COTTON

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# ANALYSIS OF NARROW ROW COTTON VS. CONVENTIONALLY GROWN COTTON

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# INTRODUCTION

## Statement of Problem

Agriculture today is changing at an amazing rate. In order to keep up with the problems of high production costs, changing technology, and low profit margins; a farm manager must evaluate new production methods compared to traditional methods and choose the most profitable.

The cotton industry is no exception. With the cost of labor, fuel, equipment, and other inputs constantly rising, the manager must find ways to cut costs while retaining the same quality of cotton produced.

A relatively recent innovation in the cotton industry that might help the producer is narrow row cotton. Producers hope that narrow row cotton will reduce tillage operations and also increase production. But, narrow row cotton production is not without its problems, and the producer must decide if the advantages are greater than the disadvantages.

In the north-central portion of Texas, some producers are changing to narrow row cotton and some are not. Take, for instance, a 500 acre cotton farm in Wilbarger County that consists of a dryland operation using four row equipment. The manager owns other land which grows wheat, so a wheat drill is already owned. He is considering going to the 20-inch row drilled cotton instead of the traditional 40-inch row cotton but cannot decide if the new technique is really more

profitable. He also has the option of either buying a new broadcast harvester or having his cotton custom harvested. What should he do?

Objectives

The objectives of this study were to determine:

A. The costs and returns per acre of an operation using traditional 40-inch rows and four row equipment.
B. The costs and returns per acre of an operation using 20-inch row drilled cotton assuming the crop will be custom harvested.
C. The costs and returns per acre of an operation using 20-inch row drilled cotton assuming ownership of a broadcast harvester with the fixed costs spread over 500 acres.
D. The amount of acreage at which the costs of custom harvesting are equal to the costs of owning a broadcast stripper.

## CONCEPTUAL FRAMEWORK

Agriculture is a complex business requiring good management decisions to keep the operation profitable. In order to increase income in todays marketing systems, farm managers must cut costs while holding production steady or increase production while holding costs steady by increasing efficiency of present methods of production or making new innovations.

I think that innovative narrow row cotton will be more profitable than 40-inch row cotton provided the farm is operated by a good manager. The problem assumes that the manager has both wheat and cotton operations and that he already owns the necessary drills and cotton equipment, except for the harvester.

If 20-inch row production is to be used, the producer must decide if he wants to custom harvest his crop or buy a broadcast stripper. This change will affect both the fixed cost and the variable cost of the cotton operation.

Custom Harvesting 20-inch Rows vs. 40-inch Rows

If the narrow row cotton is custom harvested, the fixed cost curve and variable cost curve will change a little. If custom harvested, no new equipment is necessary to produce 20-inch row cotton because the producer already owns the drills. So, the total fixed cost curve of the narrow row cotton would be above the fixed cost curve of the 40-inch row operation by the amount of the annual depreciation on the drill. But the amount of the drill depreciation will not increase the total fixed cost of the 20-inch row operation much over the fixed cost of the 40-inch row operation.

The biggest difference in cost will probably be variable costs. Narrow row cotton is planted and is not worked again until harvested. Conventional 40-inch row cotton in this area is usually planted, knifed, and cultivated two times. Obviously, the fuel costs, labor costs, and machine maintenance costs will be considerably less for the 20-inch row

cotton. So, the total variable costs will be shifted down by the amount of money that is saved by eliminating the additional cultivation. But, the cotton must be custom harvested. This cost will be higher than the cost of harvesting 40-inch row cotton, and more seed is also planted. This increased cost will shift the total variable cost upward again. The question is whether the savings for fuel, labor, and maintenance are greater or less than the increased costs of harvesting, seed, and drill depreciation. If the savings for these items are larger than the costs, then 20-inch row production will be less expensive to produce than 40-inch row production.

In addition to increasing profits by decreasing production cost, farmers hope that narrow row cotton will increase revenues. According to Marvin Sartin of the Texas A&M Agricultural Research Center in Lubbock, narrow row cotton usually yields about 10% higher than yields on 40-inch row cotton. Since the demand curve for an individual farmer is inelastic, increasing the farm's yield will increase the farm's revenue.

The combination of slightly reduced production costs and 10% higher yields should make narrow row custom harvested cotton more profitable to raise than conventionally raised cotton.

