1996[1] MILK PRODUCTION COSTS
and
SELECTED FINANCIAL BENCHMARKS
FROM 978 WISCONSIN DAIRY FARMS

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Introduction

In this study of 1996 records, 978 dairy farms averaged a basic cost of $8.55 per hundredweight equivalent (CWT EQ) on income of $14.75 per CWT EQ (the U.S. average per hundredweight milk price in 1996). Their total allocated expenses per CWT EQ of milk sold averaged $12.76. Total allocated expenses do not include a charge for unpaid labor and management or a return to equity capital. When these opportunity costs are calculated at $8.00 per hour for unpaid labor, $10.00 per hour for unpaid management, plus five percent return on the fair market value of equity capital, the total cost of production is $15.53 per CWT EQ. These and the other averages presented in this paper can be used by dairy producers to compare with their farm's cost and by consultants, bankers, and others working with dairy farmers to help farm managers better understand their operations.

In 1995, the basic cost was $7.41 per CWT EQ on income of $12.86 (The U.S. average milk price in 1995.) or basic costs were 57.6 percent of income. In 1996 basic costs were 58.0 percent of income.

Data Source

Lakeshore Farm Management Association, Fox Valley Management Association and Wisconsin County Agents[3] originally collected this data. Personnel affiliated with these associations helped individual farm managers reconcile their financial data. Individual farm managers used a number of different manual and computerized record keeping systems to enter the initial financial records, including the Agricultural Accounting and Information Management System (AAIMS©).

In 1996, 980 financial data sets were received from Lakeshore Farm Management and Fox Valley Associations and 116 farms from those participating in the Dairy Farm Business Summary (DFBS) program. Some of these records had milk income that was less than 60 percent of their total income. Those farms are not included in this analysis. However, the dairy farms left in the study still have a total of more than 80,000 cows and have produced more that 1.5 billion pounds of milk.

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1 Estimates of 1992 , 1993 and 1994 milk production costs are published in the series Managing The Farm, Volume 27:3, Volume 28: 1 and Volume 28:4 respectively. 1995 Estimates are available as a CDP Staff Paper. The results reported in those papers and the results reported in the current paper are not based on a random sample of dairy producers.

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3 The authors wish to thank Rolyn Jorgenson and other members of the Lakeshore Farm Management Association staff , Phil Christman and members of the Fox Valley Management Association as well as Nate S. Splett and various county agents for their cooperation.

Comparing the Studied Dairy Farms to Other Dairy Farms

The dairy farms in this study averaged 83 cows, with 18,493 pounds of milk sold per cow. In comparison, Wisconsin's 1996 herd size averaged 59 cows, with an average of 15,442 pounds of milk sold per cow. Wisconsin DHI (1996) herds averaged 67 cows, with production per cow estimated at 18,500 pounds. Table 1 shows range and distribution of milk sold per cow on the farms studied and on Wisconsin DHI farms.

Table 1
Milk Sold per Cow

	Study Farms		Wisconsin DHI
Pounds per Cow	Number of Farms	Percent of Farms*	Percent of Herds*
Less than 13,000	60	6	3
13,001 - 15,000	93	10	8
15,001 - 17,000	180	18	17
17,001 - 19,000	236	24	25
19,001 - 21,000	239	24	25
21,001 - 23,000	114	12	15
greater than 23,000	56	6	7

* Percent columns may not add to 100 due to rounding.

Selected Financial Measures of Studied Farms

The Farm Financial Standards Task Force (FFSTF) has recommended 16 financial measures and their method of calculation as a starting point for analysis of a farm's finances. Below are the formulas for most of these measures and their average value when these formulas and their calculation methods were used on these 978 farms. Some recommended measures were not calculated because the data set did not contain the necessary information.

Profitability Measures

Net Farm Income From Operations (NFIFO) =

Total Farm Income - Total Farm Expense (including all wages and benefits paid)

Rate of Return on Assets (ROROA) =

(NFIFO + Interest Paid - Unpaid Labor & Management Charge) / Average Total Farm Assets

Rate of Return on Equity (ROROE) =

(NFIFO - Unpaid Labor & Management Charge) / Average Total Farm Equity

Net Profit Margin (Margin) =

(NFIFO + Interest Paid - Unpaid Labor & Management Charge) / Total Farm Income

In this study of 978 farms, **total farm income** averaged $276,103 per farm. **Total farm expense** averaged $238,840 per farm The **interest paid** averaged $17,655 per farm. The **"Unpaid Labor & Management Charge"** averaged $23,335 per farm + $9,404 paid to dependants = $32,739. **Average total assets** per farm equaled $634,980 versus $552,279 in 1995. The **net worth (equity)** averaged $418,247 per farm. The **average debt** was $216,733 per farm versus $191,726 in 1995.

Profitability Measures, 1995 & 1996

	1996	1995
NFIFO per farm	37,263	32,496
NFIFO per cow	448	426
ROROA	5.36	5.57
ROROE	3.92	4.18
Net Profit Margin	12.33%	14.01%

ROROA will be studied in more detail later in this paper. It will be investigated based on production per cow, herd size, total milk sales, total investment, and cost of production.

