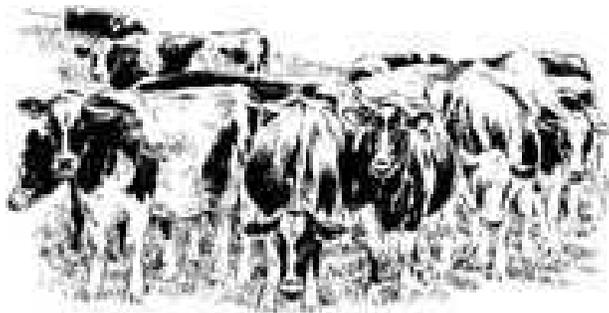


A UW-RIVER FALLS AGSTAR SCHOLARS REPORT

The Differences in Profitability among Higher Debt AgFA Dairy Farms 2003

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I. Acknowledgements

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II. Introduction

When used correctly, debt can be a very effective profit-generating tool. Debt can help farms get started, finance spring planting, provide an influx of cash during a poor milk price year, or finance asset purchases, new enterprise endeavors and farm expansions. Thus, debt is almost a necessity for most dairy farms.

Unfortunately, debt is not always used effectively. Some farms can operate profitably with a significant amount of debt, sometimes even up to 70 percent or beyond, while others cannot. The purpose of this research is to analyze the financial performance differences between the high and low profit moderate debt farms and the financial performance differences between high and low profit high debt dairy farms of the 2003 AgFA dataset. The authors hope that farm managers, lenders, extension advisors and other dairy

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⁵ The Agricultural Financial Advisor is a financial dataset containing the financial statements and financial performance measures for participating Wisconsin dairy farms.

industry stakeholders will be able to use this information to make more informed decisions regarding debt utilization and farm financial performance.

III. Data and Methods

Data for this research was supplied by UW-Extension's and the Center for Dairy Profitability's Agriculture Financial Advisor (AgFA) 2003 dataset. These farms were then placed into two debt categories: Moderate Debt Farms and High Debt Farms. The Moderate Debt Farms had debt to asset ratios that ranged from 0.40 to 0.59. The High Debt Farms exhibited debt to asset ratios of 0.60 or greater.

The Moderate and High Debt Farms categories were then subdivided into two profit categories: high and low profit. The primary financial measure used to describe profitability was the rate of return on assets (ROROA). The ROROA equals:

$$(\text{Net Farm Income from Operations} + \text{Interest} - \text{Unpaid Labor and Management}) / (\text{Average Farm Assets})$$

The ROROA financial measure has at least two advantages when comparing farm profitability. Unlike Net Farm Income from Operations (NFIO), it includes a charge for unpaid labor. This allows farms with different unpaid labor values to be compared more fairly. Second, unlike the Rate of Return on Equity (ROROE), the ROROA is also a good measure to compare the profitability of farms with different debt levels⁶.

The high profit Moderate and high profit High Debt Farms are defined as farms with a rate of return on assets (ROROA) of more than 6 percent. There were 34 high profit Moderate Debt Farms and 42 high profit High Debt Farms. The low profit Moderate and High Debt Farms were defined as farms with a ROROA of less than 2 percent. There were 42 Moderate Debt Farms and 34 High Debt Farms that were low profit farms.

After sorting the farms into their respective categories, the farms were subjected to a DuPont Analysis. The DuPont Analysis links the ROROA to two other financial measures, the asset turnover (ATO) and the operating profit margin (OPM). The ATO measures how efficiently the assets generate sales⁷. The OPM measures how much profit is generated by each sales dollar.

⁶ Two farms with different relative debt levels but the same NFIO will have very different ROROE.

⁷ Sales is also commonly referred to as either Total Farm Income, Gross Farm Income, or Gross Farm Revenue in many farm financial recordkeeping systems.