Purchase of Harvester for 20-inch Rows vs. 40-inch Row

In some places, custom harvesting may not be profitable or in some not even possible, so a harvester would have to be bought. The total fixed cost curve of planting narrow row cotton when a broadcast harvester is bought will be increased

by the amount of the new machine and the drill depreciation over the total fixed cost of 40-inch row cotton.

The total variable cost of producing narrow row cotton with a purchased harvester will be less than the variable cost of producing conventionally grown cotton. The total variable cost of producing 20-inch row cotton would be increased slightly due to increases in seed, but it would be reduced by decreases in fuel costs, labor costs, and machine maintenance. The net result probably will be a decrease in total variable cost.

The total cost for 20-inch row production will be higher than the total cost for 40-inch row production at low amounts of output, but the total cost should eventually, as output increases, become less for 20-inch row cotton than for 40-inch row cotton. Also, the yield on 20-inch row cotton should be about 10% higher than the yield on 40-inch row cotton.

Narrow row cotton should be more profitable than 40-inch row cotton even with the higher fixed cost of owning the broadcast stripper.

Custom Harvesting vs. Purchase of Harvester for 20-inch Rows

If narrow row production is used, the decision of whether to buy a broadcast harvester or not should be determined by the amount of output of the farm. The custom harvesting cost will be constant per output no matter how much output there is. If a harvester is bought, the fixed cost for a small amount of output is very high, but the fixed cost decreases with each additional unit of output. At some point

of output, the fixed cost of custom harvesting and the fixed cost of buying a harvester intersects at point Q. At the level of output, Q, it doesn't matter which method of harvesting is used. If output is less than Q, the harvesting should be custom done. If the output is more than Q, the manager should buy his own machine.

Hypothesis

Theoretically, assuming a good manager, 20-inch row cotton will be a little more profitable than conventionally grown 40-inch row cotton because of reduced production costs and increased yields. Whether to custom harvest or buy a harvester will be determined by the amount of output. The subject farm would probably be more profitable if the manager changed to narrow row production.

## RESEARCH METHODS AND PROCEDURES

Most of the information for this report was gathered by talking to agricultural specialists at Texas A&M Research Centers, implement dealers, and cotton producers. This information was used to prepare three budgets to compare returns from different methods of producing cotton on a per acre basis. One budget was for producing cotton in conventional 40-inch rows, one budget was for producing cotton in 20-inch rows and having the crop custom harvested, and the third budget was for producing cotton in 20-inch rows and owning a broadcast cotton harvester.

Budget for 40-Inch Row Cotton

The first budget I developed was for 40-inch rows. The list of assumptions that I made to start with are shown in Table I. Much of the budget that I developed was a modification of two budgets from Mr. Norman Brints, Agricultural Economist Specialist at the Texas A&M Agricultural Research Station in Lockett, Texas. The budgets were developed for the area that the farm is located in.

A yield of 275 lbs/acre was gotten by studying records from the ASCS office for farms in the area. The preharvest variable costs include seed, herbicide, equipment, labor, and interest on operating capital. The equipment costs were obtained by listing the type operation and size of machines used in the area in which the study was done. Labor hours, machine hours, variable costs, and fixed costs on a per acre basis were then obtained from the Agricultural Research Center for each machine. The interest on operating capital assumed a six month loan on the preharvest variable costs. The equipment and labor costs for the harvest costs were obtained from the same equipment sheet that the variable equipment and labor cost came from.

The fixed costs for the budget included equipment and land. The equipment cost came from the equipment sheet developed from information from Mr. Brints. Almost all rent in this area is paid on a sharecrop basis. So, the land cost was based on 1/4 of the crop less 1/4 of the chemicals, ginning, bagging, and ties.

Table I: Assumptions Made in the Three Budgets of Prices Paid and Received by farmers in Dollars

| Prices Paid | Unit | Price |
|---|---|---|
| Cotton seed | Lb. | $ .26 |
| Herbicide | 5 Gallon | 135.00 |
| Custom harvesting | Lb. | .06 |
| Labor | Hour | 2.75 |
| Cotton ginning | Bale | 31.00 |
| Diesel | Gallon | .36 |
| Oil | Gallon | 3.05 |
| Capital | Dollar | .10 |

| Prices Received | Unit | Price |
|---|---|---|
| Cotton | Lb. | $ .38 |
| Cotton seed | Ton | 100.00 |

Budget for 20-Inch Row Cotton - Custom Harvested

The revenue portion of this budget assumed a 10% increase in yield. The amount of seed was figured as 160% of the weight of the lint cotton. The preharvest variable costs had a few minor modifications from the 40-inch row budget for quantities of seed planted and the interest on operating capital. But, the major change came from the equipment and labor costs. The equipment sheet for this budget was developed by taking the equipment sheet for 40-inch row cotton and deleting all operations that would not be needed for narrow row cotton. The operations that were removed were the lister planter two times, the knife once, the cultivator two times, and the stripping. The cost of drilling was added back.

