Financial Management Practices and Farm Profitability

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Abstract

The relationship between the adoption of several basic farm financial management practices and financial performance is examined for 137 New York dairy farms. Data were gathered from farm business summary participants to understand the capital acquisition practices, business analysis techniques, and capital investment decision making processes used by these farms. The paper provides estimates regarding the adoption of various financial management practices. The results suggest that the adoption of financial management practices such as using investment analysis techniques significantly impact farm financial performance.

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Introduction

Financial management topics are given considerable emphasis in nearly every farm management course and text. Among some of the most common topics are financial control systems, budgeting, investment analysis, and securing credit. Although these topics are treated as basic farm management skills, relatively little is known about the financial management practices actually used by farmers. For instance, most financial management texts contain numerous pages and even chapters on capital budgeting, but the extent to which these techniques have been adopted by farmers is generally not known.

In addition to the lack of knowledge regarding the adoption of many basic financial management practices, little is known regarding the relationship between their adoption and farm profitability. In general, there has been a great deal of research conducted to examine the relationship between the adoption of technology and farm profitability. However, there has been little study of the empirical relationship between the use of specific financial management practices and farm profitability. Many of the studies that have been undertaken examine the relationship between financial characteristics and farm profitability rather than the relationship between the adoption of a practice such as budgeting and farm financial performance.

This study seeks determine the extent to which farmers have adopted various farm financial management practices. The study also seeks to estimate the relationship between the adoption of these practices and farm financial performance. Both questions are obviously important to farm management and finance researchers and educators. The results will help identify practices that have been widely adopted by farmers, practices that have not been widely adopted, practices that have a large impact on profitability and practices that have less impact on financial performance. These results can then be used to prioritize educational offerings and research agendas.

This paper first defines the responsibilities and practices associated with farm financial management. Then the data collected regarding the adoption of and attitudes toward these practices are described. Next, the results indicating the extent to which various financial management practices have been adopted are presented. The relationship between the adoption of these practices and farm profitability is then examined.

Financial Management

In order to examine the finical management practices of farms it is useful to have a definition of financial management. Barry, et al., pg. 3 (1995) describe financial management as "the acquisition and use of financial resources and protection of equity capital from various sources of risk." Lee, et al., pg. 3 (1988) define agricultural finance as the "economic study of the acquisition and use of capital in agriculture." Brealey and Myers pg. 13 (2000) summarize the corporate financial manager's responsibilities as "the overall task of the financial manager can be broken down into (1) the investment or capital budgeting decision, and (2) the financing decision. In other words, the firm has to decide (1) what real assets to buy and (2) how to raise the necessary cash."

These definitions are all similar in that they emphasize the importance of acquiring and investing resources. In addition, it would seem important that one consider the responsibilities

and duties associated with accomplishing these two fundamental tasks. These surrounding responsibilities might include such things as maintaining financial records, implementing control systems, and analyzing whole farm profitability. In order to understand the key management practices and responsibilities related to acquisition of funds, investment of funds, and whole farm financial management it is useful to understand what these tasks typically do and do not involve in the farm finance case.

Acquisition of Funds

In corporate finance acquisition of funds typically involves selling securities (debt or equity) to the public. In agriculture and particularly for most farms, the options for raising funds are more limited. Usually, funds are raised for both short and long-term purposes through loan agreements. It is still somewhat unusual for a farm to issue debt securities that are traded in public markets. The options for raising equity are also somewhat limited. It is very unlikely that a farm's equity claims will be traded in any kind of liquid market. This means that individuals making minority equity investments in farm firms often have reasons for doing so other than financial return, e.g., saving the family farm. While these issues are important, the current study focuses primarily on raising funds through loan agreements or controlling assets through leasing.

With this in mind, there are several possible responsibilities for the financial manager. These might include responsibilities such as: determining how different amounts of debt and equity affect the risk of the business; identifying and evaluating alternative lenders; evaluating the financial terms of a loan or lease including fees, stock, points, rate structure, and repayment period; evaluating the non-financial benefits of a capital supplier including the strength of relationship with lender, amount of information required to change lenders, etc; deciding whether to lease or purchase an asset; determining whether to use trade credit or accept cash discounts; and determining whether to use dealer financing on capital asset purchases.

Investment of Funds

In theory, a farmer would decide whether an investment should be made and then acquire the funds to do so. This means that the farmer must evaluate alternative investments and decide whether the investment is profitable. There are several techniques that the farmer might use to make this assessment. In addition to profitability the farmer must also evaluate how the investment alters the risks and returns that they face.

The broad area of investment analysis and decision making encompasses investment decisions on expendable and capital assets. However, it is expected that the manner in which expendable and capital asset purchase decisions are made differs considerably. Regardless of the type of asset that the manager is evaluating, there are several key responsibilities in this area including the following: making cash flow projections, analyzing investments to determine profitability, analyzing the investments to determine feasibility, determining which analysis techniques to apply, determining the amount of risk involved with the investment, and obtaining information necessary to make decisions.

