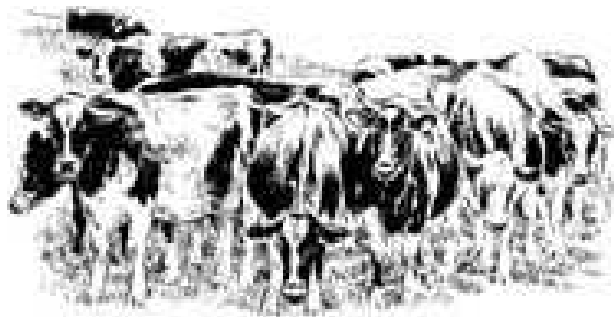


A UW-RIVER FALLS AGSTAR SCHOLARS REPORT

2003 High Yielding Dairy Farms Compared By Profitability

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Introduction

In dairy farming, high milk production per cow is often thought to be an indicator of a successful dairy operation. Nevertheless, there are high yielding dairy farms that have poor financial performance. This UW-River Falls AgStar Scholars research project examined how profitable high yielding dairy farms in 2003 compared with less profitable high yielding dairy farms in 2003. Upon reading this report, the authors hope that farm managers, agricultural financial professionals, agricultural extension professionals and other stakeholders in the Wisconsin dairy industry will have a better understanding about the differences between profitable and less profitable high yielding dairy farms in order to facilitate changes on their or their clients' farms.

Data and Methods

Data for this research was supplied by the UW-Extension and the Center for Dairy Profitability's Agricultural Financial Advisor (AgFA) dataset. This financial dataset contains the financial statements, financial performance measures, and select production variables for participating Wisconsin dairy farms.

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Using the 2003 dataset, 653 Wisconsin dairy farms were compared and ranked by yields as measured by the milk shipped per cow per year. The top 250 high yielding farms were selected for further analysis.

The 250 farms were then divided into two categories – *profitable farms* and *less profitable farms* – based upon their rate of return on assets (ROROA):

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

The ROROA measure was selected as the primary profit measure. It was selected over other profit measures, such as the various Net Farm Income (NFI) and Net Farm Income from Operations (NFIO) measures, as it charges the farm for unpaid labor. This allows farms with different unpaid labor levels to be compared more fairly. It was also selected over the Rate of Return to Equity (ROROE) measure, which is considered a very important single farm measure of profitability. The ROROA calculation is based upon the return to average farm assets. Because assets are financed with both debt capital and the farm owner's equity capital, the measure includes both the return to the farm owner's capital and unpaid labor – NFIO – as well as the return to debt holders – interest. This makes the ROROA a more reliable measure to compare farms than the ROROE measure as it is less affected by the differences in the relative equity level.⁴ The ROROA is often subject to problems associated with asset valuation extremes; however, this is less of a problem with this particular dataset due to its large sample size and its suggested protocols for asset valuation.

After sorting 95 farms into the *profitable* category and 155 farms into the *less profitable* category, the data was then 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), using the following formula:

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

Where:

$$\text{ATO} = \frac{(\text{Sales}^5)}{(\text{Average Farm Assets})}$$

And:

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

⁴ The ROROE equals (NFIO – Unpaid Labor and Management) / (Equity). Equity is calculated by subtracting average farm liabilities from average farm assets. Thus, two farms with similar asset, NFIO, and unpaid labor and management levels but different debt loads may have very different ROROE values.

⁵ 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 has some very useful characteristics for financial performance appraisal. It shows whether a farm’s relative profitability (ROROA) is due to strengths or weaknesses in its assets’ ability to generate sales (ATO) and/or its ability to profitably produce goods for sale (OPM). If the difference in ROROA is due to ATO issues, one can examine sales volume and asset issues like the milk price received, milk shipped per cow, herd size, assets per cow, etc. If the difference in ROROA seems to be due to OPM issues, one could examine the farm’s cost factors. In all, over 200 different financial and production variables were analyzed in this study. To determine whether the *profitable farms* and *less profitable farms* results were statistically significant, the results were analyzed using a two-mean t-test. A confidence level of 95 percent was used for this analysis.

Results and Conclusions

The results of the DuPont Analysis are shown in Table 1. The average ROROA for the *profitable farms* was roughly 11 percent. This means that for every dollar the farm owner and lender had invested in the typical *profitable farm*, they received 11 cents in profit. The *less profitable farms* only experienced 3 cents of profit for every dollar invested in assets. Why such a difference? When looking at the ATO, the *profitable farms* experienced an ATO of 0.54 as compared to the *less profitable farms*’ ATO of 0.41. This means that the *profitable farms* generated 54 cents in sales for every dollar they had invested in assets. The *less profitable farms* only generated 41 cents in sales for every dollar invested in assets. When looking at the cost and profit efficiency measure, OPM, the *profitable farms* were able to retain 20 cents of profit for every sales dollar generated. The *less profitable farms* only generated roughly 8 cents of profit for every sales dollar generated.

