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by

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Financial stress in agricultural cooperatives may be due to a combination of three factors: inadequate profitability, excessive debt, or high interest rates. This paper uses an analytical technique to determine the relative degree of financial stress in agricultural cooperatives attributable to each factor. Roughly 30 percent of agricultural cooperatives in our sample suffered financial stress from 1987 through 1992. The analysis indicates that the greatest portion of financial stress, 54 percent, originated from low earnings. High interest rates accounted for roughly 24 percent of the financial stress while leverage accounts for the remaining 22 percent. The results also indicate that smaller cooperatives are more than twice as likely to face financial stress than larger cooperatives. Small cooperatives are more likely to face profitability problems whereas large cooperatives are more likely to face debt and interest rate problems.

Long-term financial performance varies widely among centralized agricultural cooperative firms. Of special concern are those cooperatives that continue to perform at the lowest levels and therefore are experiencing serious financial stress. They are the least likely to be effective in meeting the needs of farmers in a competitive market place and the most likely to fail. If the sources of that stress can be identified, more effective action can be taken by those with a big stake in the business to relieve the stress and improve performance. Stakeholders include those farmers who are the voting members (and are, therefore, also customers who use the cooperative, owners who invest in the cooperative, and patrons who receive patronage refunds) and those businesses who are the lenders, suppliers, and buyers, especially affiliated regional cooperatives.

Our focus is on the largest group of centralized agricultural cooperative firms in the United States, grain marketing and farm supply local cooperatives. These cooperatives are typically both buyers of grain from farmers and sellers of farm supplies to farmers. In 1993, the U.S. Department of Agriculture (USDA) reported there were about twenty-seven hundred such firms out of a total of forty-two hundred agricultural cooperatives (U.S. Department of Agriculture 1993). USDA divided the twenty-seven hundred into two groups, depending on whether the majority of sales were grain or farm supply related. Grain marketing accounted for twelve hundred and farm supply for fifteen hundred. The relative mix of grain purchasing and supply selling varies, but since the primary customer is a farmer-member and only a small minority specialize in just grain or supply, we view them as a relatively homogeneous group.

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Financial stress can be defined in several different ways. It generally is associated with net income (profitability), net worth (solvency), and working capital (liquidity) conditions. Financial stress occurs when profitability, solvency, or liquidity are low enough to seriously impair the ability of the firm to meet its future financial needs (Lins, Ellinger, and Lattz 1987).

We define financial stress in terms of profitability over a series of years. A cooperative is considered to be experiencing financial stress if its mean rate of return on equity over this several-year period is zero or less. A more precise definition is provided in the section on analytical methods.

Our choice of profitability, specifically return on equity, as the key measure of financial stress is similar to the choice made by Featherstone, Schroeder, and Burton (1988) in their evaluation of financial stress in farm firms. It differs from the choice made by Lins, Ellinger, and Lattz (1987) in their evaluation of farm firms. They used two different measures, the solvency or leverage ratio, measured by the debt-to-asset ratio, and cash flow. We have chosen profitability because it is a more consistent and comprehensive measure of firm performance and health. It is also a better indicator of the end sought. Leverage and cash flow are means to the end.

Return on equity is a consistent measure over a several-year time period for two basic reasons: the nature of local cooperative operations and the nature of the financial records used in the analysis. Local cooperative operations have a strong seasonal pattern, resulting in widely varying current asset levels due to changes in inventories and receivables. The financial records we used are fiscal-year-end financial statements, but the fiscal year end dates are spread out throughout the calendar year. Therefore, similar cooperatives with different fiscal year end dates can report very different total assets. This results in very different solvency ratios, such as debt to assets. Equity is a much more stable quantity throughout the year, and so return on equity is a more consistent measure within a year and year to year. Furthermore, generally accepted accounting principles permit more variability in the measurement of debt and assets than in net income and equity. Cash flow is less consistent because of cash flow differences due to asset purchases, depreciation, and sales. It is also less useful to stakeholders because they usually have less information about cash flow available to them.

