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# A COMPARISON OF PRODUCTION COSTS FOR ALTERNATIVE COTTON TILLAGE SYSTEMS IN THE ROLLING PLAINS OF TEXAS

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## Abstract

The purpose of this project was to develop a comprehensive economic comparison of alternative tillage systems for cotton production in the Southern Rolling Plains of Texas. Grower interviews provided detailed information regarding equipment and labor requirements and input utilization. BudPro, a comprehensive crop budgeting software program, was used to determine and compare variable and fixed costs of cotton production. While regional in scope, this investigation provides an accurate assessment of the economic trade-offs existing between a grower's choice of tillage system and provides a framework for similar analysis in other cotton growing regions.

## Introduction

Cotton production in the United States is typically a tillage intensive enterprise. Tillage operations employed in most cotton production include multiple operations such as disking, chiseling, bedding, and shallow cultivation for weed control during the growing season. The combination of rising equipment and labor costs required to perform these tillage activities along with low prices for cotton has resulted in a renewed interest in conservation tillage systems for cotton production designed to convey numerous economic advantages including reduced tillage trips across the field, reduced labor expense, and increased machinery and equipment efficiency. Additionally, non-economic advantages to conservation tillage systems have been widely acknowledged including enhanced organic matter and soil moisture retention, as well as reduced soil compaction and soil erosion. However, adoption of conservation tillage for cotton production has been slow.

A number of recent studies have attempted to quantify the various benefits from adopting conservation tillage systems for cotton production. In a two-year study of 11 grower fields in the semi-arid climate of south Texas, Smart et al. (1999) identified reduced production costs of $55-$66 per acre and higher net returns of $119-$129 per acre for conservation tillage cotton production following grain sorghum versus conventional tillage systems . Additionally, cotton lint yields in 1997 and 1998 in the conservation tillage fields were 137 and 87 pounds per acre more than the conventional tillage fields. This yield difference was attributed to increased moisture retention and decreased evaporation under the heavy crop residue mulch in the conservation tillage treatment. These results differed from the results obtained by McConnell and Kirst (1999), who reported that neither combinations of cover crops nor tillage methods significantly affected yield for cotton in Arkansas.

Bradley (2000) investigated the economics of conservation tillage systems across eight cotton-belt states. This study showed reductions in cost of tillage for no till cotton systems amounting to $20.68 and $45.08 per acre versus conservation tillage and conventional tillage, respectively. Further, labor requirements were found to be 0.5 hours per acre lower for conservation and no till systems versus conventional tillage systems.

In a study of 13 Mississippi no till cotton growers by Parvin et al. (2001), it was acknowledged that, in general, Mississippi cotton growers that had shifted from conventional production practices to systems based on no till production were among the state's better growers, but due to the yield potential of their particular cotton soils had experienced lower yields. It was cited that some growers with the highest whole-farm yields had been able to maintain positive returns with conventional tillage practices, but their rate of return was being diminished. Other studies of the economic advantages of conservation tillage practices include Hackman (2001), who found a $36.00 per acre advantage for conservation tillage over conventional tillage in a three year evaluation of Roundup Ready cotton production in Arkansas and Atwell et al. (2001), who reported a $0.04 to $0.08 per pound cost of production advantage for conservation tillage over conventional tillage systems in a three year study in southern Alabama.

These research efforts indicate that the economic differences among alternative cotton tillage systems are highly variable, differ annually due to fluctuations in input and cotton prices, and are regionally specific. While cotton growers have access to volumes of information regarding the production considerations of alternative tillage systems, questions regarding the economic implications remain. Growers need to know if they will be adequately rewarded for switching to a new tillage system and what trade-offs between cash expenses, equipment requirements, labor requirements and overall profitability they can expect during the transition. As such, in order for cotton growers to regionally adopt new tillage system practices, they must be convinced with their own eyes and pocketbooks that the new tillage system will work in their area and over a prolonged period.

The term conservation tillage has served as an umbrella under which many different tillage labels have been placed: minimum tillage, reduced tillage and no till to name a few. The definition of minimum tillage has varied through the years and from region to region, lessening its usefulness as a description because in most instances it means reduced tillage. Reduced tillage refers to any system that is less intensive and aggressive than conventional tillage. The number of operations is decreased, or a tillage implement that requires less energy per unit area replaces an implement typically used in the conventional system. Even reduced tillage suffers as an appropriate label based on geographical differences (Reeder, 2000).

