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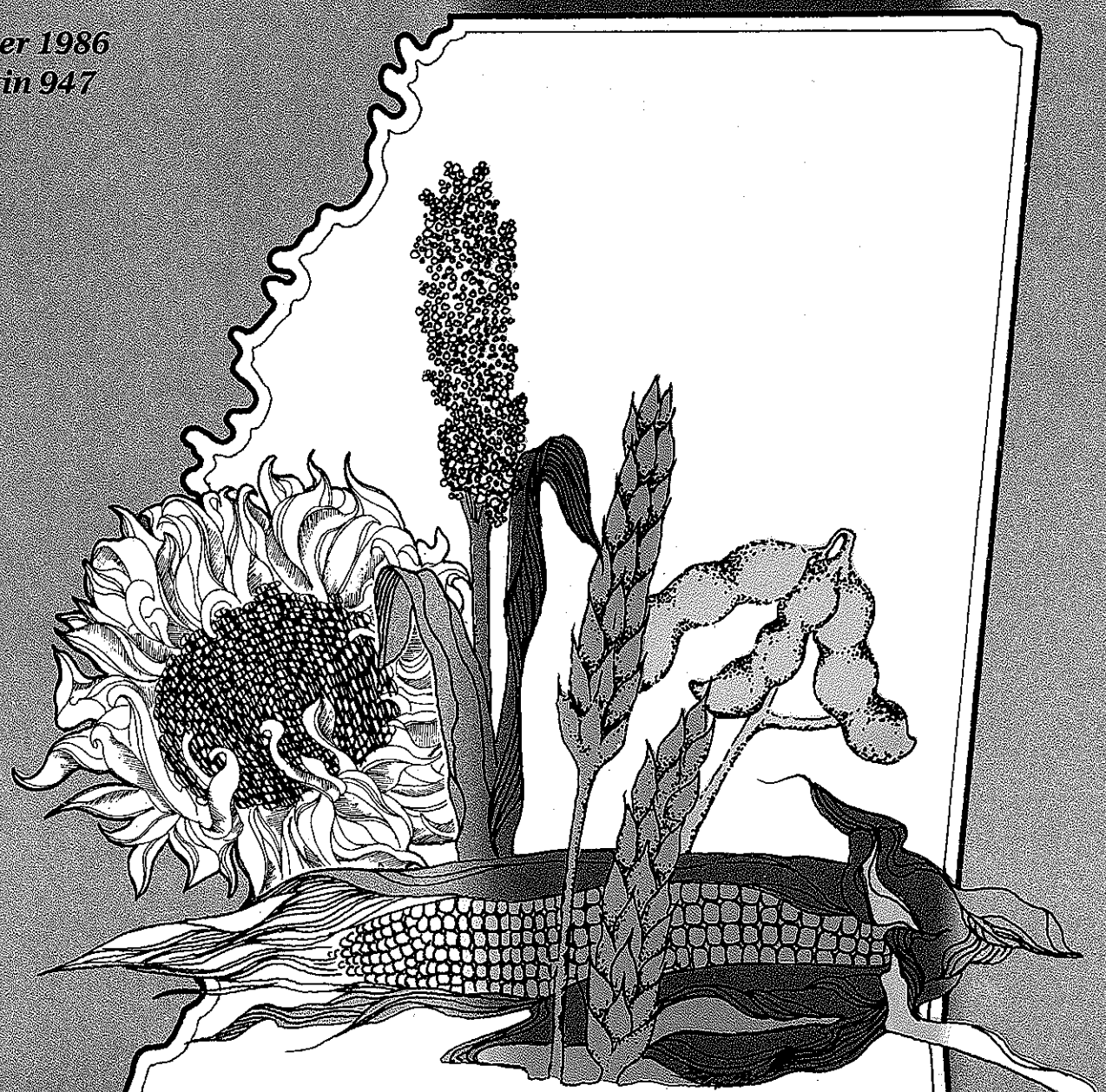

Ten Cropping Systems Evaluated for Mississippi

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Summary

Many production systems and cropping sequences are available to Mississippi farmers and each differs in its management and potential contribution to net farm income. This bulletin reports the results of a study which deals with several of these variables using yield and cost data from 3 years of crop production in the Mississippi Blackbelt. A nonirrigated experiment was conducted on Leeper silty clay (fine montmorillonitic, nonacid, thermic, Vertic Haplaquept) from 1976 through 1980. The experiment contained ten treatments of five monocrop and five doublecrop enterprises in randomized block design. Monocrops were commercial hybrid corn (*Zea mays* L.), soybeans [*Glycine max* (L.) Merr.], grain sorghum [*Sorghum bicolor* (L.) Moench], sunflowers (*Helianthus annuus* L.), and wheat (*Triticum aestivum* L.). Doublecrops were wheat followed by the first four monocrops plus an experimental insect and disease resistant corn hybrid. Yield and production records were maintained and used to calculate net returns for the cropping alternatives. The five enterprises with highest net returns per acre (in descending order) were monocrop corn ($204), doublecrop soybeans ($154), doublecropped wheat-resistant corn ($127), monocrop soybeans ($120), and doublecropped wheat-sunflowers ($114). The farming system that most fully utilized a complement of six-row equipment and associated power units and maximized net farm income above variable costs, machinery ownership costs, and land costs was calculated to be 690 acres of cropland as determined by linear programming techniques. This 690 acres would be partitioned as follows: monocrop corn (296 acres), monocrop wheat (33 acres), doublecropped wheat-resistant corn (153 acres), and doublecropped wheat-soybeans (208 acres). Net returns above specified expenses were computed to be $45,222 annually.

Introduction

Doublecropping increased in Mississippi during the 1970's. Innovations in farm equipment and pesticides combined with a favorable climate made large-scale doublecropping possible in this area. Although doublecropping is now widespread, monocropping is expected to predominate for several reasons. Some crops such as corn (*Zea mays* L.) have major insect and disease problems when planted late. Nelson et al. (4) doublecropped corn with small grains, but yields were reduced below those for conventional early-planted corn. When irrigation did not improve yield, they suggested damage by insects and/or disease as the cause. Additionally, the proportion of a farmer's land that can be managed efficiently in doublecrops is limited, and irrigation, which usually benefits doublecropping, is also limited.

The prevalent doublecrop system in Mississippi and throughout the Midsouth is soft red winter wheat (*Triticum aestivum* L.) and soybeans [*Glycine max* (L.) Merr.]. This has resulted in more wheat being harvested for grain. For example, wheat for grain in Alabama, Mississippi, Arkansas, and Tennessee totaled 946,000 acres in 1975; by 1982, the total was 4,569,000 (1). While soybeans is the crop most often grown after wheat, others such as grain sorghum [*Sorghum bicolor* (L.) Moench] and sunflowers (*Helianthus annuus* L.) may be grown (4,5,7,9). Recently-developed insect- and disease-resistant corn has made doublecropping with corn more feasible (13).

Doublecropping has a number of important potential advantages over monocropping. Doublecropping can result in substantially reduced erosion and increased net returns. Reduced tillage methods such as no-till planting of soybeans and aerial seeding of wheat can be successful in doublecropping (6).

Mutchler and Greer (3) reported a 0.25 ton per acre soil loss per year from doublecropped no-till soybeans and wheat on a loess soil of 5 percent slope. In the same study, conventionally-tilled, monocrop soybeans lost 8.54 tons of soil per acre while no-till, monocrop soybeans lost 0.50 ton per acre. In another study on Blackland Prairie soil with 3 percent slope, Hairston et al. (2) reported a 2-year average soil loss of 1.00 ton per acre for a soybean/wheat doublecrop system and 3.16 and 2.64 tons per acre, respectively, for conventionally-tilled and no-till monocrop soybeans. In this study, doublecrop, conventionally-tilled, and no-till soybean systems produced net returns of $127, $53, and $24 per acre, respectively.

There has been a great deal of doublecrop research.