Liquidity Measures

Current Ratio =
Current Assets / Current Liabilities

The average reported Current Ratio equaled 6.04.

This ratio is well above the goal of 1.25 or higher. It is very favorable because "Current Assets" are usually measured on the 1st of January when dairy farmers have large inventories of hay and grain on hand. Current liabilities are accounts payable, operating loans, deferred interest payments, and other current liabilities plus the current portion of all the non-current loans. (The current portion of a non-current loan is the amount of non-current loan's principal due in the next 12 months.) Sometimes farmers do not know the current portion of their non-current loans. In 1996, sufficient data was collected on most farms to estimate the current portion of all non-current loans.

Working Capital =
Current Assets - Current Liabilities

The average reported Working Capital equaled $65,571

The goal for working capital is one year's family draw. Two alternative liquidity measures are also calculated. They are Cash Ratios: one excludes the cash benefits, wages, and interest paid and the other includes cash benefits, wages, and interest paid.

Cash Ratio Lite (excluding cash benefits, wages, and interest paid) =
(Cash Farm Expense - Interest and Wages Paid) / Cash Farm Expense * 100

The average Cash Ratio Lite equaled 59.66%.

The cash farm expense averaged $204,698 per farm.
The cash farm income averaged $271,580 per farm.

Cash Ratio (including cash benefits, wages, and interest paid) =
Cash Farm Expense / Cash Farm Expense * 100

The average Cash Ratio equaled 75.37%.

Solvency Measures

Debt to Asset Ratio =
Average Total Farm Liabilities / Average Total Farm Assets

The debt to asset ratio on the 978 farms in this sample averaged 0.34. This equates to $34 of debt for every $100 of fair market value assets.

Total liabilities averaged $216,733 per farm.

Debt to Equity Ratio (Leverage Ratio) =
Average Total Farm Liabilities / Average Farm Net Worth

The leverage ratio averaged 0.52.

Efficiency Measures

Asset Turnover Ratio =

Total Farm Income / Average Total Assets

(Notice: the asset turnover ratio times the net profit margin equals ROROA.)

Basic Cost Ratio* =

(Total Farm Expense - Wages & Benefits Paid - Interest Paid - Depreciation) / Total Farm Income

The amount of wages and benefits paid averaged $25,022 per farm.

Wage & Benefits Paid Ratio* =

Wages & Benefits Paid / Total Farm Income

*Note: In the FFSTF recommendations these two ratios are combined into one ratio called the "Operating Expense

Interest Paid Ratio =

Interest Paid / Total Farm Income

Depreciation Expense Ratio =

Depreciation / Total Farm Income

NFIFO Ratio =

NFIFO / Total Farm Income

Note: the sum of these last 5 ratios must equal 1.

Efficiency Measures, 1995 & 1996

Item	1996	1995
Asset Turnover Ratio	0.435	0.397
Basic Cost Ratio	0.580	0.576
Wage & Benefits Paid Ratio	0.091	0.083
Interest Paid Ratio	0.064	0.071
Depreciation Expense Ratio	0.130	0.122
NFIFO Ratio	0.135	0.148

Repayment Capacity Measures

Principal Repayment and Capital Replacement Margin =
NFIFO + Depreciation + Capital Sales - Unpaid Labor & Management Charge

The average RR margin equaled $58,947 per farm or $708 per cow.

This measure is not in the FFSTF recommendations. The FFSTF recommends 2 other measures. They require a knowledge of: a) non-farm income, b) annual scheduled principal and interest payments, and c) cash withdrawals for family living and income tax payments. Using this information from our data set resulted in the following values:

Coverage Ratio = 1.94 (goal is 1.25 or greater)
Coverage Margin = $37,134 (this value should be positive)

Cost of Production Calculation Method Used

There are three commonly used methods to calculate the cost of production. They are "Cost per Unit of Primary Product Sold", "Cost per Unit of Equivalent Production Sold", and "Residual Cost per Unit of Primary Product Sold." All three of these methods will yield the same answer if the production process has just a single product. However, if the production process has joint products the results can be quite different. Dairy farms producing milk have numerous joint products: cull cows, calves, CCC milk assessment refund, cooperative dividends, property tax credit on income taxes, crop-related government payments, etc. Therefore, knowing the cost of production calculation method used in a study is essential .

Each method has some advantages and disadvantages. The primary disadvantage of the "Cost per Unit of Primary Product Sold" method is that the cost calculated **can not** be compared to the price received for the primary product (milk). The cost of production calculated with this method **must be** compared to a calculated value: "Income per Unit of Primary Product (Milk) Sold." This value is calculated by dividing the income from each joint product (cull cows, calves, CCC milk assessment refund, cooperative dividends, property tax credit on income taxes, crop-related government payments, etc) by the weight of milk sold. Those values **must be** added to the price received for milk to obtain the correct income to compare to the calculated cost. The primary advantage of the "Cost per Unit of Primary Product Sold" is the ability to divide costs by the actual amount of primary product sold.