For the purposes of this study, the term conservation tillage will refer to two alternative systems: reduced tillage and no till. The primary philosophy underlying conservation tillage entails reducing the number of tillage operations. This should reduce fuel expenses, the amount of labor required, tillage equipment required, and extend the life of the needed machinery. Changing tillage systems has an impact on both the variable and fixed costs of production. The largest cost increase associated with conservation tillage is for chemical weed control. Farmers adopting conservation tillage are likely to experience greater differences in cash flow than profitability. Understanding the true economic impact of switching tillage systems requires an understanding of cash, non-cash, variable and fixed costs. These are the considerations examined in this study for cotton growers in the Texas Southern Rolling Plains.

The Southern Rolling Plains (SRP) of Texas is an area which has historically planted 200,000 to 350,000 acres of cotton. Approximately 85 percent of the cotton production in this region is dryland with about 15 percent receiving supplemental or full irrigation. The SRP is a relatively low input production area with low historical yields as compared to other regions of the state and country (Johnson, et al., 2001). Therefore, any identified economic advantages that result from conservation tillage adoption in the SRP should be even more pronounced in other higher-yielding regions. This makes the SRP an ideal pilot area to investigate the feasibility and viability of conservation tillage for cotton production.

This research project entailed two primary objectives. The first objective was to identify the equipment requirements, labor requirements, and variable input rates for conventional, reduced tillage and no till cotton production systems in the Texas Southern Rolling Plains. The second objective was to produce a detailed set of cost of production budgets for each alternative cotton tillage system.

## Methods

Cotton growers representing 13 Southern Rolling Plains operations in Runnels and Tom Green counties and employing various conventional and conservation tillage systems were interviewed to provide detailed input use and trip-by-trip specific information related to field operations for cotton production. Inputs such as seed, fertilizer, and chemicals along with their application rates and date of application were obtained. Additional information related to individual equipment and implement inventories, labor force, and size of operation were also solicited. Cooperating producers farmed 27,236 crop acres and 16,394 dryland cotton acres. Operations ranged in size from 875 acres to 4,840 acres. Dryland cotton production on these farms ranged in size from 500 acres to 3,108 acres. The typical crop planting pattern was 2X1 with growers typically producing cotton behind wheat or sorghum crops. Following the completion of the grower surveys, the tillage activities of each grower were scrutinized by Texas Cooperative Extension specialists in the areas of entomology, agronomy, and economics to verify input rates and classify the various tillage systems employed into three categories: conventional tillage, reduced tillage, and no till.

Information supplied by each cotton grower was then be incorporated into BudPro, a comprehensive crop budgeting software available through Texas Cooperative Extension. This budgeting software provides estimates of variable and fixed costs of production resulting from the specification of input rates, field operations, application dates, equipment inventories, and input prices. For comparable cost estimates relating to equipment, information was collected from local dealerships and extension budgets to specify detailed economic data pertaining to tractors, self-propelled equipment, and implements listed by interviewed cotton growers. Tables 1, 2, and 3 present this information including purchase prices, salvage values, useful life, annual repair costs, fuel consumption rates and performance rates for each tractor, self-propelled equipment, and implement, respectively.

The resulting BudPro cost of production estimates for each cotton grower were then averaged for each category of tillage system to provide typical costs of production estimates for conservation tillage, reduced tillage and no till production systems.

## Results

After examining the detailed production information provided by 13 Southern Rolling Plains cotton operations, it was determined that seven operations employed conventional tillage practices, three operations employed reduced tillage, and three operations could be classified as no till. All of the results obtained from this study are the product of this sample of cooperating cotton growers and conclusions should be cushioned accordingly. The average dryland cotton acreage for conventional, reduced tillage, and no till operations was 1,066, 1,852, and 1,125 acres, respectively. There were no expressed differences in expected yields. Regardless of tillage system, growers indicated an expected average yield of 250 pounds per acre, with a typical range of 100 to 500 pounds per acre. Therefore, yield differences were not considered in this analysis.

