Final Report on Conservation Agriculture

JULY 2005

DEMONSTRATION FARM PROJECT
of
THE NATURAL RESOURCES TRUST

"Farm the best; alternatives on the rest."

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Drift Prairie Conservation Ag: Economics Five-Year Report

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This report documents the economic performance and conservation expenditures in 2000-2004 for the participants in the Drift Prairie Conservation Ag. demonstration farms. Financial records reports were completed with the participants and submitted by adult farm management instructors Ray Sletteland, Curt Thoreson, Marvin Knell, Connie Ova, Virgil Dagman, and Jay Olson. Averages for the North Central and Red River Valley regions from the North Dakota Farm Business Management Education Program (NDFBMEP) are also included in this report as references to show the relative financial performance of the demonstration farm participants to other participants in the NDFBMEP. NDFBMEP data were extracted from the University of Minnesota FINBIN database (http://www.finbin.umn.edu/) with additional data provided by Andrew Swenson, Economist, North Dakota State University.

A list of the indicators, along with 2000-2004 averages for demonstration farm participants, and NDFBMEP participants are given in Table 1. These indicators may be used in several ways to assess economic performance and sustainability. First, indicator values can show performance for a single year (or at a single point in time for some indicators) in absolute terms. This may indicate how good or bad a particular year was, but does not indicate to what degree the results are due to management or to factors beyond a participant's control. Second, trends in indicator values over several years can be used to show whether conditions are improving or declining, providing an indicator of long-term sustainability. Third, indicators can be assessed based on relative values. This can show performance compared to others in the region or to a fixed target. The relative indicators are calculated so values greater than one indicate performance better than the state average, and values less than one indicate performance worse than the state average. Figure 1 shows time trends in the relative indicators, averaged over the four demonstration farms. This shows the performance of the demonstration farms as a group over time compared to the regional averages. Analysis of indicator trends was performed using linear regression for each farm and the regional averages. A significance level of 10% was used in evaluating significant trends for individual farms and regional averages and evaluating differences in trends between farms and regional averages.

Summary of indicators and results for 2000-2004 (Table 1 and Figure 1)

Net farm income is a key indicator for economic viability. Net farm income can vary significantly from year to year, so assessments based on trends rather than for a single year give a more informative picture of economic viability. For 2000-2004, no net farm income trends in either absolute terms or relative to regional averages were apparent for the demonstration farms. In 2001 and 2003, all 4 demonstration farm participants had net farm incomes exceeding the regional averages, and in 2000, 2002, and 2004, 3 out of the 4 demonstration farms had net farm incomes exceeding the regional averages. Each demonstration farm had net farm incomes exceeding the regional average in at least 4 of the 5 years.

Income to expense ratio indicates farm profit margin and is an indicator of economic efficiency. The higher the income to expense ratio, the better. An income to expense ratio less than one indicates negative net farm income. No significant trends in income expense ratio were observed for any of the demonstration farms. However, in 2000 only 2 of the 4 demonstration farms had income to expense ratios exceeding regional averages. By 2001, 3 of the 4 demonstration farms had income to expense ratios exceeding regional averages, and in 2002-2004 all 4 farms had income to expense ratios exceeding regional averages.

Rate of return on investment shows the income generated by investment in farm capital, and it shows the economic performance of the farm in terms comparable to other types of investments. No significant trends in rate of return on investment were observed for any of the demonstration farms. In 2001, 2 of the 4 farms had rates of return higher than the regional averages, and in 2000, 2002, 2003, and 2004, 3 of the 4 farms had rates of return higher than the regional averages.

Net farm income to debt ratio is a measure of financial viability indicating the capacity of the farm to make payments on debt. A higher net farm income to debt ratio shows a greater capacity for debt repayment, and a lower financial risk. No significant trends in net farm income to debt ratio were observed for any of the demonstration farms. However, in 2000 and 2001, 3 of the 4 farms had net farm income to debt ratios exceeding the regional averages, and by 2002-2004, all 4 of the farms had net farm income to debt ratios exceeding the regional averages.