The primary disadvantage of the "Cost per Unit of Equivalent Production Sold" method is that an equivalent production must be determined before the cost of production can be calculated. The major advantage is that the cost of production calculated with this method **can be** compared directly to the price received for the primary product (milk).

The "Residual Cost per Unit of Primary Product Sold" method subtracts all the joints products' incomes from the costs before a cost of production of the primary product calculated. This method not used as often as the first two methods because of its many disadvantages.

This study uses the "Cost per Unit of Equivalent Production Sold" method to calculate the cost of producing milk. This method was chosen as it is easier for the reader to be in the correct frame of reference toward income when comparing it to production costs.

Cost of Production per Hundredweight Equivalent

"Basic costs" are "total allocated expenses" minus interest paid, wages and benefits paid, and depreciation expenses. Basic cost is a useful measure when comparing one farm to another because it is not influenced by the farm's debt structure, the amount of paid versus unpaid labor, or the capital consumption claimed (depreciation). The range in basic costs for the group of farms studied was $4.40 to $15.53 per CWT EQ.

An average of $8.55 was calculated by summing the total basic costs on all farms and dividing by the total number of CWT EQ produced. Thirty-five percent of the farms had a basic cost of $8.00 per CWT EQ or less. In Table 2 selected ranges of basic costs are presented. It shows the number and percent of farms in each range.

The $8.55 average basic costs means that the average farmer in the study had $6.20 of income available per CWT EQ to use for other costs (US average milk price in 1996 = $14.75 minus basic expenses of $8.55 per CWT EQ). Other costs are items such as hired labor, scheduled principal and interest payments, a down payment when purchasing assets, and/or a family living draw.

Table 2
Number of Herds in Basic Cost Production Ranges
(978 Farms)

Expenses per CWT EQ	Number of Farms	Percent of Farms*
Less than $ 5.00	6	1
5.01 - 6.00	27	3
6.01 - 7.00	112	11
7.01 - 8.00	196	20
8.01 - 9.00	287	30
9.01 - 10.00	189	19
greater than 10.00	161	16

* Percent column may not add to 100 due to rounding.

Table 3 shows the average costs per CWT EQ for selected expense categories that match the expense categories on Schedule F (Federal tax form) for 1996 and 1995. It also shows opportunity cost unpaid labor, unpaid management, and interest on equity calculations. To contrast your farm to the values in Table 3, follow the directions in the appendix and divide the number of CWT EQ calculated into the your Schedule F expense items and compare.

The basic cost of production increased by $1.14 from 1995 to 1996 (See Table 3). Feed costs contributed $0.82 to this increase and repair costs $0.09. These changes are explainable. High corn and soybean oil meal prices caused the increase in feed costs. The increase in repair costs can be explained by the fact that some repairs are required now and some repairs can be postponed (a new roof) for a short time until there is money available. Income in 1996 was better than in 1995, so dairy farmers may have done some postponed repairs.

The $0.23 increase in other costs (miscellaneous costs) is unexplainable. The $0.08 decrease in marketing fees in due to the termination of the milk tax. The remaining items increase or decrease by only a couple cents.

Normally, the goal for basic costs per CWT EQ is $7.00 or less. This goal is based on a $13.00 milk price and the average interest, capital, and labor and management (sum of hired labor and family living) costs. This goal may have changed in 1996 because of high feed and milk prices. However, if your basic farm costs are generally above $7.00 per CWT EQ, you should place some effort into cost containment.

The average column on Table 3 will help you identify categories of expense that are above average. For instance, suppose your insurance costs are $0.25 per CWT EQ and the average is $0.18, you should find out why this difference exists and what you can do about getting the cost down.

Examine each category that is above average, try to find out <u>why</u> it is above average and <u>if</u> there is anything you can do about it. If there is, do it! Closely examine a category even if it is only 2 or 3 cents above average. There are over 20 categories and a couple of pennies on each adds to over a half dollar quickly.

Table 3

Study Farms' Average Cost per CWT EQ - Selected Expense Categories
1995 & 1996

Item	Average Cost Per CWT EQ 1996	1995	Difference
Car & Truck Expense	$0.08	$0.05	0.03
Chemicals	0.21	0.18	0.03
Custom Hire	0.24	0.21	0.03
Feed Purchase	2.94	2.12	0.82
Fertilizer and Lime	0.49	0.47	0.02
Freight and Trucking	0.08	0.11	-0.03
Fuel and Oil	0.30	0.26	0.04
Farm Insurance	0.18	0.18	0.00
Marketing Fees	0.20	0.28	-0.08
Rent/Lease Equipment	0.11	0.07	0.04
Rent/Lease Other	0.51	0.54	-0.03
Repairs & Maintenance	0.86	0.77	0.09
Seeds & Plants Purch	0.34	0.34	0.01
Supplies Purchased	0.45	0.44	0.01
Taxes	0.29	0.30	-0.01

