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OST REDUCTION RESEARCH FOR COTTON PRODUCTION SYSTEM IN THE YAZOO-MISSISSIPPI DELTA (A PROGRESS REPORT)

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/ith the increasing costs of production uts and declining prices for cotton, ys to reduce the cost of growing ton must be found. This study is igned to look at some practices which ght reduce production costs in cotton.

xperiments have been carried out each ir since 1966 at the Delta Branch periment Station, Stoneville, ssissippi, to study the effect of seedbed paration and preemergence herbicides cotton yield and cost of production. e experiments consisted of 12 different dbed preparation and preemergence bicide treatments over the 4-year iod (table 1).

ield plots were 4 to 8 rows in width ended the length of the field. Two to ir fields were used each year with row gths ranging from 440 to 1,080 feet. A domized block design was used with 2 7 replications according to field size. A x 4 skip-row pattern was planted the st two years and a solid pattern the last o years. These experiments were nducted on various soil types which cluded Bosket very fine sandy loam, ndee silty clay loam, and Tunica silty y.

Stalks were cut and all plots sub-soiled rpendicular to the row direction in the ll. Spring seedbed preparation of the dded and flat planted plots consisted of o chiselings, two diskings, and one noothing operation with a ringtoothed harrow or "Do All"[3]. here a preplant herbicide such as eflan or Planavin was used, it was corporated with the "Do All." The dded plots required an additional eration with a middle buster or row pper and in some cases, depending on eather and weed growth, it was necessary to use the hippers a second time. The stubble planted plots required, in addition to the application of contact herbicide, one operation with a "Do All" to smooth and fill the crevices left by the fall subsoiling.

All fields and treatments each year were planted with the Stoneville 213 variety using a sword opener planter in conjunction with front mounted Stoneville blades. The banded herbicides, systemic insecticides, and soil fungicides were applied during the planting operation. A double disk opener planter might have performed better on the flat and stubble planted plots, but it was unavailable.

Postemergence weed control including cultivation, herbicides, and flame were used as needed. Four rows of all plots were harvested with a 2-row mechanical picker twice each year except in 1968 when only one harvest was required.

Weed Control

Weed control was more difficult where cotton was planted flat as compared to that planted on beds. Treflan or Planavin broadcast and incorporated was more

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[3] Mention of a trademark or proprietary product does not constitute a guarantee or warranty of the product by the Experiment Station and does not imply its approval to the exclusion of other products that may also be suitable.

effective on the flat planting than any of the 20-inch band treatments, Karmex broadcast on the surface and/or Karmex broadcast and incorporated. The banded treatments of Karmex and Cotoran were equal to incorporated Treflan and Planavin so far as postemergence weed control was concerned. The most effective treatment for control of most weed species involved in these tests was Treflan and Planavin broadcast and incorporated before planting plus a 20-inch band of Cotoran or Karmex at planting. However, this is an expensive method of control that might be accomplished more economically with less herbicides and more intensive cultivation.

Where Treflan or Planavin was used for 2 to 4 years, annual grass control was excellent, but there was a definite increase in the population of prickly sida. The continued use of Karmex or Cotoran, as compared with Treflan or Planavin, increased the incidence of annual grasses but was better for control of prickly sida. Alternating the use of Treflan or Planavin and Karmex or Cotoran where both annual grasses and prickly sida are problems might be a more practical solution to preemergence weed control.

Plant Growth and Yield

Adequate yield surface drainage is a prerequisite to flat planting. It was difficult to obtain stands where surface drainage was inadequate, especially where frequent and heavy rains occurred immediately after planting flat. The greatest drainage problems encountered with the flat planting in these tests were in the 4 x 4 skip-row pattern where the seedbed was prepared on four rows and left unprepared on the other four. After planting, the 4-row skips acted as lateral dams and caused some flooding during heavy rainfall. This problem also occurred to a lesser extent on the 8-row plots of solid planted cotton, especially where the flat plot was bordered by bedded plots. This would be of no consequence in a farm sized field where the land was uniformly prepared, especially on l formed fields.

The flat and stubble planting was n efficiently accomplished in the silty loam and silty clay than in the very sandy loam soil. Less soil compac after seedbed preparation on the hea soil types could account to some ex for improved planting efficiency.

The stubble planted cotton emer and grew faster than flat or conventi bed planted cotton. Compaction crusting of the soil surface was redu by plant residue which probably ai emergence.