For comparison purposes, the input requirements for each tillage system were indexed to correspond to an average dryland cotton farm size of 1,250 acres. This removed the bias related to farm size so that input requirements could be compared for different tillage systems. The influence of farm size will be addressed later.

### Machinery

Conventional wisdom suggests that adoption of conservation tillage practices require the use of higher horsepower machinery to perform multiple activities in one trip across the field. This theory did not hold universally for this sample of cotton growers. For a 1,250 acre cotton operation, the sample of cotton growers owned three to four tractors. The size of tractors for each tillage system ranged from 75 h.p. to 225 h.p. for conventional tillage; 75 h.p. to 300 h.p. for reduced tillage; and 75 h.p. to 175 h.p. for no till operations. Regardless of tillage system, the usefulness of lower horsepower tractors was identified for light duty operations with the higher horsepower tractors being used for tillage activities or to perform required operations faster.

### Labor

One of the biggest advantages frequently cited for conservation tillage adoption is reduced labor requirements. This research supports the notion that there are significant labor advantages to conservation tillage systems. For a 1,250 acre cotton operation, conventional, reduced tillage, and no till operations employed 1.68, 1.12, and 1.11 full-time employees, respectively. However, this advantage was offset somewhat by part-time employees. Part-time employees for conventional, reduced tillage, and no till operations were 1.01, 0.67 and 1.48, respectively. There is little doubt that the set of field operations specified by cotton growers implies reduced labor. For cotton production following wheat or sorghum, pre-harvest trips across the field averaged 10.44 for conventional tillage, 9.00 for reduced tillage, and 8.08 for no till. Additionally, many of the trips for conservation tillage systems could be completed faster than the more tillage intensive trips required for conventional tillage. Accordingly, pre-harvest labor per acre was identified to be 0.87, 0.61, and 0.53 hours per acre for conventional, reduced tillage, and no till, respectively.

### Fuel

Fewer (and faster) trips across the field translated into savings for fuel. The value of this advantage varies proportionately with the price of fuel, but in some years, could be substantial. Using a diesel price of $0.95 per gallon, the fuel savings to conservation tillage systems was estimated to be approximately $2 to $3 per acre.

### Equipment

Conservation tillage systems are widely recognized to require less equipment than conventional tillage. Evaluation of this set of growers showed that reduced equipment was possible through conservation tillage, however, not all producers (especially those classified as reduced tillage operations) had chosen to relinquish implements that were no longer used extensively. Some of these growers indicated an unacceptable salvage value as justification for holding onto and continuing to utilize some of the equipment on their inventory list. For the computation of fixed costs (depreciation) and repair costs, all equipment listed by the grower was included regardless of whether it appeared as an active implement in the cotton production system. Therefore, reductions in fixed costs were possible, but not universally achieved by the conservation tillage growers.

Table 4 presents the estimates of annual depreciation by farm size and tillage system employed. The estimate of actual depreciation was calculated by acknowledging the age (or useful life) of equipment as defined by the grower. The estimated depreciation refers to the same equipment inventory, but requiring replacement consistent with the defined useful life described in Tables 1-3. If a grower's actual depreciation is less than the estimated depreciation, this implies that they grower has retained equipment beyond the expected useful life. In this instance, the grower is choosing to forego all or a portion of the salvage value of the equipment in exchange for continued use. Many times this is referred to as "living off of depreciation." This is a common occurrence during extended periods of low prices or poor yields, both of which have characterized Southern Rolling Plains cotton growers. It appears as if reduced tillage growers have been most prone to retaining older equipment than either conventional tillage or no till growers. This is likely the result of a gradual transition away from conventional tillage practices that has not been completed. Finally, the significant impact of farm size on fixed costs can readily be seen. Farm size appears to play as much (if not more) of a role in influencing a grower's fixed cost structure than selection of a particular tillage system.

**Chemicals**

From a cash flow perspective, the additional expense for chemicals has likely been the biggest deterrent to greater adoption of conservation tillage. This investigation confirmed the obvious by identifying a greater dependance on chemical use to substitute for mechanical tillage activities. Pre-harvest chemical expenses were $9 to $19 per acre higher for conservation tillage systems compared to conventional tillage.