Research on the sources of financial stress with farm firms has identified three causal factors: income (profitability) or, more specifically, return on assets; leverage (solvency) or, more specifically, debt to assets; and interest rates (Featherstone, Schroeder, and Burton 1988). When these three factors are used in combination they are the determinants of return on equity. A specific algebraic relationship is provided in the section on analytical methods. This same framework is applicable to local cooperatives.

An argument can be made that the financial analysis of farm firms and cooperative firms are significantly different. Farm firms are investor oriented, and cooperatives are user or patron oriented. More specifically, the argument is that using standard financial analysis measures, especially profitability measures such as return on assets or equity, are not meaningful because net income in cooperatives is not comparable to net income in investor-oriented firms, whether they are farms or competing agribusinesses.

We agree that profitability measures, such as return on assets, do not always capture the full measure of financial benefits going to farmer users who own the cooperative. Because the users are not just owners but also customers, a com-

pletely accurate measurement of the net financial benefits and net income must take into account the nature of the exchange transaction with the customer. Benefits may be provided in this transaction that do not become part of the net income generated by the cooperative firm and do not show up in their subsequent distribution as cash patronage refunds or retained equity. For example, a cooperative may reduce gross margins on sales of fertilizer to a member customer and thereby charge a lower price than competing businesses, earn lower accounting profits per unit, and pay little or no patronage refunds. In effect, the cooperative provides most, if not all, of the financial benefits in the initial exchange transaction instead of partially through a patronage refund.

This possible difference in the nature of net income does not limit the credibility of our analysis. First, local cooperatives of the type evaluated operate in a competitive market without contracts or marketing agreements with farmers. Farmers are free to choose to do business with any agribusiness. In this open "buy-sell" environment the market can be expected to work very efficiently. Prices for goods and services are competitive, especially when farmers take into account expected distributions of net income, such as patronage refunds, and associated cash flows. Second, we are evaluating a relatively homogeneous group of businesses that follow somewhat similar business practices. We are not comparing them to non-cooperative grain marketing and farm supply agribusinesses or to farm businesses. They are being compared only to members within this similar group. Therefore, standard financial analysis measures, including measures of profitability, are highly consistent and credible.

Related Literature

Much research has compared the financial performance of cooperatives with investor-owned firm behavior. These analyses have often examined leverage, liquidity, and profitability measures. Parliament, Lerman, and Fulton (1990) examined leverage, liquidity, asset turnover, and coverage ratios in the dairy industry and found that cooperatives' median performance was significantly better, statistically, than that of investor-owned firms. However, they did not find statistically significant differences in profitability. Lerman and Parliament (1990) found similar results in the fruit and vegetable processing industry. Royer (1991) found no evidence to support the hypothesis that the financial strength of U.S. farmer cooperatives is generally weaker than that of other firms. Lerman and Parliament (1991) also compared the performance of agricultural cooperatives by size. They found that smaller cooperatives tended to be more profitable, while larger cooperatives tended to have a higher asset turnover ratio. Weldon et al. (1994) examined the leverage and profitability positions of the Banks for Cooperatives with that of large commercial banks and found the Banks for Cooperatives performed as well as the commercial banks.

A related line of research by Akridge and Hertel (1992) used a multiproduct, variable cost function to compare the efficiency of midwestern cooperative and investor-owned grain and farm supply firms. They found that cooperatives were equally efficient, in terms of variable costs per unit of output, as investor-oriented firms. Sexton and Iskow (1993) evaluated much of the research comparing the economic efficiency of cooperatives to investor-owned firms and found no credible evidence suggesting cooperatives are less efficient relative to investor-owned firms.

Parliament and Lerman (1993) examined the factors that determine a cooperative's leverage ratio. They hypothesized that a firm's business risk, financial risk, and size

would be important determinants of leverage. Their results suggested that firms with more business risk held more equity in relationship to debt. They also found that the quantitative relationship differs by line of business.