As indicated in Table 1, there was significant difference in cotton y between any of the treatments for year. In 1966, weed control inadequate for treatments 3, 8, an where herbicides were banded. The lo yields of these three treatments w probably caused by weed competiti The 20-inch banded herbicide treatme on the flat plots were very inefficient were abandoned after 1966.

There were significant differences yield between some treatments on cert soil types and in certain years as show Table 2. In 1967, yields were significa reduced in field 9 (Bosket very fine sa loam soil) where Treflan was broadc and incorporated preplant and Coto applied in a 20-inch band at planti Late maturing cotton combined wit November 3 freeze (approximat normal) was probably responsible for l yields.

The second-year stubble planted cot in field 2 produced significantly m cotton in 1968 than any of the othe treatments. There is no adequ explanation for this yield increase fr 2-year stubble planting except that cotton plants emerged sooner, gr faster, and matured earlier.

The stubble planted cotton produc significantly less cotton than any otl treatment in field 9 in 1968. The lov yield from stubble planting in this c was probably caused by inadequate pl stands. Field 9 was heavily infested w

ennial rescuegrass which made stubble
nting difficult with a sword opener
ter. However, rescuegrass is not a
blem weed on Delta farms. This field
infested as a result of earlier
cuegrass experiments.

1 1969, yields from 3 years of stubble
nted cotton in field 2 were
nificantly higher than the other six
atments. The 3-year stubble planting in
d 7, while not significant at the 0.05
el, produced considerably more cotton
n all other treatments. There seems to
some benefit derived from continuous
bble planting because in 1969 3-year
bble produced more than 1-year
bble cotton.

Table 3 shows the average of all flat and
ided treatments of all fields for a
ear period compared with the average
ld of stubble planted cotton. There
s practically no difference in yield
tween the three seedbed preparation
ethods in 1967. Yield was slightly
her from two consecutive years of
bble planted cotton in 1968 as
mpared with bedded and flat planted
atments. The yield advantage was even
eater in 1969 after three consecutive
ars of stubble planting. The 3-year
erage shows a definite yield increase
m stubble planting.

The greatest disadvantage of stubble
nting in this study was the high cost of
e contact herbicides used to destroy
nter vegetation. It may not be
cessary to destroy winter vegetation
cause most of these weeds mature and
e shortly after cotton is planted.
periments are now in progress to
termine if winter weeds should be
stroyed and to develop cheaper
ethods for destroying them.

Stubble planting is not presently
commended by the Mississippi
gricultural and Forestry Experiment
ation, however, if farmers should
tempt to plant in this manner it is
ggested that they plant a small acreage
a relatively weed-free field. It should
ot be planted in a field infested with
erennial weeds or verticillium wilt.

Costs Associated with Various Seedbed Preparation and Weed Control Methods

Records were kept on each operation associated with seedbed preparation and weed control. Tractor costs are those associated with an 80 horsepower tractor, labor costs were assumed to be $1.50 per hour, and the materials were priced as of January 1970. Interest on operating capital was charged at 8 percent for 6 months. Tables 4, 5, and 6 present the seedbed preparation costs associated with conventional seedbed preparation, flat seedbed preparation, and stubble seedbed preparation, respectively. Fertilization and planting are included to make all seedbed preparation methods compatible. From these tables it can be seen that stubble seedbed preparation is $3.39 cheaper per acre than conventional seedbed preparation and $1.62 cheaper than flat seedbed preparation. Because the stubble cotton was sidedressed, a lower rate of nitrogen fertilizer was used, costing $1.71 less. The cost of sidedressing of $1.28 partially offset the lower fertilizer cost. After adjusting for fertilizer costs, stubble seedbed preparation is $2.96 cheaper than conventional seedbed preparation, and $1.19 cheaper than flat seedbed preparation. The cost of the contact herbicide used, Paraquat and MSMA, offset much of the savings resulting from the reduced number of operations. If one bedding (hipping) could be substituted for these chemicals, an additional savings of $4.14 could be made with stubble planting. That is, the cost of the chemicals ($4.13) and application ($1.08), less the cost of bedding ($1.07).

This analysis does not include any consideration of yield increase associated with continuous stubble seedbed preparation, but if such a response can be proven the extra yield will have to be considered in any future analysis of stubble seedbed preparation.

The effects of various preemergence herbicides and combination of pereemergence herbicides on total weed

Table 1. Cotton yields of systems tests, Delta Branch Experiment Station, Stoneville, Mississippi (1966-1969).

