FARM Assistance Focus

Texas A&M AgriLife Extension

No-Till Farming Practices Offer Cost Savings and More Profit Potential to Cotton and Grain Sorghum Producers

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This study illustrates the crop performance and potential profitability of no-till versus conventional cultivation practices in dryland cotton and grain sorghum farming in South Texas.

Farmers progressively seek ways to control costs, sustain yields and improve bottom-line profitability. Adaptation of new varieties, herbicides, insecticides, farming practices, and other technology is often necessary to improve performance and insure survival, especially in times of rising costs and relatively low crop prices. More cost-efficient ways of producing a crop can often make a big difference in accomplishing goals.

The dominant management practice in the Texas Coastal Bend is conventional tillage, where crop residues are incorporated into the soil after harvest, and several tillage passes are typically made to prepare the field for planting and to manage weeds (Stichler, 2006). Conventional tillage practices can leave the soil prone to wind and water erosion. Repeated disturbance of the soil also tends to deplete soil organic matter, which leads to poor soil structure and reduced pore space. This can have the net effect of reducing water infiltration rates and reduced water storage capacity of the soil.

"No-till" is the practice of leaving the soil undisturbed throughout the year, except for fertilizer placement. Over time, this practice can help rebuild soil organic matter. In the soil, organic matter acts as a sponge for moisture, and serves as the "glue" for forming soil structure. This leads to improved water infiltration and storage. Crop residues left undisturbed on the soil surface help reduce evaporative water losses by protecting the soil from sun and wind exposure, as well as reducing crusting and sealing of the soil surface. Under no-till management, weeds are managed with herbicides, as cultivation is not an option. This can pose a challenge; however, weeds can be effectively managed with the use of diverse herbicide technologies currently available.

This study illustrates the crop performance and potential profitability of no-till versus conventional cultivation practices in dryland cotton and grain sorghum farming in South Texas.

Assumptions

In 2011, a trial was established at the Texas A&M Research and Extension Center at Corpus Christi comparing conventional to no-till management practices in a cotton and grain sorghum rotational system. The objective was to demonstrate the feasibility and yield of no-till dryland farming on Vertisol soil in south Texas. The plots were arranged in a split-plot design with four replicates of a 16 row (36-inch centers) by 160-foot tillage treatments in each block. Sorghum was grown in half the blocks and cotton in the remaining half in the first year and alternated annually. Fertilizer was applied according to soil test, weed and insect control as needed and similarly to local practices.

On average, the no-till yields per acre were slightly higher than the conventional yields (+62 lbs. for cotton and +3.24 cwt. for grain sorghum; Table 1).

The Financial And Risk Management (FARM) Assistance strategic planning model was used to illustrate the individual financial impacts of conventional vs. no-till dryland farming practices in South Texas. Four scenarios were evaluated: 1) conventional cotton; 2) no-till cotton; 3) conventional grain sorghum; and 4) no-till grain sorghum.

Table 1: Cotton and Grain Sorghum Conventional and No-Till Yields Per Acre, Corpus Christi Research and Extension Center

Year	Cotton (lbs.)		Grain Sorghum (cwt.)	
	Conventional	No-Till	Conventional	No-Till
2011	266	277	35.65	36.79
2012	428	415	26.43	39.49
2013	22	190	0.00	0.00
2014	517	565	27.74	34.41
2015	916	1,058	53.42	48.85
2016	953	910	51.29	56.48
2017	1,168	1,286	45.86	47.02
Average	610	672	34.34	37.58
Case Study Projected Average Yields				
2018	610	672	34.34	37.58
2027	640	705	34.87	38.16

Based on the results of the AgriLife Corpus Christi trial, a case study 100-acre farm was developed to project the profit potential of conventional and no-till practices in cotton and grain sorghum over a ten-year period (2018-2027). The estimated 2018 crop yields for each crop and production practice were based on 2011-2017 average research trial yields. Yields for the remaining 9 years of the forecast period are gradually increased for the assumption of improved varieties over time (Table 1). The 7 years of research trial yields provides an estimate of the yield risk of each crop/practice.