The studies discussed above indicate that little difference exists between the performance of cooperatives and investor-owned firms. These analyses used standard accounting measures of liquidity, leverage, profitability, and efficiency. We also use standard accounting measures. However, we do not compare cooperatives to investor-owned firms as was done in several of the studies cited. Also, we examine only those cooperatives that have experienced financial stress over a several-year period.

Objective

Our objective is to determine the extent to which each of the three factors, net income (return on assets), solvency (leverage), and interest rates, contribute to financial stress. More specifically, we will measure the proportion of financial stress caused by each factor. This information can be used by stakeholders and decision makers to anticipate financial stress, to take action to avoid expected financial stress when possible, and to take action to reduce existing financial stress, if possible.

Financial Stress Factors

Financial stress is identified by using the measure, return on equity. Return on equity can be calculated in a simple, straightforward manner by dividing net income by total equity. The sources of financial stress can be identified by decomposing return on equity into three components or factors: profitability, solvency, and interest rates. Profitability is measured by return on assets (income before interest and taxes, divided by total assets), and solvency is measured by the leverage ratio, debt to assets.

This breakout serves as a way to examine several aspects of a firm's financial condition. The profitability factor determines the financial stress due to difficulties in generating income. The solvency and interest rate factors determine the financial stress due to difficulties in financing assets with debt. Both the extent of debt financing and the cost of debt financing are important. A breakdown of financial stress into profitability (income), solvency (debt), and interest rate components provides cooperative stakeholders, especially managers and directors, with information that is more directly useable than a single measure. It allows decision makers to assess the effects of earnings, leverage, or interest rates on firm performance and to take action, based on this information.

Analytical Method

The analysis in this paper uses the compound average real rate (geometric mean) of return on equity as a measure of a cooperative's financial performance. The real rate of return to equity measures the rate of change in equity due to earnings and changes in assets and liabilities (Featherstone, Schroeder, and Burton 1988). Real rates of return are determined by dividing one plus the rate of return by one plus the inflation rate and subtracting one. This purges the effect of inflation from the analysis. Information from both income statement (earnings) and balance sheet (assets and liabilities) is included. A positive rate of return on equity indicates an ability to increase a cooperative's capital stock, while a negative rate of return on equity indicates that a cooperative's capital stock has declined (Barry 1986). For purposes of this paper, a cooperative is considered to be

under financial stress if its mean rate of return on equity for the period of interest, 1987 to 1992, is negative. Using a geometric mean rate of return on equity of zero as a critical value implies that cooperatives that have positive returns to equity are likely to be able to continue operations, while those cooperatives with negative returns to equity may not be able to remain in business (Featherstone, Schroeder, and Burton 1988).

The rate of return on equity is defined as:

$$RE = \frac{RA - K\delta}{1 - \delta} \quad (1)$$

where RE is the rate of return on equity, RA is the rate of return on assets, K is the interest rate, and δ is the debt-to-asset ratio (Barry, Hopkin, and Baker 1983, 59). Allocation of financial stress to its component causes, income (rate of return on assets), leverage, and rate of interest, is based on target leverage ratios and interest rates for those cooperatives that have mean rates of return greater than or equal to zero. The target leverage ratio can be thought of as the average interest rate and leverage ratio used by those cooperatives that had a positive rate of return to equity. Target leverage ratios and interest rates are estimated using equation (2) below.

$$RE_i = aRA_i + b + e_i, \quad \text{if } RE_i > 0 \quad (2)$$

where RE_i is the geometric mean return on equity, RA_i is the geometric mean return on assets, and e_i is the error term for the i th successful cooperative. The relationship between the parameter a and the leverage ratio (δ) is given by $a = 1 / (1 - \delta)$. The relationship between parameter b and the leverage ratio and the interest rate is given by $b = -K\delta / (1 - \delta)$. These equations are used to determine the target interest rate (K) and the target leverage ratio (δ).