However, few studies have included alternative cropping comparisons. Consequently, there are few economic comparisons of alternatives in the literature. Evaluations of this type would provide a basis for selection of economically feasible alternative crops and production systems in a farming enterprise.

The objectives of this study were: (1) to agronomically and economically evaluate a number of cropping systems (enterprises), and (2) to determine the appropriate farm size and number of acres of each of these enterprises that maximize annual net cash farm income from a representative farm that efficiently utilizes a complement of six-row equipment and machinery.

Materials and Methods

This nonirrigated study was conducted on the MAFES Plant Science Research Center at Mississippi State from 1976 through 1980 on nearly level Leeper silty clay (fine montmorillonitic, nonacid, thermic, Vertic Haplaquept), a bottomland Blackland Prairie soil. The soil was high in P_2O_5 and K_2O (231 and 417 lb/a, respectively), and the pH was 7.1 prior to the study.

There were ten treatments, composed of five monocrop and five doublecrop systems. Monocrops were commercial (C) hybrid corn, soybeans, grain sorghum, oil-type sunflowers, and wheat. Doublecrops consisted of wheat plus the first four monocrops above, and an experimental corn hybrid (Mp4008, developed by the USDA-ARS Corn Host Plant Resistance Research Unit at Mississippi State) which has resistance (R) to fall armyworm [*Spodoptera frugiperda* (J. E. Smith)] and southern corn rust (*Puccinia polysora* Underw.) (12).

Treatments consisting of cropping systems were arranged in randomized block design with four replications. Plots were 20 feet wide and 50 feet long. Monocrops, except for wheat, were planted in rows 40 inches apart with a John Deere® 71 flex planter. Monocrops, including wheat, were planted into prepared seedbeds. Doublecrop summer crops were planted no-till using the same planter equipped with Allis Chalmers® fluted coulters (one per row) after burning the wheat straw. Wheat was planted with a conventional grain drill, with double-disk openers spaced 7 inches apart, except in the soybean/wheat system where wheat was overseeded. Monocrop and doublecrop wheat, except for wheat following soybeans, was seeded Nov. 1-10 at a rate of 90 pounds per acre. Wheat following soybeans was aerially seeded during the first week of October at the same rate.

The study began the fall of 1976 with the seeding of wheat. Yields from this seeding were not used since this wheat was used only to initiate the cropping sequence. Monocrop yields (except wheat) and yields of the summer crops of doublecrop treatments were determined in 1977, 1978, and 1979 while wheat yields (including monocrop) were determined in 1978, 1979, and 1980.

Yields of all row crops, except doublecrop sunflowers, were determined by harvesting the two center rows of each plot using the same combine equipped with an appropriate header. Doublecrop sunflowers were harvested by hand in 1979 because of excessive lodging. Wheat was harvested by combining a 13-foot wide swath through the center of each plot between June 1 and 10. Yields were calculated for corn, soybeans, grain sorghum, sunflowers, and wheat as containing 15.5, 13.5, 13.5, 10.0, and 13.5% moisture, respectively. Wheat yields were statistically analyzed and differences among yields were tested by Duncan's new multiple range test at the 0.05 probability level. Actual production budgets for the enterprises are shown in Appendix Tables 1 through 15.

Monocrop Systems

Monocrops were grown using conventional land preparation and cultivation. Preparation consisted of sufficient chisel plowing and disking in the spring to prepare a seedbed. Land for wheat was prepared in a similar manner in the fall. Seedbeds were harrowed smooth before planting. Practices pertinent to a particular monocrop system are given below.

Corn

Preplant fertilizer containing 58, 58, and 58 lb/a of N, P_2O_5, and K_2O, respectively, was broadcast and incorporated during seedbed preparation. The commercial hybrid 'Pioneer Brand 3147' was planted between May 1 and 10. The crop was planted at a higher than required seeding rate and subsequently thinned to a population of 14,000 plants per acre. Weeds were controlled by a preemergence application of alachlor [2-chloro-2',6'-diethyl-*N*-(methoxymethyl)-acetanilide] and atrazine [2-chloro-4-(ethylamino)-6-(isopropylamino)-*s*-triazine] at the respective rates of 0.9 and 0.7 lb/a. Chemicals were applied in a 14-inch band over the drill at planting. At the first cultivation, ammonium nitrate sufficient to bring the total N application of 180 lb/a was sidedressed and incorporated. During the second cultivation, 0.5 lb/a of 2,4-D (2,4-dichlorophenoxy acetic acid) was applied as a directed spray to control broadleaf weeds. Corn was harvested in late September and stalks shredded.

Grain sorghum

Preplant fertilizer containing 58, 58, and 58 lb/a of N, P_2O_5 and K_2O, respectively, was broadcast and incorporated during seedbed preparation. 'Funks BR-79' grain sorghum was seeded at 6 lb/a between May 10 and 15. Propazine [2-chloro-4,6-bis(isopropylamino)-*s*-

triazine] was applied at the rate of 1.2 lb/a at planting. Sufficient ammonium nitrate to bring the total N application to 100 lb/a was sidedressed and incorporated with the first cultivation. Escaped weeds were controlled using two or three cultivations. Grain yields were harvested in early September and plant residue was shredded.

Soybeans

Preplant fertilizer containing 80 and 80 lb/a of P_2O_5 and K_2O, respectively, was broadcast and incorporated during seedbed preparation. Trifluralin (α,α,α-trifluoro-2,6-dinitro-*N,N*-dipropyl-*p*-toluidine) at 1.0 lb/a was incorporated during the final disking of seedbed preparation. The cultivar 'Bragg' was planted at the rate of 45 pounds of seed per acre between May 15 and 20. Cultivation (two to three times each season) and linuron [3-(3,4 dichlorophenyl)-1-methoxy-1-methylurea] applied post-directed at 0.8 lb/a were used to control weeds. Soybeans were harvested in early November.

Sunflowers

Preplant fertilizer containing 58, 58, and 58 lb/a of N, P_2O_5, and K_2O, respectively, was broadcast and incorporated during land preparation. Trifluralin at 1.0 lb/a was incorporated during the final disking of seedbed preparation. Northrup King's oil-type, sunflower hybrid 'Sunbred Brand 212' was planted at the rate of 3.0 lb/a between May 1 and 10. After emergence the plant population was thinned to 14,000 plants per acre, and ammonium nitrate was drilled beside the row in sufficient amount to bring the total N application to 100 lb/a. The crop was cultivated one or two times, harvested in early September, and stalks were shredded.

Wheat

Preplant fertilizer containing 34, 55, and 55 lb/a of N, P_2O_5, and K_2O, respectively, was broadcast and incorporated during land preparation. In late February, wheat was topdressed with sufficient N from ammonium nitrate to bring the total application to 100 lb/a. The wheat was harvested in early June and the straw was left on the soil surface. These plots were fallowed during the summer by disking.

Doublecrops

In all treatments, annual rates of 70 and 67 lb/a of P_2O_5 and K_2O, respectively, were applied in the fall. These were considered maintenance rates sufficient to supply P and K for both wheat and the following summer crop (based on calculations from soil tests and uptake and removal by expected yields). In the doublecrop systems involving corn, grain sorghum, and sunflowers, phosphate and potash were incorporated during land preparation for wheat. For the system involving soybeans, where wheat was overseeded, phosphate and potash were broadcast on the surface immediately after harvesting soybeans. Wheat, except that cropped with soybeans, received 30 lb N/a in the preplant fertilizer. Wheat following soybeans did not receive any nitrogen at planting. Doublecrop and monocrop wheat were both topdressed in late February. Doublecropped wheat, except that following soybeans, received 70 lb/a of N from ammonium nitrate as a topdressing. Wheat following soybeans received 80 lb N/a in the spring.

