

The Relative Cost Efficiency of No-Till Farms
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Introduction

For the counties in the United States participating in the 2006 Crop Residue Management Survey, the adoption of no-till production has increased from 7.4% of planted acres in 1990 to 31.5% of planted acres in 2006.¹ Another way of looking at this increase is to note that two-thirds of the farms surveyed have still not adopted a no-till production system. Given these facts, examining the relative cost of a no-till system would be of interest to both farms that have adopted a no-till system and to those considering the adoption of a no-till system.

Using Kansas Farm Management Association (KFMA) data, this paper documents cost differences between farms that have adopted a no-till production system, and those with a conventional or a reduced till system. Costs are compared on a per harvested acre basis. The characteristics of no-till and mixed tillage farms are also compared.

Data and Methods

Using costs on a per harvested acre basis, cost differences between KFMA farms that have adopted a no-till production system and KFMA farms that utilize a conventional or reduced till system (mixed tillage farms) are documented using 2006 KFMA data. Comparisons are made for farms in the northwest KFMA, the north central KFMA, the south central KFMA, and the northeast KFMA. The comparisons for the

¹ Source: 2006 Crop Residue Management Survey, Conservation Technology Information Center, West Lafayette, Indiana.

northeast KFMA involve the following counties: Atchison, Jackson, Leavenworth, and Nemaha. Data on no-till production are not available for the other counties in the northeast KFMA. Historical comparisons for the north central KFMA are generated using data from 2002 to 2006.

The Kansas Farm Management Association (KFMA) provides detailed cost information on a harvested acre basis for each participating farm. These costs are often summarized and compared across farms and groups of farms.² Cost comparisons include the following cost breakdowns: labor, machinery cost, crop cost, improvement cost, asset charges, and other expenses. Labor includes hired labor and opportunity charges on operator and family labor. Machinery cost includes repairs on machinery and equipment, machine hire, gas, fuel, oil, and depreciation on machinery and equipment. Crop cost includes seed, crop insurance, fertilizer, herbicide, and miscellaneous costs such as irrigation energy, crop storage and marketing, and crop supplies. Improvement cost includes building repairs, conservation expenses, and depreciation on buildings. Asset charges include accrual interest paid, cash rent, and opportunity charges on current and noncurrent assets. Other expenses include organizational fees, publications, travel, real estate taxes, property taxes, general farm insurance, and farm utilities.

The characteristics of no-till and mixed tillage farms are also compared for farms in the north central and south central associations. Specific characteristics examined include the following: total acres, crop acres, harvested acres, a crop intensity index, percent of crop acres planted to wheat, percent of crop acres planted to feed grains, percent of crop acres planted to oilseeds, value of farm production, net farm income,

² See the following web site for KFMA summary information: www.kmar105.com.

labor cost as a percent of value of farm production, value of farm production per worker, expense ratios, operating profit margin, and asset turnover ratio. The crop intensity index is computed by dividing harvested acres by crop acres. Farms that are double cropping would have an index above 1.00. Labor cost as a percent of value of farm production and value of farm production per worker are used to examine labor efficiency differences among the farm groups. Farms that are efficiently using labor would have a relatively low labor cost as a percent of value of farm production and a relatively high value of farm production per worker. Three expense ratios are compared: the total expense ratio, the adjusted total expense ratio, and the economic total expense ratio. The total expense ratio is computed by dividing accrual expenses and depreciation by value of farm production. The adjusted total expense ratio is computed by dividing the expenses included in the total expense ratio plus an opportunity charge on operator and family labor by value of farm production. If a farm is covering total expenses and the opportunity charge on operator and family labor, the adjusted total expense ratio will be less than 1.00. The economic total expense ratio is computed by dividing the expenses included in the adjusted total expense ratio plus an opportunity charge on owned assets by value of farm production. If the economic total expense ratio is less than 1.00, a farm is covering all economic expenses and is thus earning an economic profit. The operating profit margin ratio is computed by dividing net farm income plus accrual interest paid minus the opportunity charge on operator and family labor by value of farm production. Using the operating profit margin ratio, farms are sorted into quartiles. The percent of farms in the top and bottom quartiles is quantified and reported for each group of farms. The asset turnover ratio is computed by dividing value of farm production by average

total assets. The asset turnover ratio measures asset utilization. A higher ratio indicates that a farm is using their asset base more intensely.

Detailed Cost Comparisons

Tables 1-4 contain detailed cost comparisons for northwest, north central, south central, and northeast Kansas farms. The no-till farms tend to have relatively more crop acres and a relatively higher crop intensity index. Total cost per harvested acre is relatively lower for the no-till farms for each region. The largest difference in total cost occurred in central Kansas. Labor cost and machinery cost per acre are relatively lower for the no-till farms. With northeast Kansas being the exception, crop cost is relatively higher for the no-till farms. Asset charges are relatively higher for the no-till farms in northwest and northeast Kansas and relatively lower for the no-till farms in central Kansas.