Business Analysis and Control

One of the most important activities of the farm manager is to monitor and ensure the profitability, liquidity, and solvency of the business enterprises and entire business. In addition, financial budgets form the basis for decision making in the other functional business areas. Important tasks or responsibilities might include: comparing the business to other businesses

(benchmarking); analyzing the business over time (trend analysis); determining and monitoring measures of performance in each of the key areas; implementing an accounting or information system that provides the manager with timely information; identifying possible adjustments to the business that can be analyzed with investment analysis; and, instituting governance mechanisms in the case of multiple owners.

Previous Studies of Financial Management

Previous research on financial management has related financial structure to farm performance. For instance, the debt to asset ratio is a commonly used measure of financial structure (Gloy, Hyde, and LaDue, 2002; Purdy, Langemeier, and Featherstone, 1997; Mishra and Morehart, 2001; Kauffman and Tauer, 1986; El-Osta and Johnson, 1998; and Haden and Johnson, 1989). It reflects the proportion of the farms assets that are financed with debt and reflects the leverage decision made by farmers. Purdy, Langemeier, and Featherstone (1997) analyze the impact of several other measures of financial structure (inverted current ratio, total assets, net worth, asset turnover ratio, operating expense ratio, depreciation expense ratio, interest expense ratio, and net farm income ratio). Likewise, Ford and Shonkwiler (1994) use a ratio of equity to assets, operating margin, interest as a percent of cash expenses, and debt per cow to explain performance.

In most cases, measures of financial structure are treated as exogenous variables and the empirical findings related to the impact of debt on farm profitability are mixed. For instance, Mishra and Morehart (2001) show no significant effect and Kauffman and Tauer (1986) and El-Osta and Johnson (1998) show mixed results. Nasr, Barry, and Ellinger (1998) examine the relationship between the use of debt and nonparametric measures of efficiency of Illinois grain farms. They find that farms with debt tend to be more efficient than less leveraged peers.

Researchers have also conducted studies to examine the determinants of capital structure. These studies have typically examined how factors such as tax policy, use of contract production, interest rates, wealth, farm size, and business risk impact the use of debt (Boehlje and Ray, 1999; Parcell, Featherstone, and Barton, 1998; Jensen and Langemeier, 1996; Ahrendsen, Collender, and Dixon, 1994; Collins, 1985). Other studies have examined the relationship between profitability and record keeping practices, leasing practices, and forward contracting practices. For instance, Mishra, El-Osta, and Johnson (1999) found that financial measures and practices such as machinery costs, use of forward contracting practices, renting land, keeping formal records, and using extension information were significantly related to the net farm income of U.S. cash grain farmers. Although there have been many studies which have examined financial structure, financial performance, and their relationship, relatively few have examined the specific financial management practices adopted by farmers.

Data

Cornell's dairy farm business summary (DFBS) program collects a great deal of production and financial data from participating dairy farms. This information includes a complete set of financial statements for each farm, detailed data regarding production practices and efficiency, and operator characteristics. A mail questionnaire was used to collect supplementary information from participating farms. All of the farms who had completed a DFBS report in 2000 were identified for sampling. This resulted in a sample of 352 farms[1].

Survey Instrument

A mail delivered survey instrument was used to collect data from the DFBS participants. The instrument asked farmers to respond to a variety of questions regarding business analysis practices, input purchasing practices, capital investment purchasing practices, and capital acquisition practices[2]. A pretest of the survey instrument was conducted with extension educators and farm management and finance faculty. The financial management section of the questionnaire contained 79 response variables. As an incentive for participation, farmers were promised an individual report based on their responses to the general management questions and a copy of the results of the financial management study. The package sent on September 14, 2001 asked that they respond by October 15, 2001. On October 12, a reminder post card was sent to participants who had not completed the questionnaire. Data collection ended on December 1, 2001.

Response

Of the 352 questionnaires mailed, 149 were returned by December 1, 2001. Twelve of the respondents returned blank questionnaires or indicated that they did not wish to participate in the study. Considering only the respondents who wished to participate in the study, the response rate was 137 out of 352, or roughly 39%. Several of the respondents made errors at various places throughout the questionnaire or chose not to answer a particular question, so the number of farms responding to any particular question was potentially lower than 137.

The farms that complete the DFBS do so voluntarily and are not entirely representative of the New York dairy industry. The respondents also voluntarily chose to complete and return the questionnaire. Completion of the financial management questionnaire was not required for participation in the DFBS program. Table 1 presents several descriptive statistics for the respondents and all 352 farms in the DFBS[3]. As opposed to all DFBS participants, those responding to the survey tended to operate larger farms, 286 cows for respondents as opposed to 237 cows for DFBS participants. The general level of profitability of these farms was relatively low in 2000 when the average respondent generated a rate of return on assets with appreciation (ROA) of 3.82%. This level of profitability was in part due to relatively low milk prices. While the amount of debt and equity used to finance the operations of respondents and DFBS participants was nearly identical, interest expenses were greater for the respondents. This is due to the fact that respondent farms had greater asset values than the average DFBS participant and that both groups used nearly the same proportion of debt and equity to finance their operations.

