AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search
http://ageconsearch.umn.edu
aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

Agribusiness and Applied Economics Report No. 624 **December 2007**

The Financial Performance of North Dakota Agricultural Cooperatives

Gregory McKee

Quentin Burdick Center for Cooperatives
Department of Agricultural Economics
North Dakota State University
Fargo, North Dakota 58105

Acknowledgements

The author extends appreciation to the North Dakota Farmers Union for financial support of this study and to CHS-Land O'Lakes Member Services for data. The author also thanks Drs. David Barton and Cheryl DeVuyst, and extension specialist Andrew Swenson for valuable comments about the manuscript. The author also thanks Edie Nelson who helped prepare the manuscript.

A single copy of this publication is available free of charge. Please address your inquiry to the Department of Agribusiness and Applied Economics, North Dakota State University, P.O. Box 5636, Fargo, ND 58105-5636, phone 701-231-7441, fax 701-231-7400 or email ndsu.agribusiness@ndsu.edu. This publication is also available electronically at the following web site: http://ageconsearch.umn.edu/. NDSU is an equal opportunity institution.

NDSU is an equal opportunity institution.

Copyright © 2007 by Gregory McKee. All rights reserved. Readers may make verbatim copies of this document for non-commercial purposes by any means, provided this copyright notice appears on all such copies.

Table of Contents

List of Tables iv

Abstract v

Introduction 1

Principles of Cooperative Financial Performance 1

Data and Methods 2

Results and Discussion 3
- Sources of Net Income 3
- Profitability and Business Size 4
- Trends in North Dakota Farm Size 5
- Description and Analysis of Profitability Groups 6
- Cooperative Financial Liquidity 6
- Cooperative Financial Solvency 7

Conclusion 9

References 17

Appendix 18

List of Tables

Table		Page
1	Total Annual Cooperative Sales and Net Income, 2002-2006	10
2	Composition of Annual Net Income, by Sales Quartile, 2002-2006	11
3	Return on Local Equity, by Sales Quartile, 2002-2006	12
4	Estimated Coefficients of Relationship between Return on Local Equity and Explanatory Variables	13
5a	Number of North Dakota Farms, by Sales Class, 1992-1995	14
5b	Acreage in North Dakota Farms, by Sales Class, 1992-1995	14
6	Average Annual Return on Local Equity, by Profitability Group, 2002-2006	15
7	Current Ratio, by Profitability Group, 2002-2006	15
8	Total Liabilities and Member Equity Ratio, by Profitability Group, 2002-2006	15
9	Long-term Liabilities and Member Equity Ratio, by Profitability Group, 2002-2006	15
10	Fixed Assets and Member Equity Ratio, by Profitability Group, 2002-2006	16
11	Member Equity and Total Assets Ratio, by Profitability Group, 2002-2006	16

Abstract

Agricultural input supply and marketing cooperatives are an important part of North Dakota's agricultural economy. North Dakota agricultural cooperatives purchase and merchandise feed and food grains, maintain inventories of farm inputs, and provide specialized services. In 2004, 224 farm supply, agricultural processing, and grain handling cooperatives were present in the state (Coon and Leistritz 2005). These include independent local cooperatives and those affiliated with federated cooperatives.

The objective of this research is to assess the financial performance of North Dakota agricultural input supply and grain handling cooperatives between 2002 and 2006. In section one, the characteristics of a cooperative business and how this relates to the financial benefits a cooperative provides are described. In section two, cooperative businesses features affecting financial performance are described. In section three, data and methods used in this analysis are presented. In section four, the results are presented and discussed. Section five presents concluding remarks. The results of this analysis suggest no statistical relationship between North Dakota agricultural cooperative profitability and business size. There were consistent differences in investment behavior between relatively profitable and less profitable agricultural input supply and grain handling cooperatives in North Dakota between 2002 and 2006.

Introduction

1. Principles of Cooperative Financial Performance

Businesses are identified as cooperatives based on how their governing laws of conduct affect overall business management. Management practices most associated with cooperatives include how the firm is controlled and how benefits are distributed. Cooperatives are controlled by members. These are defined as users of the cooperative who have a right to vote on cooperative affairs. Control is exercised through votes on major issues based on a democratic or proportional basis. A group of members form a board of directors which are the member's representatives in the management process. Cooperatives distribute benefits, such as net income, to patrons. These are defined as users who receive a share of the cooperative's net income in proportion to their use of the services provided. This is done either through direct payment to the patron, or through reinvestment in the cooperative on behalf of the patron.

Businesses are also identified as cooperatives based on their ownership structure. Cooperatives, historically, are owned by its users. Owners contribute equity on a regular basis through direct investment, retained profits, or other means. It becomes a central financial responsibility of cooperative owners, therefore, to provide equity to the cooperative in proportion to the benefits they expect to receive. Such equity enables the cooperative to provide desired services over an extended period of time and to obtain credit. Hence, in order for users to obtain all the benefits a cooperative can provide they must both patronize and invest in the firm.

Cooperative members evaluate the returns to cooperative ownership when deciding whether or not to invest. Some of the returns cooperatives produce include better prices than alternative businesses, access to markets otherwise not available, and valuable information. In this study, however, only pecuniary returns are analyzed. Specifically, patronage refunds are used to measure profitability. Other returns are omitted due to lack of data.