Item	Average Cost per CWT EQ 1996	1995	Difference
Utilities	$0.28	$0.28	0.00
Vet Fees & Medicine	0.39	0.37	0.02
Breeding Fees	0.12	0.15	-0.03
Other Expenses	0.55	0.32	0.23
Non-cash Adjustments	-0.06	-0.02	-0.04
Basic Costs / CWT EQ*	**$ 8.55**	**$7.41**	**$1.14**
Mortgage Interest & Other Interest	0.94	0.92	0.02
Emp Benefit Program	0.32	0.24	0.08
Labor Hired	1.03	0.83	0.20
Depreciation	1.92	1.57	0.35
Other Costs / CWT EQ*	**$ 4.21**	**$3.55**	**0.66**
Unpaid Labor[1]	1.25	1.03	0.22
Unpaid Management[2]	0.41	0.42	-0.01
Interest on Equity[3]	1.12	1.06	0.06
Opportunity Costs	**2.78**	**2.51**	**0.27**
	======	======	====
Total Cost / CWT EQ*	**$15.53**	**$13.47**	**$2.06**

- Columns may not add due to rounding.

1. Total labor required was estimated at 60 hours per cow per year and a wage of $8.00 per hour. The unpaid labor is the difference between the estimated total labor cost (60 x $8.00 = $480) and the recorded paid labor.
2. The total management cost was assumed to be unpaid and was estimated at 10 hours per cow per year and at $10.00 per hour.
3. The interest on the fair market value equity, with no reduction in the fair market value of the farm assets for transaction costs, was estimated at 5 percent. Transaction costs can substantially reduce the owner's equity in the event the assets are sold and the net proceeds invested in non-farm assets.

The "other costs" increased by $0.66 per CWT EQ. This was due to a 33% increase in employee benefits paid, plus a 24% increase in wages paid, and a 22% increase in depreciation. Some of this increase is presumably due to the larger average herd size of this sample (83 versus 76 cows), but some of this increase is probably due to income tax management.

Increasing production can also reduce production costs, if the cost of producing the additional output is less than your current average cost. In addition, some categories are related to one another. Example: low fertilizer costs may lead to high purchased feed costs.

Table 4
Study Farms' Average Cost per Cow - Selected Expense Categories
1995 & 1996

Item	Average Cost Per COW 1996	1995	Difference	Item	Average Cost per COW 1996	1995	Difference
Car & Truck Expense	$ 18	$ 12	$ 6	Utilities	$ 64	$ 62	$ 2
Chemicals	$ 48	$ 42	$ 6	Vet Fees & Medicine	$ 87	$ 83	$ 4
Custom Hire	$ 53	$ 46	$ 7	Breeding Fees	$ 29	$ 34	-$ 5
Feed Purchase	$662	$472	$190	Other Expenses	$123	$ 72	$ 51
Fertilizer and Lime	$111	$104	$ 7	Non-cash Adjustments	-$ 15	-$ 4	-$ 11
Freight and Trucking	$ 18	$ 25	-$ 7	**Basic Costs / Cow***	**$1924**	**$1654**	**$ 271**
Fuel and Oil	$ 66	$ 58	$ 9				
Farm Insurance	$ 41	$ 40	$ 1	Mortgage Interest & Other Interest	$212	$205	$ 7
Marketing Fees	$ 44	$ 63	-$ 19				
Rent/Lease Equipment	$ 24	$ 17	$ 7	Emp Benefit Program	$ 70	$ 52	$ 18
Rent/Lease Other	$115	$120	-$ 5	Labor Hired	$230	$185	$ 45
Repairs & Maintenance	$193	$172	$ 21	Depreciation	$433	$350	$ 83
				Other Costs / Cow*	**$ 945**	**$792**	**$153**
Seeds & Plants Purch	$ 76	$ 72	$ 4				
Supplies Purchased	$102	$ 98	$ 4				
Taxes	$ 66	$ 66	$ 0				

* Columns may not add due to rounding.

There was an increase of $271 in basic costs per cow (See Table 4). This compares to an increase in income per cow of $423. However, there was also an increase in other allocated expenses of $153. This adds to a total recorded increase in expenses per cow of $424.

