair cost per hour.....	do.	1.82	2.69
Fuel used per 10-hour day.....	Gallon	35	37
Annual costs per machine:			
Depreciation.....	Dollar	852.16	343.80
Interest.....	do.	171.80	99.15
Insurance.....	do.	27.49	15.86
Repairs.....	do.	258.49	279.37
Fuel.....	do.	89.46	69.26
Grease and oil.....	do.	26.74	18.40
Total annual cost.....	do.	1,426.14	825.84
Cost per acre.....	do.	5.04	3.95
Cost per hour.....	do.	10.08	7.90

APPENDIX. --TABLES

TABLE 60.--Summary of direct costs per unit of production, by enterprise and size of farm, Delta area, Mississippi, 1958¹

Enterprise	Acres of cropland					All sizes of farms
	Unit	Less than 60 acres	60 to 399 acres	400 to 999 acres	1,000 acres or more	
Cotton, 1958 yield ²	Cents per pound	0.244	0.268	0.229	0.209	0.228
Cotton, normal yield ² ..	Cents per pound	.196	.202	.188	.178	.187
Soybeans.....	Dollar per bushel	1.24	1.10	.75	.75	.83
Corn.....	Dollar per bushel	1.65	1.14	.69	.84	.86
Oats.....	Dollar per bushel	.64	.63	.55	.42	.54
Wheat.....	Dollar per bushel	1.73	1.25	1.01	1.41	1.23

¹ Excludes overhead costs of land, buildings, and management.

² Cost of producing lint alone after deducting the value of seed from direct costs.

TABLE 61.--Summary of direct costs and returns per acre, by enterprise and size of farm, Delta area, Mississippi, 1958¹

Size of farm by acres of cropland, and costs and returns per acre	Cotton ²	Soybeans	Corn	Oats	Wheat
LESS THAN 60 ACRES					
Gross return per acre.....	\$128.56	\$40.95	\$23.95	\$30.00	\$26.85
Direct cost per acre.....	87.70	26.11	33.57	25.78	25.97
Per acre return to land and management	40.86	14.84	-9.62	4.22	.88
Unpaid labor cost per acre.....	22.57	1.90	6.37	1.44	1.33
Per acre return to unpaid labor, land, and management.....	63.43	16.74	-3.25	5.66	2.21
60 to 399 acres					
Gross return per acre.....	128.44	43.68	29.85	27.08	37.41
Direct cost per acre.....	100.65	24.57	28.72	22.64	26.11
Per acre return to land and management	27.79	19.11	1.13	4.44	11.30
Unpaid labor cost per acre.....	6.99	.99	2.92	.48	.57
Per acre return to unpaid labor, land, and management.....	34.78	20.10	4.05	4.92	11.87
400 to 999 acres					
Gross return per acre.....	152.07	45.63	46.61	27.68	38.31
Direct cost per acre.....	101.82	17.57	27.16	20.36	21.69
Per acre return to land and management	50.25	28.06	19.45	7.32	16.62
Unpaid labor cost per acre.....	1.48	.21	.35	.31	.31
Per acre return to unpaid labor, land, and management.....	51.73	28.27	19.80	7.63	16.93
1,000 acres or more					
Gross return per acre.....	161.08	41.73	36.11	33.52	25.24
Direct cost per acre.....	99.68	16.11	25.73	18.72	19.92
Per acre return to land and management	61.40	25.62	10.38	14.80	5.32
Unpaid labor cost per acre.....	--	--	--	--	--
Per acre return to unpaid labor, land, and management.....	61.40	25.62	10.38	14.80	5.32
All sizes of farms					
Gross return per acre.....	149.67	43.48	37.64	28.65	30.97
Direct cost per acre.....	99.85	18.53	27.42	20.81	21.22
Per acre return to land and management	49.82	24.95	10.22	7.84	9.75
Unpaid labor cost per acre.....	3.10	.32	1.22	.33	.19
Per acre return to unpaid labor, land, and management.....	52.92	25.27	11.44	8.17	9.94

¹ Direct costs exclude charges for land, buildings, and management.

² Costs and returns from lint alone. The value of seed was deducted from direct costs.

