Dairy Business Analysis Project: Critical Financial Performance Factors from Three Years of Analysis[1]

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INTRODUCTION

The Dairy Business Analysis Project was initiated in 1996 to collect complete financial performance information from participating Florida dairies. One of the initial objectives of the project was to document reliable financial performance information to better understand the factors affecting the performance and survival of Florida dairy businesses. Three fiscal years (1995-1997) of data have been collected and summarized in various publications and presentations. The purpose of this document is to identify the variation in selected financial performance factors, sort out some critical factors dairy managers need to pay attention to, and discuss strategies that improve financial performance.

VARIATION IN FINANCIAL PERFORMANCE

A frequently asked question is how much variation in financial performance is there among dairies. Figures 1-9 show distributions for selected factors. The shapes of these distributions provide insight into the types of businesses that are represented in the sample. They also point out several management problems that the industry should be concerned about.

The first concept the distributions illustrate is how vastly different the dairies are that are represented in the sample. Represented within all of these factors include different herd sizes (Figure 1), production levels (Figure 2), and feeding management schemes (Figure 8). Some of these differences have been attributed to different activities using various broad comparisons (Hoekema et al, 1999). Because of the wide range of businesses participating in the project, however, understanding the most profitable dairy management strategies is difficult.

Large differences in profitability are evident when looking at the distributions. Figure 7 shows the large variation in total expenses per cwt. milk sold. This implies that cost control is effectively practiced on some Florida dairy businesses. Yet, the number of dairies with total expense above $18.00 per cwt. milk sold is alarmingly high. These differences translate into wide variation in the operating profit margin (Figure 3) and subsequently the rate of return on assets (Figure 6). These differences also imply that there is a lack of both cost and investment control on most Florida dairies within this sample.

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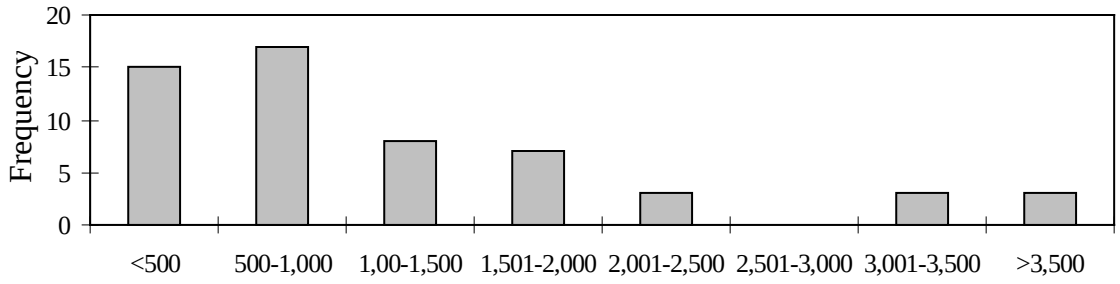


Figure 1. Distribution of total cows for 1995-1997 data set.

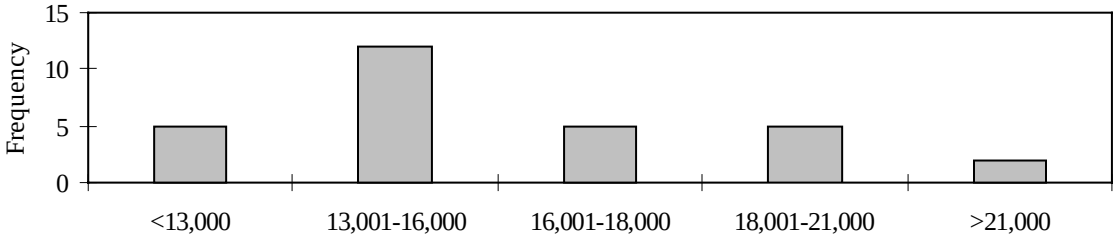


Figure 2. Distribution of pounds milk sold per cow for 1995-1997 data set.

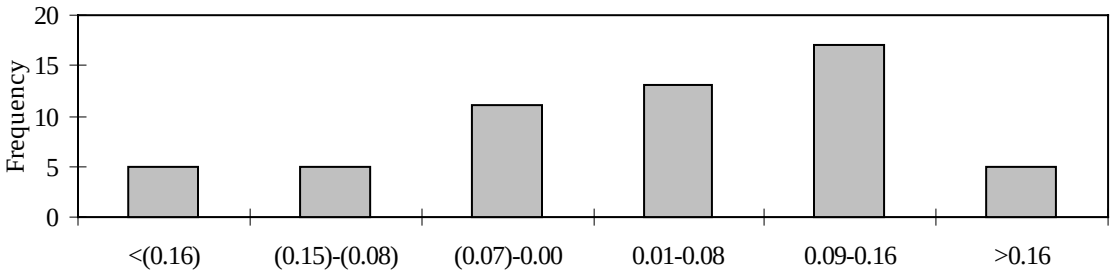


Figure 3. Distribution for operating profit margin for 1995-1997 data.

