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by

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A Regional Comparison of Farm Costs and Returns
Among Top Dairy Producers

Harry M. Kaiser and Mitchell J. Morehart*

The Upper Midwest dairy industry has been the nation's Dairybelt for decades, but is undergoing major structural change which could change this situation. The farm sector for much of Wisconsin, Minnesota, Iowa, and North Dakota is characterized by many small farms with fewer than 50 cows that grow all of their feed and raise most of their herd replacements. These types of farms are declining rapidly in this region, which is leading to a loss of market share of the nation's milk supply. For example, between 1990 and 1993, the number of dairy farms in Wisconsin, Minnesota, Iowa, and North Dakota decreased from 58,700 to 51,000, a decline of 13.1% (Milk Production, February 1990 and 1994).

At the same time, a new Dairybelt is emerging in the Western and Southwestern U.S. which is very different than the traditional dairy states. States like California, Washington, Texas, New Mexico, and Idaho have dairy farms that are much larger, more specialized, and take advantage of scale economies in producing milk. The growth in milk production in these states is attributable to the development of these large scale commercial dairy operations.

Table 1 shows shares of national milk production for the top ten dairy states for different years from 1889 to the 1993. This table illustrates both the emergence of this new Dairybelt, as well as the gradual erosion of traditional dairy states. Since 1989, the share of national milk production in traditional dairy states like Wisconsin, New York, Minnesota, Pennsylvania, and Iowa have fallen 8.4%, 2.6%, 8.6%, 1.4%, and 6.9%, respectively. At the same time, the market share of national production for new dairy states such as California, Texas, and Washington has increased 13.4%, 8.3%, and 17.9%, respectively.

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Table 1. Shares of U.S. Milk Production for Top Ten Dairy States, 1889-1993.^a

State	1889	1909	1926	1946	1966	1989	1993	% chg 1966-93	% chg 1989-93
				(%)					
Wisconsin	5.8	8.9	16.0	12.7	15.1	16.6	15.2	0.6	-8.4
California	NA	3.1	3.7	5.0	7.2	13.4	15.2	111.1	13.4
New York	12.7	10.5	7.4	6.6	8.8	7.7	7.5	-14.8	-2.6
Pennsylvania	7.1	5.5	4.6	4.4	5.9	6.9	6.8	15.3	-1.4
Minnesota	NA	5.5	7.5	7.4	8.4	7.0	6.4	-28.6	-8.6
Texas	NA	3.2	3.4	NA	NA	3.6	3.9	NA	8.3
Michigan	4.3	4.7	4.3	4.6	4.2	3.6	3.6	-14.3	0.0
Washington	NA	NA	NA	NA	NA	2.8	3.3	NA	17.9
Ohio	6.3	4.8	4.4	4.4	4.1	3.2	3.1	-24.4	-3.1
Iowa	9.3	6.6	5.6	5.7	4.7	2.9	2.7	-42.6	-6.9
Top 10	64.0	58.1	61.7	58.9	63.9	67.8	67.7	5.9	-0.2
Upper Midwest ^b	15.1	21.0	29.1	25.8	29.2	26.5	24.3	-16.8	-8.3

SOURCE: Novakovic, A., K. Jack, and M. Keniston (1990); and National Agricultural Statistics Service. Milk Production, Disposition, and Income. U.S. Department of Agriculture, selected years.

^aNA means that the state was not in the top ten in milk production in that year.

^bIn this table, Upper Midwest includes Wisconsin, Minnesota, and Iowa.

In response to this, the Upper Midwest is trying to hold its market share by encouraging the development of larger commercial dairy enterprises that are more similar to their Western counterparts than the traditional dairy farm in this region. Many feel that 300 to 600 cow farms in the Midwest not only can compete with the large Western producers, but may actually achieve lower costs and could have higher returns. However, this theory has not been tested yet. Rather, we have evidence on how average farms in the Upper Midwest compare to average farms in other regions. Since most industry leaders believe that the future of the Upper Midwest dairy industry depends primarily on the expansion of these larger scale dairies, it would be useful to see how their costs and returns differ from the most efficient farms in other regions.