In the same manner, leverage ratios and interest rates are determined for each individual cooperative except that, instead of using the mean rate of return on equity and the mean rate of return on assets, five years of actual returns to equity and assets are used. For those cooperatives having negative mean rates of return on equity, the targets are used to determine the portion of financial stress attributable to each of the three causes. The following equations are used in the allocation of financial stress.

$$RE_i^A = \frac{RA_i - \hat{K}\hat{\delta}}{1 - \hat{\delta}} \quad (3)$$

$$RE_i^L = \frac{RA_i - K\hat{\delta}}{1 - \hat{\delta}} \quad (4)$$

$$RE_i^I = \frac{RA_i - \hat{K}\hat{\delta}}{1 - \hat{\delta}} \quad (5)$$

In the above equations K "hat" and δ "hat" indicate the use of target values for the interest rate (K) and leverage ratio (δ). The capital A, L, and I in the superscript of

equations (3), (4), and (5) represent return on assets, leverage, and interest rate, respectively.

Equation (3), above, is a calculation of return on equity using target interest rate and target leverage ratio. The portion of financial stress resulting from income problems (low return on assets) is determined by dividing the rate of return on equity as determined by using the target leverage ratio and interest rate (equation 3), by the rate of return on equity using the firm actual leverage ratio and interest rate (equation 1). Two things are determined from the resulting ratio. If the result is negative, had the cooperative actually achieved the target leverage ratio and interest rate, it would have had a positive rate of return on equity, meaning that none of the financial stress is due to low income. A positive result indicates that inadequate income (return on assets) had a role in the firm's financial stress. A ratio of targeted return on equity to actual return on equity greater than one implies that the cooperative had a better leverage and interest rate combination than the targets, and all the financial stress is due to low income. Finally, if the ratio is between zero and one, the ratio determines the portion of financial stress resulting from an income problem (Featherstone, Schroeder, and Burton 1988). Similarly, equation (4) is a calculation of the rate of return on equity holding the leverage ratio at the target level and is used to allocate the portion of financial stress due to leverage. Equation (5) calculates the return on equity with interest rates set at the target and is used to determine the portion of financial stress caused by interest rates.

Equation (6) is used to determine the percentage of a cooperative's financial stress that is attributable to leverage (debt).

$$L_i = \left[\frac{RE_i - RE_i^L}{(RE_i - RE_i^L) + (RE_i - RE_i^I)} \right] * \left[\frac{RE_i - RE_i^A}{RE_i} \right] \quad (6)$$

The term in the right brackets of equation (6) represents the portion of financial stress not attributable to a low return on assets. The term in the left brackets determines the relative importance of interest rates and leverage in explaining financial stress. The remaining percentage of financial stress, not allocated to return on assets or leverage, becomes the percentage of financial stress allocated to an interest rate problem.

The Data

Since this analysis uses mean rates of returns to equity and assets, time series data are required. Annual time series financial records from 1987 through 1992 were obtained from the Cooperative Finance Association (CFA), a subsidiary of Farmland Industries. The CFA data contains, for individual cooperatives in fourteen states, complete balance sheet and income statement data, taken from audited financial statements. The data set initially contained data on 963 cooperatives. Those cooperatives that did not have data for all six years were deleted. In addition, those cooperatives that had an imputed real interest rate greater than 20 percent or less than -20 percent or had an estimated debt-to-asset ratio greater than 1 or less than zero were also deleted. This resulted in a total of 718 remaining cooperatives.