The ability of cooperatives to produce pecuniary returns for the members is affected by decisions made by its management and market conditions outside management's control. Cooperative management can use financial ratios to gauge the performance of the cooperative. Many studies of cooperative business performance use financial ratio analysis. Financial ratios have been used to analyze the economic efficiency of cooperatives (Schrader et al. 1985; Parliament et al. 1990). Other studies have used financial ratio analysis to examine cooperative performance when making a decision to merge (Henehan 2002) or after merger (Parliament and Taitt 1989; Kenkel et al. 2003).

Use of financial ratios to evaluate the performance of cooperatives is not an outcome of economic theory (Sexton and Iskow 1993). Since cooperatives represent a vertical integration between the farmer and the cooperative, using financial ratios of only part of an entity fails to account for all of the financial effects of management decision on the joint entity. Although this is a valid criticism, this study will use financial data because of data limitations. Use of financial ratios is germane to the cooperative stakeholders--members, management, and other leaders. Furthermore, to the extent non-pooling grain handling and input supply cooperatives are examined, and only competitive prices are considered, no residual benefit from vertical integration exists. In this case, financial ratio analysis is appropriate.

Regression analysis has been used to explain the statistical relationship between agribusiness performance and various explanatory variables, such as profit per unit of production, management returns per acre, and net farm income. The review of the agribusiness literature by Boyd, et al. (2007) finds that ability to achieve lower costs, higher yields, and greater productivity are important determinants of agribusiness profitability. Size, however, was not always a significant determinant. Based on financial data for the 1994 to 2003 period, Boyd et al. (2007) conducted a statistical analysis of financial determinants of local farm supply and grain handling cooperative profitability. The authors tested for statistical significance of input costs, liquidity, size, risk, the ratio of assets to equity, net profit margin, asset turnover, the times interest earned ratio, total assets, and lagged average return on equity. They concluded size was not a determinant of profitability. This study extends their work by identifying financial determinants of North Dakota agricultural input supply and grain handling cooperative profitability.

2. Data and Methods

Financial data for this study were obtained from CHS-Land O' Lakes Member Services. These data were collected from 451 fiscal year-end audited financial statements of 120 unique North Dakota farm input supply and grain handling cooperatives between 2002 and 2006. 435 observations were used. Only cooperatives with expenditures of at least two million dollars with the CHS federated cooperative system were included in the data provided by Member Services.

Data from Member Services were provided without accompanying information identifying the location or name of individual cooperatives, the type of business, or geographic location within the state. Member Services assigns a unique account number, maintained over time, to each cooperative, allowing comparison across years.

Annual data were provided for total sales; gross revenue; salary and benefits expenses; capital depreciation; local net income; patronage refunds from regional cooperatives; total net income; value of current, fixed, "other," and total assets; value of investments in other organizations; value of current liabilities; value of long-term debt; value of retained equity; and value of member equity. Table 1 summarizes the number of accounts observed, sales, and local net income for each year in the sample.

Financial ratios measuring liquidity, solvency, efficiency and profitability were calculated for each cooperative on an annual basis. Liquidity and solvency ratios include the current ratio, total liabilities as a share of member equity, long-term liabilities as a share of member equity, total value of fixed assets as a share of member equity, and total assets as a share of member equity. Asset turnover is the only efficiency ratio calculated.

The financial performance of cooperatives in the data is analyzed based on relative profitability. Profitability is measured as returns to local equity. Thus, returns refer only to net income before taxes generated by the cooperative; returns from investments made in other firms are not considered. Local equity is measured as the level of investment made by owners of the cooperative in the local cooperative only; equity invested in other firms is not considered.

Cooperatives in the data are divided into three groups based on relative annual profitability. Although such grouping eliminates information about the performance of individual cooperatives, this provides a consistent method for observing the relationship between financial performance and local financial resource management decisions. Profitability groups are designated "high," "medium," and "low." The top 25% percent of cooperatives, as measured by profitability, in any year are classified as "high." The middle 50% of cooperatives are classified as "medium" and the remaining 25% are classified as "low." Inferences are made about the relationship between local financial resource management and profitability based on trends in liquidity and solvency observed in these three groups.

Finally, following the approach of Boyd et al. (2007) a statistical model is used to detect a structural relationship between a cooperative's profitability and other factors, including business size. Variables included in the model are based on financial ratio and management factor literature (Boyd et al. 2007). 66 of the 120 cooperatives transacted business of at least two million dollars with the CHS system each year, creating a balanced panel of 330 observations.

In the statistical model (Equation 1), input costs are represented by the annual total cost of goods sold (COGS), which is calculated as the difference between sales and gross revenue. Liquidity is represented by the current ratio. Risk is measured as the cooperative-specific standard deviation of return on local equity between 2002 and 2006. The adjusted assets-to-equity and adjusted asset turnover ratios are calculated. Adjusted assets, defined as total assets less current liabilities, is included as a measure of business size. Finally, the lagged state average return on local equity is provided. Each variable is differenced by its two year contemporaneous industry average across all cooperatives. The two-year average is done to reduce the effect of any sudden industry effects to the individual cooperative. OLS is used to estimate the following:

$$ROLE_{i,t}=\alpha_t+\beta_1(COGS_{i,t})+\beta_2(current\ ratio_{i,t})+\beta_3 risk+\beta_4\left(\frac{adjusted\ total\ assets_{i,t}}{member\ equity_{i,t}}\right)+ \quad (1)$$
$$\beta_5\left(\frac{total\ sales_{i,t}}{adjusted\ total\ assets_{i,t}}\right)+\beta_6(adjusted\ assets_{i,t})+\beta_7 ROLE_{i,t-1}+\varepsilon_{i,t},$$

where *t* represents years 2003 through 2006 and *i* represents an individual cooperative. The year 2002 is dropped in order to utilize the two-year contemporaneous average.