CHART 1

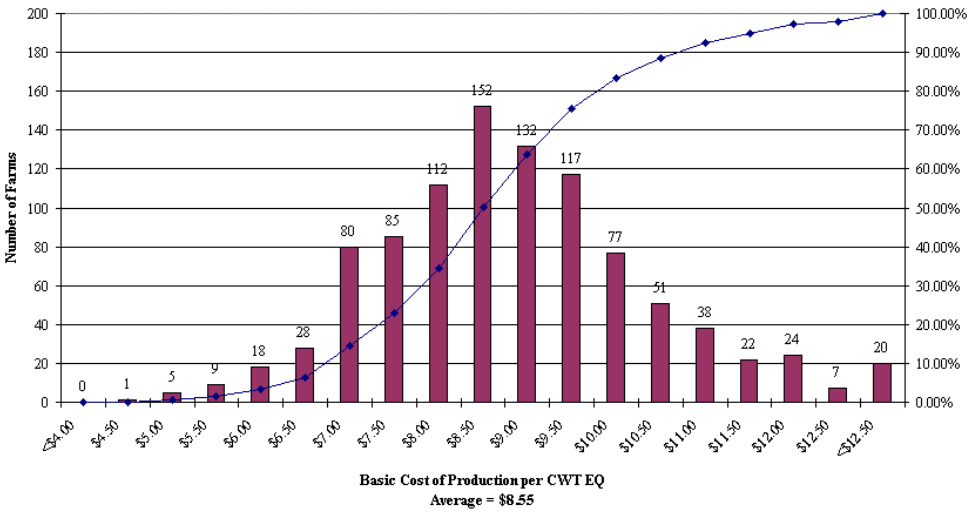
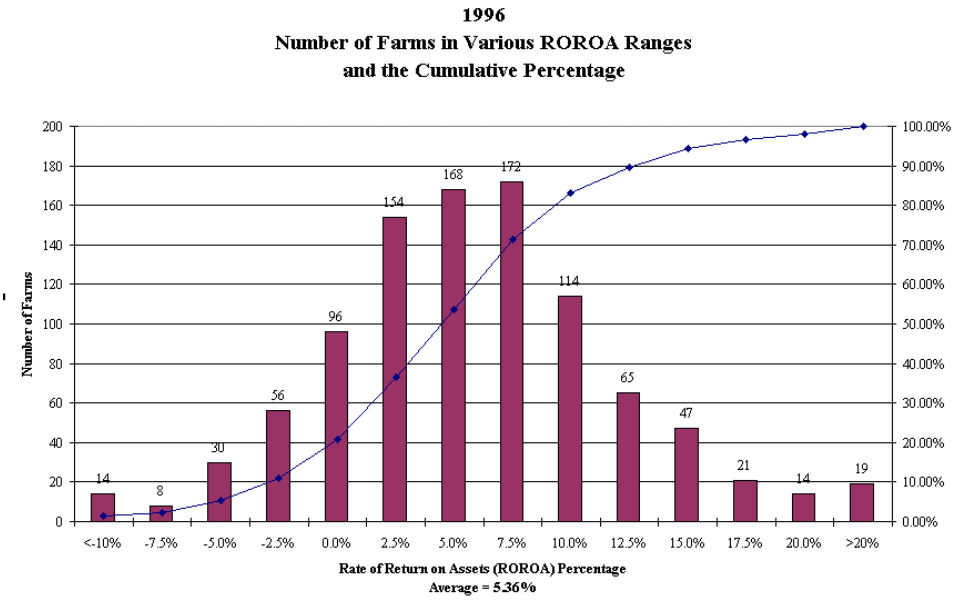


Chart 1 shows the Basic Cost of Production per CWT EQ in various ranges by $0.50 increments. Example: there are 152 farms in the range from $8.01 to $8.50.

Also, approximately 65% of the farms are producing milk for a Basic Cost of $9.50 or less.

CHART 2



The Rate of Return on Assets (ROROA) is considered one of the primary financial measures. The number of farms in various percent ranges and cumulative percentages are shown on Chart 2. Example: there are 168 farms with a ROROA between 2.51% and 5.00%. Also, 48 percent of the farms have a ROROA of greater than 5.00%.

An analysis of the "Asset Turnover Ratio" on the 978 farms in this study revealed that the quintile (20% or 196 farms) of farms having the highest Asset Turnover Ratio had a higher ROROA than the average farm (9.36% versus 5.36%).

The other part of the ROROA is the Net Profit Margin. In this study the quintile of farms with the highest Net Profit Margin had a higher ROROA than the average (12.27% versus 5.36%). In this study the quintile of farms with the highest Net Profit Margin had a Basic Cost that was more than $3.40 per CWT EQ **less than** the Basic Cost on the lowest quintile ($10.47 - $7.14).

CHART 3

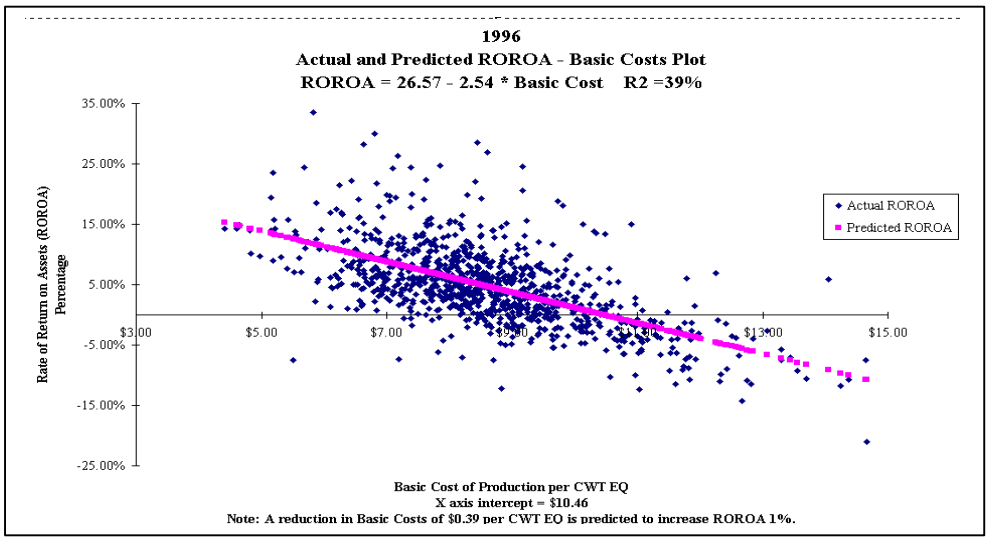


Chart 3 shows a plot of the actual ROROA and Basic Cost of Production per CWT EQ as the darker points and the predicted ROROA at a given Basic Cost as the lighter points.