The purpose of this paper is to compare costs and returns of the top dairy producers in the Upper Midwest to those in other major dairy regions of the U.S. The analysis is based on the 1989 Farm Costs and Returns Survey conducted by the U.S. Department of Agriculture. The top dairy farmers are defined in several ways, including: (1) highest returns to capital and management, (2) lowest total cash costs, and

(3) highest milk marketings per cow.

Procedures

Data Source

This report uses information collected through USDA's Farm Costs and Returns Survey (FCRS). The FCRS is a personally enumerated survey that has been conducted annually since 1984 by the National Agricultural Statistical Service (NASS) and the Economic Research Service (ERS). The target population of the survey is "all establishments that sold or normally would have sold at least \$1,000 worth of agricultural products during the year." The FCRS is conducted in all states except Alaska and Hawaii, and utilizes an integrated sample to blend multiple versions of a questionnaire into a unified data system.

For the 1989 FCRS the questionnaire versions were general expenditure, farm operator resource, wheat, dairy, burly tobacco, onions, grapefruit, and oranges. All versions contained common questions to facilitate the development of whole-farm financial statements. Differences between versions were related to the types of questions and the degree of detail required to collect enterprise specific information. Versions designed to collect information for costs of production focus on different commodities each year. In general, a four to five year rotation is used in conducting surveys.

There were 1,037 completed dairy questionnaires in 26 states. Completed questionnaires were farm operations that met the general farm definition and produced and sold milk during the entire calendar year. Forty percent of the original sample was lost due to incomplete questionnaires, refusals, or not qualifying under the farm definition. Because probabilities of selection associated with the sample units are known, data from these sample farms can be expanded to provide unbiased estimates of population values for different measures. The expansion factors or weights are established for each reporting unit and are generally equal to the inverse of the probability of being selected.

Study Region

It would be ideal to compare costs and returns for the most efficient farms on a state by state basis. However, this is impossible due to an insufficient number of observations for each state and USDA disclosure conditions for primary survey data. Rather, states are aggregated into regions to increase observations and satisfy the disclosure conditions. The following regions are represented in this study:

West	California, Texas, Idaho, Washington
Upper Midwest	Wisconsin, Minnesota, Iowa, South Dakota

The Upper Midwest and the Northeast dairy farms represent the traditional dairy states, while the Western states belong to the modern Dairybelt. For each region, the top 20% of farms, based on three performance measures were selected to compare average costs and returns on a per cow basis. The three performance measures are: (1) returns to management and capital, (2) total cash costs, and (3) milk marketings per cow. Thus, there are three separate regional comparisons made: a comparison of average returns and costs for the top 20% of farms with the highest return on management and capital, a comparison for the top 20% of farms with the lowest total cash costs, and a comparison for the top 20% of farms with the highest herd productivity (marketings per cow). These comparisons provide insight on whether regional differences in returns and costs are smaller or larger for the most efficient farms compared to all farms in the sample.

Cost and Return Comparisons

For each region, averages of the top 20% of farms for the following variables are calculated. On the income side, average milk sales, cash receipts from the sale of calves and cull cows, and other dairy-related income such as cooperative dividends are computed by region. On the cost side, average variable and fixed cash costs, as well as economic costs¹ are computed for each survey respondent and then aggregated into regions. In addition, the average number of cows per farm, marketings per cow, returns to capital and management, return on assets, and return on equity are computed and compared for each region.

¹Economic costs are defined as the sum of variable cash expenses, general farm overhead, taxes and insurance, capital replacement, nonland capital, operating capital, unpaid labor, and land costs.

Results

Table 2 presents the returns and costs for all farms in the USDA sample by region. There were 208 farms in the Upper Midwest sample, 235 in the Northeast sample, and 195 in the West sample. The Upper Midwest had the smallest farms in terms of cow numbers, averaging 50 cows compared with 63 cows in the Northeast and 235 cows in the West. In terms of productivity, the Upper Midwest was about the same as the Northeast with milk marketings per cow averaging 14,528 pounds per year (in 1989). However, average cow productivity in the Upper Midwest was only 88% of the average in the West. Total income was lowest in the Upper Midwest, and highest in the West. Differences in regional income paralleled differences in cow productivity, as prices were lowest in the West.