Note that, due to data limitations, the method used in this study differs from Boyd et al. (2007). First, net profit margin is not included in the data because income tax data are not provided, but the net savings information in the data contains information about balances after income taxes are paid. Second, the times interest earned ratio is not included because no data regarding interest expense were provided.

3. Results and Discussion

Sources of Net Income

North Dakota agricultural input supply and grain handling cooperatives receive net income from local management of financial resources and as patronage dividends from other investments, such as regional (federated) cooperatives, cooperative financial institutions, or rural utility cooperatives. In 2006, net income from local operations of 88 input supply and grain

handling cooperatives observed in North Dakota was $35,695,759. Patronage received from outside investments was $22,475,524, generating total net income of $58,171,283.

The relative contribution of local net income to total net income is related to sales volume (Table 2). Data were ranked by sales volume and the share of total net income from local operations and from outside investment was calculated. In 2006, cooperatives with sales less than the third sales quartile received between 31% and 38% of net income from local operations. In contrast, cooperatives with sales greater than the third quartile received 74% of their net income from local operations.

Financial data from the 2002 to 2005 period shows a similar relationship between sales volume and sources of net income. Cooperatives with sales less than the first quartile consistently obtained less than half of their total net income from local operations. Cooperatives with sales between the first and second quartile received between 50% and 60% of net income from local operations. Cooperatives with sales greater than the second quartile received even larger shares of their total net income from local operations. Hence, between 2002 and 2006, agricultural cooperatives with sales greater than the third quartile consistently generated most of their net income from local operations. Smaller agricultural cooperatives relied on returns from outside investments.

Profitability and Business Size

The relationship between the contribution of local operations to total net income and sales volume suggest a relationship between business size and profitability. The annual return on local cooperative equity (ROLE) was calculated for each cooperative. In 2006, the average statewide return on local equity for the 88 cooperatives observed was 8.8%. In 2006, cooperatives with sales less than the first, second, third, and fourth quartiles obtained returns on local equity of 5.1%, 8.0%, 6.0% and 16.0% respectively (Table 3). When ranked by adjusted assets, in 2006, cooperatives with adjusted assets less than the first, second, third, and fourth quartiles obtained a return of 8.1%, 5.4%, 7.9% and 13.5%. Similar analysis for data from the 2002 to 2005 period indicate that cooperatives with sales less than the first and second quartiles were generally less profitable than cooperatives with sales less than the third and fourth quartiles, regardless of the measure of business volume used.

A second way to consider whether profitability depends on business size is to observe the share of cooperatives generating at least the average annual statewide return on local equity. When ranked by sales volume, only a minority of cooperatives with sales less than the first quartile achieved this rate of return. In 2002, 11 of 25 generated at least the statewide average level of returns; in 2003, 7 of 25 did; in 2004, 1 of 20 did; in 2005, 4 of 19 did; and in 2006, 7 of 22 did. Cooperatives with sales greater than the first quartile typically had returns greater than the statewide average, with the exception of those with sales between the first and second quartiles in 2003 and 2006. Ranks based on adjusted assets generated the same qualitative results.

These results suggest the presence of a structural relationship between cooperative profitability and business size. In order to statistically determine whether this structural relationship exists, the regression model in Equation 1 is estimated. The results (Table 4) indicate

Equation 1was not very successful at describing the relationship between return on local equity and other variables. The R-squared value (0.36) and F-statistic (6.87) indicate the model is statistically valid. Three variables in the model are statistically significant, the costs of goods sold, $COGS_{i,t}$, the efficiency ratio, $\frac{total\ sales_{i,t}}{adjusted\ assets_{i,t}}$, and the lagged value of the return on local equity, $ROLE_{i,t-1}$. The estimated value of the $COGS_{i,t}$ is so small as to have essentially no effect on profitability. The efficiency ratio has a positive sign, suggesting that relatively efficient cooperatives are more profitable. The statistical relationship between lagged and current returns suggests performance in previous periods is an indicator of future performance. This makes sense if revenues are retained for working capital or as an indicator of credit worthiness.

The results of this statistical model indicate either no measurable or structural relationship exists between a cooperative's size (as based on adjusted assets) and its return on local equity, or that no relationship exists between these two which can be detected with available data. The business size variable, $adjusted\ assets_{i,t}$, was small, negative, and statistically insignificant at the 5% level. The insignificant result corresponds with Boyd et al. (2007). These results, and the observations made in Tables 2 and 3, suggest that although sales volume does not fundamentally determine whether or not a North Dakota grain marketing or input supply cooperative can be profitable, it may be relatively difficult for a smaller cooperative to be highly profitable.

Trends in North Dakota Farm Size

Current trends in the demographics of North Dakota farms will influence the sustainability of profits for agricultural input supply and marketing cooperatives in the state. On average, North Dakota farms are increasing in acreage and value of output, but the total number of farms is declining (Table 5). Between 1992 and 2005 the total number of farms in North Dakota decreased 8.2% (NASS, 2002; NASS, 2006). The total acreage farmed during this period decreased also, down 2.5% from 40.4 million acres to 39.4 million acres. Hence, the average North Dakota farm is increasing in size.