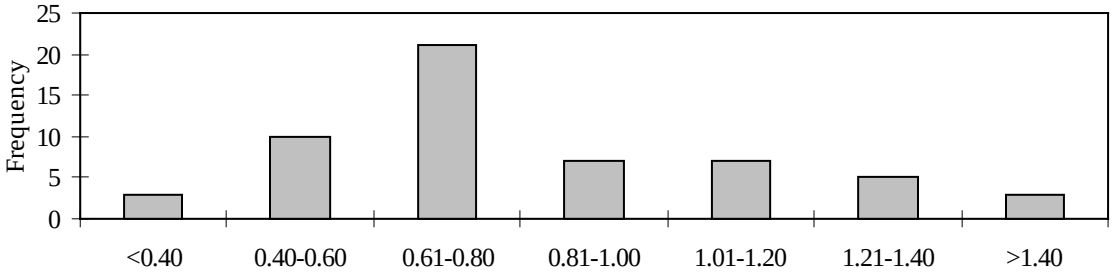


Figure 4. Distribution of the asset turnover ratio for 1995-1997.

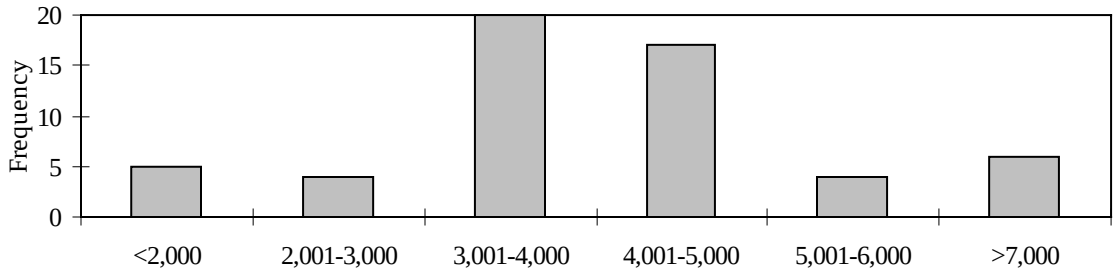


Figure 5. Distribution for average total assets per cow for 1995-1997.

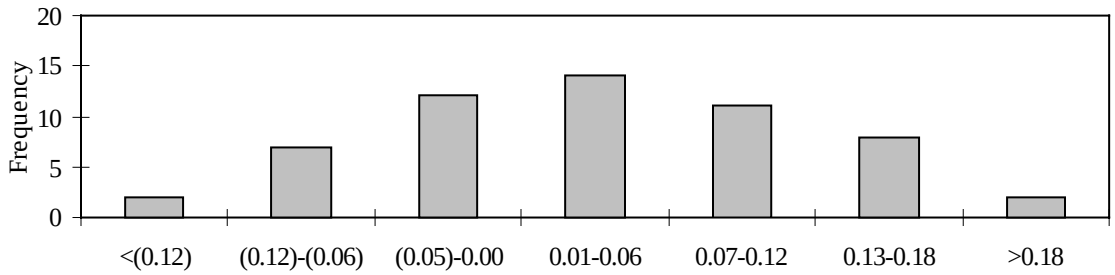


Figure 6. Distribution for the rate of return on assets for 1995-1997.

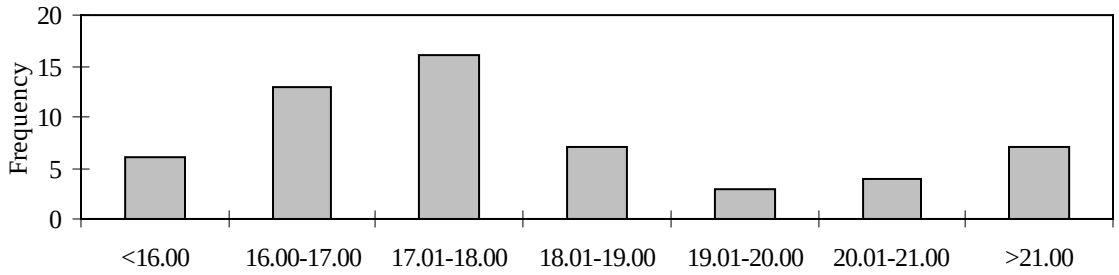


Figure 7. Distribution for total expense per cwt. milk sold for 1995-1997.

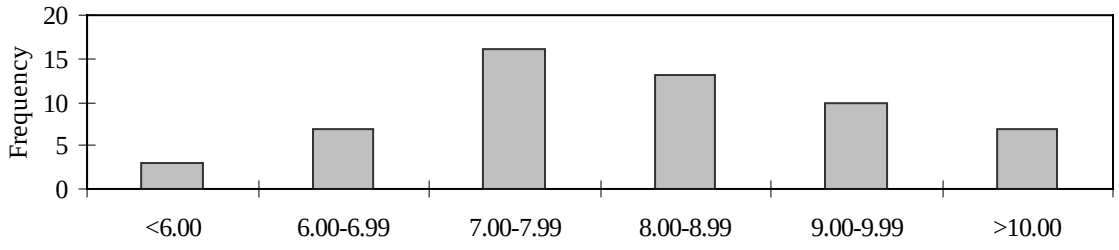


Figure 8. Distribution for purchased feed expense per cwt. milk sold for 1995-1997.