TABLE 1. Mean and Standard Deviations of the Rate of Return to Equity, Rate of Return to Assets, Leverage Ratio, and Interest Rate for Midwestern Cooperatives, 1987-1992.

| Variable ^a | Observations | Mean | Standard Deviation |
|-----------------------|--------------|-------|--------------------|
| All Firms | | | |
| R _E (%) | 718 | 2.90 | 6.91 |
| R _A (%) | 718 | 2.49 | 4.03 |
| δ (%) | 718 | 34.41 | 16.32 |
| K (%) | 718 | 0.67 | 4.52 |
| Sales (Million \$) | 718 | 7.81 | 11.78 |
| Stressed Firms | | | |
| R _E (%) | 226 | -4.29 | 4.64 |
| R _A (%) | 226 | -1.58 | 2.25 |
| δ (%) | 226 | 36.81 | 18.14 |
| K (%) | 226 | 1.75 | 3.68 |
| Sales (Million \$) | 226 | 5.51 | 6.59 |
| Non-Stressed Firms | | | |
| R _E (%) | 492 | 6.20 | 5.02 |
| R _A (%) | 492 | 4.36 | 3.20 |
| δ (%) | 492 | 33.31 | 15.30 |
| K (%) | 492 | 0.18 | 4.79 |
| Sales (Million \$) | 492 | 8.87 | 13.39 |

^a R_E = real geometric mean rate of return on equity, R_A = real geometric mean rate of return on assets, δ = leverage ratio (debt to asset), and K = real interest rate.

Results

The first step of the analysis was to calculate the real rate of return on equity and the real rate of return on assets. The average leverage ratio and interest rate were estimated for each firm using regression (equation 2). For the individual firms, actual rates of return on equity and assets were used instead of the geometric mean returns on equity and assets. Results of this analysis are summarized in table 1. The mean real return on equity for all 718 cooperatives for the six-year period was 2.90 percent. This rate of return had a standard deviation of 6.91 percent. Initial examination of the data revealed that 226 cooperatives were financially stressed for the period. The rate of return on equity for the stressed cooperatives was -4.29 percent, while the rate of return for the non-stressed cooperatives was 6.2 percent. As would be expected, the stressed cooperatives had a lower rate of return on assets, a higher leverage ratio, and a higher average borrowing cost than the non-stressed cooperatives. The mean leverage ratio was not substantially different between stressed and non-stressed firms. The mean average sales for the cooperatives are also reported in table 1. Non-stressed firms had higher average sales than did stressed firms.

The target leverage ratio and interest rate for those firms having positive mean returns on equity were 29.7 percent and 0.02 percent, respectively. The R² from the estimation of equation 2 was 82.2 percent. The t-ratio on the return-on-assets parameter (a), which provides an estimate of the leverage ratio, was 47.58, which was significant at the 1 percent level of confidence. The t-ratio on the intercept (b), which provides the estimate of the interest rate, was -0.49, which was not significant at the 5 percent level of confidence.

Table 2. Summary of Financial Stress Allocation.

| N | Description | Return on Equity | Return on Assets | Leverage Ratio (δ) | Interest Rate (K) | Return on Assets % | Leverage Problem % | Interest Rate Problem % |
|----------|--------------------------------------|---------------------------------|---------------------------------|---|----------------------------------|-----------------------------------|-----------------------------------|--|
| 718 | All Firms | 2.90 | 2.49 | 34.41 | 0.67 | | | |
| 226 | Stressed Firms | -4.29 | -1.58 | 36.81 | 1.75 | 54.28 | 21.97 | 23.75 |
| 124 | Stressed Firms $0 < (REA/RE) < 1$ | -5.61 | -2.03 | 40.06 | 2.60 | 52.16 | 21.76 | 26.08 |
| 44 | Stressed Firms $(REA/RE) < 0$ | -2.57 | 1.14 | 45.14 | 4.01 | 0 | * 51.49 | 48.51 |
| 58 | Stressed Firms $(REA/RE) > 1$ | -2.81 | -2.67 | 23.54 | -1.78 | 100 | 0 | 0 |