Government payment share of gross farm income indicates reliance of the farm on government payments for economic viability. A higher share means a greater reliance on government payments. Government payment share of gross farm income showed a generally declining trend from 2000-2004 for each of the demonstration farms, however the regional averages also showed declining trends. The relative index for reliance on government payments was calculated by dividing the regional average government payment share of gross farm income by the participant's government payment share of gross farm income, so values greater than 1 indicate a lower reliance on government payments than the regional averages. In 2000, all 4 farms showed a higher reliance on government payments than the regional averages. This declined to 1 of the 4 farms in 2001, but by 2004, 3 of the 4 farms showed a higher reliance on government payments than the regional averages.

Government payment share of farm expenses is another indicator of reliance of the farm on government payments for economic viability. A higher share means a greater reliance on government payments. Government payments accounted for an average of 10.7% of farm expenses for the demonstration farms in 2004, down from a high of 41.0% in 2000, but up from the low of 8.3% in 2002. All 4 farms showed a higher reliance on government payments than the regional averages in 2000, by 2001 this declined to 1 farm, but by 2004, 3 of the 4 farm showed a higher reliance on government payments than the regional averages.

Government and conservation payment share of gross farm income is an indicator of reliance on external funding including non-government conservation funding. A higher share means a greater reliance on external funds. Government and conservation payments accounted for an average of 14.5% of gross farm income in 2004 for the 4 demonstration farms down from a high of 29.0% in 2000, but above the low of 11.5% in 2001. With participation in the Conservation Agriculture program, relative reliance on government and conservation payments tended to be higher than the regional averages, with the exception of 2001 when 3 of the 4 farms showed a lower reliance on government and conservation payments.

Conservation share of total government and conservation payments shows the portion of external payments that are targeted directly toward conservation. A higher share means more funds targeted toward conservation. An average of 45.8% of the total government and conservation payments received by the four demonstration farms were targeted toward conservation in 2004. With participation in the Conservation Agriculture program, the conservation share of payments increased dramatically for the 4 demonstration farms since 2000 relative to the regional averages.

Total percent in debt is a key indicator for financial viability. Although debt is useful for financing economic expansion, a trend toward higher debt may indicate worsening financial condition. Farms with higher debt have less flexibility in getting through "bad" years. 3 out of the 4 farms showed a significant downward trend in total percent in debt both in absolute terms and relative to regional averages. In 2000 and 2001, 3 out of the 4 farms had total percent in debt less than the regional averages. From 2002 through 2004 all 4 farms had lower percent in debt than the regional averages.

Farm share of net income indicates the degree to which the farm is able to generate enough income to support the family. A higher reliance on nonfarm income may indicate that the farm is not economically sustainable as a family enterprise. No significant trends in farm share of net income were observed for any of the farms. In 2000, 2003 and 2004, 2 out of the 4 farms had farm shares of net income higher than the regional averages. This increased to 3 out of the 4 farms in 2001, but declined to only 1 out of the 4 farms with farm shares of net income higher than the regional averages in 2002.

Seed, chemical and fertilizer expenses per cropland acre is an indicator of the reliance on purchased inputs for crop production. While purchased inputs can be important tools to increase profitability, a high dependence on purchased inputs may mean that the farm is more vulnerable to changing economic conditions and is less self-sufficient. High use of purchased inputs may also indicate potential negative environmental effects. Although both of the regional averages and all but 1 of the 4 demonstration farms appeared to show increasing trends in use of purchased inputs from 2000-2004, only 1 demonstration farm and the Red River Valley regional average showed statistically significant increases in absolute terms. Although the differences were not statistically significant, 3 of the 4 farms had lower trends in purchased input costs than the regional averages. In 2002, 2 out of the 4 farms had a lower reliance on purchased inputs than the regional averages. In all the other years 3 out of the 4 farms had a lower reliance on purchased inputs than the regional averages.