Table 2: 2018 Conventional and No-Till Cotton and Grain Sorghum Production Costs Differences Per Acre

Expenses	Cotton (lbs.)		Grain Sorghum (cwt.)	
	Conventional ($/Acre)	No-Till ($/Acre)	Conventional ($/Acre)	No-Till ($/Acre)
Herbicides (1)	41.24	51.24	35.13	38.26
Insecticides	27.33	27.35	11.15	11.54
Custom (2)	54.48	32.08	69.59	47.24
Harvest (2,3)	155.55	171.36	15.45	16.91
Boll Weevil	4.27	4.70	n/a	n/a
Labor	13.18	7.72	15.07	9.42

(1) Includes defoliants for cotton.
(2) Assumes cotton is custom harvested.
(3) Includes ginning for cotton; hauling and drying for grain sorghum.

Per acre production inputs, costs, and estimates for overhead charges were based on typical rates and farming practices, and the 2018 District 11 Coastal Bend dryland cotton and grain sorghum budgets. Table 2 indicates per acre production costs differences between conventional and no-till. All other per acre production costs were the same for each crop. Custom costs reflect repairs, maintenance, fuel, and pickup charges. Debts and assets were not included in the analysis. Crop prices were based on average December 2017 to February 2018 futures market adjusted for discounts and basis for the Coastal Bend ($0.66/lb. cotton and $6.96/cwt. grain sorghum).

The base year for the 10-year analysis is 2018 and projections are carried through 2027. The projections for commodity price trends follow projections provided by the Food and Agricultural Policy Research Institute (FAPRI, University of Missouri) with costs adjusted for inflation over the planning horizon. Net cash farm income (NCFI) per acre was used to measure profitability, illustrating the trend and risk associated with the case study farm's financial performance expectations throughout the 10-year planning horizon under each crop and cultivation scenario.

Results

Financial projections for each crop and management practice scenario are given in Table 3. These results represent the average outcomes for total costs, receipts, and net cash farm income projections for 2018-2027. A 10-year average net cash farm income (NCFI) analysis reflects the impact of possible yield fluctuations, and changes to input costs and crop prices that likely will occur over time. Figure 1 illustrates the range of NCFI possibilities comparing conventional and no-till for both crops.

No-till cotton was the only scenario evaluated that potentially generated profitability (Table 3 and Figure 1). The average NCFI per acre is $40/year, compared to negative $28 NCFI for conventional cotton. The $68/acre, no-till advantage reflects the 62 lbs./acre higher yield, $21.60/acre less cultivation related expenses (fuel, repairs, and maintenance), and $5.46/acre labor savings per acre. These savings offset an estimated $10/acre additional no-till herbicide expenses.

At a beginning $6.96/cwt. grain sorghum price, both the no-till and conventional scenarios did not generate a positive NCFI (Table 3 and Figure 1). However, no-till had a $73/acre advantage. No-till cost savings included $22.35/acre due to no cultivation and $5.65/acre less labor, offsetting $3.13/acre additional no-till herbicide costs. The 324 lb. higher no-till yield was also a significant difference. At the average yields for both the conventional and no-till trials, the $6.96/cwt. price is below break-even.

Switching to no-till cultivation has the potential to maintain or improve yields, reduce production costs, and increase profitability per acre. Overall fuel, labor, and repairs and maintenance expenses are less due to eliminating several cultivation trips across the field annually.