Weed control consisted of 1.0 lb/a of alachlor for corn and soybeans, 1.2 lb/a of propazine for grain sorghum, and 1.5 lb/a of oryzalin (3,5-dinitro-N^4,N^4-dipropylsulfanilamide) for sunflowers as a broadcast spray at planting. Escaped weeds in soybeans were controlled with 0.7 lb/a of linuron as a post-directed spray. As with monocrops, doublecrop corn and sunflowers were planted at higher than required rates and later thinned to 14,000 plants per acre. Grain sorghum and soybeans were seeded at the same rate as the respective monocrops. Summer crops in doublecrop systems were cultivated twice each season. Diazinon [*O,O*-diethyl-*O* (2-isopropyl-4-methyl-6-pyrimidinyl) phosphorothioate] at 1.2 lb/a was used to control midge (*Contarinia sorghicola* Coquillett) in doublecrop grain sorghum. Each of the row crops in the doublecrop systems was harvested 3 to 4 weeks after the corresponding monocrop.

Economic Analyses

Crop enterprise budgets were developed for each of the cropping alternatives. Budgets were based on the 3-year average yields obtained from the field study (Table 1). Rates of application for all the variable inputs were those described in the "Materials and Methods" section. Crop prices used in the budgets were 5-year average (1980-84) prices received by farmers in Mississippi. Costs of variable inputs and machinery were based on 1985 prices paid by farmers in the study area. In constructing the budgets, performance rates on all field operations were based on using six-row equipment with associated power units. This machinery complement was developed for a full-time operator labor component with the option of hiring additional labor each month on an hourly basis whenever operator labor was restrictive in carrying out farming operations. Available machine time for performing the crop production and harvesting operations was considered to be the most restrictive resource on the farm.

The power complement included one 90-100 drawbar horsepower (DBHP) tractor, one 115-150 DBHP tractor, and one 13-foot header width, self-propelled grain combine with auxiliary header and reel equipment

for harvesting corn and sunflowers. The equipment complement included a chisel plow, heavy disk, disk harrow, field cultivator, planter with no-till attachments, grain drill, cultivator, fertilizer applicator, stalk shredder, grain cart, spin spreader, and tractor-mounted sprayer.

Mathematical linear programming was used to select the combination of crops that would provide the highest net income. Constraints on resource availability in the programming analysis were hours suitable for field work during February through November for both tractor-powered tillage and nontillage operations and harvesting operations. Hours of operator labor available during February through November were also resource constraints, but with the option of hiring hourly labor each month at a wage rate of $4.45 per hour.

Results and Discussion

Agronomic Performance

Monocrops (excluding wheat)

Monocrop yields varied considerably over the 3-year period (Table 1). This reflects the erratic quantity and distribution of summer rainfall in this experiment and throughout the Midsouth. Monocrops produced their lowest yields in 1977, but their highest yields were produced in different years. Corn and soybeans produced their highest yields in 1978, while grain sorghum and sunflowers produced highest yields in 1979. Over the 3-year period, corn and grain sorghum yields were more variable than were soybean and sunflower yields. Corn yields ranged from 57.0 to 163.5 bu/a or a change of 287% from lowest to highest. Corresponding figures for grain sorghum, soybeans, and sunflowers were 44.2 bu/a to 88.6 bu/a or 200%, 27.5 bu/a to 35.8 bu/a or 130%, and 1,280 lb/a to 1,653 lb/a or 129%, respectively. These data demonstrate the hazards of producing corn, and to a lesser extent grain sorghum, in this area without irrigation. They further suggest that, of the alternatives tested, less year-to-year yield variability would be encountered with soybeans and sunflowers.

Doublecrops

Wheat yields, including monocrop wheat yields, were analyzed and the results are shown in Table 1. Monocrop wheat produced the highest 3-year mean yield. However, the monocrop wheat yield was not significantly higher than yield of wheat following commercial corn, soybeans, or sunflowers. The yield of doublecrop wheat was strongly influenced by the other crop in the system. Wheat following soybeans, sunflowers, and commercial corn produced significantly higher yields than wheat following grain sorghum. Yields following the two doublecrop corn entries were not significantly different. However, yields of wheat following commercial corn were consistently higher than those following resistant corn. This may have been partially due to the differences in amount of stover produced by the two corn hybrids.

Due to attacks by fall armyworms and rust, the commercial hybrid produced less stover than did the experimental hybrid. Incorporation of large amounts of carbonaceous residue has been shown to adversely affect a following wheat crop (8). Also, unused N applied to commercial corn may have affected the following wheat. Grain sorghum produces large amounts of residue, and wheat following grain sorghum produced the lowest yield each year. Incorporating grain sorghum residue has been shown to be especially detrimental to a following wheat doublecrop (8). No attempt was made to adjust the N rate for doublecrop wheat with respect to the amount of residue produced by the summer crop, except in the case of wheat following soybeans. Soybeans have been estimated to supply 27 to 36 lb N/a to a following wheat crop from the soybean residue (8). Note that wheat following soybeans produced among the top yields with only 80%

Table 1. Yields of five monocrop and five doublecrop production systems over a 3-year period on Leeper silty clay at Mississippi State University.

Cropping system and crop	Grain yield 1977	1978	1979	1980	Avg.
	bu/a[1]				
MONOCROPS:					
Corn (C)	57.0	163.5	121.6		114.0
Soybeans	27.5	35.8	32.8		32.0
Grain sorghum	44.2	87.1	88.6		73.2
Sunflowers	1,280	1,477	1,653		1,470
Wheat		(40.2)	(55.8)	(30.4)	(42.1)a[2]
DOUBLECROPS:					
Wheat - corn (C)	-[3]	(38.0) 9.9	(48.0) 30.1	(30.2)	(38.7)ab 20.0[3]
Wheat - corn (R)	-[3]	(34.8) 66.7	(45.7) 59.4	(28.5)	(36.3)b 63.0[3]
Wheat - soybeans	20.2	(39.1) 22.9	(50.5) 22.9	(31.7)	(40.4)a 22.0
Wheat - grain sorghum	17.9	(31.8) 77.2	(39.6) 42.7	(25.3)	(32.2)c 45.9
Wheat - sunflowers	1,322	(37.4) 1,549	(51.0) 1,328	(33.5)	(40.6)a 1,400
Average		(36.9)b[2]	(48.4)a	(29.9)c	

[1] All yield units are bu/a except for sunflowers which are lb/a.

[2] Average yields within the column or row followed by the same letter are not significantly different at the 0.05 probability level using Duncan's Multiple Range Test.

[3] Commercial (C) and resistant (R) doublecrop corn were destroyed by a severe fall armyworm infestation in 1977. Average yields for doublecrop corn are averages of 1978 and 1979 yields.

as much fertilizer N as other wheat. However, wheat following soybeans was seeded about one month earlier than other wheat.

The summer crop portion of the doublecrops produced considerably less than did their monocrop counterparts, except for sunflowers. Doublecrop resistant corn produced 55% as much as did monocrop corn. Commercial doublecrop corn only produced 18% of the monocrop yield. Doublecrop soybeans produced 69% of the yield of monocrop soybeans. This agrees with results of another study at this location (5). The corresponding yield for doublecrop grain sorghum was 63%. Doublecrop sunflowers produced 95% of the monocrop sunflower yield.

Doublecrop corn (both commercial and resistant) failed in 1977 due to an overwhelming infestation of fall armyworm. Armyworms appeared earlier than normal in 1977 and numbers continued to increase during the summer. Although the resistant hybrid has a high degree of tolerance to fall armyworm, the 1977 results demonstrate that it cannot withstand extremely high numbers of worms. In 1978 and 1979, the resistant hybrid produced substantially more than did the commercial hybrid. Average yield for the commercial hybrid was only 32% of that of the resistant hybrid. We believe hybrids containing this resistance have potential as a late grain or silage crop. In a subsequent doublecropping study, a similar resistant hybrid produced 96 bu/a of grain with irrigation and 160 lb N/a (11).

Doublecrop grain sorghum suffered damage from fall armyworm in 1977 and to a lesser degree in 1978 and 1979. However, the worst pest of doublecrop grain sorghum was midge, which was especially severe and required two applications of insecticide each year. Monocrop sorghum, planted earlier, suffered only slight damage and was not treated for midge.