Replacement value of existing conservation practices is an indicator of the current value of previous investments in conservation. The true value of conservation practices is in the benefits they provide, however adding up all of the benefits is too difficult for a simple indicator. If conservation investment is an economic decision, then presumably, practices would only be installed and maintained if the perceived benefits exceed the costs. So replacement cost is a lower limit estimate of the benefits that are expected to be achieved. Average replacement value of existing conservation practices for the four demonstration farms was higher on owned land than on rented land at $15.56 and $4.48 per acre respectively in 2001. Average replacement values were not assessed in 2002-2004.

Spring wheat yield is an indicator of productivity. A sustainable agricultural system must be able to maintain productivity in the long term. Declining productivity is an indicator of depleted resource base. Although both of the regional averages and all of the demonstration farms appeared to show increasing spring wheat yield from 2000-2004, only 1 demonstration farm had statistically significant increases over the period both in absolute terms and relative to the regional average. In 2000, 2 out of the 4 demonstration farms had spring wheat yields exceeding the regional averages. From 2001-2004, 3 out of the 4 demonstration farms had spring wheat yields exceeding the regional averages.

Crop insurance percent of gross farm income is an indicator of the risk of the cropping system. A high reliance on crop insurance indicates a high risk cropping system. Average crop insurance for the 4 demonstration farms was 8.4% of gross farm income in 2000 and ranged from a low of 3.3% of gross farm income in 2003 to a high of 9.7% of gross farm income in 2004. In each year, 3 out of the 4 demonstration farms had a lower reliance on crop insurance than the regional averages.

Portion of cropland planted to spring wheat is an indicator of crop diversity. A more diverse cropping system is less risky than a less diverse cropping system. The portion of cropland planted to spring wheat for the Red River Valley regional average and for 1 of the 4 demonstration farms showed a significant declining trend in absolute terms from 2000-2004. Relative to the regional averages there were no significant trends in the portion of cropland planted to spring wheat for any of the demonstration farms. In 2000, 2 of the 4 farms had a lower portion of cropland planted to spring wheat than the regional averages. In all other years, only 1 of the 4 farms had a lower portion of cropland planted to spring wheat than the regional averages.

Number of crops grown is another indicator of crop diversity. Average crop diversity for the farms dropped from 7 crops per farm in 2000 to 4.25 crops per farm in 2004. 3 of the 4 farms grew at least 4 different crops in 2004.

Hired labor expense shows the employment opportunity provided by the farm, an indicator of economic support for the local community. Hired labor expenses showed significant increasing trends from 2000-2004 for 2 of the 4 farms both in absolute terms and relative to the regional averages. The number of farms with hired labor expenses greater than the regional averages fluctuated between 2-3 of the 4 farms over the period.

Conclusion

Overall there were few clear economic impacts of participation in the Conservation Agriculture (CA) project on the demonstration farms relative to other farms. In part this is due to the difficulty in discerning trends over a relatively short time span when there is substantial year-to-year variability. The clearest trend was a decrease in debt for 3 of the 4 farms over the five-year period. However, it is unclear how much of this trend can be directly attributed to participation in CA.

A substantial number of acres of residue management practices were adopted by the demonstration farm participants. In addition, soil testing and remote sensing were used to try and improve input use efficiency. It was expected that this would lead to decreased reliance on purchased inputs per cropland acre due to reduced fuel use with residue management, and due to reduced fertilizer and/or pesticide use with soil testing/precision management. Although the differences were not statistically significant, 3 of the 4 farms had lower trends in purchased input costs than the regional averages. In addition, there is often a concern that crop yields may decline with the adoption of residue management practices. Spring wheat yields showed no downward trend relative to regional averages, and 1 demonstration farm showed significant increasing spring wheat yields relative to the regional average.