The average farm in the Upper Midwest had a tremendous variable cash cost advantage over the average Western producer by almost \$500 per cow. Total cash costs were also lower for the average Upper Midwest farm by \$372 per cow compared to the typical farm in the West. Both of these regional differences was statistically significant at the 99% confidence level. This advantage was due exclusively to lower costs for feed and hired labor. Note that 43% of feed was purchased, on averaged, in the Upper Midwest compared to 91% in the West, and 56% in the Northeast. The Upper Midwest also had a total cash cost advantage over the Northeast by \$96 per cow, but this was not statistically significant at the 95% confidence level.

Total economic costs for the Upper Midwest and West were almost identical. The Upper Midwest had higher capital replacement, non-hired labor, and non-land capital costs than the West, which balanced out its total cash cost advantage. Total labor costs (hired plus unpaid) per cow were substantially higher (59% higher) in the Upper Midwest than the West, which is probably due to time allocated to growing feed in the Upper Midwest. The Northeast had the highest economic costs, averaging over \$145 per cow more than the Upper Midwest, and \$169 per cow more than the West. Like the Upper Midwest, the Northeast had substantially higher capital replacement, non-hired labor, and non-land capital costs than the West.

The bottom-line is that the West was more profitable than the Upper Midwest and Northeast in every respect except for the short-run performance measure of cash flow. Average returns to management and capital in the West was twice as much as the Upper Midwest, and five times higher than the Northeast. Return on assets in the West were 1.6 times higher than the Upper Midwest, and 2.6 times higher than the Northeast. Return on equity in the West was

Table 2. Average Returns and Costs for all Farms in the USDA Sample, 1989.

Item	Upper Midwest	Northeast	West
No. of sample farms	208	235	195
Average number of cows	50	63	283
Marketings per cow	14,528	14,574	16,503
	-----	---- per cow ----	-----
Milk sales	1,932.65	2,065.51	2,115.50
Calves and other	261.29	193.93	190.07
Total income	2,193.94	2,259.44	2,305.57
Variable cash costs:			
Total feed	826.14	865.70	1,166.58
- Purchased feed	353.31	484.66	1,062.91
Hired labor	50.32	73.02	188.17
Other	274.47	332.00	274.89
Total variable cash costs	1,150.93	1,270.72	1,629.64
Fixed costs:			
General farm overhead	78.18	71.92	42.75
Taxes and insurance	63.48	76.52	35.40
Interest	142.96	112.40	100.23
Total fixed costs	284.62	260.84	178.38
Total cash costs	1,435.55	1,531.56	1,808.02
Economic costs:			
Variable cash expenses	1,150.93	1,270.72	1,629.64
General farm overhead	78.18	71.92	42.75
Taxes and insurance	63.48	76.52	35.40
Capital replacement	240.61	256.85	143.37
Nonland capital	142.53	138.32	52.26
Operating capital	11.57	12.77	16.38
Unpaid labor	312.75	312.25	81.41
Land	59.84	65.97	34.61
Total economic costs	2,059.89	2,205.32	2,035.82
Cash flow	758.39	727.88	497.55
Return to management & capital	134.05	54.12	269.75
Return on assets (%)	5.3%	3.3%	8.5%
Return on equity (%)	3.2%	0.9%	8.5%
Assets per cow	6,588.17	8,195.27	4,414.10
Land value per cow	996.75	2,711.32	1,413.97
Acres per cow	1.79	2.67	0.73
Building value per cow	2,135.89	2,310.29	808.67
Equity per cow	4,261.52	6,174.52	3,176.90

2.7 times higher than the Upper Midwest, and 9.7 times higher than the Northeast.