The output from the BudPro budgeting software was used to provide typical cost of production estimates for each type of tillage system based on the information provided by growers. Average cost of production estimates are shown in Table 5. Since yield differences were not considered in this analysis, income estimates were not included to provide estimated returns. Further, ginning charges were not included as it was assumed that these would be identical for each tillage system (same yield) and be approximately offset by revenues generated by cottonseed.

The prevailing rental arrangement in the Southern Rolling Plains was a one-quarter landlord / three-quarter tenant share agreement with the landlord paying one quarter of the fertilizer, insecticide, and boll weevil eradication expenses. For the purposes of calculating a corresponding dollar rent, a cotton yield of 250 pounds per acre and price of $0.64 per pound (accounting for loan deficiency payments and a percentage of counter-cyclical and direct payments) was used to calculate landlord's share. After adjustments for shared expenses, the cash equivalent rental rate was $36.13 per acre. In the instance that the grower owns their own land, then estimated expenses would be reduced by this amount.

For conventional tillage operations, the variation in total variable costs of production ranged from $112.70 to $125.52 per acre, and total costs ranged from $138.00 to $168.04 per acre. Not surprisingly, the lowest total cost of production corresponded to the largest conventional tillage farm while the highest total cost of production corresponded to the smallest conventional tillage farm. For reduced tillage operations, the variation in total variable costs of production ranged from $110.85 to $133.51 per acre, and total costs ranged from $130.92 to $166.80 per acre. Again, these results reiterated the importance of size on overall cost structure. For no till operations, the variation in total variable costs of production ranged from $125.15 to $140.63 per acre, and total costs ranged from $148.53 to $169.68 per acre. Unlike the other tillage systems the smallest no till operation did not have the highest no till total cost of production. This illustrates the potential that no till operations have to address the issue of farm size with efficient equipment utilization.

The cost of production estimates in Table 5 can be used to construct a sensitivity table of break even price estimates for various cotton yields. Table 6 presents these break even estimates for both total variable costs and total costs for each tillage system. For the baseline expected yield of 250 pounds of cotton lint per acre, the break even price for variable cost is $0.5203 per pound for no till operations versus $0.4998 for reduced tillage and $0.4715 for conventional tillage. However, once fixed costs are considered, the differences among tillage systems falls to less than $0.02 per pound. The variation between low-total cost and high-total cost operations within tillage groups was $0.12 per pound for conventional, $0.14 per pound for reduced tillage, and $0.08 per pound for no till growers. This implies that management, and not tillage system, is likely to be a more important factor in ensuring profitability.

## Conclusions

The results of this analysis are based on the information obtained from cotton growers representing 13 Southern Rolling Plains operations in Runnels and Tom Green counties and employing various conventional and conservation tillage systems. Any conclusions drawn from this research should take into consideration this small sample size and the possibility that the resource endowments of these growers might not be representative of all growers. Secondly, this analysis focused on the financial implications of choosing among tillage systems and it is widely acknowledged that financial analysis alone seldom captures all of the relevant information taken under consideration. Potential environmental and agronomic benefits, such as enhanced soil moisture retention, increased organic matter content, and reduced soil compaction and erosion levels were not addressed. Further, this analysis does not attempt to differentiate between expected yield differences which might exist between tillage systems because no yield differences were championed by interviewed participants. For Southern Rolling Plains dryland cotton growers, rainfall and other production environment factors were deemed to be the over-riding determinants of cotton yield.

Based on the information provided by 13 Texas Southern Rolling Plains cotton operations, growers employing conservation tillage systems (reduced tillage and no till) were not found to have realized significantly lower estimated total costs of production. Greater variations in estimated total costs of production were identified within groups of tillage systems (i.e. between one no till producer and another) than were found between tillage systems (conventional vs. reduced tillage vs. no till). Conservation tillage systems did appear to provide cost savings for labor, fuel, machinery and equipment, and repairs and maintenance. However, these savings were offset by higher chemical expenses from the increased dependance on chemical applications to substitute for tillage activities. Conservation tillage systems were found, on average, to result in total variable costs that were $7 to $12 per acre higher and fixed costs that were $6 to $8 per acre lower. Collectively, the difference in total costs of production were estimated to be less than $4 per acre (approximately 3%) between tillage systems. This does not imply that tillage system selection cannot be an important factor for improving the cost structure for an individual operation. The variation within tillage groups underscores the ability of management to utilize appropriate tillage system adoption to facilitate cost structure improvements.

