Measuring Sustained Competitive Advantage for a Sample of Kansas Farms

By Elizabeth Yeager and Michael Langemeier

Abstract

This paper examined sustained competitive advantage for a sample of 377 Kansas Farm Management Association farms with continuous data from 1988-2007. Technical, allocative, scale and overall efficiency indices were calculated for each farm and year. Approximately 30 percent of the farms exhibited significantly above average overall efficiency levels. These farms had a competitive advantage. Conversely, approximately 28 percent of the farms exhibited significantly below average overall efficiency levels or had a competitive disadvantage. The farms with a competitive advantage were significantly larger in terms of value of farm production and acreage, had significantly lower expense ratios and significantly higher profit margins.

Introduction

It is a widely established fact that profitability and per-unit costs vary significantly among farms and ranches (Langemeier, McGrann and Parker; Babcock; Langemeier and Bradford). Are these per-unit cost differences due to random events such as weather or are these differences due to controllable factors such as managerial ability? If the differences are due to managerial ability, internal and external benchmarking is extremely important in gauging the competitiveness of individual farms and for determining the impact of a change in the farm operation. Moreover, it would be prudent to use information from farms with high managerial ability or a sustained competitive advantage to compute key benchmarks.

There are several dynamic competition theories that can be used to examine sustained competitive advantage (Porter; Hunt; Ellig and Lin). One of the most widely discussed theories that can be used to examine sustained competitive advantage is resource-based theory of the firm (Barney and Clark). Two of the fundamental axioms of resource-based theory are the heterogeneity of resources among firms and imperfect mobility. Resource heterogeneity suggests that every firm has at least some resources that are unique. Imperfect mobility reflects the fact that some resources are difficult to imitate or purchase. Identifying and utilizing unique resources that are difficult for other firms to obtain is a key component of sustaining a firm's competitive advantage. Two of the telltale signs of the importance of dynamic competition under resource-based theory are heterogeneous firms and firms with above average performance (Hunt; Barney and Clark). This study focuses on the latter characteristic.

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Previous research that examines sustained competitive advantage or persistence in the performance of farms over time is limited. The agricultural economics literature has focused on characteristics of successful farms rather than sustained competitive advantage (i.e., success over time). Studies that have examined farm success include Kauffman and Tauer; Haden and Johnson; Sonka, Hornbaker and Hudson; Plumley and Hornbaker; Ford and Shonkwiler; Purdy, Langemeier and Featherstone; Mishra and Morehart; Gloy, Hyde and LaDue; Nivens, Kastens and Dhuyvetter; and Zulauf et al. With the exception of Gloy, Hyde and LaDue, none of these studies focused on maintaining success over time or sustained competitive advantage. The Gloy, Hyde and LaDue study examined the impact of management or human capital on long-term financial performance for a sample of dairy operations. Due to the nature of the data available, the authors were not able to examine the impact of whole-farm size or farm type on long-term financial performance.

This study fills the gap in the existing literature by examining sustained competitive advantage for a sample of Kansas farms. To determine whether individual farms have a competitive advantage, overall efficiency measures are computed for each farm and year. Farm characteristics of the group of farms with above average overall efficiency levels are then compared to those of the group of farms with below average overall efficiency levels.

This study contributes to the existing literature by clearly quantifying the extent to which a sample of farms exhibit above average efficiency levels or a sustained competitive advantage. In the process, the characteristics of farms with a sustained competitive advantage will be documented and the impact of the competitive advantage on financial performance and cost control will be measured. This study also provides an indirect method of examining the relevance of dynamic competition theories such as resource-based theory.

Methods

Efficiency indices for each farm were estimated using linear programming methods (Fare, Grosskopf and Lovell; Coelli et al.). Specifically, annual observations for each farm were used to estimate efficiency relative to all other farms in a particular year. Using this approach, each farm had efficiency indices for each of the 20 years examined. Information on outputs, inputs and input prices was used to compute the efficiency indices. These data are described in the following section.