² The driving forces behind these results were higher productivity per cow and lower assets per cow in the West compared to the Upper Midwest and Northeast. For example, assets per cow in the West averaged \$4,414, while assets per cow were substantially higher in the Upper Midwest and Northeast averaging \$6,588, and \$8,195, respectively. Both traditional dairy regions need to reduce their economic costs to compete better with the West. The traditional dairy regions could become even lower cost relative to the West by concentrating on reducing some of their fixed cash expenses, increasing herd productivity, and increasing cows per farm. This type of structural change may require a different approach to feed management such as purchasing rather than growing the majority of feed.

Table 3 provides some information on the distribution of return on assets and equity by region. While the return on assets was over 1.6 times higher, on average, in the West compared to the Upper Midwest, the percent of farms with a return on assets of 5% or greater was actually lower in the West (39.3% of all farms) compared with the Upper Midwest (45.5% of all farms). Moreover, the West had a larger proportion of farmers (21.2%) with a return on assets lower than -5% compared to the Upper Midwest (14.9%). Thus, while the Upper Midwest had a lower average return on assets than the West, the Upper Midwest did not have as large a proportion of farmers experiencing a negative return on assets. However, the same relationship with the West does not hold for the Northeast. The Northeast had a lower proportion of farms having a rate of return greater than 5%, and a slightly higher proportion of farms with a rate of return less than -5% than the West.

Farms with the Highest Returns to Management and Capital

While the average farm in the West appears to be more profitable than average farms in the Upper Midwest and Northeast, how did the most profitable farms compare by region? To answer this, we selected the top 20% of farms in each region having the highest returns to management and capital (total income minus economic costs) per cow. Table 4 lists the average returns and costs for the top 20% of farms by region having the highest returns to management and capital.

²Return on assets is defined as the ratio of returns to capital and management plus nonland capital plus operating capital plus land costs divided by estimated total assets of the dairy enterprise. Similarly, return on equity is defined as the ratio of returns to capital and management plus nonland capital plus operating capital plus land costs divided by estimated total equity of the dairy enterprise.

Table 3. Distribution of Return on Assets and Equity by Region, 1989.

Region/Rate of return	Less than -5% (percent)	-5% to 5% (percent)	More than 5% (percent)
Upper Midwest			
Return on assets	14.9	39.6	45.5
Return on equity	29.6	29.6	40.8
Northeast			
Return on assets	22.3	43.6	34.1
Return on equity	30.3	34.0	35.7
West			
Return on assets	21.8	38.9	39.3
Return on equity	29.4	28.4	42.2

Interestingly, the gap in herd productivity between the traditional dairy states and the West for the top 20% most profitable farms is no lower than under the previous all farms comparisons. The most profitable producers in the Upper Midwest and Northeast had average milk marketings per cow that were 86% and 87%, respectively, of marketings per cow in the West. Farm size for producers with the highest returns was considerably larger in the West than the traditional dairy states. The average number of cows per farm for the top 20% of Western producers with the highest returns was over six times larger than comparable farms in the Upper Midwest, and four times larger than the Northeast. It is interesting that the average number of cows in the top 20% most profitable farms was only 11 cows more than the overall average for the region. On the other hand, the average number of cows in the top 20% of Western farms was 90 cows more than the overall average for the region, and the average number of cows for the top Northeast farms was 28 cows more than the overall average. Income per cow for the most profitable farms was lower in the Upper Midwest than the Northeast because of slightly lower cow productivity and higher milk prices. Income per cow in the West was higher than the two other regions because of higher cow productivity.

As was the case before, the most profitable producers in the Upper Midwest enjoyed a huge variable cash cost advantage over comparable farms in the West by almost \$300 per cow. The most profitable Upper Midwest producers also had lower variable cash costs than the Northeast by \$128 per cow. Total cash costs for these farms were closer between regions, but the Upper Midwest again had an advantage over the other two regions, which was due mainly to lower feed and hired labor costs. Unlike the previous comparison, the most profitable Upper Midwest farms also had somewhat lower economic costs than the most profitable farms in the West and Northeast.

Table 4. Average Returns and Costs for Farms in the Top 20% of the Sample in Terms of Highest Returns to Management and Capital per Cow by Region, 1989.