The line formed by the lighter points intersects the X-axis at $10.46. This means that if your Basic Cost of Production per CWT EQ is $10.46 your predicted ROROA is 0.00%. To increase your ROROA you will need to decrease your Basic Costs because the slope of the prediction line is negative and common sense says that to increase the returns to your assets you will need to decrease costs.

The analysis also predicts how much you need to decrease your Basic Cost of Production per CWT EQ to increase your ROROA by 1%. The amount is $0.39. It predicts that you will need a Basic Cost of $6.56 to have a ROROA of 10%. Is that possible? According to this study, it is. In fact, 75 farms (approximately 7.7%) in this study have Basic Costs at or below $6.56 (Chart 1), however 18% of the farms have a ROROA of greater than 10%. Therefore, if your goal is a ROROA in excess of 10%, having low basic costs is one way to get there, but having a high Asset Turnover Ratio is another.

Now that you know the two major factors (Basic Costs and Total Farm Income) affecting your ROROA you can concentrate your management efforts on them. Table 3 shows the breakdown of Basic Costs into various tax categories. Place your costs beside the costs of the farms in this study to determine which categories of cost need management attention. Then attend to them!

Additional Information

Tables 5-7 show results using different farm characteristics to sort the farms and the overall average for selected items. The tables also show averages for selected items for the lowest quintile (20 percent) of farms (196) on that item sort, the middle 60 percent (586 farms), and the highest quintile. Margin per farm is the dollars available to pay the total labor and management costs (including family living) and total capital costs include interest paid and opportunity interest on equity. As discussed earlier, ROROA is calculated by using the following formula: (NFIFO plus interest paid minus unpaid labor and management charges) divided by the average total farm assets.

Table 5

Study Farms Sorted by **Basic Cost of Production per Hundredweight Equivalent** (CWT EQ)

	Basic Cost of Production / CWT EQ	Total Allocated Costs / CWT EQ	Average No. of Cows	Crop and Pasture Acres Per Cow	Pounds Milk Sold per Cow	Margin per Farm	ROROA
Average	$8.55	$12.76	83	3.5	18,493	$115,972	5.36%
Low 20%	$6.61	$11.07	77	3.5	18,717	$148,192	9.59%
Mid 60%	$8.52	$12.75	85	3.6	18,726	$121,100	5.59%
High 20%	$10.73	$14.53	82	3.3	17,562	$68,420	-0.89%

Table 5 shows that the quintile of the farms with the lowest basic cost (low cost farms) had an average basic cost of $6.61. The quintile of the farms with the highest basic cost (high cost farms) had a basic cost of $10.73, a difference of $4.12 per CWT EQ. Chart 3 and its formulas predicts that the increase between the ROROA's of the low and high cost farms should be 10.56%. The actual difference is 10.48% (9.59 – (-0.89%)). The high cost farms had averaged 5 more cows per farm but 1155 pounds **less milk** sold per cow.

The average margin of the low cost farms was $79,772 (117%) greater than the high cost farms' average margin. The amount of milk sold, per farm, in these two groups is nearly identical. However, on average, the farm managers of the low cost farms had available more than twice as many dollars (almost $80,000 extra) to pay wages, benefits, family living, principal, interest, and make down payments on new capital purchases than the high cost farms.

Table 6
Study Farms Sorted by **Milk Sold per Cow**

	Basic Cost of Production / CWT EQ	Total Allocated Costs / CWT EQ	Average No. of Cows	Crop and Pasture Acres Per Cow	Pounds Milk Sold per Cow	Margin Per Farm	ROROA
Low 20%	$9.00	$13.48	72	3.6	13,610	$69,718	0.99%
Mid 60%	$8.56	$12.77	82	3.6	18,307	$113,012	5.27%
High 20%	$8.34	$12.41	98	3.5	22,567	$171,075	8.28%

Table 6 shows that the quintile of the farms with the lowest milk sold per cow (lower milk sold farms) had an average basic cost of $9.00 per CWT EQ. The quintile of the farms with the highest milk sold per cow (higher milk sold farms) had a basic cost of $8.34, a difference of $0.66 per CWT EQ. The higher milk sold farms had averaged 16 more cows per farm and 8957 pounds more milk sold per cow.

The average margin of the "higher milk sold" farms was $101,357 (145%) greater than the "lower milk sold"farms'. Of this extra margin, $14.60 is due to a lower basic cost of production per CWT EQ, the remainder was due to volume. The milk sold per farm on the "higher milk sold" farms was 2,211,566 pounds. This compare to an average of 979,920 pounds on the "lower milk sold" farms. Therefore, on average, the "higher milk sold" farms sold 126% more milk per farm than the "lower milk sold" farms.