In comparison to national farm averages, the average proportion of equity used by DFBS farms was relatively low, 62%. Low milk prices, combined with this level of debt financing contributed to the weak average cash flow coverage ratio for both respondents and all DFBS participants. Nearly all of the respondents (96%) and DFBS participants (97%) have some debt. This is not typical of the agricultural sector. According to the 1997 Census of Agriculture 42% of all farms incurred interest expenses. This would imply that at some point in the year 42% of U.S. farms used debt financing. However, the respondents operate much larger farms than the "average" U.S. farm. In general, both the respondents and DFBS participants represent an important segment of commercial family farm operations.

A series of questions were developed to gather information in each of the financial management areas. The approach focused on collecting data regarding the use of and attitudes toward fundamental practices in each area.

Acquisition of Funds

The questionnaire addressed several issues related to assessing the cost of funds obtained from traditional lenders and how farmers evaluated the costs and services offered by traditional lenders. One potentially important step in obtaining credit is to compare the rates and services offered by various lenders. There are several points in borrowing process at which rates and services might be compared. The second column of Table 2 shows the percentage of producers making comparisons at various points in time. Surprisingly, 21% of the respondents indicated that they never compared rates and services. The most frequent time that rates and services are compared is when the farmer is borrowing a significant amount of money. At this point in time, nearly 43% of the producers indicate that they make a comparison. Changing loan officers or changes in lender management triggered 25% of the respondents to compare rates and services, and 24% of respondents indicated that they compare rates and services every time that they borrow additional funds. Changing loan officers or changing the management of the financial institution with which the borrower has a relationship introduces uncertainty to the borrowing relationship. These factors would be expected to trigger a reevaluation of the lender/borrower relationship. It is possible that some of the respondents have not experienced this phenomenon.

In addition to traditional lenders, non-traditional lenders such as equipment manufacturers and input suppliers offer financing. Farmers may also take advantage of short-term vendor financing. In order to estimate how frequently respondents used vendor and non-traditional sources of financing they were asked how frequently they used dealer/supplier financing for purchases of feed, machinery, etc. These sources are frequently and sometimes, but rarely always used to finance purchases. As shown in Table 3, only 15% of the respondents indicated that they never used these sources of financing and more respondents indicated that they seldom or never used these sources than indicated that they always or frequently used the sources.

Respondents were also asked a series of questions regarding the methods that they use to calculate the cost of financing. First, farmers were asked if the calculated the effect of fees, patronage refunds, or stock purchase requirements when comparing effective interest rates. Surprisingly only 15% of the respondents always evaluated these factors. In fact, more producers seldom or never considered these factors than considered them. This would suggest that many producers make rate comparisons based on stated rates of interest and are not calculating the impact of fees on rates. More producers actually claimed to be calculating the effects of cash discounts forgone on feed/seed financing than considered fees, patronage, or stock purchase requirements on the effective interest rate.

These results are certainly surprising. A similar result is found in the response to the question regarding calculating the effect of rebates, terms, and interest rates on the effective interest rate. Again, more producers always or frequently consider these factors than consider fees, stock purchase requirements, and patronage. It is possible that had the question regarding fees also included the term interest rates the ratings would have changed. However, this term was not included in the question regarding cash discounts.

Many non-traditional lenders as well as some traditional lenders offer a variety of leasing programs. Respondents were asked a series of questions regarding their use and evaluation of leasing. The results in Table 4 show that leasing is not frequently used by these farmers. Only 8% of the respondents indicated that they frequently leased capital assets, while 43% indicated that they never leased capital assets.

There are several factors that a farmer might evaluate when making a capital asset leasing decision and farmers were asked which factors they evaluated and how they evaluated these factors. Tax savings are often given as a reason for leasing capital assets. While 41% of the respondents indicated that they never based leasing decisions on tax savings alone, 16% always or frequently based their decision on this factor. By leasing an asset instead of owning the asset the farmer can potentially reduce risk related to the value of the capital asset. However, when calculating the expected cost of a capital lease, the terminal value becomes important. Farmers were asked how often they considered both tax savings and terminal values when evaluating a capital lease. Because 45% of the respondents indicated that they always or frequently considered these factors when making leasing decisions, the results suggest that farmers recognize that terminal values are important considerations in leasing decisions. The size of the payment is also an important consideration in determining the effective cost of the lease. It is also the easiest of the components to observe. Although 7 percent on the respondents indicated that they frequently or always based leasing decisions on the payment alone, 70% seldom or never used this metric alone.