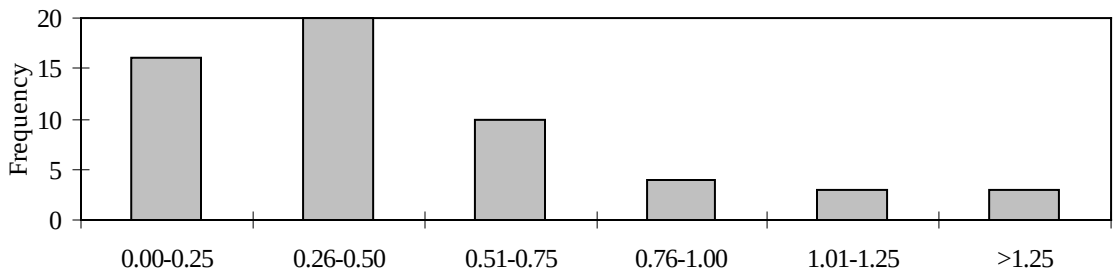


Figure 9. Distribution for machinery depreciation expense per cwt. milk sold for 1995-1997.

USING THE RATE OF RETURN ON ASSETS AS AN ANALYSIS MODEL

In order to understand this variation among businesses, it is helpful to understand which factors are driving the differences in profitability. An assumption that needs to be made when interpreting the following analyses is that the dairy business is viewed as an investment. This can be validated by the large amount of capital invested in the project dairies (1-20 million dollars in total assets). It is also assumed that investors desire a reasonable rate of return on their investment. However, each business has unique goals, opportunities, constraints, and challenges. These distributions are presented as what is measured in the overall project. Dairy managers need to sort through which factors are individually relevant to your businesses.

The rate of return on assets is a useful model for understanding the factors that affected the overall financial performance of Florida dairy businesses. The rate of return on assets is defined as:

$$\text{ROA} = \frac{\text{NFI} - \text{MGT} + \text{INT}}{\text{ATA}}$$

where ROA is the rate of return to assets, MGT is a specified charge for unpaid management, INT is interest paid on debt, and ATA is the average total assets for the fiscal year (Farm Financial Standards Council, 1995). The ATA is calculated as the average between beginning and ending total assets for the business.

Contained within this definition is a mathematical relationship between the operating profit margin and the asset turnover ratio. The operating profit margin is defined as:

$$\text{PROFMARG} = \frac{\text{NFI} + \text{INT} - \text{MGT}}{\text{REV}}$$

where REV is total gross revenues (Farm Financial Standards Council, 1995). This measure depicts how efficiently the business operated since it is adjusted for the level of debt by adding interest to net farm operating income.

The asset turnover ratio measures the rate at which revenues are generated from invested capital (i.e. assets). The asset turnover ratio is defined as follows:

$$\text{ASTURN} = \frac{\text{REV}}{\text{ATA}}$$

The asset turnover ratio indicates how many dollars of revenue are generated per dollar invested for the fiscal year (Farm Financial Standards Council, 1995). This measure provides good insight into how efficient the business utilized its capital base.

By expanding the rate of return on assets using mathematical relationships, profitability can be rewritten to better understand the factors affecting profitability. Higgins (1995) defines the rate of return on assets as follows:

$$\text{ROA} = \text{PROFMARG} \times \text{ASTURN}$$

where PROFMARG is the operating profit margin and ASTURN is the asset turnover ratio. Business profitability can thus be stated as the product between operating efficiency and asset efficiency. Describing business profitability in these terms provides an analytical framework to analyze profitability within the structure and linkages of the financial statements (Eisemann, 1997).

What results from this math is that profitability, as measured by the rate of return on assets, is affected by both capital and operating efficiency. Figure 10 displays a contour plot of the rate of return on assets as a product between the asset turnover ratio and the operating profit margin.

This figure implies a number of concepts driving the rate of return on assets. First, this is the math whether or not you may agree with it. Second, to achieve high levels of profitability the business needs both high levels of asset efficiency (asset turnover ratio) and operating efficiency (operating profit margin). What is more meaningful, however, is that this model can be used to understand which factors are driving differences in either capital efficiency, operating efficiency, or both. It is also useful for any business to understand what factors are driving individual financial performance.

The math behind profitability does not have much practical or analytical value unless used within a framework that is useful and applicable to businesses. The widely accepted DuPont profitability model is a business performance analysis tool (Weston and Brigham, 1981) that provides a framework for further analysis. Using the rate of return on assets as its base, the DuPont model can be easily adapted to a wide variety of businesses, including dairy.

Figure 11 shows a conceptualization of a dairy business within the DuPont profitability model. As shown, profitability is a product of financial efficiency parameters (i.e. profit margin and asset turnover). The financial efficiency parameters are influenced by financial performance variables. In turn, the financial performance variables are determined by performance drivers. These drivers are a function of the business itself. Control points within these drivers affect the financial performance as measured by the accounting system. This framework provides a

structure for analysis of factors influencing profitability along different branches of the DuPont framework.