The DuPont Analysis uses the following formula:

$$\text{ROROA} = \text{ATO} * \text{OPM}$$

Where:

$$\text{ATO} = (\text{Sales}) / (\text{Average Farm Assets})$$

And:

$$\text{OPM} = (\text{NFIO} + \text{Interest} - \text{Unpaid Labor and Management}) / (\text{Sales}).$$

Differences in ATO are caused by differences in sales volume and asset issues. Factors such as the milk price received, milk shipped per cow, herd size, and assets per cow (among others) were analyzed to help explain why differences in ATO occurred. To determine why differences in the OPM measures occurred, various profit and cost financial efficiency measures were compared. All differences between the farm categories were statistically significant at a confidence level of 95 percent unless noted otherwise⁸.

IV. Results and Conclusions for the Medium Debt Farms

IV-a. DuPont Analysis Results for the Medium Debt Farms

The high profit Moderate Debt Farms earned a ROROA of 11.6 percent. This indicates that these high profit farms earned approximately 12 cents of profit for every dollar invested in assets by the farm owner(s) and debt holders (Table 1). The low profit farms in this category lost approximately 0.2 cents for every dollar invested in assets.

Part of this difference can be attributed to the rather large difference in ATO. The high profit farms earned a 45 percent higher ATO than the low profit farms. On average, the high profit farms generated 55 cents in sales for every dollar invested in assets. The low profit farms generated 38 cents in sales for every dollar invested in assets.

The high profit farms were also more cost effective at producing products for sale. On average, the high profit farms earned roughly 21 cents in operating profits for every dollar in sales. The low profit farms lost 0.6 cents for every sales dollar generated.

⁸ A pooled variance t-test was used to analyze the data.

Table 1. DuPont Analysis Results for the Moderate Debt Farms

DuPont Analysis Measure		Moderate Debt Farms (Debt to Asset Ratios of 0.40 to 0.59)	
		High Profit Farms (34 Farms)	Low Profit Farms (42 Farms)
ROROA (%)	Average	11.6	-0.2
	Range	6.7 to 33.0	-7.6 to 1.7
ATO (\$)	Average	0.55	0.38
	Range	0.15 to 1.33	0.20 to 0.63
OPM (%)	Average	21.1	-0.6
	Range	7.5 to 78.2	-33.3 to 7.5

¹ The difference between the low profit farms' and high profit farms' average values was not statistically significant.

IV-b. Factors Affecting the Difference in ATO between Moderate Debt Farms

For the Moderate Debt Farms, the difference in milk shipped per cow per year between the high and low profit farms (23,562 pounds vs. 22,272 pounds) was not statistically significant (Table 2). Other differences potentially affecting ATO that were not statistically significant included herd size (177 cows vs. 143 cows) and crop acres per cow (2.72 acres vs. 3.31 acres).

The difference between the average milk price received by the high profit and low profit farms was statistically significant. On average, the high profit farms earned \$0.64/cwt more than the low profit farms. Possible explanations for why the high profit farms had a better milk price include having better milk components, milk quality, and/or more effective milk marketing plans. Had the low profit farms been able to enact programs and protocols to achieve the high profit farms' milk price, it would have meant additional milk sales of \$142 per cow or \$20,383 per farm based on the low profit farms' average milk shipped per cow and average herd size. In other words, if these low profit farms could have implemented milk-price-enhancing programs for less than \$142 per cow, it would have improved their financial performance.

The high profit farms of this category also required fewer assets per cow than the low profit farms (\$8,000 vs. \$9,641). This indicates that the high profit farm managers were better at utilizing their assets in 2003. Better asset utilization may indicate that the high profit Moderate Debt Farms

- run their operations at a more optimal capacity level;
- lease assets when appropriate;
- buy used assets when appropriate; and/or,
- hold on to assets longer in order to reduce their asset per cow requirements.

Table 2. Sales- and Asset-Based Factors Affecting the Moderate Debt Farms' ATO

Factors Affecting ATO		Moderate Debt Farms (Debt to Asset Ratios of 0.40 to 0.59)	
		High Profit Farms (34 Farms)	Low Profit Farms (42 Farms)
Milk Shipped Per Cow Per Year	Average	23,562 lbs	22,272 lbs ¹
	Range	12,045 to 31,434	14,358 to 28,100
Milk Price Received Per Hundredweight	Average	\$13.19	\$12.55
	Range	\$9.55 to \$19.80	\$11.67 to \$14.47
Herd Size	Average	177	143 ¹
	Range	43 to 606	33 to 1,838
Crop Acres Per Cow	Average	2.72	3.31 ¹
	Range	0 to 6.78	0 to 11.48
Assets Per Cow	Average	\$8,000	\$9,641
	Range	\$3,284 to \$21,697	\$4,907 to \$17,573

¹ The difference between the low profit farms' and high profit farms' average values was not statistically significant.