The major change in the harvesting costs consisted of removing the stripper and labor cost from the 40-inch row budget and adding the cost of hiring custom harvesting with a broadcast stripper. This cost of .06 cents per pound was obtained from farmers in the area who custom harvest with a broadcast stripper. The fixed costs were figured the same way as the 40-inch row budget fixed costs.

Budget for 20-Inch Row Cotton - Harvester Owned

The final budget I developed was for 20-inch row cotton in which the producer has the costs of owning a broadcast stripper instead of having the crop custom harvested. I developed this budget by modifying the 20-inch row cotton budget that I made before. The only major change was in the harvesting cost. The cost of custom harvesting was removed

and the cost of the equipment and labor of owning the harvester was added. The broadcast stripper is relatively new in this area so no one, including the research center had the cost of owning one. I developed a machinery cost worksheet assuming a new cost of $25,000, 10 years of planned use, and 125 hours annual use. These estimates were from local implement dealers and farmers. The ownership or fixed costs including annual depreciation and interest on average investment came to $28.33 per hour. The operating or variable costs including repairs, fuel, and oil came to $7.78 per hour. The trade-in value for the depreciation and the accumulated repairs were found by using tables from the 1972 Agricultural Engineers Yearbook. This worksheet assumed that 500 acres of cotton a year would be stripped. If the cotton farm was larger, the cost would be less. If the farm was smaller, the cost would be more.

Breakeven Acreage

I also used the machinery cost worksheet for the broadcast harvester to find the breakeven acreage between hiring custom stripping and assuming the costs of owning and operating a harvester. The cost of custom harvesting is $18.18 per acre. If a harvester is bought, the labor cost per acre and operating costs per acre will be constant at $1.03 and $1.95 respectively. The ownership cost per acre will change depending on the number of acres that it is used on each year. Subtracting $1.03 and $1.95 from $18.18 gives $15.20 as the ownership cost per acre at the point that the cost of

owning a harvester and custom harvesting will be equal. Multiply $15.20 by four to change from a per acre basis to a per hour basis.

Dividing the total ownership cost of $3541 per year by the ownership cost per hour at the breakeven point of $60.80 gives 58 hours per year as the breakeven level. Multiply 58 hours by 4 acres/hr. to get 232 acres as the point where the two harvest costs are equal.

## FINDINGS

The findings are centered around the results of the budget that I developed for 40-inch row cotton and 20-inch row cotton with and without ownership costs of a harvester. A short summary of these findings are in Table II. In addition, the point at which the cost of custom harvesting and owning a harvester are equal was computed.

### Comparison of Custom Harvested Narrow Row and Harvester Owned Narrow Row

The gross receipts of $139.14 per acre will be the same because the harvester ownership will not affect the yield. The preharvest costs of $37.03 per acre will also be the same. The harvesting costs will be higher by $15.20 per acre for custom harvested cotton over cotton harvested with the farm's own machine. So the total variable costs are also $15.20 higher for custom harvested cotton. The fixed costs, of course, are higher for the harvester owned cotton. But the fixed costs

Table II: Comparison of the Results of Cotton Budgets Using Different Methods of Producing in Wilbarger County on a Per Acre Basis.

| Budget Heading | 40-inch rows | 20-inch rows custom harvested | 20-inch rows harvester owned |
|---|---|---|---|
| Gross receipts | $126.50 | $139.14 | $139.14 |
| Preharvest costs | 37.03 | 28.71 | 28.71 |
| Harvest costs | 19.99 | 37.09 | 21.89 |
| Total variable costs | 57.02 | 65.80 | 50.60 |
| Fixed costs | 39.85 | 36.46 | 43.54 |
| Total costs | 96.87 | 102.26 | 94.14 |
| Net returns | 29.63 | 36.88 | 45.00 |

are higher by only $7.08. So the total costs are less for owning a harvester instead of custom harvesting by $8.12 per acre. Since the revenue is the same, owning a harvester is the most profitable way to produce narrow row cotton by $8.12 per acre. The net return from custom harvested cotton was $36.88 per acre, and the return from harvester owned cotton production was $45 per acre. Of course, the costs of owning a harvester were computed under the assumption that the manager farmed 500 acres of cotton. If less land is worked, the costs of owning a harvester would be increased until a point will be reached where custom harvesting the cotton is more profitable.