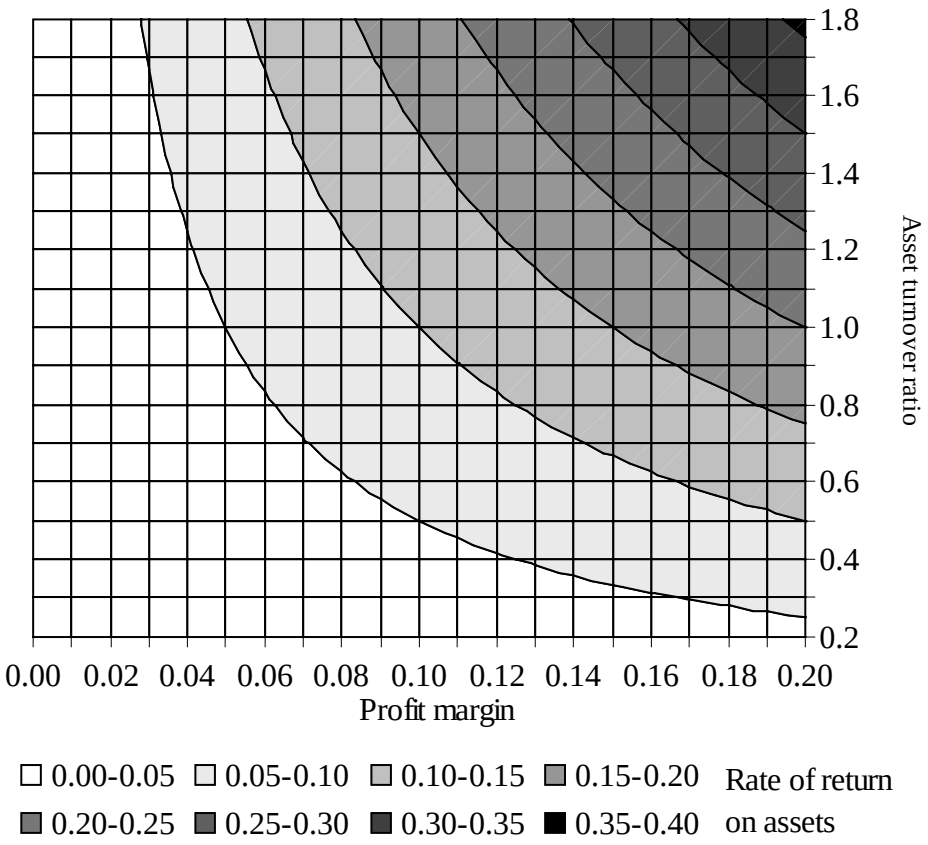
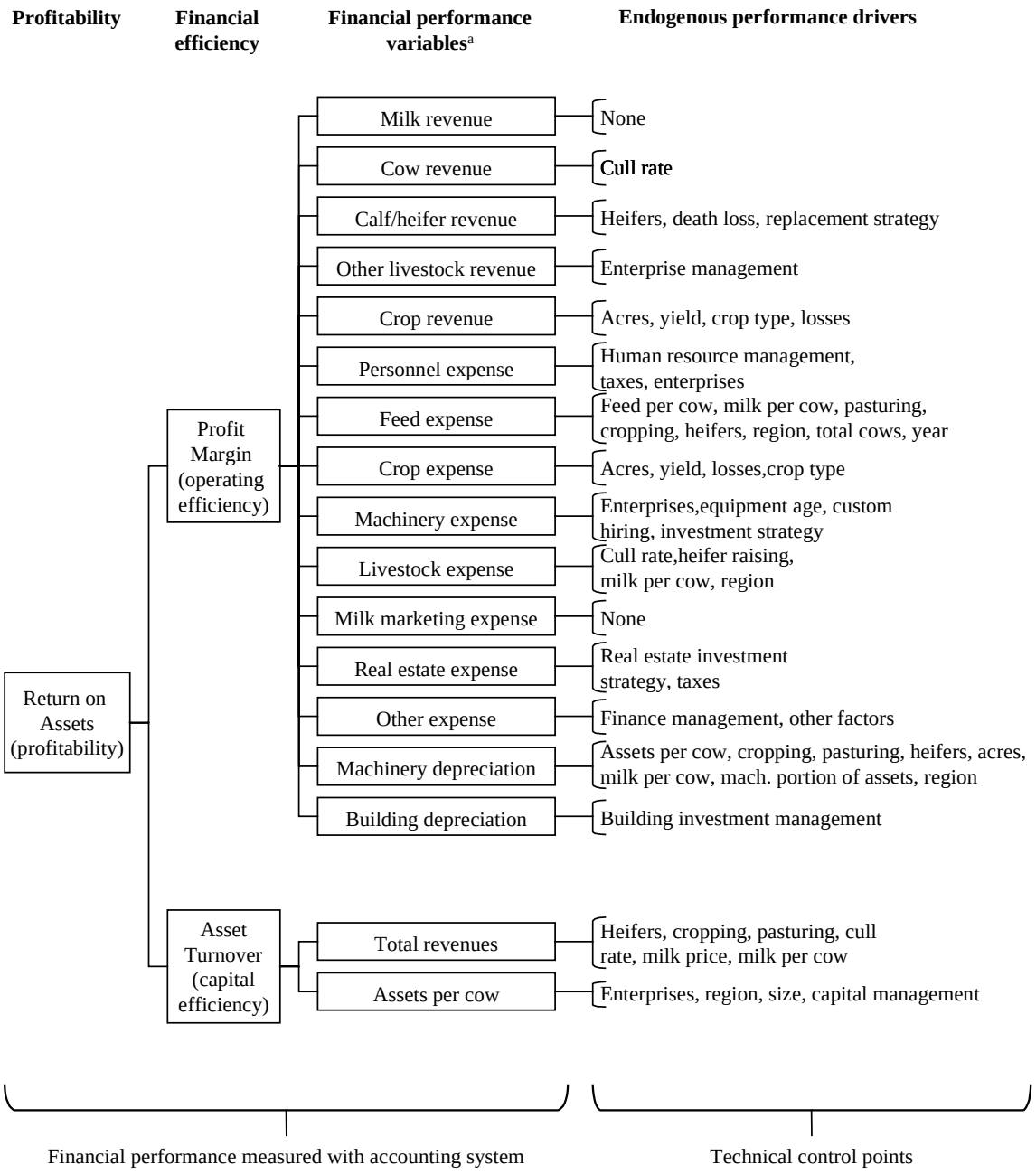