IV-c. Factors Affecting the Difference in OPM between Moderate Debt Farms

This section displays the results of the analysis conducted on the profit and cost efficiency measures that contribute to a farm's OPM. Of primary importance will be the financial efficiency ratios, those expressed as a percent of sales. While profit per head or hundredweight are important measures and were analyzed as part of this research, they are less reliable when comparing across farms. Two examples help illustrate this fact. First, two farms may have identical purchased feed costs per head but very different milk production levels. Second, one farm may have a lower cost of production per hundredweight than another, but the higher cost farm may have invested in inputs—such as a rumen buffer or better milk quality programs—that enable it to earn a much better milk price and a higher profit per hundredweight than the lower cost per hundredweight farm. Expressing costs as a percent of sales allows us to keep the costs and the sales the costs generate in proper perspective.

Net farm income from operations (NFIO) comprised roughly 17 percent of sales on the high profit Moderate Debt Farms (Table 3). This means that for every sales dollar generated, the farm earned 17 cents in NFIO. The low profit farms of this category lost one cent of NFIO for every dollar in sales. Because the NFIO financial efficiency ratio was negative, this indicates that the low profit farms were reliant on capital asset sales, loans, non-farm income, or “living off their depreciation” to provide adequate cash for principal payments and family living expenses.

The high profit farms were more cost efficient than their low profit counterparts in all four general expense financial efficiency ratio categories: total basic cost (TBC), depreciation expense, interest expense, and paid labor expense. On average, it took approximately 59 cents of every sales dollar to pay for TBC

expenses—which include all expenses other than depreciation, paid labor, and interest—on the high profit farms. The low profit farms’ average TBC financial efficiency ratio was roughly 19 percent higher. It took 70 cents of every sales dollar to pay for TBC expenses on these low profit farms.

Three specific TBC expense types were also examined: purchased feed, veterinary, and seed, chemical, fertilizer and lime expenses (SCFL). Of these three, only the difference in the veterinary expense financial efficiency ratio was statistically significant. On average, veterinary expenses totaled 2.8 percent of sales on the high profit farms as compared to the low profit farms’ 3.4 percent. The purchased feed financial efficiency ratio for both the high and low profit farms was roughly 22 percent of sales. The SCFL was roughly 4 percent for both the high and low profit farms.

Table 3. Factors Affecting the Moderate Debt Farms’ OPM

Factors Affecting OPM		Moderate Debt Farms (Farms with Debt to Asset Ratios of 0.40 to 0.59)	
		High Profit Farms	Low Profit Farms
NFIO as a Percent of Sales	Average	16.9 %	-1.0 %
Total Basic Cost as a Percent of Sales	Average	58.8 %	70.5 %
Depreciation Expense as a Percent of Sales	Average	5.7 %	11.6 %
Interest Expense as a Percent of Sales	Average	5.2 %	7.6 %
Paid Labor Expense as a Percent of Sales	Average	10.8 %	14.5 %
Purchased Feed as a Percent of Sales	Average	21.9 %	22.1 % ¹
Purchased Feed per Hundredweight	Average	\$3.68	\$3.38 ¹
Purchased Feed per Cow	Average	\$868	\$754
Veterinary Expenses as a Percent of Sales	Average	2.8 %	3.4 %
Veterinary Expenses per Hundredweight	Average	\$0.46	\$0.51 ¹
Veterinary Expenses per Cow	Average	\$109	\$114 ¹
Seed, Chemical, Fertilizer and Lime Expense as a Percent of Sales	Average	3.9 %	4.3 % ¹
Seed, Chemical, Fertilizer and Lime Expense per Hundredweight	Average	\$0.65	\$0.66 ¹
Seed, Chemical, Fertilizer and Lime Expense per Cow	Average	\$153	\$148 ¹
Seed, Chemical, Fertilizer and Lime Expense per Acre	Average	\$73	\$50
Debt to Asset Ratio	Average	0.50	0.50 ¹
Debt per Cow	Average	\$3,950	\$4,800