Although sunflowers performed well in this study, two important disadvantages of sunflower production in the Midsouth should be considered. Other studies at this location have shown sunflowers to be extremely susceptible to a leaf and stem disease (10) caused by the fungus (*Alternaria helianthi*) and to lodging from wind. Both conditions can usually be avoided by early planting. Additionally, bird damage can be a problem on late-planted sunflowers. Thus, doublecrop sunflowers are more at risk than are early planted monocrop sunflowers.

Generally, weed control was good in the study. However, tall morningglory (*Ipomoea purpurea*) and fall panicum (*Panicum dichotomiflorum*) appeared to increase in monocrop corn plots. We do not feel that this affected yields since these weeds only became noticeable after the corn had matured and light penetrated the canopy.

Yields of all doublecrop summer crops might have been higher if row spacing had been 30 inches or less. Since beginning this study, a positive crop yield response to narrow rows, when planting later than optimum, has been demonstrated in the South.

Economic Performance

Average net returns above variable expenses (Table 2) were lowest for the monocrops of grain sorghum, sunflowers and wheat and the doublecrops of wheat-commercial corn and wheat-grain sorghum. Highest net returns for monocrops were from commercial corn (C) and soybeans while wheat-resistant corn (R), wheat-soybeans, and wheat-sunflowers provided highest net returns for doublecrops.

Linear programming solutions were obtained for farming systems that included only monocrops, only doublecrops, and both monocrops and doublecrops. Diversifying land, machinery capital, and labor resources among monocrops and doublecrops resulted in higher net farm income than exclusive production of only monocrops or only doublecrops. The most profitable production systems for only monocrops and for both monocrops and doublecrops are summarized in Table 3. When only monocrops were considered, a farming system that includes 295.5 acres of commercial corn and 326.5 acres of wheat provides the highest net farm income of $12,651 when variable expenses, machinery ownership costs, and land costs are deducted from total cash receipts. This estimate of net farm income does not include any government payments to the farm operator under the target price/deficiency payment or commodity loan/diversion payment programs for corn and wheat.

A total farm size of 622 acres resulted from fully utilizing available tractor and operator labor time during April and October. Because commercial corn production entails high yield variability and risks without irrigation in this area, two additional computer programming solutions were obtained with commercial corn production limited to 100 acres and zero acres. Monocrop soybeans replaced commercial corn in the most profitable farming system.

The total farm size was increased to fully utilize the tractor and machinery complement during the restrictive months since monocrop soybeans require less tractor time than commercial corn during April and October. Replacing commercial corn with soybeans resulted in a substantial reduction in net returns to the operator's labor, management, and risk.

The wheat-resistant corn (221.7 acres) and wheat-soybean (208.5 acres) enterprises comprised the most profitable farming system when only doublecrops were considered (data not shown). Very restrictive limitations resulted for acres operated (430.2 acres) and net farm income attainable ($1,772) after variable expenses, machinery ownership costs, and land costs

Table 2. Annual expenses and net returns for alternative crops produced on Leeper silty clay at Mississippi State University[1].

Item	Monocrops					Doublecrops				
	Corn (C)	Soybeans	Grain sorghum	Sunflowers[2]	Wheat	Wheat-corn (C)	Wheat-corn (R)	Wheat-soybeans	Wheat-g. sorghum	Wheat-sunflowers[2]
INCOME:										
Yield (bu/a)	114.0	32.0	73.2	1,470	42.1	38.7	36.3	40.4	32.2	40.6
Price ($/bu)	3.17	6.78	2.41	.11	3.63	3.63	3.63	3.63	3.63	3.63
Yield (bu/a)						20.0	63.0	22.0	45.9	1,400
Price ($/bu)						3.17	3.17	6.78	2.41	.11
Total value ($/a)	361.38	216.96	176.41	161.70	152.82	203.88	331.48	295.81	227.51	301.38
VARIABLE EXPENSES ($/a):										
Fertilizer	81.75	38.30	58.97	58.97	57.15	113.84	113.84	65.35	92.01	92.01
Herbicides	7.23	15.03	5.26	6.23	.00	5.05	5.05	12.52	5.26	19.13
Insecticides	.00	.00	.00	.00	.00	.00	.00	.00	12.59	.00
Other	18.24	5.12	11.71	4.12	5.89	8.62	15.16	12.33	11.85	9.60
Seed	7.70	7.65	4.74	7.80	10.00	18.50	18.50	18.45	15.54	18 .60
Diesel Fuel	12.44	10.05	10.97	10.61	7.43	12.95	12.59	7.06	13.75	12.00
Repair and maint.	23.19	16.24	16.33	18.88	15.04	30.82	30.78	22.65	26.34	27.81
Interest on operating capital	6.46	4.62	4.99	6.00	6.43	8.58	8.31	5.73	8.58	8.37
Total variable exp.	157.01	97.01	112.97	112.61	102.74	198.36	204.23	142.09	185.92	187.52
Net return above variable expenses	204.37	119.95	63.44	49.09	50.08	5.52	127.25	153.72	41.59	113.86

[1] The crop enterprise costs and returns are based on the average yields shown in Table 1.
[2] Yield of sunflower seed is in lb/a and price of sunflower seed is $/lb.

Table 3. Most profitable production systems for general field crop farms using 6-row equipment on Leeper silty clay at Mississippi State University.

Item	Unit	Monocrops only			Monocrops and doublecrops		
		Without corn limitation[1]	With corn limitation[2]	No corn allowed[3]	Without corn limitation[1]	With corn limitation[2]	No corn allowed[3]
Crop enterprises:							
Corn (C)	acres	295.5	100.0	---	295.5	100.0	---
Soybeans	acres	---	260.6	394.0	---	260.6	393.9
Wheat	acres	326.5	326.5	326.5	33.2	---	---
Wheat & corn (R)	acres	---	---	---	153.0	170.4	170.4
Wheat & soybeans	acres	---	---	---	208.5	208.5	208.5
Total farm size	acres	622.0	687.1	720.5	690.2	739.5	772.8
Labor	hours	99.2	177.7	252.4	186.3	275.4	350.1
Net return above variable expenses	dollars	76,302	67,257	62,489	112,745	104,205	99,425
Machinery ownership expense	dollars	41,881	41,881	39,772	43,366	43,366	43,366
Land charge[4]	dollars	21,770	24,049	25,218	24,157	25,883	27,048
Net return above total specified expenses[5]	dollars	12,651	1,328	-2,500	45,222	34,956	29,011

[1] No limitation placed on the acres of monocrop corn allowed on the farm.
[2] Monocrop corn limited to a maximum of 100 acres.
[3] Monocrop corn was eliminated as a crop alternative on the farm.
[4] Land ownership and/or lease costs were charged at a rate of $35.00/acre.
[5] Net returns to general farm overhead and farm operator labor, management, and risk.

were paid. The requirements of tractor hours per acre were high during October and November since soybeans were being harvested and land was being fertilized and prepared for wheat. Decisions to devote all land to doublecrops would entail substantial reductions in net farm income.

Diversifying among monocrops and doublecrops in the farming system resulted in substantial gains in net farm income when compared with exclusive production of only monocrops or only doublecrops. Monocrop commercial corn (295.5 acres) dominated the most profitable solution and a small amount of monocrop wheat (33.2 acres) was included. Doublecrops of wheat-resistant corn (153.0 acres) and wheat-soybeans (208.5 acres) also were included in the most profitable farming system. Annual net farm income above variable expenses, machinery ownership costs, and land costs increased by $32,571 (to $45,222 annually) when compared to the most profitable farming system producing monocrops only (Table 3).

When limitations were placed on the amount of monocrop commercial corn allowed, monocrop wheat and corn were replaced with monocrop soybeans in the most profitable farming system. Annual net returns to operator labor, management, and risk were reduced by some $10,266 (with corn restricted to 100.0 acres) to $16,211 (with no corn allowed). The farm size that fully utilized the machinery complement in the restrictive months increased as monocrop soybeans replaced commercial corn in the farming system.