Table 1. DuPont Analysis Comparison of Profitable and Less Profitable High Yielding Dairy Farms

DuPont Analysis Measure		Profitable Farms (95 Farms)	Less Profitable Farms (155 Farms)	Significant Difference?
ROROA	Average	10.80 %	3.12 %	Yes
	Range	7.06 to 55.38 %	-119 to 6.97 %	
ATO	Average	0.54	0.41	Yes
	Range	0.22 to 2.53	0.13 to 1.15	
OPM	Average	20.19 %	7.58 %	Yes
	Range	7.50 to 50.62 %	-887 to 25.62 %	

Table 2 displays select factors affecting the ATO of these high yielding farms. The *profitable farms* and *less profitable farms* have comparable milk production levels. This isn't too surprising. The 250 farms were selected initially from the original 653 farms due to their milk production level. Although the *profitable farms* and *less profitable farms* had similar milk production levels, they differed in their average milk price received and milk income per cow. On average, the *profitable farms* received \$0.42 more per hundredweight shipped and \$146 more milk income per cow than their less profitable counterparts. This may indicate that the *profitable farms* had better milk quality or that the managers developed and implemented more effective milk marketing plans. Farms with financial and productive characteristics similar to the *less profitable farms'* characteristics may want to consider examining their milk marketing plans and milk quality programs in order to determine if more profitable alternatives can be implemented.

Table 2. Factors Affecting ATO: Sales-Based Measures

Factors Affecting ATO		Profitable Farms	Less Profitable Farms	Significant Difference?
Milk Shipped Per Cow Per Year	Average	24,342 lbs	23,987 lbs	No
	Range	21,340 to 31,434 lbs	21,270 to 30,967	
Milk Price Received Per Hundredweight	Average	\$13.15	\$12.73	Yes
	Range	\$6.58 to \$14.82	\$10.60 to \$16.32	
Milk Income Per Cow	Average	\$3,199	\$3,053	Yes
Milk Income as a Percent of Sales	Average	79.67 %	80.39 %	No
Calf Income as a Percent of Sales	Average	1.47 %	2.69 %	Yes
Calf Income Per Milk Hundredweight	Average	\$0.24	\$0.43	Yes
Calf Income Per Cow	Average	\$58.94	\$102.20	Yes
Cull Income as a Percent of Sales	Average	3.72 %	4.33 %	No
Cull Income Per Milk Hundredweight	Average	\$0.61	\$0.69	No
Cull Income Per Cow	Average	\$149.38	\$164.61	No
Crop Income as a Percent of Sales	Average	1.81 %	3.18 %	Yes
Crop Income Per Milk Hundredweight	Average	\$0.30	\$0.50	No
Crop Income Per Cow	Average	\$72.97	\$120.70	No
Crop Income Per Acre	Average	\$32.93	\$41.47	No
Government Income as a Percent of Sales	Average	4.90 %	5.68 %	No
Government Income Per Hundredweight	Average	\$0.81	\$0.90	No
Government Income Per Cow	Average	\$196.37	\$215.63	No
Government Income Per Acre	Average	\$88.62	\$74.10	No

Even though 2003 was a “good” crop price year, the *profitable farms* were less reliant on crop sales.⁶ On average, 1.81 percent of the total sales for the *profitable farms* came from crop sales, as opposed to the 3.18 percent value associated with the *less profitable farms* (Table 2).

When looking at the asset-based factors affecting ATO (Table 3), the *profitable farms* had an average of 37 more cows than the *less profitable farms*. Although the *profitable farms* had larger herd sizes, they had fewer total crop acres (both forage and grain acres) and forage acres on a per cow basis. This may indicate the following:

- 1) The *profitable farms* experienced higher crop and forage yields;
- 2) The *profitable farms* found it more profitable to purchase a larger percentage of their feed needs; and/or
- 3) The additional acreage farmed by the *less profitable farms* was not very profitable.

On average, the *profitable farms* employed \$1,733 less assets per cow (Table 3). This may indicate that the *profitable farms* were better than the *less profitable farms* at spreading their assets over more cows, utilizing leasing options more often, and/or utilizing assets that were more depreciated. Farms with financial performance measures similar to those of the *less profitable farms*’ may want to investigate whether they are operating at optimal capacity. They should also determine whether producing with fewer assets (through profitably leasing assets or utilizing custom hiring services) or less valuable assets (by holding on to equipment longer or purchasing more used equipment) is more profitable than their current asset procurement practices.