Efficiency indices computed for each farm included technical, allocative, scale and overall efficiency. Technical efficiency measures whether a farm is producing on the production possibility frontier. A farm that produces on the production possibility frontier is maximizing output given their current input levels. A farm that is not producing on the production frontier is not maximizing output given their current input levels and is thus technically inefficient. Output and input data are used to compute technical efficiency indices. Allocative efficiency measures whether a farm is using the optimal mix of inputs. A farm that is allocatively efficient is producing on the average cost frontier or is minimizing cost given their current level of inputs and outputs. Scale efficiency measures whether a farm is producing at the most efficient size. A firm that is scale efficient is producing at the lowest per unit cost. Output, input and input price data are used to compute allocative and scale efficiency indices. Overall efficiency represents the product of technical, allocative and scale efficiency. For more information pertaining to the estimation of technical, allocative, scale and overall efficiency, see Coelli et al.

A farm may be efficient for one or two measures and not the others. It is only overall efficient if it is efficient for all three measures. Efficiency indices range from zero to one. Farms with an overall efficiency index of one are producing on the production possibility frontier, are using the optimal mix of inputs and are producing at the most efficient scale for their level of production. In other words, these farms are technically, allocatively and scale efficient, and are producing at the lowest cost per unit of output. Farms with an index below one could lower per-unit costs by reducing inefficiency.

Using the computed annual overall efficiency indices, the farms were categorized into three categories: significantly above average, insignificantly different from average and significantly below average. This categorization was done using t-tests in Excel. Further t-tests were conducted to determine if the differences in average efficiency levels, selected farm characteristics and financial efficiency ratios were statistically significant among the overall efficiency categories. These t-tests were conducted using Statistical Analysis Software (SAS), the Cochran approximation for degrees of freedom and assuming unequal variances (Cochran and Cox).

The financial efficiency ratios compared were the total expense ratio, the adjusted total expense ratio, the economic total expense ratio, profit margin, asset turnover ratio and return on assets. Each ratio was calculated for individual farms, for overall efficiency categories, and for the group as a whole. When the ratios were calculated for a group of farms, they represent a weighted average rather than an arithmetic mean.

The total expense ratio was computed by dividing total expenses by value of farm production. The adjusted total expense ratio was computed by dividing total expenses plus unpaid family and operator labor by value of farm production. The opportunity charge on family and operator labor was computed by multiplying the number of operators by average family living expenses. The economic total expense ratio was computed by dividing total expenses plus unpaid family and operator labor plus an opportunity charge on net worth by value of farm production. The opportunity charge on net worth was computed by multiplying average net worth by the 20-year average interest rate. An economic total expense ratio below one indicates that a farm or group of farms is earning an economic profit. The profit margin was computed by dividing net farm income plus cash interest minus unpaid family and operator labor by value of farm production. The asset turnover ratio was computed by dividing value of farm production by average total assets. Return on assets was computed by multiplying the profit margin by the asset turnover ratio. It is important to note that return on assets did not include capital gains or losses on assets.

Before discussing the data, expectations were made as to what the results might reveal. It was expected that there would be economies of size and that the larger farms in terms of value of farm production and acreage would be more efficient. Small farms are often assumed to have a difficult time competing with larger farms and earning an economic profit so it was important to measure their financial performance along with efficiency indices to determine if this was an issue for the sample of farms.

Data

The farms chosen for this study participated in the Kansas Farm Management Association (KFMA) program. The 377 farms included in this study all had continuous data from 1988 to 2007. In order to compute overall efficiency indices, information was required on economic costs, inputs, input prices and outputs. Economic cost was computed by summing cash costs, depreciation, an opportunity charge on family and operator labor and an opportunity charge on net worth. Three inputs were used in the analysis: labor, purchased inputs and capital. Labor was represented by the number of workers (paid and unpaid) on the farm. Labor price was obtained by dividing labor cost by the number of workers. Implicit input quantities for purchased inputs and capital were computed by dividing purchased input cost and capital cost by USDA input price indices. Purchased inputs included fuel and utilities; seed; fertilizer and lime; herbicide and insecticide; livestock expenses such as feed, veterinarian expenses and breeding charges; storage and marketing; and miscellaneous expenses such as organizational dues and fees. Capital included repairs, machine hire, cash farm rent, property taxes, insurance, cash interest, conservation expenses, depreciation and an opportunity charge on net worth.