Diversifying among the doublecrop and monocrop alternatives allowed greater utilization of the machinery and operator labor complement. The results indicate that farm operators in Mississippi and the Midsouth with soil and other resources similar to those considered in this study could substantially increase their annual net farm income by doublecropping wheat with an experimental resistant corn and soybeans on about half of their cropland. Combining these doublecrops with the monocrops of commercial corn, wheat, or soybeans allows an expansion of the total land operated by about 7% to 10% through better utilization of machinery and equipment.

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Appendix Tables

Table 1. Monocrop corn, 6-row equipment. Estimated operation costs per acre, Blackbelt Area, Mississippi, 1985.

Operation or Item	Size or Unit	Trac. Num.	Month Perf.	Times Over	Mach. Hours	Tractor Cost		Equip. Cost		Labor	Material (or service)			Total Costs
						Direct	Fixed	Direct	Fixed	Hours	Quant.	Price	Cost	
						---Dollars---						---Dollars---		
Stalk Shredder	4-row	5	Oct	1.00	0.160	1.34	1.53	0.26	1.08	0.160				4.21
Lime (Spread) BB	ton		Nov	1.00							0.500	15.00	7.50	7.50
Chisel Plow	16 ft	5	Mar	2.00	0.440	3.67	4.22	0.54	1.37	0.440				9.81
Spin Spreader	300 bu	3	Apr	1.00	0.100	0.65	0.71	0.59	1.11	0.100				3.06
Fert 13-13-13	cwt										4.460	8.86	39.52	39.52
Chisel Plow	16 ft	5	Apr	1.00	0.220	1.84	2.11	0.27	0.69	0.220				4.90
Disk Harrow	21 ft	5	Apr	2.00	0.280	2.34	2.68	1.26	2.59	0.280				8.87
Field Cult	21 ft	3	Apr	1.00	0.100	0.65	0.71	0.30	0.77	0.100				2.44
Plant + Pre.	6-row	5	Apr	1.00	0.180	1.50	1.73	0.66	1.69	0.180				5.58
Corn Seed	lb										7.000	1.10	7.70	7.70
Alachlor	lb										0.900	5.05	4.55	4.55
Atrazine	lb										0.700	2.19	1.53	1.53
Cultivate-Early	6-row	3	May	1.00	0.210	1.36	1.50	0.28	0.63	0.210				3.77
Cult Early + Fert	6-row	3	May	1.00	0.210	1.36	1.50	0.54	1.03	0.210				4.43
Nitrate (34% N)	cwt										3.660	9.49	34.73	34.73
Cult + Post-Late	6-row	5	Jun	1.00	0.180	1.50	1.73	0.33	0.74	0.180				4.30
2,4-D	lb										0.500	2.31	1.16	1.16
Combine-Corn	4-row		Sep	1.00	0.330			13.44	22.71	0.330				36.15
Grain Cart	250 bu	3	Sep	1.00	0.120	0.78	0.86	0.18	0.40	0.120				2.21
Haul Corn	bu		Sep	1.00							114.000	0.16	18.24	18.24
TOTALS						16.97	19.28	18.66	34.82				114.92	204.65
INTEREST ON OPERATING CAPITAL														6.46
TOTAL SPECIFIED COSTS														211.11

Table 2. Monocrop soybeans, 6-row equipment. Estimated operation costs per acre, Blackbelt Area, Mississippi, 1985.

Operation or Item	Size or Unit	Trac. Num.	Month Perf.	Times Over	Mach. Hours	Tractor Cost		Equip. Cost		Labor	Material (or service)			Total Costs
						Direct	Fixed	Direct	Fixed	Hours	Quant.	Price	Cost	
						---Dollars---						---Dollars---		
Lime (Spread) BB	ton		Nov	1.00							0.500	15.00	7.50	7.50
Chisel Plow	16 ft	5	Apr	3.00	0.660	5.51	6.33	0.81	2.06	0.660				14.71
Spin Spreader	300 bu	3	May	1.00	0.100	0.65	0.71	0.59	1.11	0.100				3.06
Fert 0-20-20	cwt										4.000	7.70	30.80	30.80
Disk + Incorp	21 ft	5	May	1.00	0.180	1.50	1.73	0.81	1.67	0.180				5.71
Trifluralin	lb										1.000	6.23	6.23	6.23
Field Cult	21 ft	3	May	1.00	0.100	0.65	0.71	0.30	0.77	0.100				2.44
Plant	6-row	5	May	1.00	0.140	1.17	1.34	0.44	1.13	0.140				4.08
Soybean Seed	lb										45.000	0.17	7.65	7.65
Cultivate-Early	6-row	3	Jun	1.00	0.210	1.36	1.50	0.28	0.63	0.210				3.77
Cult + Post-Late	6-row	5	Jun	1.00	0.180	1.50	1.73	0.33	0.74	0.180				4.30
Linuron	lb										0.800	10.67	8.54	8.54
Surfactant	pt										0.400	0.66	0.26	0.26
Cultivate-Late	6-row	3	Jul	1.00	0.140	0.90	1.00	0.19	0.42	0.140				2.51
Combine-SB/WH	20 ft		Oct	1.00	0.230			8.35	13.89	0.230				22.24
Grain Cart	250 bu	3	Oct	1.00	0.120	0.78	0.86	0.18	0.40	0.120				2.21
Haul Soybean	bu		Oct	1.00							32.000	0.16	5.12	5.12
TOTALS						14.01	15.90	12.28	22.82				66.10	131.12
INTEREST ON OPERATING CAPITAL														4.62
TOTAL SPECIFIED COSTS														135.74

Table 3. Monocrop grain sorghum, 6-row equipment. Estimated operation costs per acre, Blackbelt Area, Mississippi, 1985.

Operation or Item	Size or Unit	Trac. Num.	Month Perf.	Times Over	Mach. Hours	Tractor Cost		Equip. Cost		Labor	Material (or service)			Total Costs
						Direct	Fixed	Direct	Fixed	Hours	Quant.	Price	Cost	
						---Dollars---						---Dollars---		
Stalk Shredder	4-row	5	Oct	1.00	0.160	1.34	1.53	0.26	1.08	0.160				4.21
Lime (Spread) BB	ton		Nov	1.00							0.500	15.00	7.50	7.50
Chisel Plow	16 ft	5	Mar	3.00	0.660	5.51	6.33	0.81	2.06	0.660				14.71
Spin Spreader	300 bu	3	Apr	1.00	0.100	0.65	0.71	0.59	1.11	0.100				3.06
Fert 13-13-13	cwt										4.460	8.86	39.52	39.52
Disk Harrow	21 ft	5	Apr	1.00	0.140	1.17	1.34	0.63	1.30	0.140				4.44
Field Cult	21 ft	3	Apr	1.00	0.100	0.65	0.71	0.30	0.77	0.100				2.44
Plant + Pre.	6-row	5	Apr	1.00	0.180	1.50	1.73	0.66	1.69	0.180				5.58
Grain Sorghum Seed	lb										6.000	0.79	4.74	4.74
Propazine	lb										1.200	4.38	5.26	5.26
Cultivate-Early	6-row	3	May	1.00	0.210	1.36	1.50	0.28	0.63	0.210				3.77
Cult Early + Fert	6-row	5	Jun	1.00	0.210	1.75	2.01	0.54	1.03	0.210				5.34
Nitrate (34% N)	cwt										1.260	9.49	11.96	11.96
Cultivate-Late	6-row	3	Jul	1.00	0.140	0.90	1.00	0.19	0.42	0.140				2.51
Combine-Grain SGM	20 ft		Sep	1.00	0.200			7.26	12.08	0.200				19.33
Grain Cart	250 bu	3	Sep	1.00	0.120	0.78	0.86	0.18	0.40	0.120				2.21
Haul Sorghum	bu		Sep	1.00							73.200	0.16	11.71	11.71
TOTALS						15.60	17.72	11.71	22.57				80.68	148.28
INTEREST ON OPERATING CAPITAL														4.99
TOTAL SPECIFIED COSTS														153.26

Table 4. Monocrop sunflower, 6-row equipment. Estimated operation costs per acre, Blackbelt Area, Mississippi, 1985.