Treatments	Plant 4 - skip 4			Solid planted		
	1966 4 fields	1967 3 fields	66-67 Avg.	1968 2 fields	1969 3 fields	68-69 Avg.
	Pounds of seed cotton per acre					
1. Bed, plant, Karmex 20" band	4053	3846	3950	2392	2132	2262
2. Bed, plant, Cotoran 20" band	--	--	--	--	2206	--
3. Bed, Treflan 20" band, plant	3789	--	--	--	2174	--
4. *Treflan broadcast, bed, plant	3876	3799	3838	2338	2288	2313
5. *Treflan broadcast, bed, plant Karmex 20" band	--	--	--	2403	2123	2263
6. *Treflan broadcast, bed, plant Cotoran 20" band	--	3599	--	2371	--	--
7. *Treflan broadcast, plant flat	4044	3673	3859	2411	2097	2254
8. Treflan 20" band, plant flat	3789	--	--	--	--	--
9. Plant flat, Karmex 20" band	3638	--	--	--	--	--
10. Plant flat, Karmex broadcast on soil surface	--	3772	--	--	--	--
11. Karmex broadcast and incorporated, plant flat	--	--	--	2474	--	--
12. One pint each Paraquat and MSMA broadcast on vegetation, stubble plant, Cotoran 20" band	--	3761	--	2546	2444	2495
LSD @ .05	NS	NS		NS	NS	

* Planavin was substituted for Treflan in 1968.

Table 2. Significant yield differences in the cotton systems tests, Delta Branch Experiment Station, Stoneville, Mississippi (1967-1969).

Treatments	1967	1968		1969	
	Field 9[1]	Field 2[2]	Field 9	Field 2	Field 7[3]
	Pounds of seed cotton per acre				
1. Bed, plant, Karmex 20" band	3968	2252	2531	2021	2051
2. Bed, plant, Cotoran 20" band	--	--	--	2281	2089
3. Bed, Treflan 20" band, plant	--	--	--	2046	2033
4. Treflan broadcast, bed, plant	3853	2299	2377	2401	1995
5. Treflan broadcast, bed, plant, Karmex 20" band	--	2377	2428	2001	2089
6. Treflan broadcast, bed, plant, Cotoran 20" band	3517	2196	2546	--	--
7. Treflan broadcast, plant flat	3831	2184	2637	2162	1753
10. Plant flat, Karmex broadcast on soil surface	3963	--	--	--	--
11. Karmex broadcast and incorporated, plant flat	--	2372	2430	--	--
12. One pint each Paraquat and MSMA broadcast on vegetation, stubble plant, Cotoran 20" band	3909	2949	2143	2640	2387
LSD @ .05	236	425	190	239	N.S.
C.V.	6.2%	12.0%	6.6%	7.2%	

1/ Field 9 - Bosket very fine sandy loam soil 7 replications.
2/ Field 2 - Dundee silty clay loam soil 4 replications.
3/ Field 7 - Tunica silty clay soil 2 replications.

control costs were evaluated. As indicated in another portion of this report, there was some variation between tests in some fields in some years. Generally, however, the type of preemergence herbicide used did not affect inputs for postemergence weed control. Tables 7 through 11 indicate total costs associated with various preemergence herbicides. The cost of the preemergence herbicides plus their application determined the difference in total costs as all postemergence weed control practices and inputs are the same. The total costs ranged from $23.00 p acre where a 20-inch band of Karmex s used to $29.37 per acre broadcast Tref plus a 20-inch band of Cotoran.

Every preemergence herbicide r combination of preemergence herbici s may have some usefulness in specific g s and weed situations. It would app however, that weed control costs i cotton can be reduced if the m appropriate preemergence herbicide we used for the grass and weed situatio each cotton field.

Summary

Experiments were conducted over a 4-year period (1966-1969) on different soil types at the Delta Branch Experiment Station, Stoneville, Mississippi, to study the effect of seedbed preparation and preemergence herbicides on cotton yield and cost of production.

1. In 1967, first-year stubble planted cotton yields were equal to those of cotton (conventional seedbed preparation) planted flat and on beds.

2. In 1968, second-year stubble planted cotton yields were higher than those of cotton planted flat and on beds.

3. The third-year stubble planting produced significantly more cotton in 1969 than the flat and bedded plantings.

4. The contact herbicides (Paraquat and MSMA) used to kill winter weeds in the stubble planted cotton were expensive ($4.13 per acre for herbicides). If winter weeds must be controlled, chea methods must be devised.

5. Incorporated Treflan or Plana gave better control of annual grasses l the incidence of prickly sida increa where these herbicides were u continuously.