The changes in number and size of farm vary by value of output. The number of relatively large farms, those producing annual output valued greater than $100,000, is increasing, up 10% since 1992. The average farm size in this sales class increased 10.4%, from 2,378 to 2,676 acres. The number of mid-size farms in the state, those producing annual output valued between $10,000 and $99,999, is declining, down 35.7% since 1992. The average farm size in this sales class decreased 8.5%, from 973.0 to 890.8 acres. The number of relatively small farms, those producing output valued between $1,000 and $9,999, is growing, up 54.5% since 1992. The average farm size in this sales class increased 81.2%, from 181.2 to 329.4 acres.[i] This trend reflects the national trend of farm consolidation, which is driven by efficiency factors such as economies of scale and changes in technology.

Anecdotal evidence provided by cooperative managers indicates operators of relatively large and small farms demand different types of goods and services and at different frequencies. To the extent the operators of these farms are served by agricultural cooperatives, the cooperatives will face increased heterogeneity of needs from their membership. This trend, coupled with declining rural population in the state (Rathge et al. 2002), indicate that managers

of agricultural input supply and marketing cooperatives will need to assess how their management of their financial resources will affect the level of benefits the cooperative provides.

Description and Analysis of Profitability Groups

Following the procedure described above, the 120 cooperatives were sorted into groups of high, medium, and low profitability. Table 6 presents the statewide average profitability, as measured by ROLE, for the high, medium, and low profitability groups. Average returns were between 4.3% and 10.7% between 2002 and 2006. An average cooperative in the high and medium profitability groups always had positive returns. In contrast, an average cooperative in the low profitability group always lost money.

The coefficient of variation was calculated. This is a relative measure of variance in returns which accounts for the average return. For example, a variance of 5% during years in which the average return is 50% is different from years in which the average return is 2%. It is sometimes used as a representative measure of the riskiness of a company's returns. This statistic indicates no clear trend with respect to whether the average cooperative's profitability was more or less volatile over time.

The 66 cooperatives observed in each year of the sample period tended change profitability group over time, however. All except three were classified into more than one profitability group during the sample period. Six of 66 (10%) cooperatives were in the high group for at least four years. Twenty-five cooperatives were members of the high group at least one year between 2002 and 2006. Twenty-five (38%) cooperatives were in the medium group for at least four years. Forty-eight cooperatives were members of the medium group at least one year between 2002 and 2006. Two cooperatives (3%) were members of the low group at least four years. Twenty-five cooperatives were members of the low group at least one year between 2002 and 2006. These results indicate that a relatively profitable cooperative is not guaranteed to remain so, and that relatively unprofitable cooperatives have been observed to improve their performance.

Cooperative Financial Liquidity

Financial data provided by CHS-Land O'Lakes Member Services can be used to identify patterns in cooperative financial liquidity between 2002 and 2006. This is relevant because financial liquidity refers to the ability of cooperatives to meet their short-term financial obligations and to obtain short-term credit. Short-term credit is used to make short-term investments or purchase inventories. Short-term investment trends can be studied by calculating the current ratio, which indicates changes in the relative use of cash or debt to invest in short-term assets. Based on the short-term investment behavior observed in the high, medium, and low profitability groups described above, inferences are made about local financial resource management and the level of financial benefits generated by cooperatives.

The current ratio for all 120 cooperatives was calculated. Average annual ratio for each profitability group is presented in Table 7. Current ratios declined for the high performing group between 2002 and 2006, down from 1.66 to 1.43. The available data indicate that this change was due to relatively larger increases in current liabilities than in current assets. Anecdotal information suggests this is related to increased values of grain inventory.

Cooperatives in the low and medium profitability groups experienced increasing current ratios during the 2002-2006 period. Ratio values were highest in 2006. Ratios for the medium group approached 3.00. No data were provided by Member Services to explain these increases. In comparing this situation with that of cooperatives in the high profitability group, the medium and low performing cooperatives make relatively less use of available working capital to conduct operations. This could indicate cooperative managers are putting off expenditures until later time periods, or have risk averse preferences. Hypothesis tests conducted using a standardized t-statistic indicate the performance of high cooperatives are statistically different from medium and low cooperatives in 2005 and 2006, but statistically indistinguishable in other years.

Cooperative Financial Solvency

Financial data provided by CHS-Land O'Lakes Member Services can be used to identify patterns in cooperative financial solvency between 2002 and 2006. This is relevant because financial solvency refers to a firm's ability to leverage equity or acquire debt capital. The ratios are also indicators of the extent to which cooperatives are using long-term debt.