Although the purchased feed and SCFL financial efficiency ratios did not differ significantly, the amount spent on purchased feed per cow and SCFL per acre did. The high profit farms spent \$868 on purchased feed per cow. Their low profit counterparts spent \$754 per cow on purchased feed. The high profit farms spent \$70 per acre on SCFL expense, but the low profit farms spent \$50 dollars per acre. When you combine the facts that the high and low profit farms' purchased feed and SCFL financial efficiency ratios were similar, but their respective per head and per acre values for these expenses were different, it indicates that the high profit farms were able to maintain their rate-of-return on their investment in these two inputs at a higher level of investment. Thus, they appear to have recognized that there were additional profitable returns—perhaps from higher yields, better components, or increased grain and forage sales—by investing more heavily in purchased feed and SCFL inputs.

The high profit farms had a much lower depreciation financial efficiency ratio than the low profit farms (approximately 6 percent vs. 12 percent). This means that \$1.00 of depreciation generated roughly \$17.50 in sales.⁹ On the low profit Moderate Debt Farms, \$1.00 of depreciation generated roughly \$8.33 in sales—a 52 percent difference. This provides further evidence that the high profit Moderate Debt Farms were much better at utilizing their assets. This may mean that the high profit farms

- run their operations at a more optimal capacity level;
- recognize when it is more profitable to lease assets;
- buy used assets when appropriate; and/or,
- hold on to assets longer in order to reduce their depreciation expense.

The interest expense financial efficiency ratio was roughly 5 percent on the high profit farms. This means that every \$1.00 in interest expense supported \$20 in sales on the high profit farms. The interest expense financial efficiency ratio was 60 percent higher on the low profit farms. It took 8 cents of every sales dollar to pay the interest expense on these farms, or, in other terms, \$1.00 of interest expense supported \$12.50 in sales. Although the debt to asset ratio was the same for the high and low profit farms, the low profit farms' average debt per cow was roughly 21 percent higher. The reason for the difference between these two debt measures is that the low profit farms required more assets per cow than the high profit farms. Thus, not only did asset utilization compromise the low profit farms' ATO, it also compromised their depreciation and interest financial efficiency.

⁹ \$17.50 in sales = (\$1.00 of interest expense) / (6 % depreciation expenses financial efficiency ratio / 100 %)

It took approximately 11 cents of every sales dollar to pay for paid labor on the high profit farms as opposed to 14.5 cents on the low profit farms. It should be noted, however, that the high profit farms averaged 545 more unpaid labor hours per year than the low profit farms.

V. Results and Conclusions for the High Debt Farms

V-a. DuPont Analysis Results for the High Debt Farms

The high profit High Debt Farms had a ROROA of 9.6 percent (Table 4). The less profitable High Debt Farms experienced a ROROA of -2.8 percent. This means that the low profit farms lost approximately 3 cents for every dollar that the farm owner and debt holders invested in assets.

Although the average ATO for the high profit farms was 21 percent higher than the low profit group, the difference was not statistically significant. The difference between the high- and low profit farms’ OPM was significant. The high profit farms of this category earned approximately 17 cents in profit for every sales dollar generated. The low profit farms lost 6 cents for every sales dollar generated.

Table 4. DuPont Analysis Results for the High Debt Farms

DuPont Analysis Measure		High Debt Farms (Debt to Asset Ratios of 0.60 or Greater)	
		High Profit Farms (42 Farms)	Low Profit Farms (34 Farms)
ROROA (%)	Average	9.6 %	-2.8 %
	Range	6.6 to 55.4	-31.6 to 1.6
ATO (\$)	Average	0.57	0.47 ¹
	Range	0.32 to 2.53	0.19 to 1.56
OPM (%)	Average	16.8	-6.0
	Range	9.1 to 40.0	-167.2 to 5.0

¹ The difference between the low profit farms’ and high profit farms’ average values was not statistically significant.