Item	Upper Midwest	Northeast	West
No. of sample farms	56	66	54
Average number of cows	61	91	373
Marketings per cow	15,410	15,543	17,797
	-----	----- per cow -----	-----
Milk sales	2,052.88	2,191.84	2,289.73
Calves and other	343.27	260.27	300.19
Total income	2,396.15	2,452.11	2,589.92
Variable cash costs			
Total feed	631.57	691.41	784.71
- Purchased feed	256.77	459.30	696.28
Hired labor	51.53	72.63	201.43
Other	258.01	305.32	252.20
Total variable cash costs	941.11	1,069.36	1,238.34
Fixed costs:			
General farm overhead	69.75	56.34	39.45
Taxes and insurance	57.94	62.52	33.59
Interest	153.73	124.88	117.11
Total fixed costs	281.42	243.74	190.15
Total cash costs	1,222.53	1,313.10	1,428.49
Economic costs:			
Variable cash expenses	941.11	1,069.36	1,238.34
General farm overhead	69.75	56.34	39.45
Taxes and insurance	57.94	62.52	33.59
Capital replacement	190.69	186.39	147.37
Nonland capital	122.43	109.06	50.67
Operating capital	9.46	10.75	12.45
Unpaid labor	167.67	149.59	49.42
Land	35.80	40.18	30.69
Total economic costs	1,594.85	1,684.19	1,601.98
Cash flow	1,173.62	1,139.01	1,161.43
Return to management & capital	801.30	767.92	987.94
Return on assets (%)	15.4%	14.0%	25.2%
Return on equity (%)	19.7%	17.3%	35.0%
Assets per cow	6,384.16	6,633.47	4,352.34
Land value per cow ^{653.70}	1,742.12	1,357.38	
Acres per cow	1.08	1.67	0.60
Building value per cow	2,432.27	1,926.50	855.17
Equity per cow	4,135.55	4,458.39	2,869.66

Cash flow per cow among the top 20% of farms was quite similar among the three regions, with the Upper Midwest having a slightly higher level than the two other regions. However, as was the case before, the most profitable producers in the West had substantially higher returns to management and capital than the Upper Midwest and Northeast, averaging \$988 per cow as opposed to \$801 (Upper Midwest) and \$768 (Northeast). Return on assets in the West for the top 20% most profitable farms was about 1.6 times higher than the Upper Midwest, and 1.8 times higher than the Northeast. Return on equity in the West for the top 20% most profitable farms was about 1.8 times higher than the Upper Midwest, and two times higher than the Northeast. Again, higher productivity per cow and lower assets per cow in the West compared to the Upper Midwest and Northeast were driving these results. Average assets per cow in the West were \$4,352, which was \$2,032 and \$2,281 per cow lower than the Upper Midwest and Northeast. While the most profitable farms in the Upper Midwest and Northeast had respectable profitability measures, they will have to increase cow productivity and numbers, and further reduce investment per cow to become as profitable as the top Western farms.

Farms with the Lowest Total Cash Costs

The second performance measure used in this paper was total cash costs. Table 5 presents average returns and costs for the top 20% of farms based on lowest total cash costs per cow. Using this performance measure, the top 20% of farms in the Upper Midwest were actually 20% smaller than the overall average for the region, averaging just 40 cows per farm. Compared to all farms in the Upper Midwest, the 20% lowest cost producers had variable cash costs and total cash costs per cow that were 63% and 61%, respectively, of the overall average. However, total economic costs per cow were closer between the lowest cash cost producers (76% of overall average) and the overall average. The lowest cash cost producers had higher unpaid labor costs than the overall average. The lowest cash cost farms also had lower herd productivity than the overall average (97% of overall average) because they fed less.

These same patterns did not hold for the lowest cash cost farms in the West and Northeast (Table 5). The lowest cash cost farms in these two regions were slightly larger and more productive than the overall average. The least cost Upper Midwest farms again enjoyed a cost advantage over the West and Northeast. Variable and total cash costs per cow on least cost Upper Midwest farms averaged 63% and 66% of the average least cost Western farm, and 83% and 86% of the average least cost Northeastern farm. However, total economic costs per cow were much closer between regions due to higher unpaid labor, nonland capital, capital replacement, and general farm overhead costs in the Upper Midwest. The economic costs per

Table 5. Average Returns and Costs for Farms in the Top 20% of the Sample in Terms of Lowest Total Cash Cost per Cow by Region, 1989.