Figure 10. Contour plot of the rate of return on assets as a product of the profit margin and asset turnover ratio. Adapted from Hoekema, 1998.



[a]All variables are on a per cwt. milk sold basis except assets per cow.

Figure 11. A dairy business analysis framework using the DuPont profitability model. Adapted from Hoekema, 1998.

CRITICAL FACTORS AFFECTING FLORIDA DAIRY BUSINESSES

This framework was used to quantify which financial performance variables influenced the rate of return on assets. The variables affecting the operating profit margin and the asset turnover

ratio were separately analyzed. Verified financial performance information from participants in the Dairy Business Analysis Project from 1995-1997 fiscal years was used in the analysis. This information was verified for completeness and accuracy and validated using the statement of owner's equity and statement of cashflows. Overall, 56 observations were used in this analysis.

Partial correlation coefficients were used to identify which factors influenced both the asset turnover ratio and the operating profit margin. These coefficients identify the amount of variation each variable contributes to the factor analyzed. For further details regarding the statistical methodology of this analysis, please see Hoekema (1998).

The partial correlation coefficients for determinants of the asset turnover ratio are listed in Table 1. Average total assets per cow was the most influential factor, accounting for 60% of the variation in the asset turnover ratio (Table 1). Pounds milk sold per cow had the next highest influence, explaining 18% of the variation. The quadratic effect for average total assets per cow was also influential (14%, Table 1) suggesting that the rate of decrease in the asset turnover ratio decreased with increasing assets per cow. However, more data is needed to verify this effect. Total revenues per cwt. milk sold explained another 4% of the variation (Table 1).

The partial correlation coefficients for determinants of the operating profit margin are listed in Table 2. Milk price contributed to 31% of the variation in the operating profit margin (Table 2). Machinery depreciation expense per cwt. milk sold was the most influential expense variable and explained 16% of the variation in the operating profit margin (Table 2). Variation in purchased feed expense per cwt. milk sold contributed another 13% to the variation in the operating profit margin (Table 2). Livestock expense, crop revenue, and machinery expense per cwt. milk sold individually contributed between 6% and 7% to the variation (Table 2). Other significant variables include calf and heifer revenues, milk marketing expense, personnel expense, real estate expense, and other livestock revenue per cwt. milk sold (Table 2).

These results have several implications. First, average total assets per cow was the most important factor describing the efficiency of asset use. The long, right tail of the distribution (Figure 5) suggests that control of capitalization levels was not well-practiced on some Florida dairy businesses. Total revenue levels, although varying due to market conditions between years, contributed a relatively small amount to the variation in the asset turnover ratio. Herd size did not describe variation in the asset turnover ratio in this sample. This is an especially significant result given the broad distribution for total cows in this sample (Figure 1). This reaffirms the importance that assets per cow has on profitability. It also reaffirms statements by Bailey et al. (1997) that consideration of assets per cow is necessary when planning a new dairy.

The results also show the degree to which changes in milk price have affected profitability. In effect, 31% of the variation in the operating profit margin was caused by fluctuations in milk price. This demonstrates the degree to which Florida dairy businesses are susceptible to milk market fluctuations.

Variation in machinery depreciation expense per cwt. milk sold, surprisingly, had a dramatic effect on the operating profit margin (0.16 partial R^2, Table 2). The wide distribution (Figure 9) implies that control for this expense was highly variable between dairies. This result may also

reflect tax management strategies that used accelerated depreciation methods. It is unclear from this study which factor affected variation to a greater degree.

The variation in purchased feed expense per cwt. milk sold explained 13% of the variation in the operating profit margin (Table 2). While a relatively important expense variable, it is somewhat surprising that the contribution was not higher than that of other expense variables. This may suggest that standardizing this expense by pounds milk sold may have corrected for differences in feeding efficiency between businesses, masking its effect on the operating profit margin. It may also suggest that purchased feed expense was a control priority for dairy managers. Still, the variation implies that management control of this expense factor was highly variable among dairies.