The first solvency ratio calculated in this paper is the ratio of total liabilities, defined as current liabilities and long-term debt, and member equity (Table 8). Values of this ratio generally increased for an average cooperative in each profitability group. This was largely due to increased liabilities during this period. Cooperatives in the high profitability group experienced the largest ratio increase. The average value of total liabilities for highly profitable cooperatives between 2002 and 2004 was $3,868,837. The average total member equity per highly profitable cooperative was $3,923,353 over the same period. The total liabilities-to-member equity ratio ranged from 1.00 to 1.17 during this period. Between 2005 and 2006, however, the average value of total liabilities increased to $7,839,442. Total member equity increased to $6,394,512 in 2005, and then declined to $4,888,243 in 2006, a 50% increase in total equity followed by a 24% decrease. Although information was not provided to explain these changes in member equity, they may be explained by large patronage payments from regional cooperatives coupled by immediate efforts to retire member equity. The decline in member equity in 2007 and the stable level of liabilities led to the increase in the ratio of total liabilities and member equity for highly profitable cooperatives, up from 1.16 in 2005 to 1.74 in 2006. Cooperatives in the medium and low profitability groups experienced the same pattern of increased member equity in 2005 and decline in 2006, but the percentage changes in equity were smaller, a 20% increase and then a 15% to 17% decrease in equity. Note, however, that the debt to equity ratio of medium profitability cooperatives improved in 2006. Since equity declined 15% to 17%, liabilities must have declined at a greater rate. The change in value of liabilities for highly profitable cooperatives during this period was principally due to increased current liabilities. For cooperatives in the high profitability group, average current liabilities in 2005 and 2006, $6,745,995, was approximately double the 2002-2004 average of $3,521,879. During the same time, the value of current liabilities for the medium and low profitability groups remained close to their averages of $3,449,025 and $1,497,730 respectively.

The second solvency ratio calculated in this paper is the ratio of long-term liabilities and member equity (Table 9). There is no overall trend in the ratio values, indicating that the agricultural supply and marketing cooperatives in the state are acquiring or redeeming long-term

liabilities at roughly the same rate as they acquire or redeem member equity. Analysis of the data indicate that cooperatives in the low profitability group tend to carry, on average, less long-term debt than cooperatives in the medium and high profitability groups. The average total annual long-term debt for these groups was $230,879, $460,511, and $1,442,829, respectively, between 2002 and 2006. The amount of long-term debt fluctuated at different rates for the different groups. Cooperatives in the high profitability group tended to have the greatest variance in amount of long-term debt and also had the single largest change in value of debt, with an 862% increase in average long-term debt for the group from 2002 to 2003. The other groups had changes near or above 100%. As a whole, these results indicate that high profitability may be associated with relatively large amounts of long-term debt coupled with a successful ability to secure large changes in credit amounts.

The third solvency ratio calculated in this paper is the ratio of fixed assets and member equity (Table 10). If debt capital is not exclusively used for fixed asset purchases, this ratio may indicate the extent to which member equity is held in fixed assets. An upward trend was observed for cooperatives in the high profitability group, increasing from a low of 0.38 in 2002 to a high of 0.81 in 2006. This can be explained by an increase in fixed assets accompanied by a decline in member equity. The average total value of fixed assets for high profit cooperatives between 2002 and 2004 was $1,754,176. The average for the 2005 and 2006 period increased 127% to $3,983,049. Member equity decreased 24% for this group in 2006. This observation indicates that high performing cooperatives have purchased substantial amounts of fixed assets in the past two years, while still aggressively retiring equity. No data are available to suggest why medium and low profitability cooperatives did not experience a similar change in their ratio of fixed assets and member equity.

The final solvency ratio calculated paper is the ratio of member equity and adjusted assets (Table 10). This ratio indicates the extent to which a cooperative leverages member equity with other sources in order to perform operations. The values for this ratio were steady and similar for the three profitability groups between 2002 and 2005. In 2006 the ratio value decreased for all three groups. The decrease in these values corresponds with simultaneous increases in current and fixed assets but a larger percent increase in liability and decreased member equity for cooperatives in all three groups.

The ratio of total assets and member equity was consistently highest for the high profitability group. Statistical tests indicate it would be very unlikely for a typical cooperative in the medium and low cooperative groups, by chance alone, to have a ratio as high as a typical cooperative in the high profitability group. Firms with high asset-to-equity ratios use debt capital in conjunction with equity capital to take advantage of business opportunities. Firms with low ratios may be using a strategy of foregoing debt capital and failing to take advantage of business opportunities. Although the sudden increase of this ratio for all profitability groups indicates that a typical medium and low profitability cooperative may have made more use of debt capital in 2006, as a share of member equity, the statistical test mentioned above indicates that a fundamental difference between high profit cooperatives is to make relatively more use of debt than other groups.

4. Conclusion

Members make a decision to both patronize and invest in a cooperative when they decide to do business with it. Cooperative members receive the maximum benefits from their investment in cooperatives when the returns the cooperative produces are at least equal to those of the next best alternative use of these financial resources invested. This study analyzed the returns from financial management decisions made by agricultural input supply and marketing cooperatives in North Dakota. Data from audited financial statements from 120 cooperatives, filed between 2002 and 2006, were analyzed. Inferences were made about the relationship between local financial resource management and profitability based on trends in liquidity and solvency observed in these three groups.

The results of this study describe the relationship between cooperative size and profitability. Only relatively large cooperative tended to provide financial returns for their members from net income from operations managed at the local cooperative. Relatively small cooperatives tended to provide returns as transfers from other entities. No statistical relationship was found, however, between a cooperative's sales volume and its level profitability.