Item	Upper Midwest	Northeast	West
No. of sample farms	33	44	38
Average number of cows	40	68	293
Marketings per cow	14,179	14,578	17,974
	-----	----- per cow -----	-----
Milk sales	1,886.78	2,034.74	2,277.41
Calves and other	299.31	177.66	167.19
Total income	2,186.09	2,212.40	2,444.60
Variable cash costs:			
Total feed	487.89	542.83	753.21
- Purchased feed	241.25	308.95	669.31
Hired labor	21.71	56.80	145.05
Other	210.61	269.36	250.46
Total variable cash costs	720.21	868.99	1,148.72
Fixed costs:			
General farm overhead	56.33	48.82	43.76
Taxes and insurance	44.56	48.48	35.71
Interest	51.71	43.81	85.63
Total fixed costs	152.60	141.11	165.10
Total cash costs	872.81	1,010.10	1,313.82
Economic costs:			
Variable cash expenses	720.21	868.99	1,148.72
General farm overhead	56.33	48.82	43.76
Taxes and insurance	44.56	48.48	35.71
Capital replacement	204.43	189.92	174.67
Nonland capital	134.52	112.62	52.21
Operating capital	7.24	8.73	11.54
Unpaid labor	354.03	289.64	91.30
Land	40.27	45.15	26.00
Total economic costs	1,561.59	1,612.35	1,583.91
Cash flow	1,313.28	1,202.30	1,130.78
Return to management & capital	624.50	600.05	860.69
Return on assets (%)	12.1%	12.4%	21.3%
Return on equity (%)	11.5%	13.4%	26.7%
Assets per cow	6,744.18	6,178.89	4,463.59
Land value per cow	477.36	1,452.91	1,265.80
Acres per cow	1.27	1.70	0.56
Building value per cow	2,799.41	1,630.90	916.83
Equity per cow	5,506.79	4,488.27	3,226.56

cow for the lowest cash cost producers in the Upper Midwest averaged 99% of comparable Western farms and 97% of comparable Northeastern farms. Upper Midwest farms with the lowest cash costs had a higher level of cash flow per cow (\$1,313) than least cost farms in the West (\$1,131) and the Northeast (\$1,202). However, as was the case before, the least cost producers in the West had substantially higher returns to management and capital than the Upper Midwest and Northeast, averaging \$861 per cow as opposed to \$625 (Upper Midwest) and \$600 (Northeast). Return on assets in the West for the lowest cash cost farms was 1.8 times higher than the Upper Midwest, and 1.7 times higher than the Northeast. Again, higher productivity per cow and lower assets per cow in the West compared to the Upper Midwest and Northeast were driving these results. The lowest cash cost farms in the West had assets per cow averaging \$4,464, while the lowest cash cost farms in the Upper Midwest and Northeast had assets per cow averaging \$6,744 and \$6,179, respectively. Note that these results clearly show that lowest cash costs do not necessarily mean highest returns. For example, while the 20% lowest cash cost farms in the Upper Midwest had a 12.1% return on assets, the top 20% of Upper Midwest farms with the highest returns averaged a 15.4% return on assets. Similar results hold in the West and the Northeast.

Farms with the Highest Marketings per Cow

The final performance measure used in this paper was milk marketings per cow. Table 6 lists the average returns and costs for farms with the highest 20% marketings per cow for each region. Farms with the highest herd productivity were slightly larger than average for each region. As was true before, Western farms with the highest herd productivity averaged 2,679 pounds of milk more per cow than the most productive Upper Midwest farms, and 2,134 pounds of milk more per cow than the most productive Northeast farms, on average. Thus, under all performance measures, Western farms were found to have substantially higher marketings per cow than the two traditional dairy regions. Unlike previous results, the Northeast rather than the West had the highest average income per cow, followed by the West and Upper Midwest. Farms with the highest herd averages in the Upper Midwest had the lowest total cash costs per cow of all three regions. Total cash costs for these farms in the Upper Midwest averaged \$1,787 per cow, which was \$351 per cow higher than the overall average for the region due mainly to higher feed costs. Total cash costs for the highest producing herds in the West averaged \$2,148 per cow, while comparable Northeast farms average \$1,836 per cow. Due to higher capital replacement, unpaid labor, nonland capital, land, general farm overhead, and taxes and insurance costs, however, the highest producing herds in the Upper Midwest had higher (\$130 per cow) total economic costs per cow than comparable Western farmers.