This research would suggest that cotton growers in the Southern Rolling Plains should not adopt conservation tillage practices with the expectation that this choice alone will provide lower total costs of production. It is very likely that the immediate cash flow impacts (i.e. higher variable cost expenses) from conservation tillage will be more visible to the grower than the less-apparent reductions in fixed costs (i.e. depreciation). Further, there is a certain amount of flexibility with any tillage system that this analysis might have overlooked. Conventional tillage growers have a limited ability to postpone machinery replacement decisions or forego the salvage value of trade-ins by retaining fully-depreciated equipment within the operation. This strategy called, "living off of depreciation," has been common for Southern Rolling Plains cotton growers facing several years of poor cotton prices and weather to achieve $3 to $6 per acre per year reductions in fixed costs. Conservation tillage producers have the flexibility to reduce or eliminate many of their chemical expenses in growing seasons when it becomes evident that weather conditions (or some other factor) will not permit economical cotton production. This managerial flexibility is especially valuable in a dryland cotton situation. Therefore, the choices and options become infinite between dedicating investment capital to machinery and equipment or dedicating it to variable expenses. This research cannot definitively suggest the preferred option.

Farm size and management of machinery and equipment inventories appeared to have a greater influence on fixed cost structure than did selection of tillage system. This research did identify the potential for individual cotton growers to achieve lower fixed cost structures (lower per acre depreciation expenses) through adopting reduced tillage or no till systems. However, adopting a conservation tillage system does not immediately provide these savings. In order to achieve cost savings, growers must adjust their machinery and equipment inventories to liquidate excess tractors and implements or take on additional land to enhance machinery and equipment efficiency. Transition to a new tillage system is usually a gradual process. Actual tillage practices can be changed faster than adjusting machinery and equipment inventories, but it must be recognized that the full benefits of a new tillage system cannot be realized until it is fully adopted.

When looking at fixed costs, there is no denial that farm size does matter. Conservation tillage systems appear to offer opportunities for coping with a small farm base or capitalizing from larger farm acreage. Since cotton can be produced through a conservation tillage program with less machinery and equipment than conventional tillage systems, smaller cotton growers might choose conservation tillage as a lower cost avenue of entering the industry. On the other end of the spectrum, conservation tillage systems were identified to require less labor per acre. Therefore, reduced tillage and no till systems have the potential to facilitate expanding farm size to fully utilize and increase the efficiency of machinery, equipment and labor.

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Table 1. Tractors, purchase price, salvage value, useful life, annual repair costs, and fuel consumption rates.

| Tractors | Purchase Price | Salvage Value | Useful Life | Annual Repair Cost | Fuel per Hour |
|---|---|---|---|---|---|
| 300 h.p. | $122,286 | $12,229 | 10 | $1,211 | 15.44 |
| 260 h.p. | $113,324 | $11,332 | 10 | $1,122 | 13.51 |
| 225 h.p. | $104,362 | $10,436 | 10 | $1,033 | 11.58 |
| 200 h.p. | $100,002 | $10,000 | 10 | $1,800 | 10.45 |
| 175 h.p. | $ 83,266 | $ 8,327 | 10 | $1,499 | 8.65 |
| 150 h.p. | $ 72,690 | $ 7,269 | 10 | $1,308 | 7.36 |
| 125 h.p. | $ 60,457 | $ 6,046 | 10 | $1,088 | 6.44 |
| 100 h.p. | $ 46,683 | $ 4,668 | 10 | $ 840 | 6.07 |
| 75 h.p. | $ 27,049 | $ 2,705 | 10 | $ 487 | 4.41 |

Table 2. Self -propelled equipment, purchase price, salvage value, useful life, annual repair cost, fuel consumption rate, and performance rate.