Outputs consisted of crops and livestock. Implicit crop and livestock quantities were computed by dividing crop income and livestock income by crop price and livestock price indices. The crop price index represents a weighted average price for feed grains, oilseeds, wheat, and hay. The all beef price was used to represent the livestock price index (USDA).

Table 1 presents the mean and standard deviation of inputs, outputs, selected farm characteristics and selected farm efficiency ratios for the 377 farms over the 20 year period. The average value of farm production was $219,312. Farms were divided into four categories based on their value of farm production. The categories were assigned as follows: farms with an average value of farm production under $100,000 (VFP 1), farms with an average value of farm production between $100,000 and $249,999 (VFP 2), farms with an average value of farm production between $250,000 and $499,999 (VFP 3) and farms with an average value of farm production of $500,000 and above (VFP 4). Approximately 22.8 percent of the farms or 86 farms were in category VFP 1, and approximately 5 percent of the farms or 19 farms were in category VFP 4.

The incomes as a percent of value of farm production were calculated by taking the respective income levels for a set of enterprises (e.g., corn and grain sorghum) and dividing by value of farm production. The sources of income chosen were beef, feed grains, hay and forage, oilseeds and small grains. Originally other species of livestock were looked at as well, but they represented a very small portion of income. The two largest shares of income in terms of percent of value of farm production were from beef and feed grains. The smallest share of income looked at in this study was from hay and forage.

Input cost shares were calculated by taking the respective cost and dividing it by the summation of costs from labor, purchased inputs, and capital. Capital had the largest average cost share with approximately 49.9 percent followed by purchased inputs and labor. For benchmarking purposes, average costs can also be divided by value of farm production. The results were similar in the fact that capital still represented the largest expense. Capital as a percent of value of farm production was approximately 66.6 percent on average.

Financial performance measures were also important in this study. Based on the 20 year averages, 95 out of the 377 farms, or approximately 25 percent of the farms, had a negative profit margin. The average profit margin for all of the farms was 0.148. Approximately 9 percent of the farms earned an economic profit during the study period. The averages for the total expense ratio, the adjusted total expense ratio, the economic total expense ratio, the asset turnover ratio, and the return on assets are as follows: 0.754, 0.918, 1.171, 0.269 and 0.040, respectively.

Results

The average technical, scale, allocative and overall efficiencies for each year along with the summary statistics are presented in Table 2. The average overall efficiency was 0.58 or 58 percent. The farms were ranked each year based on their overall efficiency indices. The highest average rank was 30 while the lowest average rank was 372. The most efficient farm had an average overall efficiency score of 0.845 and was only 100 percent efficient relative to all the other farms for 3 of the 20 years. The average overall efficiency for the lowest ranked farm was 0.212. That farm was ranked last 5 of the 20 years. The difference from the most efficient to the least efficient farm was 0.633. In terms of average costs, the consequences from being the least efficient compared to the most efficient was $185,251. This is a large impact considering the average net farm income was $53,935.

The most efficient farm was above average in every year in terms of overall and technical efficiency. This farm was 100 percent technically efficient 6 out of the 20 years. However, for two years and three years this farm had below average scale and allocative efficiency indices, respectively. This shows how difficult it is for a farm to be above average each and every year. The most efficient farm only earned an economic profit 9 out of the 20 years.

Statistical tests revealed that 113 farms (29.97 percent) had above average overall efficiency and 105 farms (27.85 percent) had below average overall efficiency. The remaining 159 farms (42.18 percent) had overall efficiency levels that were not significantly different from average. The farms in the above average group had a sustained competitive advantage while those in the below average group had a sustained competitive disadvantage for the sample period.