Operation or Item	Size or Unit	Trac. Num.	Month Perf.	Times Over	Mach. Hours	Tractor Cost		Equip. Cost		Labor	Material (or service)			Total Costs
						Direct	Fixed	Direct	Fixed	Hours	Quant.	Price	Cost	
						---Dollars---						---Dollars---		
Stalk Shredder	4-row	5	Oct	1.00	0.160	1.34	1.53	0.26	1.08	0.160				4.21
Lime (Spread) BB	ton		Nov	1.00							0.500	15.00	7.50	7.50
Chisel Plow	16 ft	5	Mar	3.00	0.660	5.51	6.33	0.81	2.06	0.660				14.71
Spin Spreader	300 bu	3	Mar	1.00	0.100	0.65	0.71	0.59	1.11	0.100				3.06
Fert 13-13-13	cwt										4.460	8.86	39.52	39.52
Disk + Incorp	21 ft	5	Mar	1.00	0.180	1.50	1.73	0.81	1.67	0.180				5.71
Trifluralin	lb										1.000	6.23	6.23	6.23
Field Cult	21 ft	3	Apr	1.00	0.100	0.65	0.71	0.30	0.77	0.100				2.44
Plant	6-row	5	Apr	1.00	0.140	1.17	1.34	0.44	1.13	0.140				4.08
Sunflower Seed	lb										3.000	2.60	7.80	7.80
Cult Early + Fert	6-row	5	Apr	1.00	0.210	1.75	2.01	0.54	1.03	0.210				5.34
Nitrate (34% N)	cwt										1.260	9.49	11.96	11.96
Cultivate-Late	6-row	3	May	1.00	0.140	0.90	1.00	0.19	0.42	0.140				2.51
Combine-SF	4-row		Sep	1.00	0.300			11.13	18.57	0.300				29.70
Grain Cart	250 bu	3	Sep	1.00	0.120	0.78	0.86	0.18	0.40	0.120				2.21
Haul Sunflowers	cwt		Sep	1.00							14.700	0.28	4.12	4.12
TOTALS						14.24	16.22	15.26	28.25				77.12	151.08
INTEREST ON OPERATING CAPITAL														6.00
TOTAL SPECIFIED COSTS														157.08

Table 5. Monocrop wheat, 6-row equipment. Estimated operation costs per acre, Blackbelt Area, Mississippi, 1985.

Operation or Item	Size or Unit	Trac. Num.	Month Perf.	Times Over	Mach. Hours	Tractor Cost		Equip. Cost		Labor	Material (or service)			Total Costs
						Direct	Fixed	Direct	Fixed	Hours	Quant.	Price	Cost	
						---Dollars---						---Dollars---		
Lime (Spread) BB	ton		Aug	1.00							0.500	15.00	7.50	7.50
Chisel Plow	16 ft	5	Aug	2.00	0.440	3.67	4.22	0.54	1.37	0.440				9.81
Disk Harrow	21 ft	5	Sep	1.00	0.140	1.17	1.34	0.63	1.30	0.140				4.44
Spin Spreader	300 bu	3	Oct	1.00	0.100	0.65	0.71	0.59	1.11	0.100				3.06
Fert 0-20-20	cwt										2.750	7.70	21.18	21.18
Nitrate (34% N)	cwt										1.000	9.49	9.49	9.49
Disk Harrow	21 ft	5	Oct	1.00	0.140	1.17	1.34	0.63	1.30	0.140				4.44
Section Harrow	6-row	3	Oct	1.00	0.100	0.65	0.71	0.04	0.09	0.100				1.49
Grain Drill	24 ft	5	Oct	1.00	0.140	1.17	1.34	1.04	2.28	0.140				5.82
Wheat Seed	lb										90.000	0.12	10.80	10.80
Spin Spreader	300 bu	3	Feb	1.00	0.100	0.65	0.71	0.59	1.11	0.100				3.06
Nitrate (34% N)	cwt										2.000	9.49	18.98	18.98
Combine-SB/WH	20 ft		Jun	1.00	0.230			8.35	13.89	0.230				22.24
Grain Cart	250 bu	3	Jun	1.00	0.120	0.78	0.86	0.18	0.40	0.120				2.21
Haul Wheat	bu		Jun	1.00							42.100	0.14	5.89	5.89
TOTALS						9.89	11.24	12.57	22.85				73.84	130.39
INTEREST ON OPERATING CAPITAL														6.43
TOTAL SPECIFIED COSTS														136.82

Table 6. Wheat before commercial corn, 6-row equipment. Estimated operation costs per acre, Blackbelt Area, Mississippi, 1985.

Operation or Item	Size or Unit	Trac. Num.	Month Perf.	Times Over	Mach. Hours	Tractor Cost		Equip. Cost		Labor	Material (or service)			Total Costs
						Direct	Fixed	Direct	Fixed	Hours	Quant.	Price	Cost	
						---Dollars---						---Dollars---		
Stalk Shredder	4-row	5	Oct	1.00	0.160	1.34	1.53	0.26	1.08	0.160				4.21
Lime (Spread) BB	ton		Oct	1.00							0.500	15.00	7.50	7.50
Chisel Plow	16 ft	5	Oct	2.00	0.440	3.67	4.22	0.54	1.37	0.440				9.81
Spin Spreader	300 bu	3	Oct	1.00	0.100	0.65	0.71	0.59	1.11	0.100				3.06
Fert 0-24-24	cwt										3.000	9.19	27.57	27.57
Nitrate (34% N)	cwt										0.900	9.49	8.54	8.54
Disk Harrow	21 ft	5	Oct	1.00	0.140	1.17	1.34	0.63	1.30	0.140				4.44
Section Harrow	6-row	3	Oct	1.00	0.100	0.65	0.71	0.04	0.09	0.100				1.49
Grain Drill	24 ft	5	Oct	1.00	0.140	1.17	1.34	1.04	2.28	0.140				5.82
Wheat Seed	lb										90.000	0.12	10.80	10.80
Spin Spreader	300 bu.	3	Feb	1.00	0.100	0.65	0.71	0.59	1.11	0.100				3.06
Nitrate (34% N)	cwt										2.100	9.49	19.93	19.93
Combine-SB/WH	20 ft		Jun	1.00	0.230			8.35	13.89	0.230				22.24
Grain Cart	250 bu	3	Jun	1.00	0.120	0.78	0.86	0.18	0.40	0.120				2.21
Haul Wheat	bu		Jun	1.00							38.700	0.14	5.42	5.42
TOTALS						10.06	11.43	12.20	22.63				79.76	136.08
INTEREST ON OPERATING CAPITAL														6.65
TOTAL SPECIFIED COSTS														142.73

Table 7. Commercial corn after wheat, 6-row equipment. Estimated operation costs per acre, Blackbelt Area, Mississippi, 1985.