Implications and Other Considerations

Table 3: 2018-2027 Projected Profitability of Conventional vs. No-Till Dryland Crops in South Texas

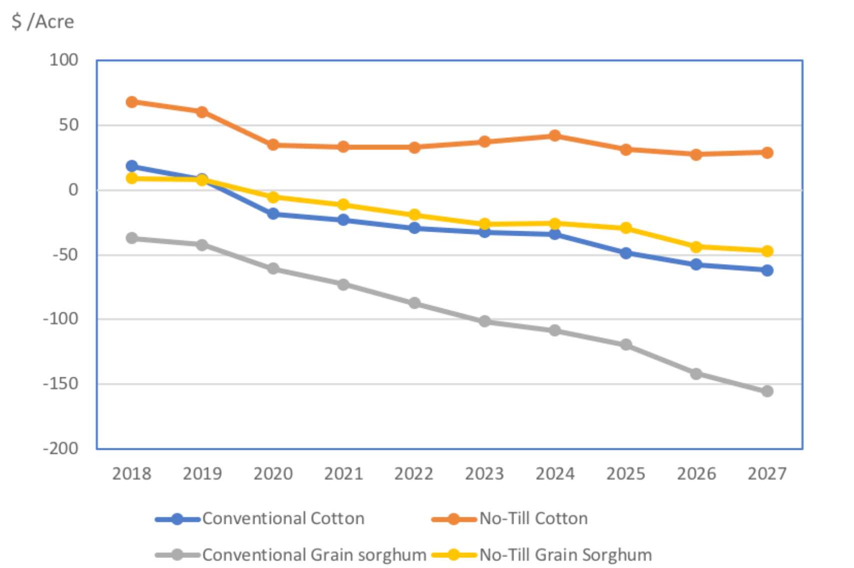
Scenario		10-Year Annual Averages		
		Total Cash Receipts ($/Acre)	Total Cash Costs ($/Acre)	Net Cash Farm Income ($/Acre)
1	Conventional Cotton	507	535	-28
2	No-Till Cotton	557	517	40
3	Conventional Grain	249	341	-92
4	No-Till Grain	272	291	-19

Although not considered in this analysis, no-till may also have a fixed cost advantage over conventional, as it would typically require less investment in machinery and equipment. Based on calculations from the Texas AgriLife Coastal Bend budgets, the savings in depreciation and investment costs of no-till vs. conventional was estimated to be $19.90/acre for cotton and $22.37/acre for grain sorghum in 2018. Savings are primarily due to the elimination of larger horse-power tractors, field cultivators, rippers, and crop cultivators.

However, short-term costs and cash flow implications of an equipment transition must be considered. While the estimated economic cost of ownership may be less expensive for a no-till system, that difference assumes all other things (age of equipment, timing of purchase, required debt, etc.) are equal. Often, these other factors are not equal, particularly if you are considering a transition to newer no-till equipment from an older conventional equipment complement. The newer equipment could, in the short-term, create a higher fixed cost of ownership. The higher value asset will mean increased opportunity cost of capital, higher depreciation, and possibly additional cash flow obligations if debt financing is necessary for the purchase. It is this short-term hurdle that may be holding many producers back from transitioning to no-till.

Switching to no-till cultivation has the potential to maintain or improve yields, reduce production costs, and increase profitability per acre. Overall fuel, labor, and repairs and maintenance expenses are less due to eliminating several cultivation trips across the field annually. For both no-till cotton and grain sorghum, herbicide and spraying expenses will likely be higher due to one or two additional applications. Repairs specific to planters may also be higher in no-till systems than normally expected in conventional farming since the soil is not tilled before planting and may be compacted in the surface. But, the overall costs savings from no-cultivation are expected to offset any additional spraying expenses and planter maintenance. No-till also has potentially significant agronomic benefits over conventional practices including higher soil organic matter, improved water infiltration and storage, and protecting against wind and water erosion.

Figure 1: Annual Average Net Cash Farm Income



Actual results will likely vary by producer, actual cultivation practices, production region, and crop markets. Crop producers should continue to implement management practices that improve the bottom-line and financial performance of their operation.

References

Stichler, C., A. Abrameit, and M. McFarland. 2006. Best Management Practices for Conservation/Reduced Tillage B-6189. Texas A&M AgriLife Extension Service. College Station, TX.