| Self-Propelled Equipment | Purchase Price | Salvage Value | Useful Life | Annual Repair Cost | Fuel per Hour | Acres per Hour |
|---|---|---|---|---|---|---|
| Hi cycle Sprayer - 60 ft. | $ 60,000 | $ 6,000 | 12 | $2,700 | 2.9 | 30 |
| Hi cycle Sprayer - 48 ft. | $ 48,000 | $ 4,800 | 12 | $2,160 | 2.9 | 24 |
| Spider Sprayer - 20 ft. | $ 20,000 | $ 2,000 | 12 | $ 900 | 2.9 | 10 |
| | | | | | | |
| Stripper 4 Row | $120,000 | $12,000 | 10 | $ 8,100 | 6.0 | 6 |
| Stripper 8 Row | $160,000 | $16,000 | 10 | $10,800 | 6.0 | 8 |

Table 3. Implements, size, purchase price, salvage value, useful life, annual repair Cost, and performance rate.

| Implement | Size | Purchase Price | Salvage Value | Useful Life | Annual Repair Cost | Acres per Hour |
|---|---|---|---|---|---|---|
| Bedder/Lister | 8 row | $10,500 | $1,050 | 10 | $ 756 | 11.05 |
| Chisel Plow | 16 ft. | $ 8,000 | $ 800 | 10 | $ 576 | 8.33 |
| Chisel Plow | 20 ft. | $12,000 | $1,200 | 10 | $ 864 | 11.11 |
| Chisel Plow | 26 ft. | $15,600 | $1,560 | 10 | $1,123 | 14.44 |
| Chisel Plow | 30 ft. | $18,000 | $1,800 | 10 | $1,296 | 16.67 |
| Cultivator | 8 row | $13,000 | $1,300 | 10 | $ 648 | 12.50 |
| Field Cultivator | 10 row | $10,000 | $1,000 | 10 | $ 720 | 14.30 |
| High Residue Cultivator | 8 row | $13,000 | $1,300 | 10 | $ 936 | 10.00 |
| Disk | 18 ft. | $17,500 | $1,750 | 10 | $1,750 | 10.00 |
| Tandem Disk | 26 ft. | $22,500 | $2,250 | 10 | $1,620 | 14.28 |
| Moldboard Plow | 8 row | $13,729 | $1,373 | 7 | $1,412 | 3.50 |
| Paratill Plow | 4 row | $ 7,500 | $ 750 | 15 | $ 293 | 7.75 |
| Paratill Plow | 8 row | $ 8,900 | $ 890 | 15 | $ 347 | 12.50 |
| Strip Till Plow | 8 row | $10,000 | $1,000 | 10 | $ 765 | 11.11 |
| Planter | 8 row | $21,000 | $2,100 | 8 | $1,819 | 14.28 |
| Max Emerge Planter | 8 row | $26,000 | $2,600 | 8 | $1,901 | 14.28 |
| Ripper | 13 ft. | $ 5,600 | $ 560 | 15 | $ 336 | 7.79 |
| Ripper | 21 ft. | $ 9,050 | $ 905 | 15 | $ 543 | 11.11 |
| Big Ox Ripper | 8 row | $13,000 | $1,300 | 15 | $ 780 | 15.38 |
| Shredder | 4 row | $ 6,000 | $ 600 | 8 | $ 277 | 6.06 |
| Shredder | 8 row | $ 8,500 | $ 850 | 8 | $ 392 | 12.12 |
| Hooded Sprayer Mounted | 8 row | $ 8,900 | $ 890 | 12 | $ 534 | 10.00 |
| Boom Sprayer | 10 row | $ 1,300 | $ 130 | 7 | $ 117 | 12.12 |
| Mounted Boom Sprayer | 18 row | $ 2,350 | $ 235 | 7 | $ 212 | 21.80 |
| Stalk Puller | 8 row | $10,000 | $1,000 | 10 | $ 369 | 12.12 |
| Stalk Chopper | 8 row | $10,000 | $1,000 | 10 | $ 369 | 12.12 |

Table 4. Tillage system, dryland cotton acreage, and corresponding depreciation expenses, Texas southern rolling plains, participating farms.

