

THE IMPACT OF NARROW SKIP-ROW COTTON ON COST PER POUND

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Introduction

Because production costs have been trending upward relative to the price of lint, many producers are trying or considering alternative cotton production systems. The relationship between cotton price and production costs has changed considerably in recent years. The question is, at what range of prices of cotton does the difference in production costs and difference in yields favor solid cotton and over what range of prices is skip-row preferred. In general, an acre of solid cotton exhibits higher yields than one acre of skip-row cotton. Cotton is sold by the pound. This report examines narrow-skip versus solid cotton in terms of cost and yield.

Standard Comparison

In the past, the distinction between a cotton acre and a land acre was important in an agronomic and economic sense. While the agronomic relationships are still valid, the economic distinction between a land acre and a cotton acre have vanished. All yields, costs, and returns in this report are reported on a *land basis* for dryland, or non-irrigated, cotton.

Relative to solid planted 40-inch cotton, full-skip, usually denoted "2x1," has an 80-inch skip between the drills in the skip-row. In other words, full-skip has an additional 40-inch skip for every third unplanted row. The narrow-skip planting pattern has a 64-inch skip between the drills in the skip-row, i.e., an additional 24-inch skip relative to solid planted but 16 inches less than a full skip pattern. Hence, narrow-skip exhibits higher yields than a full-skip pattern. The narrower the skip, the closer the yield of skip-row cotton approaches the yield of solid planted cotton.

Yield

Most of the replicated research on skip-row planting patterns was conducted during the early 1970's. Table 1 summarizes five studies conducted by scientists at the Stoneville experiment station [Cooke, 1975; Cooke and Heagler, 1969; Cooke and Spurgeon, 1975; Cooke et al, 1972; Fulgham et al, 1973]. Much of this research compared a full-skip pattern

versus solid planted cotton. The reader is reminded that narrow-skip out-yields full-skip. The Stoneville wide-bed planting pattern, which is closer to narrow-skip than full-skip ("2 x 1"), yielded on average 96 percent of solid. The other studies ranged from 88-92 percent of solid. Thus, growers considering a shift from solid to skip-row cotton must be able to produce high yields (more than 90% of the solid yield on a land acre basis).

The Department of Agricultural Economics annual cost of producing cotton reports [Delta 1999 Planning Budgets], utilize a yield of 825 pounds of lint per acre for solid planted cotton versus 760 pounds per acre for narrow-skip, or 92 percent of solid.

Costs

Solid cotton planted in 40-inch rows has 13,068 linear feet of row per acre while narrow-skip has 10,052.3 linear feet of row per acre. A narrow-skip pattern is 76.92 percent cotton relative to solid planted cotton (narrow-skip/solid). Hence, materials applied "down the row" are 76.92 percent of the rate applied to solid planted cotton. Additionally, there is another important distinction. The narrow-skip cost adjustments to the solid estimates of cost are related to linear feet of row per acre and improvements in equipment efficiency (especially harvesting units). Land, management, and general farm overhead expenses do not vary for the two systems. One turn, or round, through the field with a 4-row cotton picker in solid planted 40-inch cotton covers 320 inches. One turn with the same picker adjusted to harvest narrow-skip, covers 416 inches of width. With narrow-skip, the performance rates for the cotton harvesting units (pickers, boll buggies, and module builders) as well as the hand (weed control) labor are improved so that their cost per acre is reduced. For example, the performance rate for a fully supported and efficient 4-row picker in solid planted cotton is 0.181 hours per acre [Delta 1999 Planning Budgets]. The performance rate for the same picker in narrow-skip planted cotton is 0.135 hours per acre. One 4-row picker, boll buggy, module builder plus two tow tractors costs more than \$400,000. Not only is harvest direct cost per acre (\$27.00) reduced as a function of the change in performance rate, the potential exists to spread annual fixed cost over additional acres so that the fixed cost per acre (\$32.13) is also reduced. If additional cotton acres are not available and fixed cost per acre is not reduced, harvest is completed in fewer days. A faster (fewer total days) harvest (a type of earliness) increases realized yield and quality or price [Cooke et al, 1998; Cooke et al, 1991; Parvin, 1990; Spurlock et al, 1991; Parvin and Cooke, 1990; Parvin et al, 1987]. Table 2 summarizes the estimated cost and expected yield for solid and narrow-skip cotton. The solid estimates are directly from MSU 1999 cost of production publication(s). The narrow-skip yield is assumed to be to 92 percent of solid. Note that direct costs

and total costs divided by yield (cents per pound) both favor narrow-skip in Table 2.

Net Returns

According to conventional wisdom, low prices favor skip-row planting patterns while high prices favor solid planted cotton. This relationship remains true today, but the relativity of a high price and a low price must be modified to take into account the current cost of production. Table 3 summarizes net returns per acre for the two systems assuming the costs and yields reported in Table 2. In terms of net returns above total costs, solid planted cotton is preferred at cotton prices above \$1.15 per pound. Relative to net returns above direct costs, solid planted cotton is preferred at prices above \$0.99 per pound. Over a reasonable range of cotton prices, the narrow-skip planting pattern is preferred. The reader is cautioned that at the current price of cotton, both systems result in negative profits. The columns associated with net returns above direct cost should be employed with great caution. Economic theory clearly indicates that short-run decisions should be, or can safely be, based on returns above direct cost. In theory, the difference between direct and fixed costs is clear. For many growers with annual equipment payments and land costs, the entire concept of net returns above direct costs can be misleading. Often returns above direct costs are positive and net returns are negative.

Cost Per Pound

At the yields assumed, 825 and 760, the total cost for solid planted cotton is \$0.85 per pound and narrow-skip is \$0.82 per pound [Table 2]. Because of the change in some of the operational inputs, the direct cost per pound differs. Selected items that differ by production system are summarized in Table 4.