Allocation of financial stress among all 226 financially stressed cooperatives shows that, on average, 54.3 percent of financial stress can be attributed to a return-on-assets problem (table 2). Leverage problems account for 22.0 percent of financial stress, while interest rate problems account for 23.8 percent of the financial stress. The analysis indicates that 124 of the cooperatives suffered from both low returns and financing difficulties (leverage and/or interest rate problems). For these cooperatives, return-on-assets problems accounted for 52.2 percent of financial stress, leverage problems accounted for 21.8 percent, and interest rate problems accounted for 26.1 percent of financial stress. The average return on assets for these firms was -2.0 percent, which was lower than the average of all stressed cooperatives but still negative. These cooperatives, had on average, a slightly higher average interest rate and a slightly higher leverage ratio than all financially stressed cooperatives.

Forty-four cooperatives had no financial stress due to return-on-assets problems. These firm's difficulties can be attributed to financing decisions. The stress was divided about equally between leverage (51.5) and interest rate (48.5) problems. The return on assets on these firms was 1.1 percent. These firms had a higher leverage ratio and a significantly higher interest rate than all cooperatives as a whole.

Fifty-eight out of the 226 financially stressed cooperatives were shown to have all of their financial stress attributed to a return-on-assets problem. In other words, all of their financial stress was due to a lack of profitability, and none of their financial stress was due to financing related problems. The return on assets for these firms averaged -2.7 percent. These cooperatives had a much lower leverage ratio than the average financially stressed firms.

Financial Stress by Size

Table 3 provides a summary of financial stress analysis by firm size where size is determined by total assets. Firms are separated into three groups according to quartiles. Smallest firms make up the bottom twenty-fifth percentile group, followed by the middle fifty percentiles, and the largest firms are represented by the top twenty-fifth percentile. As firm size increases, the percentage of financially stressed firms decreases (table 3). Of the smallest firms, 45.6 percent are financially stressed. The percentage of firms financially stressed is 30.5 percent of the medium-sized firms and 19.4 percent of the largest cooperatives.

The type of stress that cooperatives face differs by the size of firm. The smallest cooperatives are more predominately facing a return-on-assets problem, with 61.6 percent of financial problems due to the return on assets. In fact, 29.3 percent of the small cooperatives facing financial stress have only a return-on-assets problem. Firms having no financial stress due to profitability were only 15.9 percent of the stressed firms. Again, the most severe problem facing the medium-sized cooperatives was profitability (54.8 percent). However, the distribution of stress for the medium-sized cooperatives is not substantially different than all cooperatives. Broken down into categories of financial stress, 17.4 percent had no profitability stress, and 26.6 percent had only profitability stress. Large cooperatives predominantly faced stress due to financing as only 35.4 percent of financial stress could be attributed to low profitability. Only 14.3 percent of large cooperatives faced profitability problems alone, while 34.3 percent faced financing problems alone.

The analysis of financial stress by size, as measured by total assets, indicates that smaller cooperatives are more likely to face financial stress than larger cooperatives. A larger cooperative is only 43 percent as likely to face financial stress

TABLE 3. Summary of Financial Stress Allocation by Size.