The north central KFMA has been collecting information on detailed costs for no-till and mixed tillage farms for several years. Table 5 contains total cost per harvested acre comparisons for 2002 through 2006. Subtracting total cost per harvested acre for mixed tillage farms from total cost per harvested acre for no-till farms yields cost differences ranging from -\$11.74 in 2005 to \$1.16 in 2002. Higher fuel prices have contributed to the cost advantage associated with no-till farms in recent years.

Farm Characteristic Comparisons

Table 6 contains a comparison of the characteristics of no-till and mixed tillage farms. The no-till farms tend to be larger, as measured using either total acres or value of farm production, farm their ground more intensely, produce less wheat, and produce more feed grains and oilseeds. Crop rotation information is not collected from KFMA

farms. However, using the information in Table 6, it appears that the no-till farms are including feed grains and oilseeds in their rotations to a greater extent than the mixed tillage farms.

The no-till farms are relatively more labor efficient (i.e., have a lower labor cost as a percent of value of farm production and a higher value of farm production per worker) and have a lower economic total expense ratio indicating that they are more cost efficient. Approximately 24% and 19% of the no-till and mixed tillage farms, respectively, are earning an economic profit. The no-till farms, on average, have a higher operating profit margin ratio and asset turnover ratio.

Though the no-till farms are on average larger, more cost efficient, and more profitable, it is important to note that these tendencies are not true for all farms. A relatively large percent of the no-till farms, approximately 38%, have a value of farm production below \$250,000. Similarly, approximately 12% of the mixed tillage farms have a value of farm production greater than \$500,000. In terms of profitability, approximately 7% of the no-till farms are in the bottom profit margin quartile and approximately 24% of the mixed tillage farms are in the top profit margin quartile.

Summary and Conclusions

This paper documents cost differences between farms that have adopted a no-till production system and farms with a mixed tillage system (i.e., conventional till or reduced till system). Cost per harvested acre is relatively lower for the farms that have adopted a no-till system. The largest differences in cost per harvested acre are for the farms in central Kansas. In addition to having a relatively lower cost per harvested acre,

on average, the no-till farms exhibited a lower economic total expense ratio, improved labor efficiency indices, and higher operating profit margin and asset turnover ratios.

Though on average the no-till farms have a cost advantage, adopting a no-till system does not necessarily mean that a farm will increase their cost efficiency. Every farm has a unique set of resources to work with. It is also important to note that some of the no-till farms were in the bottom operating profit margin quartile and that some of the mixed tillage farms were in the top operating profit margin quartile. Success is more allusive than just adopting a particular system.

Table 1. Detailed Cost per Acre Comparisons for Northwest Kansas Farms.^a

Item	No-Till Farms	Mixed Tillage Farms
Number of Farms	23	153
Crop Acres	2,575	2,155
Harvested Acres	2,173	1,556
Crop Intensity Index	0.844	0.722
<u>Labor Cost</u>		
Hired Labor	8.02	6.88
Operator and Family Labor	10.97	13.09
Sub-Total	18.99	19.97
<u>Machinery Cost</u>		
Repairs	12.68	15.96
Machine Hire	8.58	11.00
Gas, Fuel, and Oil	8.95	12.86
Depreciation	13.16	10.23
Sub-Total	43.37	50.05
<u>Crop Cost</u>		
Seed and Crop Insurance	15.57	14.14
Fertilizer	24.30	20.47
Herbicide	19.24	18.40
Miscellaneous	12.82	15.71
Sub-Total	71.93	68.72
<u>Improvement Cost</u>		
Sub-Total	2.87	2.24
<u>Asset Charges</u>		
Interest Paid	18.21	12.56
Cash Farm Rent	11.54	11.69
Opportunity Charges	24.69	26.19
Sub-Total	54.44	50.44
<u>Other Expenses</u>		
Sub-Total	8.93	10.57
Total Cost per Harvested Acre	200.53	201.99

^a Source: Kansas Farm Management Association Databank.

Table 2. Detailed Cost per Acre Comparisons for North Central Kansas Farms.^a

Item	No-Till Farms	Mixed Tillage Farms
Number of Farms	59	202
Crop Acres	1,444	977
Harvested Acres	1,503	998
Crop Intensity Index	1.041	1.021
<u>Labor Cost</u>		
Hired Labor	7.54	6.79
Operator and Family Labor	16.20	19.36
Sub-Total	23.74	26.15
<u>Machinery Cost</u>		
Repairs	14.38	15.88
Machine Hire	5.28	8.79
Gas, Fuel, and Oil	10.73	13.71
Depreciation	10.72	11.89
Sub-Total	41.11	50.27
<u>Crop Cost</u>		
Seed and Crop Insurance	15.59	13.03
Fertilizer	29.88	28.01
Herbicide	16.60	11.59
Miscellaneous	1.27	1.35
Sub-Total	63.34	53.98
<u>Improvement Cost</u>		
Sub-Total	2.26	2.52
<u>Asset Charges</u>		
Interest Paid	10.79	11.63
Cash Farm Rent	12.63	9.59
Opportunity Charges	21.61	27.89
Sub-Total	45.03	49.11
<u>Other Expenses</u>		
Sub-Total	13.30	14.18
Total Cost per Harvested Acre	188.78	196.21

^a Source: Kansas Farm Management Association Databank.