Because leasing decisions involve the commitment to cash flows over time, it is most accurate to compare their costs with a discounted cash flow method which incorporates tax savings and the terminal value of the asset. Unfortunately, these comparisons are difficult to make. Respondents were asked how frequently they used discounted cash flows to compare the decision to lease an asset versus buying the asset. Surprisingly 19% of respondents indicated that they always or frequently made this comparison. On the other hand 61% either seldom or never used this method in making a leasing decision.

Investment Analysis and Decision Making

The manner in which expendable and capital asset purchase decisions are analyzed and made differs considerably. Capital assets, such as facilities or equipment, require large initial expenditures and generate cash flows for a considerable period of time, while expendable assets, such as feed or seed, are typically inputs to a short-term production process. Thus, time and scale tend to distinguish capital asset purchases from expendable asset purchases. Data was collected to analyze both capital and expendable asset purchases.

Regardless of the type of asset purchased, the manager must project the amount of cash that will be generated by the asset and compare this to the amount of cash required to purchase the asset. If the asset generates more cash than it costs after accounting for timing of the cash flows, it is a profitable investment. This decision rule essentially amounts to purchasing assets at a price below what they are worth to the farm. In the case of purchasing expendable assets, a variety of strategies can be used to insure that goods and services are purchased at a fair price.

Perhaps the most easily implemented purchasing strategy is to occasionally obtain price quotes from more than one supplier. Table 5 shows how frequently farmers obtain price quotes from more than one supplier of inputs such as feed, seed, fertilizer, and fuel. The results indicate that only 8% of the respondents seldom or never obtain more than one price quote. Many, 24%, responded that they always obtain price quotes. Another possible strategy that might be used to improve the value proposition is to negotiate prices with suppliers. Once price quotes have been obtained from multiple suppliers it is relatively easy to ask suppliers to meet or exceed another supplier's offer. Respondents were asked how frequently the negotiated prices with suppliers of financing and typical expendable asset suppliers, such as feed, seed, fertilizer, and fuel suppliers. The average frequency with which this strategy was used was nearly as great as that for obtaining

price quotes. One might infer that a major use of multiple price quotes is to drive negotiations with a preferred supplier.

It is sometimes difficult to observe the quality of purchased inputs such as feed and seed and the quality of inputs such as feed can vary considerably. Scientifically testing the quality of purchased inputs is strategy that can be used to insure that the quality of the inputs at least meets the minimum quality level desired. A question was asked to determine the frequency with which farmers sample and test feed for its quality. As opposed to the other input purchasing strategies, a greater proportion of respondents indicated that they always used this technique (28% – Table 5). On the other hand, a greater proportion of respondents (15%) had never used this technique. It is possible that those who have adopted this practice find it very useful and they always use it, while others have yet to adopt the practice at all.

There are several potential sources of information that dairy farmers might use to purchase inputs like feed, seed, fertilizer, and fuel. Although one would expect that each individual's personal experience with a particular product or supplier would heavily influence their purchase decisions, farmers also receive useful information from a variety of other sources. Some of these information sources include other farmers, local dealers and salespeople, consultants, and lenders.

The respondents were asked identify the frequency that the obtained information from various sources when making a decision regarding the purchase of inputs such as feed, seed, fertilizer, and fuel. Table 6 shows the percent of respondents using a source by the five levels of frequency considered and the average rating of each source. Salespeople and local dealers were important sources of information for expendable asset purchases. None of the respondents indicated that they never relied on these information sources. Nearly twice as many producers rated the salesman as an always useful source as indicated that any other source was always useful. Sources typically thought to provide neutral information, such as consultants and extension, were used sometimes, seldom, or never by a large proportion of respondents.

In addition to expendable assets, farmers must make capital investment decisions. There are many methods that the farm manager might use to evaluate such an investment. Perhaps the most commonly used technique is to determine if the investment will generate enough cash flow by itself to repay a loan to purchase the asset. The manager might also consider whether the entire farm can generate enough earnings to repay the loan for a new investment. Unfortunately, the use of either of these methods does not insure that an investment will actually generate a profit, only that it or the business can generate enough cash to repay the loan.

Another common method used to evaluate capital investments is to calculate the time that it takes for the earnings of the investment to equal the cost of the investment. This method is commonly referred to as the payback period. Although this method accounts for the fact that cash flows are generated over a period of time, the method treats cash flows generated in later years equivalent to cash outlays. Because of factors such as opportunity costs, inflation and risk, this is not typically the case. In order to account for these factors, one can use discounted cash flow techniques such as net present value or the internal rate of return. Although these measures are typically more accurate assessments of profitability, they have the disadvantage of being more difficult to calculate and understand.