Table 3 presents the average efficiency ratios, farm characteristics and financial ratios for the above average, average and below average farms in terms of their overall efficiency. The discussion below will focus on differences between the farms with above average and below average overall efficiency indices. The average overall efficiency for the above average group was 0.696 while the average overall efficiency for the below average group was 0.453. All efficiency components were significantly different among the overall efficiency categories. This is not surprising because overall efficiency is the product of the other three efficiency categories. The highest average overall efficiency for the above average group was 0.845 with the highest average efficiency for the below average group being 0.550. The lowest average overall efficiency level for a farm in the above average group was 0.626.

Value of farm production varied greatly among overall efficiency categories. The above average category had an average value of farm production of $332,709, and the below average category had an average value of farm production of $109,601. Fifty percent of the farms in the top category had a value of farm production between $250,000 and $499,999. In the average category, 57 percent of the farms had a value of farm production between $100,000 and $249,999. Of the farms in the below average category, 56 percent of the farms had a value of farm production less than $100,000.

Despite the differences in farm size, the percent of value of farm production derived from beef income, oilseed income and small grains income was not significantly different among the overall efficiency categories. The percent of value of farm production from feed grain income was significantly different for the below average group who tended to receive less income from corn and grain sorghum as compared to the above average group. The percent of value of farm production from hay and forage income was significantly different for the above average category who only received approximately 1.4 percent of their income from this category as compared to approximately 5.2 percent for the below average farms.

All of the cost shares were significantly different for the above and below average overall efficiency categories. The below average group typically spent a greater share on labor and capital while the above average group spent a larger share on purchased inputs. These results do not imply that the above average group is spending more money on purchased inputs relative to their output levels. Rather, these results are a direct result of the difficulty farms in the below average category have in controlling labor and capital costs. For example, capital cost as a percent of value of farm production was 93.3 percent for the below average category and 56.4 percent for the above average category.

Other major differences among the categories were total crop acres, number of operators, number of workers and financial performance. The total expense, the adjusted total expense and the economic total expense ratios were all lower, as expected, for the above average overall efficiency category. The profit margin ratio, asset turnover ratio and return on assets were higher for the above average category. The asset turnover ratio which measures how efficiently farm assets are being utilized to generate revenue was 0.338 and 0.169 for the above and below average categories, respectively. Both the profit margin and the economic total expense ratio proved to be significantly correlated to the overall efficiency categories. The economic total expense ratio was approximately 1 for the above average group and approximately 1.5 for the below average group. None of the farms in the below average category compared to approximately 28 percent of the farms in the above average category had an average economic total expense ratio below 1. Therefore, none of the farms in the below average category were earning an economic profit. The average profit margin ratio was 21.2 percent and -2.4 percent for the above and below average categories, respectively. None of the farms in the above average category had a negative average profit margin, but 72 farms in the below average category, approximately 69 percent of the farms in this category, had a negative average profit margin.

Because the value of farm production played such an integral role in explaining differences among the overall efficiency categories, Table 4 was created. Table 4 examines the differences among the average efficiency measures and the financial ratios based on average farm size measured by value of farm production. The average overall efficiency for the smallest farms was 0.474 while the average overall efficiency for the largest farms was 0.666. While it is possible for the smaller farms to have a competitive advantage over the 20 year period, it was more common for them to be at a competitive disadvantage. Less than 1.2 percent of the farms with an average value of farm production under $100,000 had above average overall efficiency while approximately 68.4 percent of the farms with a value of farm production over $500,000 had above average overall efficiency. Approximately 68.6 percent of the smallest farms and only 5.3 percent of the largest farms were in the below average efficiency category.

Results for the other efficiencies are also presented in Table 4. Technical and allocative efficiencies do not seem to be directly correlated with value of farm production. The smallest differences were in allocative efficiency. This indicates that across farm size categories, producers are adequately choosing the optimal mix of inputs for production. It is worth noting that the largest farms had significantly lower average scale efficiency than the middle two groups. The farms with the highest average scale efficiency (0.962) had a value of farm production between $250,000 and $499,999. All 99 of the farms in this group had above average scale efficiency. Based on this sample, farms with a value of farm production over $500,000 had lower average scale efficiency. This was a surprising result; without further research, it does not indicate that farms should decrease production in order to earn a value of farm production under $500,000. Farms in the smallest farm size category tended to have the lowest average scale efficiency.