Table 3. Detailed Cost per Acre Comparisons for South Central Kansas Farms.^a

Item	No-Till Farms	Mixed Tillage Farms
Number of Farms	36	283
Crop Acres	1,982	1,371
Harvested Acres	2,078	1,361
Crop Intensity Index	1.048	0.993
<u>Labor Cost</u>		
Hired Labor	7.58	8.43
Operator and Family Labor	14.15	19.27
Sub-Total	21.73	27.70
<u>Machinery Cost</u>		
Repairs	12.69	18.12
Machine Hire	7.61	11.21
Gas, Fuel, and Oil	13.30	16.38
Depreciation	15.84	13.41
Sub-Total	49.44	59.12
<u>Crop Cost</u>		
Seed and Crop Insurance	20.47	13.96
Fertilizer	28.32	28.40
Herbicide	20.77	12.42
Miscellaneous	2.99	3.14
Sub-Total	72.55	57.92
<u>Improvement Cost</u>		
Sub-Total	2.46	2.34
<u>Asset Charges</u>		
Interest Paid	11.20	10.64
Cash Farm Rent	5.98	8.14
Opportunity Charges	21.09	27.49
Sub-Total	38.27	46.27
<u>Other Expenses</u>		
Sub-Total	8.45	11.88
Total Cost per Harvested Acre	192.90	205.23

^a Source: Kansas Farm Management Association Databank.

Table 4. Detailed Cost per Acre Comparisons for Northeast Kansas Farms.^a

Item	No-Till Farms	Mixed Tillage Farms
Number of Farms	13	60
Crop Acres	706	773
Harvested Acres	748	763
Crop Intensity Index	1.059	0.987
<u>Labor Cost</u>		
Hired Labor	4.18	8.68
Operator and Family Labor	26.69	24.95
Sub-Total	30.87	33.63
<u>Machinery Cost</u>		
Repairs	17.93	18.35
Machine Hire	8.45	8.84
Gas, Fuel, and Oil	13.85	16.06
Depreciation	13.84	11.57
Sub-Total	54.07	54.82
<u>Crop Cost</u>		
Seed and Crop Insurance	27.74	26.49
Fertilizer	30.89	33.65
Herbicide	14.54	14.63
Miscellaneous	0.58	0.72
Sub-Total	73.75	75.49
<u>Improvement Cost</u>		
Sub-Total	3.50	8.24
<u>Asset Charges</u>		
Interest Paid	13.05	12.04
Cash Farm Rent	16.21	19.60
Opportunity Charges	59.26	50.40
Sub-Total	88.52	82.04
<u>Other Expenses</u>		
Sub-Total	17.82	20.58
Total Cost per Harvested Acre	268.53	274.80

^a Source: Kansas Farm Management Association Databank.

Table 5. Historical Cost per Harvested Acre Comparisons for North Central Kansas Farms.^a

Year	No-Till Farms	Mixed Tillage Farms
2002	158.59	157.43
2003	161.09	169.14
2004	176.94	187.20
2005	184.43	196.17
2006	188.78	196.21

^a Source: Kansas Farm Management Association Databank.

Table 6. Characteristics of No-Till and Mixed Tillage Farms in Central Kansas.^a

Item	No-Till Farms	Mixed Tillage Farms
Number of Farms	94	480
Total Acres	2,062	1,626
Crop Acres	1,645	1,208
Harvested Acres	1,718	1,209
Crop Intensity Index	1.044	1.001
Percent of Crop Acres Planted to Wheat	40.30%	50.99%
Percent of Crop Acres Planted to Feed Grains	30.70%	22.27%
Percent of Crop Acres Planted to Oilseeds	24.56%	12.83%
Value of Farm Production (VFP)	\$370,847	\$273,706
Net Farm Income (NFI)	\$64,519	\$47,422
Labor Cost as a Percent of VFP	16.54%	19.28%
Value of Farm Production per Worker	\$237,875	\$198,338
Total Expense Ratio (TER)	0.826	0.827
Adjusted Total Expense Ratio (ATER)	0.951	0.978
Economic Total Expense Ratio (ETER)	1.085	1.155
Percent of Farms with ETER less than 1.000	24.47%	19.17%
Operating Profit Margin Ratio	0.1114	0.0847
Percent of Farms in Bottom Profit Margin Quartile	7.45%	28.33%
Percent of Farms in Top Profit Margin Quartile	30.85%	23.75%
Asset Turnover Ratio	0.3833	0.3054
Percent of Farms with VFP less than \$100,000	2.13%	17.50%
Percent of Farms with VFP between \$100,000 and \$250,000	36.17%	40.00%
Percent of Farms with VFP between \$250,000 and \$500,000	41.49%	30.42%
Percent of Farms with VFP greater than \$500,000	20.21%	12.08%

^a Source: Kansas Farm Management Association Databank.