6. Banded Karmex and Cotoran. most cases, adequately controlled an grasses and gave better control of pric sida than Treflan and Planavin.

7. There was no difference in number or cost of postemerge operations required to control weeds any of the preemergence herbic treatments.

8. Total per acre cost inclu preemergence herbicides, application, all subsequent postemergence operati ranged from $23.01 for a 20-inch ban Karmex to $29.37 for incorpora Treflan plus a 20-inch band of Coto

ale 3. Effect of seedbed preparation on yield of cotton, Delta Branch Experiment Station, Stoneville, Mississippi.

Treatment	Plant 4 - Skip 4	Solid planted		3-year average
	1967[1]	1968[2]	1969[1]	
	Pounds of seed cotton per acre			
ventional seedbed planted on beds	3748	2376	2185	2770
ventional seedbed planted flat	3723	2443	2097	2754
uble planted[3]	3761	2546	2444	2917

verage of 3 fields.
verage of 2 fields.
ubble planted 1, 2, and 3, consecutive years for 1967, 1968, and 1969, spectively.

ale 4. SOLID COTTON: Estimated costs per acre, 4-row equipment, sandy soils, conventional seedbed preparation.

ration	Tractor costs		Equipment costs		Labor costs	Materials costs
	Direct	Fixed	Direct	Fixed		
	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars
u stalks	.37	.24	.05	.18	.36	--
soil	1.01	.64	.18	.27	.98	--
sel	.47	.29	.08	.17	.45	--
sel & Fertilize	.51	.32	.09	.19	.50	6.16
k	.36	.23	.17	.29	.35	--
k	.36	.23	.17	.29	.35	--
e	.31	.20	.10	.16	.30	--
ed	.31	.20	.10	.16	.30	--
condition	.31	.20	.12	.24	.30	--
nt & preemerge	.37	.24	.21	.44	.72	5.41
ctor and trailer	.10	.12	.06	.13	.40	--
totals	4.48	2.91	1.33	2.52	5.01	11.57
Interest on operating capital			.90			
Total costs per acre			28.72			

le 5. SOLID COTTON: Estimated costs per acre, 4-row equipment, sandy soils, flat seedbed preparation.

ration	Tractor costs		Equipment costs		Labor costs	Materials costs
	Direct	Fixed	Direct	Fixed		
	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars
stalks	.37	.24	.05	.18	.36	--
soil	1.01	.64	.18	.27	.98	--
sel	.47	.29	.08	.17	.45	--
sel & fertilize	.51	.32	.09	.19	.50	6.16
k	.36	.23	.17	.29	.35	--
k	.36	.23	.17	.29	.35	--
condition & corporate herbicides	.31	.20	.12	.24	.30	2.94
nt	.37	.24	.21	.44	.72	2.88
ctor & trailer	.10	.12	.06	.13	.40	--
totals	3.86	2.51	1.13	2.20	4.41	11.98
Interest on operating capital			.86			
Total costs per acre			26.95			

Table 6. SOLID COTTON: Estimated costs per acre, 4-row equipment, sandy ... stubble seedbed preparation.

Operation	Tractor costs Direct	Tractor costs Fixed	Equipment costs Direct	Equipment costs Fixed	Labor costs	Mat... co...
	Dollars	Dollars	Dollars	Dollars	Dollars	Do...
Cut stalks	.37	.24	.05	.18	.36	
Subsoil	1.01	.64	.18	.27	.98	
Row condition	.31	.20	.12	.24	.30	
Apply contact herbicides	.39	.25	.03	.04	.37	1
Sidedress	.39	.25	.03	.13	.38	
Plant	.37	.24	.21	.44	.72	
Tractor and trailer	.10	.12	.06	.13	.40	
Subtotals	2.94	1.94	.68	1.43	3.51	1
Interest on operating capital		.84				
Total costs per acre		25.33				

Table 7. SOLID COTTON: Weed control costs, 4-row equipment, sandy soils, ... Karmex on 20-inch band.