Limitations

The research on skip-row versus solid planted cotton summarized in Table 1 was non-irrigated. In years with severe drought skip-row cotton can out-yield solid cotton. For example, in 1971 Fulgham et al. reported that skip-row out-yielded solid by 21 percent. Drought years are a factor in the reported yield relationship of skip-row to solid of 92 to 96 percent. The introduction of irrigation technology will alter the results presented in this report.

Individual growers are cautioned not to use the information summarized in this report for their particular farming situation. They should utilize their own cost and yield data. This information is presented only as a guide. It is all relative to a solid yield of 825 pounds of lint per acre with a per acre production cost of \$703.84. These are estimates of averages. By definition, an average estimate implies that 50 percent of

the growers have a yield higher than 825 pounds of lint per acre and 50 percent of the growers (not necessarily the same 50 percent) have a cost less than \$703.84 per acre.

In the experience of the authors, many growers have a yield of more than 100 pounds greater than the solid yield of 825 employed in this report, and many growers have total costs (primarily direct and fixed costs) over \$100 per acre less than the estimate employed in this report. Also, the relationship between narrow-skip and solid yield is thought to vary from percent of solid depending on the type of cotton soil. There are three types of cotton soil found in the Delta area of Mississippi: deep silt loam, medium silty clay loam, and shallow silty clay. These soils vary by texture and range from excellent, good, to fair in terms of internal and surface drainage. The reader is cautioned that while the percent of solid yield increases as soil productivity decreases, the absolute yield decreases. Additionally, because of soil differences among farms, the 92 percent yield relationship applied in this report may not be large enough for some farms. Such changes will dramatically alter the specific numbers presented in this report, especially the important ones connected in Table 3. For example, if the narrow-skip yield is 850 (an increase of 90 pounds of lint per acre) and total cost per acre is \$472.97 (a decrease of approximately \$150), and the price of seed is \$0.05 per pound, the breakeven price is \$0.49 per pound of lint. If the narrow-skip yield is increased by 40 to 800 and total cost is decreased by \$5.00 to \$467.93, breakeven price is \$0.52.

Conclusions and Implications

Broad based conclusions or recommendations on narrow-skip versus solid cotton are not clear. However, a dryland cotton farmer (no irrigation) with mostly medium silty clay loam and shallow silty clay soils that has historically planted solid cotton probably should consider narrow-skip rather than solid cotton. But this change in technology, at current prices, may not result in positive profits.

However, one thing is clear. Many Mid-South cotton farmers will grow their cotton differently (less costly per acre and per pound) in the year 2000 (a few started in 1999) than was done in the recent past; therefore, individual grower yields and relationships will vary. The difference in the cotton production system may not be in planting pattern, but it will be different.

Table 1. Relative yield per acre, solid vs. skip-row planting pattern, Delta area of Mississippi.

Year	Soil	Length of study	Planting pattern	Yield	Solid yield	% of solid
1969	Sand	4	2x1	711	790	90.00
	Loam		2x1	627	710	88.31
	Clay		2x1	393	580	67.76
1972	Sand	4	2x1	640	730	87.67
1973	Sand	4	SWB ¹	777	809	96.04
1975	Sand	3	2x1	675	730	92.47
1975	Sand	3	2x1	675	767	88.01
1998	Sand	4	NSK ²	760	825	92.12

¹SWD - Stoneville Wide Bed

²NSK - Narrow-skip

Table 2. Estimated cost and expected yield, solid vs. narrow-skip planting pattern, cotton, Delta area of Mississippi, 1999.

Item	Unit	Solid	Narrow-Skip
Yield	Pounds/acre	825	760
Direct cost	dollars/acre	460.92	392.16
Fixed cost	dollars/acre	82.92	71.74
Land	dollars/acre	90.00	90.00
M&OH ¹	dollars/acre	70.00	70.00
Total cost	dollars/acre	703.84	623.90
DC÷Y	cents/pound	55.87	51.60
TC÷Y	cents/pound	85.31	82.09

¹Management plus general farm overhead.

Table 3. Net returns per acre above total cost and direct cost, solid vs. narrow-skip planting pattern, selected cotton prices.

Price	Net Returns			
	Total Cost		Direct Cost	
	Solid	Narrow-Skip	Solid	Narrow-Skip
1.20	510.09	506.99	593.02	578.73
1.10	427.59	430.99	510.52	502.73
1.00	345.09	354.99	428.02	426.73
.90	262.59	278.99	345.52	350.73
.80	180.09	202.99	263.02	274.73
.70	97.59	126.99	186.52	198.73
.60	15.09	50.99	98.02	127.73
.50	-67.40	-25.00	-15.52	46.73
.40	-149.90	-101.00	-66.97	-29.26

Table 4. Estimated Direct, Fixed, & Total Specified Costs per Acre, solid and narrow-skip cotton.

Input	Production System		Difference
	Solid	Narrow-Skip	
Seed	\$14.40	\$10.94	\$3.46
Fertilizer	\$45.04	\$40.15	\$4.89
Herbicide	\$48.88	\$36.21	\$12.67
Fungicide	\$16.32	\$12.40	\$3.92
Insecticide	\$84.06	\$80.42	\$3.64
Operator Labor	\$17.50	\$15.66	\$1.84
Diesel Fuel	\$10.17	\$8.48	\$1.69
Repairs & Maintenance	\$35.27	\$31.38	\$3.89
Gin	\$66.00	\$60.80	\$5.20
Direct Expenses	\$460.92	\$392.16	\$68.76
Fixed Expenses	\$82.92	\$71.74	\$11.18
Total Specified Expenses	\$543.85	\$463.90	\$79.95

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