Other expense variables individually explained between 1-7% of the variation in the operating profit margin (Table 2). These variables included livestock, machinery, milk marketing, and real estate expense, all on a per cwt. milk sold basis. While not major contributors to variation, these expenses should not be overlooked as priorities for control.

Table 1. Partial correlation coefficients for the asset turnover ratio.

Independent variable[a]	Partial R^2	F	p<F
Average total assets per cow	0.60	82.68	0.0001
Pounds milk sold per cow	0.18	132.61	0.0001
Average total assets per cow squared	0.14	30.20	0.0001
Total revenues per cwt. milk sold	0.04	73.38	0.0001
Total	0.97		
Unexplained variation	0.03		

[a]Adapted from Hoekema, 1998.

Table 2. Partial correlation coefficients for the operating profit margin

Independent variable[a]	Partial R^2	F	P<F
Milk price	0.31	23.90	0.0001
Machinery depreciation expense per cwt. milk sold	0.16	16.25	0.0002
Purchased feed expense per cwt. milk sold	0.13	16.88	0.0001
Livestock expense per cwt. milk sold	0.07	11.23	0.0015
Crop revenue per cwt. milk sold	0.06	10.43	0.0022
Machinery expense per cwt. milk sold	0.06	13.40	0.0006
Calf and heifer revenue per cwt. milk sold	0.03	7.33	0.0094
Milk marketing expense per cwt. milk sold	0.03	9.94	0.0028
Personnel expense per cwt. milk sold	0.02	5.76	0.0204
Real estate expense per cwt. milk sold	0.01	5.40	0.0247
Other livestock revenue per cwt. milk sold	0.01	5.38	0.0251
Total	0.89		
Unexplained variation	0.11		

[a]Adapted from Hoekema, 1998.

UNDERSTANDING CRITICAL PROFITABILITY FACTORS

As the previous discussion outlines, the two main determinants of the rate of return on assets are the operating profit margin and the asset turnover ratio. Efforts to improve either of these critical profitability factors will, in effect, improve the profitability of the business. It is helpful to understand, however, both why these factors are important and what factors drive differences between dairy businesses.

First of all, the asset turnover ratio is an important profitability factor although many dairy managers do not pay much attention to it. The main reason for its importance is due to the fact that many lenders look at this number. The asset turnover ratio measures the ability of investments to generate dollars and pay themselves back in the form of revenues. Table 3 illustrates the relationship between levels of the asset turnover ratio and the payback period (in years). In essence, the higher the asset turnover ratio, the less time it takes for the investment to pay itself back.

Table 3. Levels of asset turnover ratio and corresponding annual payback periods.

Asset turnover ratio	Revenue payback (years)
0.25	4.0
0.50	2.0
0.75	1.3
1.00	1.0
1.25	0.8

The faster payback period associated with higher levels of the asset turnover ratio has several implications for dairy business management. First of all, the investment stays ahead of depreciation (which is a function of the useful life of the investment). This implies that the investment will stay ahead of the loan payments (if the money was borrowed) since most loans are based on the useful life of the investment. More importantly, higher asset turnover ratios correspond with higher levels of revenue generation and potential profits.

As dairy business managers, there are two ways to control the asset turnover ratio. The method of highest impact is by controlling assets per cow. The reason this is a useful management control point is because, on most dairies, cows are what generate the revenues and subsequent profits. If assets per cow is then controlled, the efficiency of revenues generated from the dairy will be improved. This is especially true for those dairy managers planning to reinvest in their businesses. The results in Table 1 show the opportunity dairies have for improving control of assets per cow.

Controlling the asset turnover ratio has implications even for those businesses without plans to reinvest in the short term. Figure 12 displays a contour plot of the asset turnover ratio using total revenues of $18.58 per cwt. milk sold, the average for the 1995-1997 data set. This shows the opportunity that managers have to influence the asset turnover ratio by changing either assets per cow or pounds milk sold per cow. However, increases in the amount of milk sold per cow

without regard to the efficiency of production (i.e. feed expense per unit output) may have detrimental effects to overall profitability.