Harvester Owned Narrow Row vs. 40-Inch Row

The gross receipts from narrow row cotton should be about 10% higher than 40-inch row cotton because the yield should be about 10% higher. The revenue for 40-inch row cotton was $126.50 per acre and the revenue from 20-inch row cotton was $139.14. The preharvest cost for 40-inch rows was $8.32 more expensive due to the additional amount of tillage. But, the narrow row cotton cost more to harvest by $2.70. The broadcast harvester added $3.69 per acre onto the fixed cost of the narrow row production. So the net return for narrow row cotton was $45.00 per acre compared to $29.63 per acre for 40-inch row production.

Breakeven Acreage for Harvesting

The point at which the costs of owning a self-propelled

broadcast stripper and the costs of having the crop custom harvested is at 232 acres of cotton.

Change in Price Assumption

If the assumption is made that cotton is going to bring $.30/lb. instead of $.38/lb. the results stay about the same. The 40-inch row cotton will return $7.63 per acre, the custom harvested 20-inch row cotton will return $12.64 per acre, and the 20-inch row cotton with ownership costs will return $20.76 per acre. The 20-inch row cotton will still return as much as $13.13 per acre over 40-inch row cotton or $6,565 on the entire subject farm.

## SUMMARY AND CONCLUSIONS

The objective of this study was to compare the profitability of producing 40-inch row cotton with the profitability of producing 20-inch row cotton. Also, to determine whether it is more profitable to custom harvest 20-inch row cotton or to own a broadcast stripper on a 500 acre farm in Wilbarger County, Texas.

Summary

Budgets for 40-inch row cotton, 20-inch row custom harvested cotton, and 20-inch row cotton harvested with the producers own machine were developed. The budgets were developed with information obtained from agricultural research centers, implement dealers, and area cotton producers.

The 40-inch row cotton budget was developed by modifying two budgets obtained from the Texas A&M Agricultural Research Center in Lockett. The budget for 20-inch row production which is to be custom harvested was developed by modifying the 40-inch budget and gathering information from producers of 20-inch cotton. The budget developed for narrow row cotton with ownership costs of a broadcast harvester was done by modifying the other budget for 20-inch row cotton. A machine cost worksheet had to be developed for the stripper for this last budget. Information was obtained from implement dealers and cotton producers for the machine cost worksheet.

The results were that the most profitable way to produce was to grow 20-inch row cotton and the producer own his own harvester. This method of producing returned $45.00 per acre or $22,500 for the entire 500 acre farm. The custom harvested narrow row cotton returned $36.88 or $18,440 for the farm. The 40-inch row cotton returned $29.63 per acre or $14,815 for the farm. The breakeven acreage for owning a self-propelled broadcast harvester as opposed to having the work done is 232 acres. If less than 232 acres of cotton is produced, the manager should hire the crop custom harvested. If more than 232 acres of cotton is produced, owning a broadcast stripper is cheaper.

## Implications

This report suggests that a good manager can make more money by growing 20-inch row cotton than he can by growing 40-inch row cotton. If the producer is small, he will be

ahead to have his harvesting custom done. But, a larger producer will be ahead in the long run to invest in a broadcast stripper. I think that more narrow row cotton will be planted in Wilbarger County after producers watch the farmers that are now producing narrow row cotton. I think that it is significant to mention that the producers that are buying the self-propelled broadcast harvesters and changing to narrow row cotton now are the same people that are generally thought of as keeping the best record of operations in the community. Narrow row cotton will become more widely accepted in the near future, and eventually I believe that most cotton will be grown in narrow rows.