Table 1. Economic Indicators and 2000-2004 Values

	Demonstration Farm Averages					North Central FBMEP Averages					Red River Valley FBMEP Averages				
Indicator	**2000**	**2001**	**2002**	**2003**	**2004**	**2000**	**2001**	**2002**	**2003**	**2004**	**2000**	**2001**	**2002**	**2003**	**2004**
Net farm income	$104,636	$91,720	$137,433	$171,962	$108,227	$55,673	$25,485	$52,221	$65,293	$58,389	$111,763	$74,248	$105,240	$123,318	$85,337
Income to Expense Ratio	1.45	1.32	1.47	1.54	1.36	1.32	1.14	1.26	1.30	1.24	1.28	1.19	1.27	1.27	1.19
Rate of return on investment	11.4%	8.4%	14.0%	14.4%	6.5%	8.6%	0.3%	6.7%	8.9%	6.1%	13.0%	6.3%	11.6%	11.7%	5.5%
Net farm income to debt ratio	0.52	0.30	0.43	0.57	0.42	0.19	0.08	0.16	0.19	0.15	0.24	0.16	0.23	0.24	0.15
Government payment share of gross farm income	29.0%	16.8%	5.6%	10.1%	7.9%	29.3%	28.6%	8.0%	13.5%	9.0%	19.8%	18.1%	4.3%	8.4%	5.7%
Government payment share of farm expenses	41.0%	21.8%	8.3%	15.3%	10.7%	38.6%	32.5%	10.1%	17.4%	11.2%	25.3%	21.5%	5.5%	10.7%	6.8%
Conservation and government payment share of gross farm income	29.0%	20.3%	11.5%	16.6%	14.5%	29.3%	28.6%	8.0%	13.5%	9.0%	19.8%	18.1%	4.3%	8.4%	5.7%
Conservation share of total government and conservation payments	1.0%	21.0%	53.0%	46.8%	45.8%	3.7%	3.6%	12.8%	7.2%	9.4%	1.0%	1.5%	4.7%	2.6%	3.3%
Total percent in debt	36.8%	35.1%	33.3%	28.3%	27.1%	44.2%	46.6%	45.4%	45.2%	44.9%	44.5%	44.5%	44.1%	43.4%	43.7%
Farm share of net income	84.2%	82.6%	85.1%	87.7%	81.3%	75.4%	59.6%	74.0%	76.5%	73.7%	88.6%	84.2%	86.8%	88.3%	84.7%
Seed, chemical and fertilizer expenses per cropland acre	$46.10	$43.67	$50.00	$57.26	$48.07	$35.50	$39.31	$38.90	$48.84	$48.68	$84.44	$83.71	$75.77	$97.34	$94.63
Replacement value of existing conservation practices – owned land	$16.35	$15.56													
Replacement value of existing conservation practices – rented land	$4.12	$4.88													
Spring wheat yield	40.7	41.7	34.0	54.5	61.6	32.1	28.9	26.7	37.3	43.5	49.2	47.0	36.8	60.9	63.7
Crop insurance percent of gross farm income	8.4%	7.8%	8.4%	3.3%	9.7%	17.4%	16.7%	11.2%	6.5%	12.5%	5.5%	7.5%	5.2%	1.9%	6.0%
Portion of cropland planted to spring wheat	31.8%	38.8%	43.8%	39.9%	35.1%	16.4%	26.9%	25.5%	26.4%	22.8%	39.2%	38.3%	38.6%	34.7%	32.4%
Number of crops grown	7	4.25	5	4.75	4.25										
Hired labor expense	$15,430	$16,826	$15,850	$15,336	$23,526	$4,985	$5,033	$5,725	$6,553	$7,769	$16,805	$19,394	$21,535	$24,337	$23,859

Figure 1. Trends in the demonstration farm average relative indicators compared to NDFBMEP state averages.