V-b. Factors Affecting the Difference in ATO between High Debt Farms

Unlike the Moderate Debt Farms, the difference between the high profit and low profit High Debt Farms’ ATO was not statistically significant (Table 4). Nevertheless, Table 5 shows that there were statistically significant differences in the sales-oriented factors of milk shipped per cow (22,419 lbs vs. 19,935 lbs) and milk price per cow (\$13.21/cwt vs. \$12.25/cwt). Had the low profit farms been able to enact programs and protocols to achieve the high profit farms’ milk production level and milk price, it would have

made a \$215 per cow or \$41,925 per farm (based upon the low profit farms’ average herd size of 195 cows) difference in their sales.

The differences in the asset-based financial measures affecting ATO—herd size, crop acres per cow, and assets per cow—were not statistically significant. Thus, the reasons why the high and low profit High Debt Farms’ ATO difference was not statistically significant may be due to similarities in asset utilization as opposed to sales-based issues.

Table 5. Sales- and Asset-Based Factors Affecting the High Debt Farms’ ATO

Factors Affecting ATO		High Debt Farms (Debt to Asset Ratios of 0.60 or Greater)	
		High Profit Farms (42 Farms)	Low Profit Farms (34 Farms)
Milk Shipped Per Cow Per Year	Average	22,419 lbs	19,935 lbs
	Range	9,479 to 25,364	13,145 to 25,315
Milk Price Received Per Hundredweight	Average	\$13.21	\$12.25
	Range	\$11.57 to \$19.86	\$10.80 to \$14.16
Herd Size	Average	259	195 ¹
	Range	30 to 1,100	30 to 903
Crop Acres Per Cow	Average	2.14	1.79 ¹
	Range	0 to 5.47	0 to 15.90
Assets Per Cow	Average	\$6,741	\$7,331 ¹
	Range	\$1,697 to \$11,209	\$1,897 to \$12,895

¹ The difference between the low profit farms’ and high profit farms’ average values were not statistically significant.

V-c. Factors Affecting the Difference in OPM between High Debt Farms

The high profit High Debt Farms had an NFIO financial efficiency ratio of roughly 8 percent (Table 6). This indicates that the high profit farms generated 8 cents of NFIO for every sales dollar generated. The low profit farms lost nearly 4 cents for every sales dollar generated. This means that the low profit High Debt Farms, like the low profit Moderate Debt Farms, had to rely on non-farm income, new debt, capital asset sales or the cash freed up from their depreciation expense in order to generate funds for debt repayment and family living expenses.

Table 6. Factors Affecting the OPM of High Debt Farms

Factors Affecting OPM		High Debt Farms (Farms with Debt to Asset Ratios of 0.60 or Greater)	
		High Profit Farms	Low Profit Farms
NFIO as a Percent of Sales	Average	8.4 %	-3.9 %
Total Basic Cost as a Percent of Sales	Average	59.4 %	78.5 %
Depreciation Expense as a Percent of Sales	Average	8.1 %	15.6 %
Interest Expense as a Percent of Sales	Average	7.3 %	9.6 %
Paid Labor Expense as a Percent of Sales	Average	12.2 %	12.3 % ¹
Purchased Feed as a Percent of Sales	Average	23.3 %	24.1 % ¹
Purchased Feed per Hundredweight	Average	\$3.82	\$3.68 ¹
Purchased Feed per Cow	Average	\$857	\$742
Veterinary Expenses as a Percent of Sales	Average	3.0 %	3.7 % ¹
Veterinary Expenses per Hundredweight	Average	\$0.49	\$0.56 ¹
Veterinary Expenses per Cow	Average	\$109	\$113 ¹
Seed, Chemical, Fertilizer and Lime Expense as a Percent of Sales	Average	3.6 %	4.8 % ¹
Seed, Chemical, Fertilizer and Lime Expense per Hundredweight	Average	\$0.59	\$0.74 ¹
Seed, Chemical, Fertilizer and Lime Expense per Cow	Average	\$133	\$148 ¹
Seed, Chemical, Fertilizer and Lime Expense per Acre	Average	\$71	\$73 ¹
Debt to Asset Ratio	Average	0.76	0.79 ¹
Debt per Cow	Average	\$5,055	\$5,655 ¹