| N | Description | Return on Equity | Return on Assets | Leverage Ratio (δ) | Interest Rate (K) | Return on Assets % | Leverage Problem % | Interest Rate Problem % |
|-----|-----------------------|------------------|------------------|-----------------------------|-------------------|--------------------|--------------------|-------------------------|
| 718 | All Firms | 2.90 | 2.49 | 34.41 | 0.67 | | | |
| 226 | Stressed Firms | -4.29 | -1.58 | 36.81 | 1.75 | 54.28 | 21.97 | 23.75 |
| 180 | Small Firms | 0.47 | 1.52 | 31.19 | 1.52 | | | |
| 82 | Stressed Small Firms | -5.78 | -2.28 | 34.77 | 1.34 | 61.60 | 21.44 | 16.95 |
| 45 | $0 < (REA/RE) < 1$ | -7.57 | -3.06 | 39.98 | 2.64 | 58.92 | 22.04 | 19.04 |
| 13 | $(REA/RE) < 0$ | -4.53 | 1.74 | 46.67 | 5.01 | 0 | 58.97 | 41.03 |
| 24 | $(REA/RE) > 1$ | -3.11 | -2.98 | 18.54 | -3.09 | 100 | 0 | 0 |
| 358 | Medium Firms | 3.21 | 2.65 | 33.29 | 0.71 | | | |
| 109 | Stressed Medium Firms | -3.32 | -1.35 | 35.29 | 1.97 | 54.84 | 19.64 | 25.52 |
| 61 | $0 < (REA/RE) < 1$ | -4.13 | -1.54 | 37.89 | 2.65 | 50.45 | 20.54 | 29.01 |
| 19 | $(REA/RE) < 0$ | -1.76 | 0.97 | 42.78 | 3.84 | 0 | 46.73 | 53.27 |
| 29 | $(REA/RE) > 1$ | -2.64 | -2.47 | 24.92 | -0.70 | 100 | 0 | 0 |
| 180 | Large Firms | 4.69 | 3.15 | 39.87 | -0.25 | | | |
| 35 | Stressed Large Firms | -3.85 | -0.66 | 46.36 | 2.04 | 35.40 | 30.42 | 34.18 |
| 18 | $0 < (REA/RE) < 1$ | -5.68 | -1.14 | 47.66 | 2.33 | 41.06 | 25.19 | 33.75 |
| 12 | $(REA/RE) < 0$ | -1.72 | 0.77 | 47.25 | 3.19 | 0 | 50.93 | 49.07 |
| 5 | $(REA/RE) > 1$ | -2.38 | -2.34 | 39.57 | -1.73 | 100 | 0 | 0 |

than a smaller cooperative. The smaller cooperatives are more likely to be stressed due to low returns whereas the source of stress for the larger cooperatives is more likely to be financing.

Financial Stress by Product Mix

Table 4 examines financial stress by product mix, where product mix is measured by grain income divided by all income. The bottom twenty-fifth percentile in this group are those cooperatives with the lowest portion of grain to other products making up their gross income (16.9 percent). The top twenty-fifth percentile are the firms having the highest proportion of the gross income from the sale of grain (37.0 percent). The analysis indicates that cooperatives with low and medium grain sales have nearly identical percentages of financially stressed cooperatives of 30.6 and 29.9 percent respectively. Those cooperatives that relied more heavily on grain sales tended to have a higher proportion of financially stressed firms (35.6 percent).

Those cooperatives obtaining the least portion of their gross income from grain sales had a much higher portion of financial stress from profitability than the middle group, but a lower portion of stress from liquidity and interest rate problems (table 4). Those firms with the highest grain sales had the highest percentage of financially stressed firms but did not deviate much from the mean of all 226 stressed firms with regard to the breakdown of stress.

From 1987 to 1992, firms deriving the highest portion of their gross income from grain marketing are more likely to be financially stressed than cooperatives with less reliance on grain as a source of gross income. Firms that rely less on grain marketing tend to suffer more from profitability problems, whereas firms with medium grain sales tend to suffer stress due to financing problems. However, the differences by product mix are less dramatic than those for cooperative size.¹

Conclusions

Agricultural cooperatives experience varying levels of financial stress. Financial stress may be due to a combination of three factors: inadequate profitability, excessive debt, or high interest rates. This paper uses an analytical technique to determine the relative degree of financial stress in agricultural cooperatives attributable to each factor. The analytic technique has been successfully applied to farms in previous research. A database of 718 grain marketing and farm supply cooperatives was evaluated, of which 226 were determined to be financially stressed. The results of the analysis indicate that the greatest portion of financial stress, 54 percent, originates from low earnings. High interest rates accounted for 24 percent of financial stress problems, while leverage accounted for the remaining 22 percent.