Table 3. Factors Affecting ATO: Asset-Based Measures

Factors Affecting ATO		Profitable Farms	Less Profitable Farms	Significant Difference?
Herd Size	Average	187	150	No
	Range	30 to 1,100	30 to 1,838	
Total Crop Acres Per Cow	Average	2.22	2.91	Yes
	Range	0 to 11.1	0 to 11.8	
Forage Acres Per Cow	Average	1.37	1.72	Yes
	Range	0 to 2.77	0 to 5.08	
Assets per Cow	Average	\$7,494	\$9,227	Yes
	Range	\$1,697 to \$21,527	\$3,025 to \$24,475	

⁶ According to USDA-NASS data, the average prices for Wisconsin in 2003 were \$2.35 for corn and \$7.11 for soybeans. These prices were the highest corn and soybean prices for Wisconsin during the 1993 to 2004 time period.

The factors affecting OPM are displayed in Tables 4 and 5. Table 4 expresses profit and expense items as a percentage of sales. These are often referred to as the financial efficiency measures. The measures in Table 5 express profit and expenses on a per cow, hundredweight and acre basis. As the financial efficiency ratios in Table 4 consider the actual expense encountered and the sales those expense items generated, the financial efficiency ratios serve as the primary expense comparisons in this analysis.

The profitable farms generated almost 19 cents in NFIO for every sales dollar created (Table 4). The less profitable farms only generated roughly 6 cents in NFIO for every sales dollar. This amounted to a \$547 per cow difference (Table 5).

A major component of the difference in NFIO was the total basic costs (TBC) measure. TBC include all expenses except for paid labor, depreciation, and interest. TBC accounted for nearly 65 percent of sales dollars on the less profitable farms. It took approximately 57 cents of every sales dollar to pay for TBC items on the profitable farms (Table 4). When looking at specific TBC items, there was only a statistically significant spending difference in terms of veterinary expenses and seed, chemical, fertilizer, and lime expenses. The difference in veterinary expenses, although significant, was small. The less profitable farms had to allocate 3.5 percent of their sales dollars to cover veterinary expenses; the profitable farms needed 2.9 percent of their sales dollars to cover their veterinary expenses. This amounted to a difference of \$19 per cow between the two farm categories (Table 5).

The *less profitable farms* spent roughly 5.5 cents of every sales dollar on seed, chemical, fertilizer and lime expense as compared to the *profitable farms'* rate of 3.9 cents for every sales dollar (Table 4). This amounted to a \$50 per acre difference in these crop expenses (Table 5). Although the *less profitable farms* had more crop acres, earned a higher percentage of their total farm sales from crop sales, and spent a higher percentage of their total sales on agronomic expenses, they had to purchase roughly the same amount of purchased feed as the *profitable farms*. When one couples these facts with the fact that 2003 was a good market price year for cropping enterprises, this may show that the less profitable farms had cropping enterprises that hindered the profitability of their overall farm operation and/or that they had less efficient feed buying protocols in place as compared to the *profitable farms'* protocols. Producers with financial performance measures similar to those of the *less profitable farms'* measures may want to consider doing an in-depth analysis of their cropping enterprise and feed buying protocols to see how improvements can be made.

Despite the fact that the profitable farms had a higher depreciation expense on a per hundredweight and per cow basis, there was no difference between the percentage of sales dollars used to

cover depreciation expense. There was also no statistical difference in the percent of sales needed to cover interest expense. There was a statistical difference, albeit small, in the amount of sales dollars required to cover paid labor expense. The *less profitable farms* required roughly 14 cents of every sales dollar to pay paid labor expenses (Table 4). The *profitable farms* required 12.6 cents of sales to cover their paid labor expense.