Statistical tests performed on the financial ratios indicate that they are significantly different between the smallest and largest farms. On average, the largest farms have lower total expense, adjusted total expense and economic total expense ratios. The largest farms had an economic total expense ratio of approximately 1 while the smallest farms had an economic total expense ratio of approximately 1.6. The farms with a value of farm production above $500,000 also have higher profit margin ratios, asset turnover ratios and return on assets. The average profit margin ratio for the farms with a value of farm production under $100,000 was -11.3 percent while the average profit margin ratio for the farms with a value of farm production over $500,000 was 21.6 percent.

The percent of value of farm production from the different income sources was not presented in Table 4, however, these numbers were calculated. The percent of value of farm production from beef income for the smallest farms was approximately 38 percent compared to only 21.1 percent for the largest farms. The percent of value of farm production from small grain income was approximately 19.4 percent for the smallest farms and 8.8 percent for the largest farms. The percent of value of farm production from feed grain income was approximately 12.5 percent for the smallest farms and 23.1 percent for the largest farms. The percent of value of farm production from oilseed income was approximately 13.6 percent for the smallest farms and 22.3 percent for the largest farms. It appears that the largest farms are earning more from feed grains and oilseeds while small farms are earning a larger percent from beef and small grains.

It is evident that economies of size are playing a major role in the Kansas farm sector. The results indicate that on average the farms with a competitive advantage are larger than the farms with a competitive disadvantage in terms of value of farm production and acres.

Summary

This study examined the incidence of sustained competitive advantage for a sample of 377 Kansas farms. Efficiency indices were used to determine whether an individual farm had a competitive advantage, a competitive disadvantage or neither. Approximately 30 percent of the farms had a sustained competitive advantage while approximately 28 percent had a sustained competitive disadvantage. Results of the study are consistent with dynamic competition theories, such as resource-based theory, that suggest that it is possible for some firms to outperform their rivals over a long period of time (Hunt; Ellig and Lin).

The farm with the highest average overall efficiency had an average ranking of 30 while only being 100 percent efficient 3 out of the 20 years. The farm with the lowest average overall efficiency was the least efficient farm 5 out of the 20 years. This farm had an average ranking of 372 and its highest ranking over the 20 years was 359. Thus, though it was possible for farms to have a competitive advantage, it was difficult to consistently outperform peers.

The farms with a sustained competitive advantage were significantly larger, had significantly lower expense ratios and had significantly higher profit margins. Approximately 68.4 percent of the farms with a value of farm production greater than $500,000 had a sustained competitive advantage. Only about 1.2 percent of the smallest farms which had an average value of farm production under $100,000 had a competitive advantage.

The results of this study have three important implications. First, according to this study, a substantial proportion of small farms have a competitive disadvantage. Small farms tend to be covering cash costs, but in most cases are not even coming close to covering opportunity costs. Large farms are much more likely to have a competitive advantage and in many cases are covering both cash and opportunity costs. Second, because some farms have a competitive advantage, it is important for farms to benchmark using the information from these farms. Benchmarking using average farm information will provide a false signal. For a farm to grow and prosper, it will need to have a competitive advantage. Third, while it was possible for some farms to have a competitive advantage, it was very difficult for a farm to consistently outperform their peers every year. Based on the results of this study, it is important to use several years of financial data to benchmark rather than data from just one year.

This article also provides some insight into future research priorities. One of the biggest challenges to farms and ranches today is identifying and taking advantage of unique resources to create a competitive advantage. Most farms have some advantage that can be used to gain the upper hand. Farms without any unique resource will find it increasingly difficult to compete in tomorrow's agricultural industry. The next step in this line of research would be to further contrast the difference in characteristics and resources between farms with a competitive advantage and farms with a competitive disadvantage. Unique resources could be identified through a survey to producers asking about the factors they believe give them an advantage over others. Trend analysis would also be an interesting extension to this study. It is likely that there has been a shift in the characteristics of these operations over the 20 year period that this study encompasses. Some are likely getting larger while others are downsizing and many farms have probably changed their output mix over the sample period. These trends have likely impacted their efficiency levels.