The results of this study also describe whether relationships exist between profitability, and changes or trends in short- and long-term investment during the 2002 and 2006 time period. The cooperatives in this study tended to shift between varying levels of profitability, suggesting that relatively profitable cooperatives are not guaranteed to remain so and the relatively unprofitable cooperatives have been observed to improve performance. The most profitable cooperatives in this study were observed to have declining current ratios between 2002 and 2006, suggesting they may be maintaining relatively smaller inventories or granting relatively less credit to members. Highly profitable cooperatives were observed to maintain relatively large amounts of current liabilities, as a share of member equity. These cooperatives had relatively large amounts of long-term debt and were able to secure large changes in the absolute amount of credit without having a different ratio of long-term liabilities and member equity than relatively less profitable cooperatives. Highly profitable cooperatives increased investment in fixed equity during 2005 and 2006 at a faster rate than their simultaneous losses or retirement of member equity. Relatively less profitable cooperatives consistently balanced increases in fixed assets and decreases in member equity. Finally, the most profitable cooperatives in this study consistently made use of more debt capital, relative to member equity, than less profitable cooperatives.

A trend toward a greater number of relatively small and relatively large North Dakota farms suggests increased heterogeneity in cooperative membership. Agricultural input supply and grain marketing cooperative managers should evaluate whether these investment trends optimally accommodate trends in North Dakota farm size and heterogeneity in demand for goods and services from both small and large farm operators. Data are not available to describe members in each cooperative, and thereby couple trends in farm size with cooperative membership. The results of this study can be useful for decision makers of cooperative businesses to consider when evaluating whether any changes to their strategic plans should be made to either increase profitability or to accommodate this trend in farm size and member heterogeneity.

Table 1. Total Annual Cooperative Sales and Net Income, 2002-2006

Year	N	Total Sales	Total Local Net Income
2002	99	$1,275,477,823	$19,380,671
2003	100	$1,599,590,282	$24,627,218
2004	77	$1,749,075,117	$28,540,144
2005	73	$1,806,500,513	$37,458,157
2006	88	$2,229,655,176	$35,695,759

Table 2. Composition of Annual Net Income, by Sales Quartile, 2002-2006

2006 Sales	N	Local Net Income	Patronage	Total Net Income	Patronage/Total Local Net Income
Between third and fourth quartile	22	$29,178,864	$10,252,958	$39,431,822	26.0%
Between second and third quartile	22	$3,635,300	$6,060,846	$9,696,146	62.5%
Between first and second quartile	22	$1,962,831	$4,045,836	$6,008,667	67.3%
Less than first quartile	22	$918,764	$2,115,885	$3,034,648	69.7%
Total	88	$35,695,759	$22,475,524	$58,171,283	Avg. 38.6%

2005 Sales	N	Local Net Income	Patronage	Total Net Income	Patronage/Total Local Net Income
Between third and fourth quartile	19	$24,902,215	$7,043,599	$31,945,814	22.0%
Between second and third quartile	19	$8,165,775	$3,518,278	$11,684,053	30.1%
Between first and second quartile	18	$3,594,038	$2,491,587	$6,085,625	40.9%
Less than first quartile	19	$796,130	$1,739,738	$2,535,868	68.6%
Total	75	$37,458,157	$14,793,203	$52,251,360	Avg. 28.3%

2004 Sales	N	Local Net Income	Patronage	Total Net Income	Patronage/Total Local Net Income
Between third and fourth quartile	20	$18,331,164	$3,643,834	$21,974,998	16.6%
Between second and third quartile	20	$6,978,546	$2,706,485	$9,685,031	27.9%
Between first and second quartile	19	$2,736,853	$1,889,137	$4,625,990	40.8%
Less than first quartile	20	$493,581	$1,064,509	$1,558,090	68.3%
Total	79	$28,540,144	$9,303,965	$37,844,109	Avg. 24.6%

2003 Sales	N	Local Net Income	Patronage	Total Net Income	Patronage/Total Local Net Income
Between third and fourth quartile	25	$17,128,747	$3,141,171	$20,269,918	15.5%
Between second and third quartile	25	$4,829,378	$1,393,526	$6,222,904	22.4%
Between first and second quartile	25	$1,977,943	$1,522,615	$3,500,558	43.5%
Less than first quartile	25	$32,936	$604,506	$637,442	94.8%
Total	100	$23,969,004	$6,661,818	$30,630,822	Avg. 21.7%

2002 Sales	N	Local Net Income	Patronage	Total Net Income	Patronage/Total Local Net Income
Between third and fourth quartile	25	$13,134,211	$3,173,947	$16,308,158	19.5%
Between second and third quartile	25	$3,736,565	$2,460,913	$6,197,478	39.7%
Between first and second quartile	24	$1,969,064	$2,005,992	$3,975,056	50.5%
Less than first quartile	25	$58,478	$990,400	$1,048,878	94.4%
Total	99	$18,898,318	$8,631,252	$27,529,570	Avg. 31.4%

Table 3. Return on Local Equity, by Quartile, 2002-2006

2006 Sales	ROLE	2006 Adjusted Assets	ROLE	N
Between third and fourth quartile	16.00%	Between third and fourth quartile	13.50%	22
Between second and third quartile	6.00%	Between second and third quartile	7.86%	22
Between first and second quartile	8.00%	Between first and second quartile	5.42%	22
Less than first quartile	5.10%	Less than first quartile	8.12%	22
Average	8.80%	Average	8.77%	

2005 Sales	ROLE	2005 Adjusted Assets	ROLE	N
Between third and fourth quartile	16.20%	Between third and fourth quartile	15.52%	19
Between second and third quartile	14.50%	Between second and third quartile	12.53%	19
Between first and second quartile	-1.60%	Between first and second quartile	11.67%	18
Less than first quartile	1.70%	Less than first quartile	-9.19%	19
Average	8.00%	Average	7.95%	