Operation or Item	Size or Unit	Trac. Num.	Month Perf.	Times Over	Mach. Hours	Tractor Cost		Equip. Cost		Labor	Material (or service)			Total Costs
						Direct	Fixed	Direct	Fixed	Hours	Quant.	Price	Cost	
						----------Dollars----------						----------Dollars----------		
Plant-NT+Pre	6-row	5	Jun	1.00	0.170	1.42	1.63	0.67	1.69	0.170				5.41
Corn Seed	lb										7.000	1.10	7.70	7.70
Alachlor	lb										1.000	5.05	5.05	5.05
Cultivate-Early	6-row	3	Jul	1.00	0.210	1.36	1.50	0.28	0.63	0.210				3.77
Cult Early + Fert	6-row	5	Jul	1.00	0.210	1.75	2.01	0.54	1.03	0.210				5.34
Nitrate (34% N)	cwt										5.300	9.49	50.30	50.30
Cultivate-Late	6-row	3	Aug	1.00	0.140	0.90	1.00	0.19	0.42	0.140				2.51
Combine-Corn	4-row		Sep	1.00	0.330			13.44	22.71	0.330				36.15
Grain Cart	250 bu	3	Sep	1.00	0.120	0.78	0.86	0.18	0.40	0.120				2.21
Haul Corn	bu		Sep	1.00							20.000	0.16	3.20	3.20
TOTALS						6.21	7.00	15.30	26.88				66.25	121.64
INTEREST ON OPERATING CAPITAL														1.93
TOTAL SPECIFIED COSTS														123.57

Table 8. Wheat before resistant corn, 6-row equipment. Estimated operation costs per acre, Blackbelt Area, Mississippi, 1985.

Operation or Item	Size or Unit	Trac. Num.	Month Perf.	Times Over	Mach. Hours	Tractor Cost		Equip. Cost		Labor	Material (or service)			Total Costs
						Direct	Fixed	Direct	Fixed	Hours	Quant.	Price	Cost	
						----------Dollars----------						----------Dollars----------		
Stalk Shredder	4-row	5	Oct	1.00	0.160	1.34	1.53	0.26	1.08	0.160				4.21
Lime (Spread) BB	ton		Oct	1.00							0.500	15.00	7.50	7.50
Chisel Plow	16 ft	5	Oct	2.00	0.440	3.67	4.22	0.54	1.37	0.440				9.81
Spin Spreader	300 bu	3	Oct	1.00	0.100	0.65	0.71	0.59	1.11	0.100				3.06
Fert 0-24-24	cwt										3.000	9.19	27.57	27.57
Nitrate (34% N)	cwt										0.900	9.49	8.54	8.54
Disk Harrow	21 ft	5	Oct	1.00	0.140	1.17	1.34	0.63	1.30	0.140				4.44
Section Harrow	6-row	3	Oct	1.00	0.100	0.65	0.71	0.04	0.09	0.100				1.49
Grain Drill	24 ft	5	Oct	1.00	0.140	1.17	1.34	1.04	2.28	0.140				5.82
Wheat Seed	lb										90.000	0.12	10.80	10.80
Spin Spreader	300 bu	3	Feb	1.00	0.100	0.65	0.71	0.59	1.11	0.100	3.06			
Nitrate (34% N)	cwt										2.100	9.49	19.93	19.93
Combine-SB/WH	20 ft		Jun	1.00	0.230			8.35	13.89	0.230				22.24
Grain Cart	250 bu	3	Jun	1.00	0.120	0.78	0.86	0.18	0.40	0.120				2.21
Haul Wheat	bu		Jun	1.00							36.300	0.14	5.08	5.08
TOTALS						10.06	11.43	12.20	22.63				79.42	135.74
INTEREST ON OPERATING CAPITAL														6.65
TOTAL SPECIFIED COSTS														142.39

Table 9. Resistant corn after wheat, 6-row equipment. Estimated operation costs per acre, Blackbelt Area, Mississippi, 1985.

Operation or Item	Size or Unit	Trac. Num.	Month Perf.	Times Over	Mach. Hours	Tractor Cost		Equip. Cost		Labor	Material (or service)			Total Costs
						Direct	Fixed	Direct	Fixed	Hours	Quant.	Price	Cost	
						----------Dollars----------						----------Dollars----------		
Plant-NT+Pre	6-row	5	Jun	1.00	0.170	1.42	1.63	0.67	1.69	0.170				5.41
Corn Seed	lb										7.000	1.10	7.70	7.70
Alachlor	lb										1.000	5.05	5.05	5.05
Cultivate-Early	6-row	3	Jul	1.00	0.210	1.36	1.50	0.28	0.63	0.210				3.77
Cult Early + Fert	6-row	3	Jul	1.00	0.210	1.36	1.50	0.54	1.03	0.210				4.43
Nitrate (34% N)	cwt										5.300	9.49	50.30	50.30
Cultivate-Late	6-row	3	Aug	1.00	0.140	0.90	1.00	0.19	0.42	0.140				2.51
Combine-Corn	4-row		Sep	1.00	0.330			13.44	22.71	0.330				36.15
Grain Cart	250 bu	3	Sep	1.00	0.120	0.78	0.86	0.18	0.40	0.120				2.21
Haul Corn	bu		Sep	1.00							63.000	0.16	10.08	10.08
TOTALS						5.81	6.48	15.30	26.88				73.13	127.61
INTEREST ON OPERATING CAPITAL														1.66
TOTAL SPECIFIED COSTS														129.27

Table 10. Wheat before soybeans, 6-row equipment. Estimated operation costs per acre, Blackbelt Area, Mississippi, 1985.

Operation or Item	Size or Unit	Trac. Num.	Month Perf.	Times Over	Mach. Hours	Tractor Cost		Equip. Cost		Labor	Material (or service)			Total Costs
						Direct	Fixed	Direct	Fixed	Hours	Quant.	Price	Cost	
						----------Dollars----------						----------Dollars----------		
Lime (Spread) BB	ton		Nov	1.00							1.000	15.00	15.00	15.00
Spin Spreader	300 bu	3	Nov	1.00	0.100	0.65	0.71	0.59	1.11	0.100				3.06
Fert 0-24-24	cwt										3.000	9.19	27.57	27.57
Spin Spreader	300 bu	3	Feb	1.00	0.100	0.65	0.71	0.59	1.11	0.100				3.06
Nitrate (34% N)	cwt										2.400	9.49	22.78	22.78
Combine-SB/WH	20 Ft		Jun	1.00	0.230			8.35	13.89	0.230				22.24
Grain Cart	250 bu	3	Jun	1.00	0.120	0.78	0.86	0.18	0.40	0.120				2.21
Haul Wheat	bu		Jun	1.00							40.400	0.14	5.66	5.66
TOTALS						2.07	2.28	9.70	16.51				71.00	101.56
INTEREST ON OPERATING CAPITAL														4.36
TOTAL SPECIFIED COSTS														105.92

Table 11. Soybeans after wheat, 6-row equipment. Estimated operation costs per acre, Blackbelt Area, Mississippi, 1985.

Operation or Item	Size or Unit	Trac. Num.	Month Perf.	Times Over	Mach. Hours	Tractor Cost		Equip. Cost		Labor	Material (or service)			Total Costs
						Direct	Fixed	Direct	Fixed	Hours	Quant.	Price	Cost	
						----------Dollars----------						----------Dollars----------		
Plant-NT+Pre	6-row	5	Jun	1.00	0.170	1.42	1.63	0.67	1.69	0.170				5.41
Soybean Seed	lb										45.000	0.17	7.65	7.65
Alachlor	lb										1.000	5.05	5.05	5.05
Cultivate-Early	6-row	3	Jul	1.00	0.210	1.36	1.50	0.28	0.63	0.210				3.77
Cultivate-Late	6-row	3	Jul	1.00	0.140	0.90	1.00	0.19	0.42	0.140				2.51
Cult + Post-Late	6-row	5	Aug	1.00	0.180	1.50	1.73	0.33	0.74	0.180				4.30
Linuron	lb										0.700	10.67	7.47	7.47
Plant by Air			Oct	1.00										0.00
Plant by Air	cwt										0.900	3.50	3.15	3.15
Wheat Seed	lb										90.000	0.12	10.80	10.80
Combine-SB/WH	20 ft		Nov	1.00	0.230			8.35	13.89	0.230				22.24
Grain Cart	250 bu	3	Nov	1.00	0.120	0.78	0.86	0.18	0.40	0.120				2.21
Haul Soybean	bu		Nov	1.00							22.000	0.16	3.52	3.52
TOTALS						5.96	6.71	9.99	17.77				37.64	78.07
INTEREST ON OPERATING CAPITAL														1.37
TOTAL SPECIFIED COSTS														79.44

Table 12. Wheat before grain sorghum, 6-row equipment. Estimated operation costs per acre, Blackbelt Area, Mississippi, 1985.