Producers were asked a series of questions to examine which investment analysis techniques they used. They were presented with three possible investments, a major facility expansion of more than 25%, an equipment replacement, and an increase in herd size of 10%. It

is expected that more analyses and more sophisticated techniques will generally be used for the larger investment, the facility expansion. Because conducting a net present value analysis of an equipment replacement is typically more difficult than for a new facility, it is not expected that many producers will use this method of analysis on that investment. Table 7 shows the percent of farmers using each technique for each type of investment. For all types of investments, the ability to make loan payments was the most common method used to evaluate an investment. It was most commonly used for facility expansions (74%), which would typically require a loan agreement. Only a small proportion of farmers were using discounted cash flow techniques like NPV analysis, and as expected the smallest proportion were using this technique when making an equipment replacement. The payback period was used by at least 40% of the respondents to evaluate all of the investments.

A series of questions was asked to determine how the respondents created budgets and conducted profitability analyses. Respondents were presented with a question and asked to choose the answer that described the method that they most frequently used to make a cash flow budget. The percent of farmers that used various techniques to create a budget for a major capital investment are shown in Table 8. The combined proportion of producers not making a cash flow budget (4%) or calculating the budget in their head (16%) was nearly as great as the number of producers who created a spreadsheet budget on their computer (21%). Many of the respondents (41%) used detailed written calculations to create their budgets. Surprisingly, only 6% of the respondents allowed the lender to make their cash flow budget with little of their input.

A similar question was asked for the case of profitability analysis of a capital investment. Table 9 shows the most common methods used to conduct a profitability analysis of a major capital investment. The results are very similar to the cash flow results. However, more respondents (9%) did not conduct a profitability analysis than did not conduct cash flow analysis (4%). Likewise, more (14%) outsourced the profitability analysis to a consultant.

Business Analysis and Control Practices

Benchmarking, or comparing the farm's financial performance to other peer farms, is a potentially useful method for evaluating farm business performance. This measure allows one to identify weak areas where peer farms are outperforming the business or strong areas where the business is outperforming its peers. Table 10 shows that 62% of the respondents compare their annual profitability and financial efficiency measures such as ROA and asset turnover, to other farms in order to make decisions. This high level of adoption is expected given that access to benchmarking reports is one incentive for participation in the DFBS. Another useful business analysis technique is to track and compare the farm's own performance over time. A large proportion of the farms (84%) indicated that they used a comparison of their farm's annual profitability and financial efficiency of their farm over time in order to make decisions. Surprisingly, 75% of the farms indicated that they held a formal business analysis meeting to review financial performance in order to help them understand and make changes to their operation.

Slightly over half of the farms (52% – Table 10) were preparing annual written financial budgets. This is expected because nearly all of the businesses are borrowing money. A budget is a critical tool for preparing to borrow funds and shows repayment capacity. A common point at which a farm decides to make a budget is when undertaking a major change. When making a major change in the operation it is important to understand the amount of funds required, whether the new operation/investment will be profitable, and whether any funds invested can be repaid. The budget is an essential component of these analyses. Although not preparing a written

financial budget annually, 22% of the respondents were preparing a budget when they were making a major change in their business. This means that 74% of the respondents were preparing written financial budgets. This would seem to be an exceptionally high proportion of respondents, but it is important to remember that they are participants in the DFBS which requires that they prepare and submit annual financial statements.

When conducting benchmarking or trend analysis, it is necessary to identify which performance measures to analyze. Profitability is among the most important areas to measure. Respondents were given a list of six performance measures and asked to choose the measure that they most frequently used to measure farm performance. Table 11 lists these performance measures and the proportion of farmers that used each measure. Three of the measures, net cash income, accrual net farm income, and rate of return on assets are measures of profitability. Net cash income was by far the most popular measure (39%) of financial performance. Although somewhat useful for tracking a farm's profitability over time, net cash income is biased by changes in inventory and unpaid resources. Accrual net farm income was the second most popular measure. Given that many farmers used trend analyses to track the performance of their business over time, this is a very appropriate measure of profitability. Surprisingly, nearly as many farmers used their check book balance as a measure of profitability as accrual net farm income. The three measures of production, milk production per cow, check book balances, and gross cash income, were used by 32% of the respondents.

Relationship between Financial Management Practices and Profitability

A linear regression model was used to investigate the relationship between farm profitability and the adoption of financial management practices. The basic model is shown in equation (1).

$$Profit = f\begin{pmatrix} Captial\ Acquisition\ Practices, Investment\ Analysis\ and\ Decision\ Making, \\ Business\ Analysis\ and\ Control, Personal\ and\ Business\ Characteristics \end{pmatrix} \quad (1)$$

Profitability is hypothesized to be a function of the capital acquisition, investment analysis and decision making, business analysis and control practices used by the farmer, and the personal and business characteristics of the farmer. The rate of return on assets (ROA) (with appreciation) was used as the measure of farm profitability. It is defined in equation 2.

$$\boldsymbol{ROA} = \frac{\left(\text{Net Farm Income - Operator Labor and Managment + Interest Expense}\right)}{\text{Average Farm Assets}} \quad (2)$$

Where *Net Farm Income* is the farm's accrual net farm income, *Operator Labor and Management* is the operator's estimate of the value of unpaid labor and management expenses, *Interest Expense* is the interest expense for the year, and *Average Farm Assets* is the average of the beginning and ending market value of farm assets. ROA is pre-tax, does not include non-farm income, and does account for the amount of unpaid labor and management.