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Table 1. Summary statistics for sample of Kansas farms, 1988-2007

	Mean	Standard Deviation
Inputs		
Labor Index	73,106	47,711
Purchased Input Index	148,427	137,800
Capital Index	156,437	109,788
Outputs		
Crop Index	237,986	227,935
Livestock Index	107,106	185,625
Farm Characteristics		
Value of Farm Production (VFP)	219,312	189,312
VFP 1	22.81%	42.02%
VFP 2	45.89%	49.90%
VFP 3	26.26%	44.06%
VFP 4	5.04%	21.91%
Percent of VFP from Beef Income	23.76%	40.90%
Percent of VFP from Feed Grain Income (corn & grain sorghum)	20.24%	16.15%
Percent of VFP from Hay and Forage Income	2.66%	9.87%
Percent of VFP from Oilseed Income (soybeans and sunflowers)	17.30%	16.25%
Percent of VFP from Small Grain Income (primarily wheat)	15.53%	18.58%
Labor Cost Share	15.30%	5.87%
Purchased Input Cost Share	34.79%	8.68%
Capital Input Cost Share	49.91%	8.41%
Accrual Net Farm Income	53,935	79,217
Total Acres	1,759	1,191
Total Crop Acres	1,035	738
Number of Operators	1.108	0.522
Number of Workers (includes hired, family, and operator labor)	1.547	1.010
Crop Labor Percentage	73.13%	25.77%
Financial Efficiency Ratios		
Total Expense Ratio	0.754	0.135
Adjusted Total Expense Ratio	0.918	0.220
Economic Total Expense Ratio	1.171	0.340
Profit Margin	0.148	0.191
Asset Turnover Ratio	0.269	0.148
Return on Assets	0.040	0.052

Note: The means for percent of VFP from the respective income sources, cost shares, and financial efficiency ratios represent a weighted average.

Table 2. Average efficiency measures for sample of Kansas farms, 1988-2007

	Technical	Scale	Allocative	Overall
Year				
1988	0.785	0.893	0.832	0.581
1989	0.792	0.894	0.875	0.621
1990	0.773	0.888	0.899	0.615
1991	0.771	0.885	0.873	0.594
1992	0.796	0.921	0.900	0.658
1993	0.757	0.905	0.884	0.603
1994	0.748	0.914	0.905	0.618
1995	0.725	0.840	0.885	0.540
1996	0.790	0.898	0.917	0.650
1997	0.771	0.924	0.898	0.639
1998	0.745	0.827	0.881	0.537
1999	0.747	0.834	0.857	0.531
2000	0.790	0.888	0.914	0.640
2001	0.775	0.893	0.879	0.610
2002	0.763	0.841	0.864	0.552
2003	0.726	0.863	0.884	0.551
2004	0.776	0.860	0.897	0.597
2005	0.723	0.858	0.879	0.544
2006	0.727	0.851	0.896	0.551
2007	0.659	0.781	0.855	0.433
Summary Statistics				
Average	0.757	0.873	0.884	0.583
Minimum	0.659	0.781	0.832	0.433
Maximum	0.796	0.924	0.917	0.658

Table 3. Farm characteristics of Kansas farms with above average, average and below average overall efficiency, 1988-2007