Operation	Tractor costs Direct	Tractor costs Fixed	Equipment costs Direct	Equipment costs Fixed	Labor costs	Mate... co...
	Dollars	Dollars	Dollars	Dollars	Dollars	Dol...
Banded Karmex	--	--	.04	.09	--	1.0
Cultivate	.39	.25	.08	.14	.38	
Cultivate and postemerge	.43	.27	.11	.19	.42	1.5
Cultivate & postemerge	.43	.27	.11	.19	.42	1.6
Cultivate & postemerge	.37	.24	.09	.17	.36	.6
Cultivate & flame	.45	.28	.11	.20	.44	.5
Cultivate & postemerge	.37	.24	.09	.17	.36	2.5
Hand weed control	--	--	--	--	6.00	
Subtotals	2.44	1.55	.63	1.15	8.38	8.7
Interest on operating capital		.78				
Total costs per acre		23.00				

ble 8. SOLID COTTON: Weed control costs, 4-row equipment, sandy soils, Cotoran on 20-inch band.

ation	Tractor costs Direct	Tractor costs Fixed	Equipment costs Direct	Equipment costs Fixed	Labor Costs	Materials costs
	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars
ed Cotoran	--	--	04	.09	--	2.53
ivate	.39	.25	.08	.14	.38	--
ivate & postemerge	.43	.27	.11	.19	.42	1.05
ivate & postemerge	.43	.27	.11	.19	.42	1.56
ivate & postemerge	.37	.24	.09	.17	.36	.66
ivate & flame	.45	.28	.11	.20	.44	.65
ivate & postemerge	.37	.24	.09	.17	.36	2.85
a weed control	--	--	--	--	6.00	--
otals	2.44	1.55	.63	1.15	8.38	9.30
nterest on operating capital		.83				
otal costs per acre		24.28				

ble 9. SOLID COTTON: Weed control costs, 4-row equipment, sandy soils, broadcast Treflan.

cation	Tractor costs Direct	Tractor costs Fixed	Equipment cost Direct	Equipment cost Fixed	Labor costs	Materials costs
	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars
All & incorporate rbicides	.31	.20	.12	.24	.30	2.94
ctor & trailer	.10	.12	.06	.13	.40	--
tivate	.39	.25	.08	.14	.38	--
tivate & postemerge	.43	.27	.11	.19	.42	1.05
tivate & postemerge	.43	.27	.11	.19	.42	1.56
tivate & postemerge	.37	.24	.09	.17	.36	.66
tivate & flame	.45	.28	.11	.20	.44	.65
tivate & postemerge	.37	.24	.09	.17	.36	2.85
d weed control	--	--	--	--	6.00	--
totals	2.85	1.87	.77	1.43	9.08	9.71
Interest on operating capital		.90				
Total costs per acre		26.61				

Table 10. SOLID COTTON: Weed Control costs, 4-row equipment, sandy soils broadcast Treflan + Karmex.

Operation	Tractor costs Direct	Tractor costs Fixed	Equipment costs Direct	Equipment costs Fixed	Labor costs	Mater co
	Dollars	Dollars	Dollars	Dollars	Dollars	Dol
Do All & incorporate herbicides	.31	.20	.12	.24	.30	
Tractor & trailer	.10	.12	.06	.13	.40	
Banded Karmex	--	--	.04	.09	--	
Cultivate	.39	.25	.08	.14	.38	
Cultivate & postemerge	.43	.27	.11	.19	.42	
Cultivate & postemerge	.43	.27	.11	.19	.42	
Cultivate & postemerge	.37	.24	.09	.17	.36	
Cultivate & flame	.45	.28	.11	.20	.44	
Cultivate & postemerge	.37	.24	.09	.17	.36	
Hand weed control	--	--	--	--	6.00	
Subtotals	2.85	1.87	.81	1.52	9.08	1
Interest on operating capital		.95				
Total costs per acre		28.09				

Table 11. SOLID COTTON: Weed Control costs, 4-row equipment, sandy soils broadcast Treflan + banded Cotoran.

Operation	Tractor costs Direct	Tractor costs Fixed	Equipment costs Direct	Equipment costs Fixed	Labor costs	Mate co
	Dollars	Dollars	Dollars	Dollars	Dollars	Do
Do All & incorporate Herbicides	.31	.20	.12	.24	.30	
Tractor & trailer	.10	.12	.06	.13	.40	
Banded Cotoran	--	--	.04	.09	--	
Cultivate	.39	.25	.08	.14	.38	
Cultivate & postemerge	.43	.27	.11	.19	.42	
Cultivate & postemerge	.43	.27	.11	.19	.42	
Cultivate & postemerge	.37	.24	.09	.17	.36	
Cultivate & flame	.45	.28	.11	.20	.44	
Cultivate & postemerge	.37	.24	.09	.17	.36	
Hand weed control	--	--	--	--	6.00	
Subtotals	2.85	1.87	.81	1.52	9.08	12
Interest on operating capital		1.00				
Total costs per acre		29.37				