In order to assess the impact of the adoption of various management practices, the regression model in (3) was estimated.

$$\begin{aligned} ROA &= \beta_0 + \beta_1 Cows + \beta_2 Age + \beta_3 Education + \beta_4 Equity \\ &+ \beta_5 RateCalc + \beta_6 Discounts + \beta_7 Rebates + \beta_8 LsEval + \beta_9 Rates \\ &+ \beta_{10} CFMajor + \beta_{11} CFequip + \beta_{12} Analysis \\ &+ \beta_{13} PerfMeasure + \beta_{14} Budget + \beta_{15} Benchmark + \beta_{16} Prices + \varepsilon \end{aligned}$$

Where *ROA* is the percentage rate of return on assets for the year 2000 (e.g., an ROA of 5% was entered as 5.00), the β_i*'s* are parameters to be estimated, and ε is a normally distributed error term. The explanatory variables *Cows, Age, Education*, and *Equity* account for the personal and business characteristics of each farm. *Cows* is the average herd size of the farm for 2000, *Age* is the age of the primary decision maker in years, *Education* is the years of formal education obtained by the primary decision maker, and *Equity* is the percent of farm assets financed with equity.

The *RateCalc, Discounts, Rebates, LsEval*, and *Rates* variables are meant to measure the impact of strategies to assess or lower the cost of capital. Respondents were presented a 5-point Likert scale and asked to indicate how frequently (1 = never, 5 = always) they considered various factors when assessing the cost of capital obtained from various sources. *RateCalc* measures how frequently the respondent determined the effect of fees, patronage refunds, or stock purchase requirements on effective interest rates; *Discounts* measures how frequently respondents considered cash discounts forgone when evaluating the effective rate of interests for feed/seed financing; *Rebates* measures how frequently respondents consider rebates, terms, and interest rates when considering the effective interest rate on machinery financing; *LsEval* measures how frequently the respondent includes taxes in terminal values in calculations to evaluate leases. Respondents were also asked how frequently they compared the interest rates and services of lenders. *Rates* is an indicator variable identifying respondents who indicated that they never compared interest rates and services of lenders.

The investment analysis and practices of the farms were measured with the *CFMajor*, *CFEquip*, and *Analysis* indicator variables (1= yes, 0 = no). These variables identify respondents who indicated that they used either the payback period, projected cash flow (ability to make loan payments), or discounted cash flow techniques such as net present value or internal rate of return for a major expansion (*CFMajor*) or for an equipment replacement decision (*CFequip*). The *Analysis* variable identifies (1=yes, 0 = no) producers who conducted a profitability analysis for a major capital investment using a detailed written analysis, a computer spreadsheet, or hired a consultant or accountant to conduct the analysis.

The *PerfMeasure, Budget, Benchmark, and Prices* variables measure the use of business analysis and control practices. *PerfMeasure* identifies producers who identified either accrual net farm income or ROA as their preferred measure of farm performance as opposed to net cash income, check book balance, gross cash income, or milk production per cow (1 = yes, 0 = no). *Budget* identifies producers who prepare an annual written budget (1 = yes, 0 = no). *Benchmark* identifies producers who used a comparison of their farm's annual profitability and financial efficiency to other farms in decision making (1 = yes, 0 = no). *Prices* measures how frequently the farmer obtained price quotes from more than one source when buying inputs such as feed, seed, fertilizer, and fuel (5= always, 1 = never).

The model was estimated using the REG procedure in SAS version 8.01. The parameter estimates and model fit statistics are shown in Table 12. The model fits relatively well. The F-statistic for the joint significance of the parameters is large enough to comfortably reject the hypothesis that the parameters explain no variation in ROA.

Of the business and personal characteristics, variables for farm size and the proportion of equity used to finance the farm was significantly different from zero. The positive relationship between farm size and profitability provides evidence of a positive relationship between farm size and profitability in the dairy industry. It appears that farms with a greater proportion of equity are

more profitable than their peers with greater leverage. The variables for age and education were not statistically different from zero.

With respect to the variables intended to measure the impact of the role of capital acquisition, only one variable (*Rebates*), was significantly different from zero. Unfortunately, the sign of the parameter would indicate that farmers who more frequently considered the impact of rebates and terms on the effective interest rates were less profitable than their peers who considered these factors less frequently. This result is certainly surprising. It might be explained by poor wording in the question, or by the possibility that the individuals who frequently rely on dealer financing are not able to obtain lower cost sources of financing. Even if this result is discounted it is surprising that the other variables did not have a significant impact on profitability. It is worthwhile pointing out that the parameters for the *Discounts* and *RateCalc* variables are in the correct direction and possess relatively large t-statistics. However, the results from this section would seem to indicate that it is difficult for farmers to increase profitability with these strategies.