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# APPENDIX

BUDGET FOR 20-INCH ROW COTTON - CUSTOM HARVESTED

| Item | Unit | Price or Cost/Unit | Quantity | Value or Cost |
|---|---|---|---|---|
| Gross Receipts from Production: | | | | |
| Lint | lb. | $ .38 | 303.00 | $115.14 |
| Seed | ton | 100.00 | .4 | 24.00 |
| Total | | | | $139.14 |
| Variable Costs: | | | | |
| Preharvest: | | | | |
| Seed | lb. | .26 | 22 | 5.72 |
| Herbicide | acre | 5.06 | 1 | 5.06 |
| Equipment | acre | 8.94 | 1 | 8.94 |
| Labor | hour | 2.75 | 2.77 | 7.62 |
| Interest on Operating Capital | $ | .10 | 13.67 | 1.37 |
| Total | | | | $28.71 |
| Harvest: | | | | |
| Gin, bag, ties | bale | 31.00 | .61 | 18.91 |
| Custom harvesting | lb. | .06 | 303.00 | 18.18 |
| Total | | | | $37.09 |
| Total Variable Costs: | | | | $65.80 |
| Income Above Variable Costs: | | | | $73.34 |
| Fixed Costs: | | | | |
| Equipment | acre | $ 13.75 | 1 | $13.75 |
| Land | acre | 26.10 | 1 | 26.10 |
| Total | | | | $39.85 |
| Total Costs: | | | | $102.26 |
| Net Returns: | | | | $ 36.88 |

BUDGET FOR 20-INCH ROW COTTON - HARVESTER OWNED

| Item | Unit | Price or Cost/Unit | Quantity | Value or Cost |
|---|---|---|---|---|
| Gross Receipts from Production: | | | | |
| Lint | lb. | $ .38 | 303.00 | $115.14 |
| Seed | ton | 100.00 | .24 | 24.00 |
| Total | | | | $139.14 |
| Variable Costs: | | | | |
| Preharvest: | | | | |
| Seed | lb. | .26 | 22 | $ 5.72 |
| Herbicide | acre | 5.06 | 1 | 5.06 |
| Equipment | acre | 8.94 | 1 | 8.94 |
| Labor | hour | 2.75 | 2.77 | 7.62 |
| Interest on Operating Capital | $ | .10 | 13.67 | 1.37 |
| Total | | | | $ 28.71 |
| Harvest: | | | | |
| Gin, bag, ties | bale | 31.00 | .61 | $ 18.91 |
| Equipment | acre | 1.95 | 1 | 1.95 |
| Labor | hour | 2.75 | .375 | 1.03 |
| Total | | | | $ 21.89 |
| Total Variable Costs: | | | | $ 50.60 |
| Income Above Variable Costs: | | | | $ 88.54 |
| Fixed Costs: | | | | |
| Equipment | acre | 14.74 | 1 | $ 14.74 |
| Land | acre | 28.80 | 1 | 28.80 |
| Total | | | | $ 43.54 |
| Total Costs: | | | | $ 94.14 |
| Net Returns: | | | | $ 45.00 |

BUDGET FOR 40-INCH ROW COTTON

| Item | Unit | Price or Cost/Unit | Quantity | Value or Cost |
|---|---|---|---|---|
| Gross Receipts from Production: | | | | |
| Lint | lb. | $ .38 | 275.00 | $104.50 |
| Seed | ton | 100.00 | .22 | 22.00 |
| Total | | | | $126.50 |
| Variable Costs: | | | | |
| Preharvest: | | | | |
| Seed | lb. | .26 | 16 | 4.16 |
| Herbicide | acre | 5.06 | 1 | 5.06 |
| Equipment | acre | 14.31 | 1 | 14.31 |
| Labor | hour | 2.75 | 4.27 | 11.74 |
| Interest on Operating Capital | $ | .10 | 17.64 | 1.76 |
| Total | | | | $37.03 |
| Harvest: | | | | |
| Gin, bag, ties | bale | 31.00 | .55 | 17.05 |
| Equipment | acre | 1.56 | 1 | 1.56 |
| Labor | hour | 2.75 | .5 | 1.38 |
| Total | | | | $19.99 |
| Total Variable Costs: | | | | $57.02 |
| Income Above Variable Costs: | | | | $69.48 |
| Fixed Costs: | | | | |
| Equipment | acre | 13.75 | 1 | $13.75 |
| Land | acre | 26.10 | 1 | 26.10 |
| Total | | | | $39.85 |
| Total Costs: | | | | $96.87 |
| Net Returns: | | | | $29.63 |