Operation or Item	Size or Unit	Trac. Num.	Month Perf.	Times Over	Mach. Hours	Tractor Cost		Equip. Cost		Labor	Material (or service)			Total Costs
						Direct	Fixed	Direct	Fixed	Hours	Quant.	Price	Cost	
						----------Dollars----------						----------Dollars----------		
Stalk Shredder	4-row	5	Oct	1.00	0.160	1.34	1.53	0.26	1.08	0.160				4.21
Lime (Spread) BB	ton		Oct	1.00							0.500	15.00	7.50	7.50
Chisel Plow	16 ft	5	Oct	2.00	0.440	3.67	4.22	0.54	1.37	0.440				9.81
Spin Spreader	300 bu	3	Oct	1.00	0.100	0.65	0.71	0.59	1.11	0.100				3.06
Fert 0-24-24	cwt										3.000	9.19	27.57	27.57
Nitrate (34% N)	cwt										0.900	9.49	8.54	8.54
Disk Harrow	21 ft	5	Oct	1.00	0.140	1.17	1.34	0.63	1.30	0.140				4.44
Section Harrow	6-row	3	Oct	1.00	0.100	0.65	0.71	0.04	0.09	0.100				1.49
Grain Drill	24 ft	5	Oct	1.00	0.140	1.17	1.34	1.04	2.28	0.140				5.82
Wheat Seed	lb										90.000	0.12	10.80	10.80
Spin Spreader	300 bu	3	Feb	1.00	0.100	0.65	0.71	0.59	1.11	0.100				3.06
Nitrate (34% N)	cwt										2.100	9.49	19.93	19.93
Combine-SB/WH	20 ft		Jun	1.00	0.230			8.35	13.89	0.230				22.24
Grain Cart	250 bu	3	Jun	1.00	0.120	0.78	0.86	0.18	0.40	0.120				2.21
Haul Wheat	bu		Jun	1.00							32.200	0.14	4.51	4.51
TOTALS						10.06	11.43	12.20	22.63				78.85	135.17
INTEREST ON OPERATING CAPITAL														6.65
TOTAL SPECIFIED COSTS														141.82

Table 13. Grain sorghum after wheat, 6-row equipment. Estimated operation costs per acre, Blackbelt Area, Mississippi, 1985.

Operation or Item	Size or Unit	Trac. Num.	Month Perf.	Times Over	Mach. Hours	Tractor Cost		Equip. Cost		Labor	Material (or service)			Total Costs
						Direct	Fixed	Direct	Fixed	Hours	Quant.	Price	Cost	
						Dollars						Dollars		
Plant-NT+Pre	6-row	5	Jun	1.00	0.170	1.42	1.63	0.67	1.69	0.170				5.41
Grain Sorghum Seed	lb										6.000	0.79	4.74	4.74
Propazine	lb										1.200	4.38	5.26	5.26
Cultivate-Early	6-row	3	Jul	1.00	0.210	1.36	1.50	0.28	0.63	0.210				3.77
Cult Early + Fert	6-row	5	Jul	1.00	0.210	1.75	2.01	0.54	1.03	0.210				5.34
Nitrate (34% N)	cwt										3.000	9.49	28.47	28.47
Cultivate-Late	6-row	3	Aug	1.00	0.140	0.90	1.00	0.19	0.42	0.140				2.51
Spray-TR														
Mount-3Pt.	21 ft	3	Aug	2.00	0.360	2.33	2.57	0.18	0.34	0.360				5.41
Diazinon	lb										1.200	10.49	12.59	12.59
Combine-Grain SGM	20 ft		Oct	1.00	0.200			7.26	12.08	0.200				19.33
Grain Cart	250 bu	3	Oct	1.00	0.120	0.78	0.86	0.18	0.40	0.120				2.21
Haul Sorghum	bu		Oct	1.00							45.900	0.16	7.34	7.34
TOTALS						8.53	9.57	9.30	16.59				58.40	102.38
INTEREST ON OPERATING CAPITAL														1.93
TOTAL SPECIFIED COSTS														104.31

Table 14. Wheat before sunflower, 6-row equipment. Estimated operation costs per acre, Blackbelt Area, Mississippi, 1985.

Operation or Item	Size or Unit	Trac. Num.	Month Perf.	Times Over	Mach. Hours	Tractor Cost		Equip. Cost		Labor	Material (or service)			Total Costs
						Direct	Fixed	Direct	Fixed	Hours	Quant.	Price	Cost	
						Dollars						Dollars		
Stalk Shredder	4-row	5	Sep	1.00	0.160	1.34	1.53	0.26	1.08	0.160				4.21
Lime (Spread) BB	ton	Sep	1.00								0.500	15.00	7.50	7.50
Chisel Plow	16 ft	5	Oct	2.00	0.440	3.67	4.22	0.54	1.37	0.440				9.81
Spin Spreader	300 bu	3	Oct	1.00	0.100	0.65	0.71	0.59	1.11	0.100				3.06
Fert 0-24-24	cwt										3.000	9.19	27.57	27.57
Nitrate (34% N)	cwt										0.900	9.49	8.54	8.54
Disk Harrow	21 ft	5	Oct	1.00	0.140	1.17	1.34	0.63	1.30	0.140				4.44
Section Harrow	6-row	3	Oct	1.00	0.100	0.65	0.71	0.04	0.09	0.100				1.49
Grain Drill	24 ft	5	Oct	1.00	0.140	1.17	1.34	1.04	2.28	0.140				5.82
Wheat Seed	lb										90.000	0.12	10.80	10.80
Spin Spreader	300 bu	3	Feb	1.00	0.100	0.65	0.71	0.59	1.11	0.100				3.06
Nitrate (34% N)	cwt										2.100	9.49	19.93	19.93
Combine-SB/WH	20 ft		Jun	1.00	0.230			8.35	13.89	0.230				22.24
Grain Cart	250 bu	3	Jun	1.00	0.120	0.78	0.86	0.18	0.40	0.120				2.21
Haul Wheat	bu		Jun	1.00							40.600	0.14	5.68	5.68
TOTALS						10.06	11.43	12.20	22.63				80.02	136.34
INTEREST ON OPERATING CAPITAL														6.75
TOTAL SPECIFIED COSTS														143.09

Table 15. Sunflower after wheat, 6-row equipment. Estimated operation costs per acre, Blackbelt Area, Mississippi, 1985.

Operation or Item	Size or Unit	Trac. Num.	Month Perf.	Times Over	Mach. Hours	Tractor Cost		Equip. Cost		Labor	Material (or service)			Total Costs
						Direct	Fixed	Direct	Fixed	Hours	Quant.	Price	Cost	
						----------Dollars----------						----------Dollars----------		
Plant-NT+Pre	6-row	5	Jun	1.00	0.170	1.42	1.63	0.67	1.69	0.170				5.41
Sunflower Seed	lb										3.000	2.60	7.80	7.80
Oryzalin	lb										1.500	12.75	19.13	19.13
Cult Early + Fert	6-row	5	Jul	1.00	0.210	1.75	2.01	0.54	1.03	0.210				5.34
Nitrate (34% N)	cwt										3.000	9.49	28.47	28.47
Cultivate-Late	6-row	3	Aug	1.00	0.140	0.90	1.00	0.19	0.42	0.140				2.51
Combine-SF	4-row		Sep	1.00	0.300			11.13	18.57	0.300				29.70
Grain Cart	250 bu	3	Sep	1.00	0.120	0.78	0.86	0.18	0.40	0.120				2.21
Haul Sunflowers	cwt		Sep	1.00							14.000	0.28	3.92	3.92
TOTALS						4.85	5.50	12.70	22.11				59.31	104.48
INTEREST ON OPERATING CAPITAL														1.62
TOTAL SPECIFIED COSTS														106.11

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