The results for the investment analysis and decision making variables are more encouraging. Here, farmers who used either payback period, cash flow (ability to make loan payments), or discounted cash flow techniques to evaluate a major expansion or equipment replacement were significantly more profitable than their peers. The sizes of the marginal effects were quite large. Other things equal, farmers who conducted these analyses had an ROA that was 470 and 450 basis points greater than their peers. A similar result was obtained when considering the process that a farmer used to evaluate the profitability of a major capital investment. Here, farmers who conducted a detailed written analysis, used a computer spreadsheet, or hired a consultant or account to conduct a profitability analysis generated an ROA that was 400 basis points greater than farmers who did not conduct an analysis, conducted it in their head, or let the lender make the analysis with little input. These results provide evidence that there are positive returns to investment analysis.

None of the business analysis and control variables that were considered had a marginal effect that was statistically different from zero. This result was somewhat surprising. However, it is possibly explained by the fact that most of the practices were adopted by a large number of the farms.

Summary

The study examined the financial management practices of 137 New York dairy farms. Financial management practices were divided into three areas: capital acquisition, investment analysis and decision making, and business analysis and control. The results provide estimates of the extent to which various financial management practices have been adopted. For instance, trend analysis was the most commonly used business analysis method. While many farms chose to measure performance with accrual net farm income or the rate of return on assets, many also chose measures such as milk production per cow or gross sales as their preferred measure of performance. Nearly three quarters of the respondents prepared either an annual written financial budget or prepared a written financial budget before making major changes in their operation. Roughly half of the producers either input data on a spreadsheet or used detailed written calculations to conduct cash flow or profitability analyses.

The study also took a first step toward estimating the impact of financial management practices on farm profitability. The basic results suggest that the greatest returns to financial management practices seem to be generated in the investment analysis and decision making area..

Farmers who conducted detailed financial analyses were substantially more profitable than the farmers who did them "in their head" or did not make the calculations. These basic results strongly suggest that there are positive returns to conducting detailed financial analyses. Producers who wish to improve performance may benefit from applying appropriate techniques for analyzing financial strengths and weaknesses.

The results for the capital acquisition and business analysis areas were somewhat less definitive. Given that there appear to be such strong relationships between investment analysis and profitability, it would seem likely that there are positive returns to the other financial management areas as well. However, one must recognize that with respect to acquiring capital, producers are constrained by their financial resources and credit worthiness.

The results regarding the impact of these practices on profitability are only preliminary. Further work is needed to examine the impact of the adoption of financial management practices on farm profitability. It is important to examine the specific mechanisms through which these strategies might impact profitability. For example, it would seem likely that capital acquisition strategies should improve profitability by lowering the cost of capital, investment analysis techniques should result in the acquisition of more productive assets, and business analysis and control practices should help control operating expenses. Additional work is needed to relate the adoption of these strategies to the component of the profit equation that they are most likely to influence.

Notes:

1. The farms included in the sample were the farms that had completed a year 2000 DFBS report by September 1, 2001. Some farms reported their 2000 results to the DFBS later than this date and are not included in the sample.

2. The questionnaire also asked farmers about their goals and a series of questions from the Management Development Questionnaire. These questions are designed to measure a respondent's capabilities in various general management areas. The responses to these questions are not reported in this study.

3. The DFBS actually contains 14 farms from states other than New York. These farms were also included in the study and are potential respondents.

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Table 1. Average Characteristics of year 2000 DFBS Participants and Survey Respondents.

Characteristic	Average All DFBS Farms	Average for all Survey Respondents
Number	352	137
Operator Age (years)	47.0	46.6
Average number of cows	237.2	285.9
Average assets	$1,493,277	$1,764,497
Net farm income with appreciation	$84,036	$89,247
Rate of return on assets with appreciation	3.02%	3.82%
Net farm income with appreciation per cow	$462	$468
Milk per cow (lbs/year)	19,323	20,141
Percent Equity	61.53%	61.78%
Projected cash flow coverage ratio	1.22	1.03
Interest expense	$48,099	$58,267
Percent of farms with debt	97%	96%

Table 2. Frequency at Which Lender Rates and Services are Compared.

Compare Rates and Services[a]	Percent of Farmers Comparing
Every time I borrow additional funds	24
When borrowing a significant amount of money	43
When there has been a change in the lender relationship such as a new loan officer or new lender management	25
Annually check and compare interest rates and services	17
Never	21

[a]Multiple responses allowed

Table 3. Percent of Farmers Using Non-Traditional Lenders and Methods to Calculate Cost of Financing.

Source of Financing	N	Always	Frequently	Sometimes	Seldom	Never
Use dealer/supplier financing of feed, machinery, etc.	137	1	19	39	26	15
Calculate effect of fees, patronage refunds, or stock on effective interest rates	135	15	14	24	22	25
Calculate effect of cash discounts foregone on effective interest rate for dealer financing	135	32	31	16	8	13
Calculate effect of rebates, terms, and interest rates on effective rate of machinery financing	137	29	27	22	12	10

Table 4. Percent Using Leasing and Factors Evaluated When Making the Leasing Decision.