Financial stress was also examined by the size of the cooperative and the product mix. Results indicated that smaller cooperatives were more than two times as likely to be facing financial stress than large cooperatives. The source of financial stress also differs by size with the smaller cooperatives suffering more from low profitability and the larger cooperatives more likely suffering from interest rate and leverage difficulties. Cooperatives that have a greater percent of their earnings from grain marketing are more likely to be stressed than the other cooperatives, although the results by product mix are much less dramatic than by firm size.

The analysis indicates a need for two distinct areas of further research into the problem of financial stress in agricultural cooperatives. The allocation of a substantial

TABLE 4. Summary of Financial Stress Allocation by Product Mix.

| N | Description | Return on Equity | Return on Assets | Leverage Ratio (δ) | Interest Rate (K) | Return on Assets % | Leverage Problem % | Interest Rate Problem % |
|-----|-----------------------|------------------|------------------|-----------------------------|-------------------|--------------------|--------------------|-------------------------|
| 718 | All Firms | 2.90 | 2.49 | 34.41 | 0.67 | | | |
| 226 | Stressed Firms | -4.29 | -1.58 | 36.81 | 1.75 | 54.28 | 21.97 | 23.75 |
| 180 | Low Grain Firms | 2.81 | 2.67 | 32.00 | 0.89 | | | |
| 55 | Stressed Low Grain | -5.48 | -2.23 | 34.79 | 0.90 | 64.34 | 15.31 | 20.34 |
| 28 | 0<(REA/RE)<1 | -7.17 | -2.78 | 38.73 | 2.83 | 54.96 | 20.08 | 24.96 |
| 7 | (REA/RE)<0 | -6.51 | 1.91 | 43.29 | 5.77 | 0 | 40.00 | 60.00 |
| 20 | (REA/RE)>1 | -2.76 | -2.92 | 26.29 | -3.50 | 100 | 0 | 0 |
| 358 | Medium Grain Firms | 3.12 | 2.63 | 35.90 | 0.65 | | | |
| 107 | Stressed Medium Grain | -3.70 | -1.16 | 39.64 | 2.03 | 48.20 | 26.71 | 25.09 |
| 63 | 0<(REA/RE)<1 | -4.86 | -1.63 | 41.07 | 2.38 | 50.12 | 23.37 | 26.51 |
| 24 | (REA/RE)<0 | -1.55 | 0.97 | 47.00 | 3.25 | 0 | 57.73 | 42.27 |
| 20 | (REA/RE)>1 | -2.60 | -2.24 | 26.31 | -0.54 | 100 | 0 | 0 |
| 180 | High Grain Firms | 2.51 | 1.97 | 34.06 | 0.36 | | | |
| 64 | Stressed High Grain | -4.33 | -1.80 | 33.28 | 2.03 | 57.20 | 19.15 | 23.65 |
| 33 | 0<(REA/RE)<1 | -5.79 | -2.34 | 38.21 | 2.84 | 56.38 | 18.96 | 24.66 |
| 13 | (REA/RE)<0 | -2.33 | 1.04 | 42.72 | 4.48 | 0 | 46.16 | 53.84 |
| 18 | (REA/RE)>1 | -3.10 | -2.87 | 17.42 | -1.24 | 100 | 0 | 0 |

amount of financial stress to return-on-assets problems suggests that profitability is a problem for many cooperatives. Profitability is highly influenced by the marketing methods used by a cooperative. Research into the impact of a cooperative's marketing characteristics on profitability would provide additional information pertaining to financial stress resulting from a return-on-assets problem.

Debt-related financial stress and leverage and interest rate problems account for a smaller portion of financial stress. This suggests that these cooperatives may not be using an optimal capital structure. Capital structure refers to the combination of debt and equity used to finance a cooperative. Research directed toward determining the optimal capital structure for agricultural cooperatives could provide solutions to debt-related financial stress problems.

Note

1. Because cooperatives that have a high reliance on grain income depend on volume to generate profits, year-to-year variability in production due to weather and year-to-year variability in government program set-aside requirements do not allow these results to be generalized.

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