TABLE 62.--Prices paid by farmers for purchased materials used in crop production,
Delta area, Mississippi

Material	Unit	Price per unit ¹	Material	Unit	Price per unit ¹
Seed:		<u>Dollars</u>	Insecticides--Con.		<u>Dollars</u>
Cotton:			Spray materials--Con.		
Treated only.....	Ton	127.00	Dieldrin (1.5 #/gal.)	Gallon	4.20
Delinted only.....	do.	133.00	Aldrin (2 #/gal.)....	do.	3.20
Treated and delinted.	do.	135.00	Heptachlor (2 #/gal.)	do.	3.75
Soybean.....	Bushel	3.40	Dust materials:		
Corn.....	do.	9.24	Malathion, 5%.....	Pound	.09
Oats.....	do.	1.35	Malathion, 10%.....	do.	.145
Wheat.....	do.	3.58	Aldrin, 2 1/2%.....	do.	.075
Fertilizer:			Toxaphene, 20%.....	do.	.08
Ammonium nitrate (33%)	Ton	72.00	Calcium arsenate.....	do.	.07
Nitrate of soda (16.2%)	do.	60.00	Dynatox.....	do.	.11
Anhydrous ammonia (82%)	do.	120.00	3-5-0.....	do.	.065
Cyanamid (21%).....	do.	79.00	3-10-0.....	do.	.075
Ammonium sulphate (21%)	do.	52.00	3-10-5.....	do.	.13
Nitrate of lime (21%)..	do.	57.00	DDT, 5%.....	do.	.05
Urea (45%).....	do.	115.00	DDT, 10%.....	do.	.065
0-20-20.....	do.	63.00	Sulfur.....	do.	.03
Potash (60%).....	do.	48.00	Heptachlor, 2 1/2%...	do.	.075
Chilean nitrate (16.4%)	do.	56.00	Herbicides:		
Aqua ammonia (24.7%)...	do.	37.50	CIPC (4 #/gal.).....	Gallon	7.00
Uran (30%).....	do.	72.00	Karmex (3 #/gal.).....	do.	19.50
5-10-5.....	do.	41.00	2-4D (4 #/gal.).....	do.	3.20
6-8-8.....	do.	44.00	Post-emergence oil.....	do.	.25
8-8-8.....	do.	48.00	Defoliants:		
Lime.....	do.	6.00	Calcium cyanamide.....	Pound	.046
Insecticides:			Sodium chlorate.....	do.	.10
Spray materials:			Sodium chlorate.....	Gallon	1.35
Malathion (5 #/gal.)..	Gallon	6.20	Pentachlorophenol.....	do.	3.00
Toxaphene (6 #/gal.)..	do.	2.00	DEF.....	do.	6.00
Methyl parathion			Amino triazole.....	Pound	3.15
(2 #/gal.).....	do.	5.50	Fuel and lubricants:		
DDT (2 #/gal.).....	do.	1.35	Gasoline (net).....	Gallon	.18
3-10-0.....	do.	3.00	Butane.....	do.	.126
Endrin (1.6 #/gal.)..	do.	6.90	Motor oil.....	do.	1.00
Parathion (2 #/gal.)..	do.	5.50	Grease.....		.20
Guthion (1.5 #/gal.)..	do.	15.00			

¹ 1957 average prices paid by farmers, obtained from farm supply firms in the Delta by Farm Economics Division.

TABLE 63.--1958 season average prices received by farmers, Mississippi

Crop	Unit	Amount	Crop	Unit	Amount
Cotton.....	Cents per pound	34.23	Corn.....	Dollars per bushel	1.18
Soybeans.....	Dollars per bushel	1.95	Oats.....	do	.75
			Wheat.....	do	1.79

Source: (1) Cotton - Statistics on Cotton and Related, Data. Supplement to Stat. Bulletin No. 99, October, 1960. AMS, USDA, Washington, D. C.
 (2) Other crops - Agricultural Statistics, 1960. USDA, Washington, D. C.

TABLE 34.--Normal yields per acre on cotton farms, Delta area, Mississippi, 1958

(Estimated by farmers, March, 1958)

Crop	Unit	Cropland per farm				All sizes of farms
		Less than 60 acres	60 to 399 acres	400 to 999 acres	1,000 acres or more	
Cotton.....	Pounds lint	502	552	570	588	569
Soybeans.....	Bushel	24.6	24.4	24.4	22.3	23.5
Corn.....	do.	35.9	49.3	47.3	51.3	48.5
Oats.....	do.	32.6	51.1	57.2	49.3	53.4
Wheat.....	do.	31.8	30.4	31.7	26.3	28.7