Factor Considered	N	Always	Frequently	Sometimes	Seldom	Never
Lease capital assets	135	0	8	27	21	43
Decision based on tax savings only	121	5	11	24	19	41
Taxes and terminal values considered in lease evaluation	125	26	19	23	7	24
Decision to lease based on payment only	124	3	4	23	23	47
Discounted cash flows used to compare lease versus buy	123	8	11	19	20	41

Table 5. Percent of Respondents Using Various Input Purchasing Strategies.

Strategy	N	Always	Frequently	Sometimes	Seldom	Never
Obtain price quotes from more than one source when buying inputs such as feed, seed, fertilizer, and fuel	136	24	38	29	7	1
Negotiate prices of inputs such as feed, seed, fertilizer, and fuel	137	22	29	34	12	4
Negotiate terms of a loan from a lender, dealer, or other source of financing	136	14	19	40	19	8
Sample and test feed for content quality	131	28	28	16	13	15

Table 6. Use of Various Information Sources for Input Purchases.

Information Source	N	Always	Frequently	Sometimes	Seldom	Never
Salesman	136	21	46	28	5	0
Local dealer	137	11	59	25	5	0
Manufacturer or technical specialist	136	6	24	50	17	4
Consultant	135	10	30	30	16	13
Extension	137	3	19	45	20	12

Table 7. Percent of Farmers Using Alternative Capital Investment Analysis Techniques.

Investment Decision	Pay-back Period	Projected Cash Flow, ability to make loan payments	Net Present Value or Internal Rate of Return
Major facility expansion of more than 25%	43	74	12
Equipment replacement	45	67	7
Expanding herd size by 10%	40	69	10

Table 8. Most Common Method Used to Make a Cash Flow Budget for a Major Capital Investment.

Method	Percent Using
Don't make a cash-flow budget	4
Calculate in my head	16
Detailed written calculations	41
Input data on computer and make a spreadsheet	24
Lender makes cash flow projection with little of my input	6
Hire a consultant or accountant	9

N = 133

Table 9. Most Common Method Used to Conduct a Cash Flow Analysis of a Major Capital Investment.

Method	Percent Using
Don't make a cash-flow budget	9
Calculate in my head	16
Detailed written calculations	34
Input data on computer and make a spreadsheet	21
Lender makes cash flow projection with little of my input	5
Hire a consultant or accountant	14

N = 132

Table 10. Percent of Farmers Using Various Business Analysis Practices.

Business Analysis Practice	Number Responding	Percent of Farms Using
Compare annual farm profitability and financial efficiency measures to other farms	137	62
Track profitability and efficiency measures over time to help understand financial performance	137	84
Conduct a formal business analysis review or meeting	136	75
Prepare a written budget every year	136	52
Prepare a budget only when making a major change	136	22
Never	136	26

Table 11. Use of and Average ROA by Various Measure of Profitability.

Performance Measure	Percent of Farmers Indicating Measure was Most Frequently Used
Net Cash Income	39
Gross (total) Cash Income	4
Accrual Net Farm Income	20
Check Book Balance	18
Return on assets	9
Milk Production per Cow	10

N = 132

Table 12. Parameter Estimates for the Profitability Regression Model.

Parameter	Estimate	t-statistic
Intercept	-9.85	-1.72*
Herd Size (Cows)	0.0053	2.43**
Age (years)	0.0029	0.05
Education (years)	-0.0106	-0.04
Percent Equity	0.0558	1.82*
Include patronage, fees, etc in effective interest rate calc. (RateCalc)	0.7356	1.55
Include discounts foregone for feed/seed financing cost (Discounts)	0.7645	1.44
Include rebates, terms, and interest rates for machinery financing cost (Rebates)	-1.2714	-2.07**
Include taxes and terminal values in lease evaluation (LsEval)	-0.5281	1.17
Never compare lender rates and services (Rates)	1.2172	0.77
Use payback, cash flow, or NPV for major expansion (CFmajor)	4.7023	2.34**
Use payback, cash flow, or NPV for equipment replacement (CFequip)	4.5309	1.99**
Hire or create a written or computer profitability analysis (Analysis)	4.0052	3.22**
Prepare an Annual Budget (Budget)	0.0312	0.02
Use benchmarking (Benchmark)	-1.1174	-0.90
Preferred performance measure is ROA or Accrual NFI (PerfMeasure)	0.2329	0.18
Obtain input price quotes (Prices)	-0.13275	0.20
F-Statistic for joint significance of parameters	2.18**	
R-Square	0.31	
Adjusted R-Square	0.17	
Number of farms	93	

*indicates significance at the 0.10 level, **indicates significance at the 0.05 level