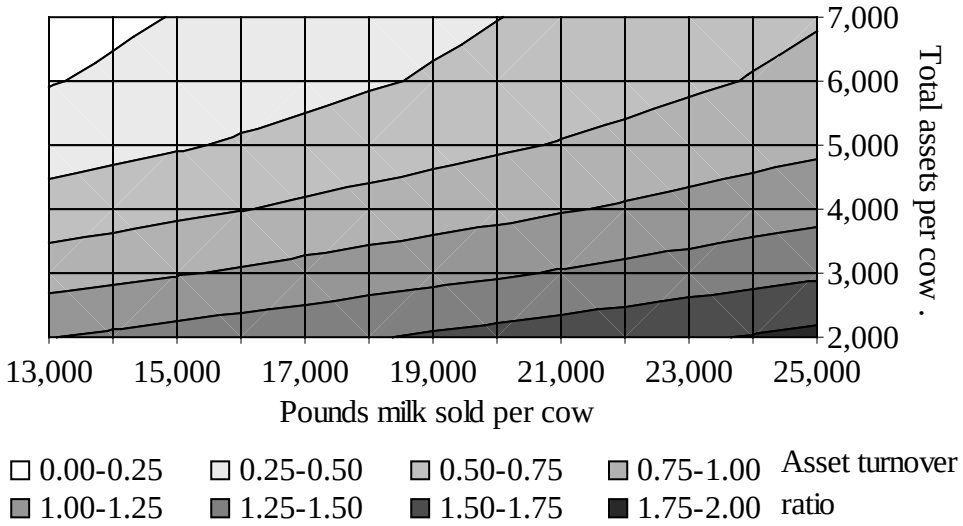


Figure 12. Contour plot of asset turnover ratio for milk production levels with different capitalization levels using total revenues of $18.58 per cwt. milk sold. Adapted from Hoekema, 1998.

A factor of equal importance to the asset turnover ratio is the operating profit margin. Defined simply, it is the portion that is retained as profit out of all the dollars that are generated by the business. When adjusted for debt service (i.e. interest paid on liabilities), it is an excellent measure of the operating efficiency of the business. Figure 3 illustrates how variable this factor was for Florida dairy businesses. A closer look at how the dollars flow through dairies provides some insight into how dairy managers can improve operating efficiency.

Figure 13 illustrates, as a percent of total revenues, where the dollars flowed, in terms of expenses and net farm income, for the Top 25%[3] dairies in the 1997 project summary. Conversely, Figure 14 shows the same information as an average across all dairies. The first observation to point out is the large difference in net farm income with the Top 25% group having 11% retained as net farm income from operations (Figure 13) compared to the 2% average for all dairies (Figure 14).

The second, and perhaps more important observation is that there was not a large difference for any particular expense area. These figures support the notion that the Top 25% group effectively controlled all expenses. In fact, further analysis revealed that the Top 25% group had below average expenses in six of nine expense categories (Hoekema, 1999). Moreover, the Top 25% group did not substantially differ in herd size, pounds milk sold per cow, or cull rates. This

[3] Top 25% based on net farm income from operations per cwt. milk sold.

points out the difficulty of using one or two factors such as herd size or production level to predict profitability.

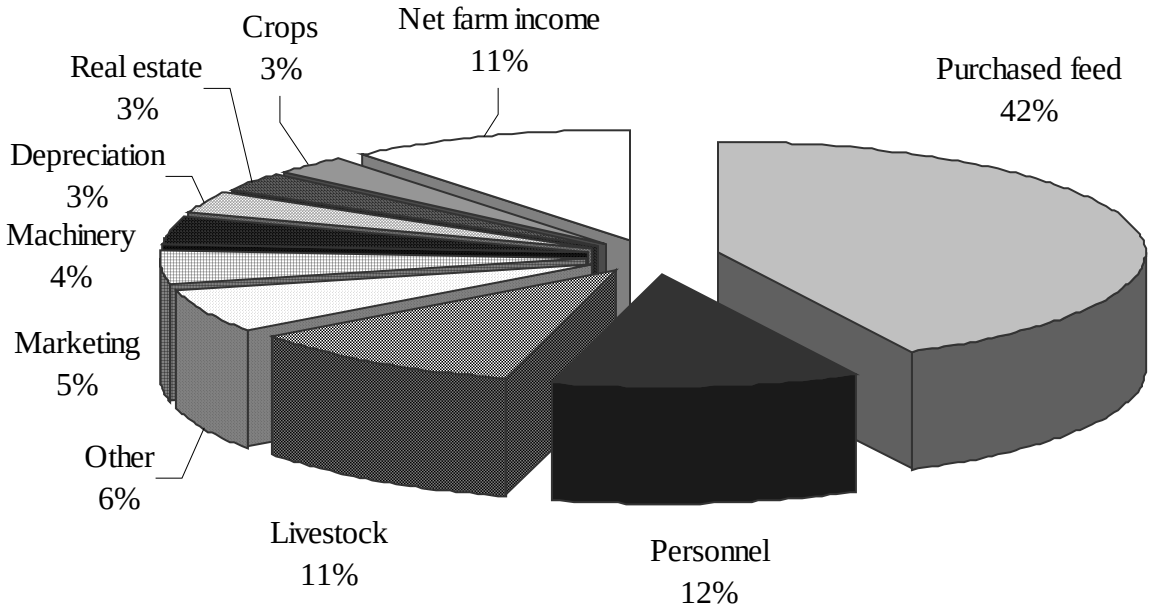


Figure 13. 1997 expenses and net farm income from operations for Top 25% dairies for net farm income from operations per cwt. milk sold. Adapted from Hoekema et al (1999).