Table 4. Factors Affecting OPM: Financial Efficiency Ratios

Factors Affecting OPM		Profitable Farms	Less Profitable Farms	Significant Difference?
NFIO as a Percent of Total Farm Income	Average	18.99 %	5.69 %	Yes
Total Basic Cost as a Percent of Sales	Average	57.38 %	64.81 %	Yes
Depreciation Expense as a Percent of Sales	Average	6.70 %	10.17%	No
Interest Expense as a Percent of Sales	Average	4.36 %	5.08 %	No
Paid Labor Expense as a Percent of Sales	Average	12.58 %	14.24 %	Yes
Purchased Feed as a Percent of Sales	Average	20.87 %	21.34 %	No
Veterinary Expenses as a Percent of Sales	Average	2.85 %	3.52 %	Yes
Marketing and Hedging Expense as a Percent of Sales	Average	1.06 %	1.17 %	No
Seed, Chemical, Fertilizer and Lime Expense as a Percent of Sales	Average	3.94 %	5.47 %	Yes
Gas, Fuel and Oil Expense as a Percent of Sales	Average	1.52 %	1.98 %	No
Custom Hire Expense as a Percent of Sales	Average	3.75 %	3.99 %	No
Equipment Rental Expense as a Percent of Sales	Average	0.88 %	0.54 %	No
Other Rental Expense as a Percent of Sales	Average	3.17 %	3.40 %	No
Repair Expenses as a Percent of Sales	Average	3.57 %	4.24 %	No

Table 5. Factors Affecting OPM: Select Profit and Expense Measures per Milk Hundredweight, Cow and Acre

Factors Affecting OPM		Profitable Farms			Less Profitable Farms			Significant Difference?		
		\$/cwt	\$/cow	\$/acre	\$/cwt	\$/cow	\$/acre	\$/cwt	\$/cow	\$/acre
NFIO	Average	\$3.13	\$763	\$344	\$0.90	\$216	\$74	Yes	Yes	Yes
Total Basic Cost	Average	\$9.47	\$2,304	\$1,040	\$10.26	\$2,462	\$845	Yes	Yes	No
Depreciation Expense	Average	\$1.11	\$269	\$223	\$1.61	\$386	\$155	Yes	Yes	No
Interest Expense	Average	\$0.72	\$175	\$79	\$0.80	\$193	\$66	No	No	No
Paid Labor Expense	Average	\$2.07	\$593	\$307	\$2.25	\$611	\$244	No	No	No
Purchased Feed	Average	\$3.44	\$838	NA	\$3.38	\$811	NA	No	No	NA
Veterinary Expenses	Average	\$0.47	\$115	NA	\$0.56	\$134	NA	Yes	Yes	NA
Marketing and Hedging Expense	Average	\$0.17	\$43	\$19	\$0.19	\$45	\$15	Yes	No	No
Seed, Chemical, Fertilizer and Lime Expense	Average	\$0.65	\$158	\$71	\$0.87	\$208	\$71	Yes	Yes	No
Gas, Fuel and Oil Expense	Average	\$0.09	\$61	\$28	\$0.10	\$75	\$26	No	Yes	No
Custom Hire Expense	Average	\$0.62	\$151	\$68	\$0.63	\$152	\$52	No	No	No
Equipment Rental Expense	Average	\$0.14	\$35	\$16	\$0.19	\$45	\$15	Yes	Yes	No
Other Rental Expense	Average	\$0.52	\$127	\$3	\$0.54	\$129	\$3	No	No	No
Repair Expenses	Average	\$0.59	\$143	\$65	\$0.67	\$161	\$55	No	No	No

Summary

This report displays the results of a research project that compared profitable high yielding AgFA Wisconsin dairy farms with less profitable high yielding AgFA Wisconsin dairy farms. The data examined was for 2003. There were 95 farms in the *profitable farm* category and 155 farms in the *less profitable farm* category. The *profitable farms* had an average ROROA that was approximately 3.5 times the average ROROA of the *less profitable farms*. The *profitable farms*' higher average ROROA was attributed to higher ATO and higher OPM measures. The *profitable farms*' high ATO measure was linked to better milk prices and more efficient utilization of assets. They milked more cows than the *less profitable farms* and farmed fewer acres. The *profitable farms*' high OPM was linked to a lower total basic cost financial efficiency ratio. The *less profitable farms*' higher TBC financial efficiency ratio was contributed to several factors. Although 2003 was a high price year for crop enterprises, the *less profitable farms*' low OPM was linked to

a high seed, chemical, fertilizer and chemical expense financial efficiency ratio. Furthermore, despite having more crop acres, the *less profitable farms* had equivalent purchased feed expenditures. Veterinary expenses and paid labor expenses were slightly higher.

Farms with financial and production measures that are similar to the *less profitable farms*' may want to investigate the following to improve their financial performance:

- 1) Earn higher milk prices. This may be accomplished through the development and implementation of better milk marketing plans and/or improved milk quality protocols;
- 2) Improve asset utilization. Better asset utilization may be achieved by profitably renting assets, holding on to purchased equipment for longer periods of time, buying quality used equipment, and/or insuring that the dairy runs at its optimal capacity;
- 3) Examine their dairy nutrition program and/or feed purchase decisions and protocols; and/or
- 4) Investigate the profitability of their crop and forage enterprises.