Expenses per CWT EQ are sometimes thought to be negatively related to production per cow, i.e., that as production per cow increases, expenses per CWT EQ decrease. Statistical tests (correlation and regression analysis) showed no meaningful relationship between production per cow and basic costs per CWT EQ on the 978 farms studied. However, in this data set, milk sold per cow is a significant variable, at the 95% confidence level, in determining ROROA, but its R^2 (predictive power) is only 18 percent.

Table 7
Study Farms Sorted by **Average Number of Cows per Farm**

	Basic Cost of Production / CWT EQ	Total Allocated Costs / CWT EQ	Average No. of Cows	Crop and Pasture Acres Per Cow	Pounds Milk Sold per Cow	Margin Per Farm	ROROA
Low 20%	$8.76	$12.84	38	4.4	16,568	$45,603	2.62%
Mid 60%	$8.45	$12.59	64	4.0	18,501	$90,141	4.55%
High 20%	$8.63	$12.92	186	2.9	18,876	$263,570	7.26%

Table 7 sorts the farms by the number of cows in the herd. It shows that the quintile of the farms with the lowest cow numbers (lower cow numbers farms) had an average basic cost of $8.76 per CWT EQ. The quintile of the farms with the highest cow numbers (higher cow numbers farms) had a basic cost of $8.63, a difference of $0.13 per CWT EQ. The "high cow numbers" farms had averaged 148 more cows per farm and 2308 pounds more milk sold per cow.

The average margin of the “higher cow numbers” farms was $217,967 (478%) greater than the “lower cow numbers”farms’. Of this extra margin, $4,564 is due to a lower basic cost of production per CWT EQ, the remainder is due to volume. The milk sold per farm on the “higher cow numbers” farms was 3,510,936 pounds. This compare to an average of 629,584 pounds on the “lower cow numbers” farms.

Expenses per CWT EQ are sometimes thought to be negatively related to herd size, i.e., that as herd size increases, expenses per CWT EQ decrease. In this sample of dairy farms, statistical tests (correlation and regression analysis) showed no meaningful relationship between herd size and basic costs per CWT EQ. However, in this data set, herd size is a significant variable, at the 95% confidence level, in determining ROROA, but its R^2 (predictive power) is only 2 percent.

While the “Cost per Unit of Equivalent Production Sold” method described earlier is the best comparison method for most items, purchased dairy feed may benefit from another measure. Purchased dairy cattle feed per hundredweight of milk sold may be an important measure. The farms studied averaged $3.56 of purchased feed per hundredweight of milk sold. However, one needs to be careful with this number because the feed purchased produces more than milk. It also produced the calf, some of the weight gain as a first calf heifer grows into a mature cow, and maybe some of the weight gain in a heifer as she grows from a calf to a springer. These would be considered joint products.

Summary

The farms in this study were larger and had higher average production per cow than the Wisconsin average. Total income per cow averaged $3,318, of which $2,791 was milk income. In addition, 90 percent of total income was from the sale of products directly related to the dairy enterprise (milk, cull cows, and calves). Total allocated expenses per cow averaged $2,870, which left $448 per cow as a return to the farmer's (and family's) unpaid labor, management, and equity capital (NFIFO).

Corresponding 1995 values were: total income per cow - $2,872, total allocated expenses per cow - $2,446, and NFIFO per cow - $426.

The largest single expense item purchased feed averaged $662 per cow, $2.94 per CWT EQ, and $3.56 per hundredweight of milk sold. This was the only expense item calculated both on a per hundredweight of milk sold and on a per CWT EQ basis. The CWT EQ unit was developed to account for all the dairy farm's income sources. The CWT EQ units produced on each farm were calculated by summing output from all the various income sources on the farm and dividing that value by the average 1996 U.S. milk price ($14.76).

In 1995 the purchased feed costs were $472 per cow, $2.12 per CWT EQ, and $2.55 per hundredweight of milk sold. The high corn, soybean oil meal, and hay prices caused this large increase in feed cost in 1996. To date in 1997, these prices have moderated somewhat and therefore it s expected that feed costs for 1997 will be somewhat lower than the feed costs were for 1996. However, it is doubtful feed costs will return to the 1995 levels in 1997. This reality is causing financial stress on dairy farms because the price of milk has returned to 1995 levels.

The total allocated expenses per CWT EQ averaged $12.76 and basic costs averaged $8.55 per CWT EQ. The business term equivalent to "basic costs" is the "cost of goods." Business individuals want to know their "cost of goods" per dollar of income. The basic costs or cost of goods per dollar of income averaged 58 cents (the $8.55 basic cost divided by the $14.75 average milk price in 1996). The other 42 cents, per dollar of income, is available for hiring labor, principal and interest payments, down payments or payment for asset purchases, and/or family living draw. The goal for this value is 45 cents per dollar of income.

The reduction in basic costs required to increase ROROA one percent was $0.39. This is the same value as in 1995. The slope of the regression line was nearly identical as well (-2.54 in 1996 and –2.57 in 1995). The intercept changed from $9.51 in 1995 to $10.46 in 1996. This change mimics the change in basic costs ($0.95 versus $1.14) and further suggests that basic costs are a good predictor of ROROA.