2004 Sales	ROLE	2004 Adjusted Assets	ROLE	N
Between third and fourth quartile	14.80%	Between third and fourth quartile	13.85%	20
Between second and third quartile	14.40%	Between second and third quartile	12.84%	20
Between first and second quartile	8.80%	Between first and second quartile	12.93%	19
Less than first quartile	3.60%	Less than first quartile	1.90%	20
Average	7.30%	Average	7.28%	

2003 Sales	ROLE	2003 Adjusted Assets	ROLE	N
Between third and fourth quartile	11.70%	Between third and fourth quartile	14.19%	25
Between second and third quartile	12.20%	Between second and third quartile	10.88%	25
Between first and second quartile	3.90%	Between first and second quartile	3.64%	25
Less than first quartile	5.30%	Less than first quartile	5.95%	25
Average	7.10%	Average	7.08%	

2002 Sales	ROLE	2002 Adjusted Assets	ROLE	N
Between third and fourth quartile	12.10%	Between third and fourth quartile	8.20%	25
Between second and third quartile	5.10%	Between second and third quartile	9.26%	25
Between first and second quartile	-0.80%	Between first and second quartile	6.60%	24
Less than first quartile	-1.30%	Less than first quartile	-11.10%	25
Average	6.60%	Average	6.65%	

Table 4. Estimated Coefficients of Relationship between Return on Local Equity and Explanatory Variables, Using Sales as a Measure of Business Volume

Variable	Coefficients	Standard Error	t Stat	P-value
Intercept	0.034	0.031	1.120	0.268
Cost of goods sold$_{i,t}$	0.000	0.000	2.270	0.026
Current ratio$_{i,t}$	-0.002	0.003	-0.690	0.493
Risk$_{i,t}$	0.122	0.176	0.690	0.489
Adjusted assets/member equity$_{i,t}$	0.024	0.015	1.620	0.109
Sales/adjusted assets$_{i,t}$	0.002	0.001	2.430	0.017
Adjusted Assets$_{i,t}$	0.000	0.000	-1.630	0.106
ROLE$_{i,t-1}$	0.419	0.093	4.510	<.0001

Table 5a. Number of North Dakota Farms, by Sales Class, 1992-2005

Year	$1,000-$9,999	$10,000-$99,999	$100,000+	Total
1992	5,500	18,500	9,000	33,000
1993	6,700	16,800	9,500	33,000
1994	6,500	16,000	10,000	32,500
1995	6,700	15,600	10,200	32,500
1996	7,400	15,100	9,500	32,000
1997	8,500	14,000	9,000	31,500
1998	8,300	14,000	8,900	31,200
1999	8,400	13,800	8,800	31,000
2000	8,400	13,400	9,000	30,800
2001	8,500	13,000	9,100	30,600
2002	8,600	12,600	9,300	30,500
2003	8,800	12,000	9,500	30,300
2004	8,700	11,800	9,800	30,300
2005	8,500	11,900	9,900	30,300

Table 5b. Acreage in North Dakota Farms (x000), by Sales Class

Year	$1,000-$9,999	$10,000-$99,999	$100,000+	Total
1992	1,000	18,000	21,400	40,400
1993	3,100	16,000	21,200	40,300
1994	3,300	15,500	21,400	40,200
1995	3,300	14,900	21,700	39,900
1996	3,400	14,500	22,000	39,900
1997	3,500	14,000	22,200	39,700
1998	3,400	14,000	22,100	39,500
1999	3,400	13,900	22,100	39,400
2000	3,400	13,500	22,500	39,400
2001	3,300	12,700	23,400	39,400
2002	3,000	11,800	24,600	39,400
2003	3,000	11,200	25,200	39,400
2004	2,900	10,700	25,800	39,400
2005	2,800	10,600	26,000	39,400

Table 6. Average Annual Return on Local Equity, by Profitability Group, 2002-2006

Year	N	All Cooperatives	Coefficient of Variation	High	Medium	Low
2002	99	4.24%	5.65	19.24%	8.64%	-12.85%
2003	100	7.97%	1.73	21.64%	8.77%	-7.30%
2004	79	10.67%	5.25	24.47%	10.75%	-2.66%
2005	75	7.99%	3.73	25.41%	10.99%	-3.39%
2006	88	8.77%	1.61	25.28%	7.88%	-5.96%

Table 7. Current Ratio, by Profitability Group, 2002-2006

Year	All	High	Medium	Low
2002	1.80	1.66	1.87	1.81
2003	1.78	1.43	1.87	1.94
2004	1.38	1.42	1.17	1.71
2005	2.01	1.35	2.22	2.24
2006	2.38	1.43	2.99	2.17

Table 8. Total Liabilities and Member Equity Ratio, by Profitability Group, 2002-2006

Year	All	High	Medium	Low
2002	0.71	1.00	0.69	0.43
2003	0.84	1.17	0.80	0.59
2004	0.86	1.10	0.87	0.64
2005	0.90	1.16	0.82	0.78
2006	1.05	1.74	0.76	0.96

Table 9. Long-term Liabilities and Member Equity Ratio, by Profitability Group, 2002-2006

Year	All	High	Medium	Low
2002	0.12	0.13	0.09	0.18
2003	0.11	0.12	0.08	0.14
2004	0.12	0.19	0.08	0.13
2005	0.13	0.15	0.11	0.15
2006	0.10	0.16	0.07	0.10

Table 10. Fixed Assets and Member Equity Ratio, by Profitability Group, 2002-2006