| Farm Number and Tillage System | Dryland Cotton (acres) | Actual Depreciation ($/acre/yr.) | Estimated Depreciation ($/acre/yr.) | Differential ($/acre/yr.) |
|---|---|---|---|---|
| Farm 8 - Conventional | 500 | $42.52 | $43.60 | $1.08 |
| Farm 9 - Conventional | 550 | $39.23 | $42.67 | $3.44 |
| Farm 3 - Conventional | 775 | $37.24 | $42.13 | $4.89 |
| Farm 2 - Conventional | 810 | $34.88 | $34.88 | $0.00 |
| Farm 7 - No Till | 875 | $30.09 | $30.09 | $0.00 |
| Farm 11 - Reduced | 900 | $33.29 | $42.67 | $9.38 |
| Farm 4 - No Till | 1,000 | $29.05 | $31.52 | $2.47 |
| Farm 1 - Conventional | 1,059 | $33.34 | $36.88 | $3.54 |
| Farm 12 - No Till | 1,500 | $16.23 | $19.80 | $3.57 |
| Farm 5 - Conventional | 1,525 | $22.76 | $28.85 | $6.09 |
| Farm 6 - Reduced | 1,550 | $27.57 | $31.14 | $3.57 |
| Farm 10 - Conventional | 2,242 | $25.64 | $30.04 | $4.40 |
| Farm 13 - Reduced | 3,108 | $20.07 | $25.15 | $5.08 |
| Average - All Farms | 1,261 | $30.15 | $33.80 | $3.65 |
| Average - Conventional | 1,066 | $33.66 | $37.01 | $3.35 |
| Average - Reduced | 1,852 | $26.98 | $32.99 | $6.01 |
| Average - No Till | 1,125 | $25.12 | $27.14 | $2.02 |

Table 5. Per acre cost of production estimates for conventional, reduced tillage and no-till systems, Texas southern rolling plains.

| | Conventional | Reduced | No Till |
|---|---|---|---|
| Production Cost | | | |
| Seed | $ 7.62 | $ 7.62 | $ 7.62 |
| Fertilizer | $ 3.50 | $ 5.25 | $ 6.50 |
| Chemicals | $ 6.15 | $ 15.81 | $ 27.19 |
| Crop Insurance | $ 13.00 | $ 13.00 | $ 13.00 |
| Fuel | $ 6.57 | $ 4.25 | $ 3.07 |
| Lube | $ 0.66 | $ 0.43 | $ 0.31 |
| Repairs | $ 20.24 | $ 20.52 | $ 14.63 |
| Labor - $8 per hour | $ 6.96 | $ 4.88 | $ 4.24 |
| Boll Weevil Eradication Assessment | $ 8.00 | $ 8.00 | $ 8.00 |
| Interest on Credit Line | $ 1.91 | $ 1.93 | $ 2.25 |
| | $ 74.61 | $ 81.69 | $ 86.81 |
| Harvest Cost | | | |
| Operator Harvested | | | |
| Labor/Fuel/Lube/Repairs | $ 7.13 | $ 7.13 | $ 7.13 |
| Crop Share Rent | $ 36.13 | $ 36.13 | $ 36.13 |
| Total Variable Costs | $117.87 | $124.95 | $130.07 |
| Fixed Costs | | | |
| Depreciation | $ 33.66 | $ 26.98 | $ 25.12 |
| Total Costs | $151.53 | $151.93 | $155.19 |

Table 6. Sensitivity analysis of break-even price estimates for various cotton yields and alternative tillage systems, Texas southern rolling plains.

| | cotton yields - lint pounds per acre | | | | |
|---|---|---|---|---|---|
| | 100 | 175 | 250 | 325 | 400 |
| Conventional Tillage | | | | | |
| Break Even - Variable Costs | $1.1787 | $0.6735 | $0.4715 | $0.3627 | $0.2947 |
| Break Even - Total Costs | $1.5153 | $0.8659 | $0.6061 | $0.4662 | $0.3788 |
| Reduced Tillage | | | | | |
| Break Even - Variable Costs | $1.2495 | $0.7140 | $0.4998 | $0.3845 | $0.3124 |
| Break Even - Total Costs | $1.5193 | $0.8682 | $0.6077 | $0.4675 | $0.3798 |
| No Till | | | | | |
| Break Even - Variable Costs | $1.3007 | $0.7433 | $0.5203 | $0.4002 | $0.3252 |
| Break Even - Total Costs | $1.5519 | $0.8868 | $0.6208 | $0.4775 | $0.3880 |