	Above Average 113 Farms	Average 159 Farms	Below Average 105 Farms
Average Efficiency Measures			
Overall Efficiency	0.696[a]	0.589[b]	0.453[c]
Technical Efficiency	0.826[a]	0.742[b]	0.704[c]
Allocative Efficiency	0.901[a]	0.887[b]	0.860[c]
Scale Efficiency	0.939[a]	0.899[b]	0.763[c]
Farm Characteristics			
Value of Farm Production (VFP)	332,709[a]	211,173[b]	109,601[c]
VFP 1	0.88%	16.35%	56.19%
VFP 2	37.17%	57.23%	38.10%
VFP 3	50.44%	23.27%	4.76%
VFP 4	11.50%	3.14%	0.95%
Percent of VFP from Beef Income	23.23%[a]	23.28%[a]	27.01%[a]
Percent of VFP from Feed Grain Income (corn & grain sorghum)	20.34%[a]	21.43%[a]	16.60%[b]
Percent of VFP from Hay and Forage Income	1.39%[a]	3.23%[b]	5.15%[b]
Percent of VFP from Oilseed Income (soybeans and sunflowers)	15.81%[a]	19.00%[a]	17.19%[a]
Percent of VFP from Small Grain Income (primarily wheat)	14.43%[a]	15.90%[a]	17.97%[a]
Labor Cost Share	14.30%[a]	14.66%[a]	19.21%[b]
Purchased Input Cost Share	39.93%[a]	33.77%[b]	24.74%[c]
Capital Input Cost Share	45.77%[a]	51.57%[b]	56.05%[c]
Accrual Net Farm Income	93,815[a]	46,858[b]	21,734[c]
Total Acres	2,127[a]	1,856[a]	1,216[b]
Total Crop Acres	1,321[a]	1,087[b]	651[c]
Number of Operators	1.301[a]	1.051[b]	0.985[b]
Number of Workers (includes hired, family, and operator labor)	2.066[a]	1.432[b]	1.164[c]
Crop Labor Percentage	68.91%[a]	74.89%[a]	75.03%[a]
Financial Efficiency Ratios			
Total Expense Ratio	0.718[a]	0.778[b]	0.802[c]
Adjusted Total Expense Ratio	0.846[a]	0.940[b]	1.093[c]
Economic Total Expense Ratio	1.039[a]	1.191[b]	1.542[c]
Profit Margin Ratio	0.212[a]	0.136[b]	-0.024[c]
Asset Turnover Ratio	0.338[a]	0.263[b]	0.169[c]
Return on Assets	0.072[a]	0.036[b]	-0.004[c]

Note: The means for percent of VFP from the respective income sources, cost shares, and financial efficiency ratios represent a weighted average. Unlike superscripts indicate that the means are statistically different at the 5% level.

Table 4. Efficiency and farm performance by Value of Farm Production (VFP) category

	Less than $100,000	$100,000 to $249,999	$250,000 to $499,999	$500,000 and more
Average Efficiency Measures				
Number of Farms	86	173	99	19
Average VFP	71,047[a]	169,036[b]	342,121[c]	708,296[d]
Average Overall Efficiency	0.474[a]	0.590[b]	0.650[c]	0.666[c]
Above Average Overall Efficiency (# of farms)	1	42	57	13
Below Average Overall Efficiency (# of farms)	59	40	5	1
Average Technical Efficiency	0.773[a]	0.732[b]	0.767[a]	0.860[c]
Above Average Technical Efficiency (# of farms)	30	24	22	14
Below Average Technical Efficiency (# of farms)	25	65	16	2
Average Allocative Efficiency	0.875[a]	0.886[ab]	0.883[ab]	0.901[bc]
Above Average Allocative Efficiency (# of farms)	29	65	29	7
Below Average Allocative Efficiency (# of farms)	17	27	18	2
Average Scale Efficiency	0.703[a]	0.906[b]	0.962[c]	0.875[d]
Above Average Scale Efficiency (# of farms)	0	106	99	7
Below Average Scale Efficiency (# of farms)	82	14	0	4
Financial Efficiency Ratios				
Total Expense Ratio	0.806[a]	0.759[b]	0.746[b]	0.740[b]
Adjusted Total Expense Ratio	1.197[a]	0.956[b]	0.868[c]	0.837[c]
Economic Total Expense Ratio	1.600[a]	1.228[b]	1.090[c]	1.053[c]
Profit Margin Ratio	-0.113[a]	0.121[b]	0.192[c]	0.216[c]
Asset Turnover Ratio	0.178[a]	0.248[b]	0.304[c]	0.310[c]
Return on Assets	0.020[a]	0.030[b]	0.058[c]	0.067[c]

Note: The financial efficiency ratios represent a weighted average. Unlike superscripts indicate that the means are statistically different at the 5% level.