Year	All	High	Medium	Low
2002	0.39	0.38	0.38	0.40
2003	0.43	0.41	0.45	0.40
2004	0.47	0.47	0.50	0.42
2005	0.46	0.64	0.41	0.35
2006	0.51	0.81	0.42	0.40

Table 11. Member Equity and Adjusted Assets Ratio, by Profitability Group, 2002-2006

Year	All	High	Medium	Low
2002	0.91	0.90	0.93	0.90
2003	0.92	0.90	0.94	0.91
2004	0.91	0.86	0.94	0.92
2005	0.90	0.87	0.92	0.90
2006	0.72	0.68	0.76	0.69

References

Boyd, S., M. Boland, K. Dhuyvetter, and D. Barton. 2007. "Determinants of Return on Equity in U.S. Local Farm Supply and Grain Marketing Cooperatives." Journal of Agricultural and Applied Economics 39.

Coon, R., and L. Leistritz. 2005. "Economic Contribution North Dakota Cooperatives Make to the State Economy," pp. 7, Department of Agribusiness and Applied Economics Report. Department of Agribusiness and Applied Economics, North Dakota State University, Fargo, ND.

Henehan, B. 2002. "The Decision to Merge: A Case Study of U.S. Dairy Cooperatives," pp. 23, Working paper. Department of Applied Economics and Management, Cornell University, Ithaca, NY.

Kenkel, P., A. Gilbert, and B. Spence. 2003. "Post Merger Financial Performance of Oklahoma Cooperatives," pp. 8, Southern Agricultural Economics Association Annual Meeting, Mobile, AL.

Parliament, C., and J. Taitt. 1989. "Mergers, Consolidations, Acquisitions: Effect on Performance of Agricultural Cooperatives," Staff paper. Department of Agricultural and Applied Economics, University of Minnesota., Minneapolis.

Parliament, C., Z. Lerman, and J. Fulton. 1990. "Performance of Cooperatives and Investor-Owned Firms in the Dairy Industry." Journal of Agricultural Cooperation 5: 1-16.

Rathge, R., M. Clemenson, and R. Danielson. 2002. "North Dakota Population Projections: 2005 to 2020," pp. 120. North Dakota State Data Center, Fargo, ND.

Schrader, L. F., E. M. Babb, R. D. Boynton, and M. G. Lang. 1985. "Cooperative and Proprietary Agribusiness: Comparison of Performance," Agricultural Experiment Station Bulletin. Purdue University, West Lafayette, IN.

Sexton, R. J., and J. Iskow. 1993. "What Do We Know About the Economic Efficiency of Cooperatives: An Evaluative Survey." Journal of Agricultural Cooperation 8: 15-27.

United States Department of Agriculture. National Agricultural Statistics Service. 2002. " North Dakota Agricultural Statistics Annual Bulletin" Washington, D.C.

United States Department of Agriculture. National Agricultural Statistics Service. 2005. " North Dakota Agricultural Statistics Annual Bulletin" Washington, D.C.

Appendix

Glossary of financial ratios

Seven measures of financial performance were calculated for each cooperative in this study. The set of ratios considered was limited due to the set of variables provided.

Liquidity ratios

Current ratio

Method: Divide the value of current assets by the value of current debt.

Principle: This ratio characterizes the ability of a cooperative to meet its short-term debt obligations. A generally accepted ratio is approximately two, meaning that for every dollar of short term debt the cooperative has two dollars of short-term assets, such as inventories or accounts receivable, to pay its obligations.

Solvency ratios

Total debt to member equity

Method: Divide the value of all current and long-term liabilities by the total value of equity held by cooperative members.

Principle: This ratio characterizes the relative proportion of capital provided by owners of common stock in the cooperative and by creditors. A generally accepted ratio is just under one, meaning that the amount of assets obtained through debt is slightly less than the amount of assets owned by cooperative members.

Long-term debt to member equity

Method: Divide the total value of all long-term liabilities by the total value of equity held by cooperative members.

Principle: This ratio characterizes the amount of owner equity available. Lower ratios indicate greater solvency and greater protection of cooperative assets from creditors.

Member equity to fixed asset

Method: Divide the total value of equity held by cooperative members by the total value of all fixed assets.

Principle: This ratio characterizes the extent to which member capital supports long-term investment.

Asset to member equity

Method: Dividing the total value of adjusted assets owned by the cooperative by the total value of member equity.

Principle: This ratio characterizes the cooperative's use of and/or qualification for debt financing. In general, a higher ratio indicates the cooperative is in a relatively good position for obtaining debt financing. However, a very high ratio could indicate that management is not taking advantage of its debt financing capacity.

Efficiency

Asset turnover

Method: Divide the value of cooperative output (total sales) by adjusted assets.

Principle: This is a measure of how efficiently a cooperative uses its assets to generate output. Higher ratio values indicate that the cooperative creates more production per dollar of assets. Asset turnover can vary, however, by type of business.

Profitability

Return on local equity

Method: Divide net income from local operations by the difference between the total value of member equity and the value of investments made in other cooperatives.

Principle: This ratio measures the profits received by the cooperative based on financial management of equity held at the local cooperative alone. A high ratio may indicate a highly leveraged business or substantial net earnings. A low ratio may indicate a conservative approach in which much equity is retained, or reflect low net earnings.

[i] No data are available to determine how much of this increase is from contributions to the Conservation Reserve Program.