Appendix: Cost of Producing Milk
per
Hundredweight Equivalent

Prepared by Gary Frank, UWEX - Madison

Work Sheet:		An Example Farm	Your Farm
1.	Total Schedule F Income (Schedule F, line 11)	$126,161	_____
2.	Form 4797 Income[1]	$ 12,143	_____
3.	Change[2] in Feed Inventory	-$ 4,127	_____
4.	Change[2] in Livestock Inventory	$ 10,500	_____
5.	Other	$0	_____
6.	Total Farm Income (On this worksheet, add lines 1 through 5.)	$144,677	_____
7.	Average Milk Price[3]	$ 12.86	_____
8.	Hundredweight Equivalents (CWT EQ) of Milk Produced (On this worksheet, divide line 6 by line 7)	11,250	_____
9.	Total Schedule F Expenses (Schedule F, line 35)	$122,521	_____
10.	Change[2] in Accounts Payable	$ 1,543	_____
11.	Change[2] in Prepaid Expenses	$ 1,200	_____
12.	Total Allocated Costs (On this worksheet, add lines 9 and 10, then subtract line 11)	$122,864	_____
13.	Total Interest Paid (Add Schedule F lines 23a and 23b)	$ 8,470	_____
14.	Wages and Benefits Paid (Only those reported on Schedule F; to obtain this value add Schedule F lines 17, 24, and 25)	$ 12,682	_____
15.	Depreciation Claimed (Schedule F line 16 minus Depr. claimed on livestock)	$ 15,346	_____
16.	Total Basic Costs (On this worksheet, line 12 minus lines 13, 14, and 15)	$ 86,366	_____
17.	Basic Cost per CWT EQ[4] (On this worksheet, line 16 divided by line 8)	$ 7.68	_____
18.	Margin in dollars per CWT EQ available to cover all other costs[5] (On this worksheet, line 7 minus line 17)	$ 5.18	_____
19.	Total $'s available for other costs (On this worksheet, line 18 times line 8)	$58,275	_____
20.	Total Allocated Costs/CWT EQ (On this worksheet, divide line 12 by line 8)	$ 10.92	_____
21.	Total $'s available to cover unallocated costs[6] (On this worksheet, (line 7 minus line 20) times line 8)	$21,825	_____

The footnotes are on the back of this page

Footnotes

[1] Form 4797 usually contains only income from the sale of culled raised dairy livestock. In those cases, simply enter the income reported. However, Form 4797 can contain the sale of purchased dairy livestock and the "one-time" sale of some other asset(s), such as an old plow. If your Form 4797 contains either of these items adjustments must be made.

In the case of the "one-time" sale, that income must be subtracted from the Total Form 4797 income before a value is entered. In the case where purchased breeding livestock are included, enter the net amount. This net will take into account the unrecovered basis that was claimed against this sale.

[2] Change equals the ending amount minus the beginning amount. The best way to get this value is to ask yourself if there was any change in this item during the year in question. If the answer is "yes" then follow with the question, "how much?" This method avoids having to determine the absolute inventory level at the beginning and end of the year in question.

[3] If you wish to compare your costs to the costs on other farms, use the U.S. average all milk price for the year in question. It was $13.74, $12.27, $13.15, $12.86, $13.03, $12.86, and 14.75 in 1990 - 1996, respectively. Or you can divide your total milk income (before any deductions for hauling, marketing, etc.) by the number of hundredweight of milk you sold during the year to calculate the average milk price on your farm. However, then you can only accurately compare your costs this year to <u>your</u> costs in previous years.

[4] The average Basic Cost on selected Wisconsin dairy farms was $7.54, $7.68, $7.11, $7.41, $8.55 in 1992-1996, respectively. Farmers should calculate this value each year to monitor changes in their basic production costs. This value is especially important if you are expanding, acquiring more debt, and/or paying additional labor. This value allows farm managers to compare their cost to previous years, other dairy businesses, and the price without regard to herd size, production level, debt position, and percent of total labor paid. See Managing the Farm Vol. 28 No. 1&2 for more information.

[5] The "other" cost items are: interest (both that actually paid and the opportunity cost interest on your equity in the business), capital consumed (reduction in the value of your machinery, equipment, etc. caused by using it and/or by it becoming obsolete), labor and management paid, and the opportunity cost of unpaid labor and management. Any return above all these costs is an economic profit.

[6] At this point, for many farm managers, the unallocated costs are for their (and their family's) labor and management plus a return to their equity capital. However, sometimes farm managers pay their family members (or themselves) some wages and benefits that are deductible on Schedule F. In those cases, don't expect this margin to be as large as when the return to all the farmer's (and family's) labor, management, and equity capital are imbedded in it.

In the example, the farm's margin available for unallocated costs is $21,825. However, if some or all of the amount on line 14 was paid to family members, this is <u>not</u> the return to the farmer's (and family's) labor, management, and equity capital. Then the return to their labor, management, and equity capital is the amount calculated above plus the wages and benefits paid to family members. In the example, if all the wages and benefits paid were to family members, the total return to their labor, management, and equity capital is $34,507 ($21,825 plus $12,682).