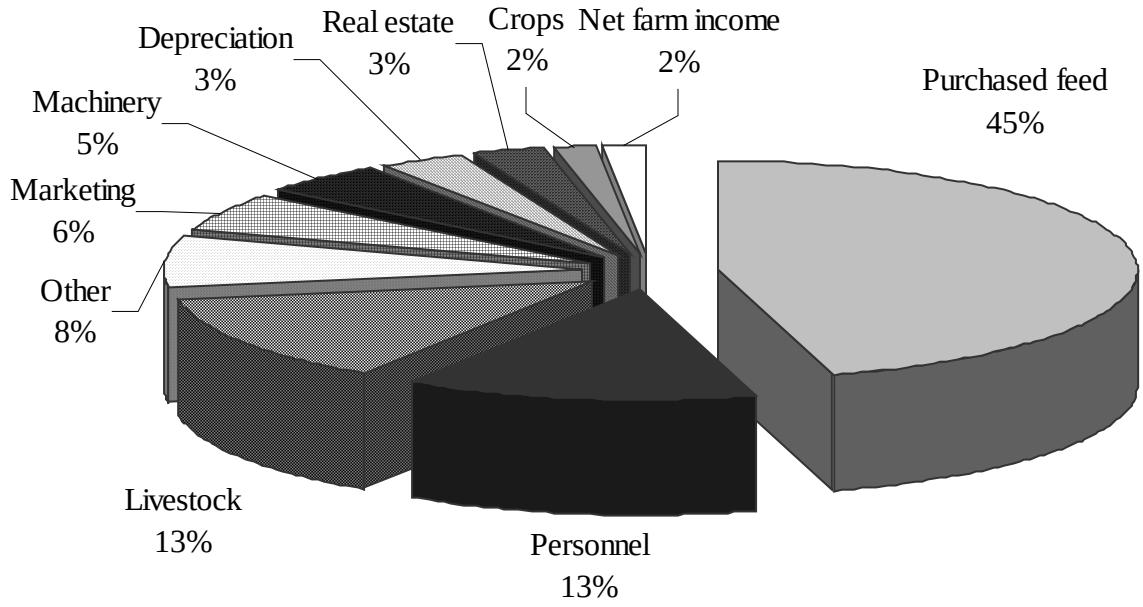


Figure 14. Average 1997 expenses and net farm income from operations. Adapted from Hoekema et al (1999).

STRATEGIES FOR INCREASING PROFITABILITY

In light of the large differences in both the capital and operating efficiency of Florida dairy businesses, several strategies for increasing profitability can be specified. The first is to focus on analyzing and improving the cost of milk production. Managers also need to make profitable investments. Debt should be used carefully. Moreover, dairies do not operate in a vacuum so other factors may be important to an individual business.

When managing the cost of production (i.e. operating efficiency) it is important to understand that there are not set standards that will guarantee a certain level of profitability. However it is useful to understand how the business compares for various performance factors. The first place to investigate is the total expense of production. Comparative analysis using applicable benchmarks is useful to understand if your business is out of line in a particular area. If the business is high in an area, ask if a particular activity or enterprise explains the deviation. If not, it is a sign of a potential cost control problem and should be remedied. Realize, however, when managing feed expenses, it is imperative to realize the interaction between milk per cow and feed expense. Least cost and high production rations may not always be the most profitable and should be approached with caution.

The dairy business also needs profitable investments. Anytime a new piece of equipment is purchased or an addition to a building is made, the prudent dairy manager should ask, 'Will this investment generate revenues for the business?' Be aware of 'back-door' investments that may indirectly generate revenues through increases in efficiency. These include, but are not limited to investments that increase cow comfort, labor efficiency, feed efficiency, and decrease lameness or acidosis to name a few.

Unfortunately, all investments come with a price tag attached, requiring discernment when making investment decisions. Highly depreciable assets with short useful lives (examples include machinery and equipment) do cost dairies money. The results in Table 1 support this notion by showing that machinery depreciation expense per cwt. milk sold was most influential expense variable on the operating profit margin.

Another factor that needs to be taken into account is whether or not the capital for the investment is borrowed. Anytime a new liability is added to the business, it is affected by both increased interest expense and a burden on cash flow to make timely payments. While this dynamic is certainly not prohibitive to borrowing, it does focus the decision on the demand for an investment to generate returns.

Debt management deserves a publication on its own accord due to the complexities of the time value of money and the dynamics of borrowing. A brief discussion is helpful to at least understand the basics of finance. Again, there are not set guidelines that apply to every dairy business. However, debt is usually borrowed in anticipation of some future returns. Since cows generate the majority of revenues on most dairies, it makes some sense to think in terms of total liabilities per cow as a rough measure of the debt level a dairy business is carrying. Moreover, if debt per cow is greater than the value of the cow, increased pressure is placed on the cow to generate returns (i.e. milk) just to service the debt in a timely manner let alone pay other

expenses. Although not established as a control point in the previous analyses, debt per cow is a factor that needs to be managed on dairy businesses for the above reasons.

It is not extremely profound to state that dairy businesses are complex entities that are driven by many factors and their interactions. However, it is my observation that those of us working with dairy businesses tend to underestimate the degree of complexity and oversimplify management decisions. Because of this, it is imperative that each dairy manager individually understands and identifies where opportunities and constraints lie within the business. Figure 11 is proposed as helpful for understanding the 'big picture' of dairy business management. It is most useful if applied within the business itself.

The critical assumption that needs to be made by managers in order that any of the above practices are effective is to focus on profit. No matter if the business is focused on growing equity in the business, servicing debt in a timely manner and paying off the mortgage, simply making a living, or working to reinvest in the business; each of these goals take a profitable business to achieve.

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