There were statistically significant differences concerning the high and low profit High Debt Farms' TBC, Depreciation and Interest financial efficiency ratios. TBC expenditures accounted for 59 percent of sales on the high profit farms. The TBC financial efficiency ratio was 32 percent higher for the low profit farms. On the low profit farms, it took roughly 79 cents of every sales dollar to pay for TBC expenditures.

The differences between the low and high profit farms in purchased feed, veterinary expenses, or SCFL financial efficiency ratios were not statistically significant. This indicates that the difference in TBC comes from sources other than the three major TBC expense items. While there was no difference between the low and high profit farms concerning the purchased feed financial efficiency ratio, the high profit farms

did spend on average \$115 more per cow on purchased feed. Nevertheless, based upon their \$13.21 average milk price, the high profit farms only needed to generate an additional 870 pounds of milk shipped per cow as compared to the low profit farms to compensate themselves for their higher feed cost per cow. The high profit farms actually shipped on average 2,484 pounds more per cow per year than the low profit farms.

The depreciation financial efficiency ratio was lower for the high profit farms. Roughly, 8 percent of sales dollars were required to compensate the farm for its depreciation expense. This means that every dollar of depreciation supported \$12.35 of sales on the high profit farms. On the low profit farms, almost 16 percent of the sales dollars were required to cover the depreciation expense, meaning that every dollar of depreciation supported only \$6.25 of sales. The low profit farms may want to consider ways to increase their sales volume or reduce their depreciation expense to a level that is more appropriate for their sales volume.

Although the debt to asset and debt per cow ratios were quite similar, the difference between the low and high profit farms' interest expense financial efficiency ratio was significant; roughly 7 percent of all sales dollars were required to cover the high profit farms' interest expense. On the low profit farms, approximately 10 percent of all sales dollars were required to pay interest payments. Since the debt to asset, asset per cow, and debt per cow ratios of the high and low profit farms were similar, this indicates that the low profit farms did not have the sales volume needed to support their debt load.

VI. Summary

In 2003, the high profit Moderate Debt Farms earned a ROROA of 11.6 percent. The low profit Moderate Debt Farms earned a ROROA of -0.2 percent. Reasons for why the high profit Moderate Debt Farms outperformed the low profit farms included having a better ATO. The high profit Moderate Debt Farms' average ATO was better due to a higher average milk price and better asset utilization. The high profit Moderate Debt Farms also had a better average OPM due to several factors:

- A better TBC financial efficiency ratio;
 - Despite similar performance with regard to purchase feed and SCFL financial efficiency ratios
- A better depreciation expense ratio;
- A better interest expense financial efficiency ratio;
- And, a better paid labor expense financial efficiency ratio.¹⁰

¹⁰ However, the high profit Moderate Debt Farms did have, on average, more unpaid labor hours.

The high profit High Debt Farms earned a 9.6 percent ROROA in 2003. The low profit High Debt Farms earned a -2.8 percent ROROA. Although the difference in ATO was not statistically significant, the high profit High Debt Farms did ship more milk per cow and also earned a higher milk price. The difference between the high- and low profit High Debt Farms' OPM was statistically significant. The following are reasons for the high profit High Debt Farms' better operating efficiency:

- A better TBC financial efficiency ratio;
 - Despite similar performance with regard to purchase feed and SCFL financial efficiency ratios
- A better depreciation expense financial efficiency ratio; and
- A better interest expense financial efficiency ratio.

With the exception of the paid labor expense ratio of the Moderate Debt Farms, it first appears that the reasons why the Moderate and High Debt Farms' high profit farms had better operating efficiency than their low profit counterparts were quite similar. It should be noted, however, that the depreciation expense and interest expense differences between the high and low profit Moderate Debt Farms were due to asset utilization issues. The difference in these two ratios between the high and low profit High Debt Farms were due to sales volume issues.