Table 6. Average Returns and Costs for Farms in the Top 20% of the Sample in Terms of Highest Milk Marketings per Cow by Region, 1989.

Item	Upper Midwest	Northeast	West
No. of sample farms	56	65	40
Average number of cows	54	84	368
Marketings per cow	18,017	18,562	20,696
	-----	----- per cow -----	-----
Milk sales	2,388.78	2,637.67	2,603.97
Calves and other	319.03	198.56	187.60
Total income	2,707.81	2,836.23	2,791.57
Variable cash costs:			
Total feed	1,007.50	1,041.15	1,351.25
- Purchased feed	390.85	576.89	1,269.71
Hired labor	90.75	99.49	250.57
Other	339.06	409.77	357.31
Total variable cash costs	1,437.31	1,550.41	1,959.13
Fixed costs:			
General farm overhead	98.58	86.11	49.99
Taxes and insurance	75.00	80.78	34.14
Interest ^{176.04}	118.25	104.40	
Total fixed costs	349.62	285.14	188.53
Total cash costs	1,786.93	1,835.55	2,147.66
Economic costs:			
Variable cash expenses	1,437.31	1,550.41	1,959.13
General farm overhead	98.58	86.11	49.99
Taxes and insurance	75.00	80.78	34.14
Capital replacement	268.13	294.84	130.70
Nonland capital	155.57	142.57	48.72
Operating capital	14.45	15.58	19.69
Unpaid labor	335.14	247.67	64.15
Land	88.57	78.54	36.13
Total economic costs	2,472.75	2,496.50	2,342.65
Cash flow	920.88	1,000.68	643.91
Return to management & capital	235.06	339.73	448.92
Return on assets (%)	6.7	6.6	11.7
Return on equity (%)	4.8	5.2	13.2
Assets per cow	7,409.55	8,764.31	4,738.20
Land value per cow	1,390.91	3,034.16	1,511.97
Acres per cow	2.25	3.02	0.41
Building value per cow	2,093.80	1,932.56	736.53
Equity per cow	4,861.56	6,515.21	3,400.04

Northeastern farmers with the highest herd averages had the highest level of cash flow per cow of the three regions, averaging \$1,001 per cow. Upper Midwest farmers had the second highest level of cash flow at \$921 per cow, followed by Western farms at \$644 per cow. However, the Western farms with the highest herd averages had the highest returns to management and capital of the three regions, averaging almost twice as much as comparable Upper Midwest farmers. The most productive farms in the West had return on assets and equity that were about twice that of the most productive farms in the Upper Midwest and Northeast. Return on assets, in this case, averaged 11.7% in the West and 6.7% and 6.6% in the Upper Midwest and Northeast, respectively. Return on equity averaged 13.2% in the West, and 4.8% and 5.2% in the Upper Midwest and Northeast, respectively. As was true in all previous comparisons, the West had substantially lower assets per cow (\$4,738) than the Upper Midwest (\$7,410) and the Northeast (\$8,764).

Comparing Three Performance Measures

Table 7 compares average returns and costs for the top farms in the Upper Midwest based on the three different performance measures used in this paper. This comparison is useful because it provides an indication of what the basic differences are between the most profitable vs. lowest cash cost vs. most productive farms in the region.

The most profitable farms in the region had the most cows averaging 61 per farm, while the lowest cash cost farms had the least number of cows averaging just 40 cows per farm. Upper Midwest farms with the highest marketings per cow had production levels that were 3,838 pounds more per cow than the least cost farms, and 2,607 pounds more per cow than the most profitable farms. The lowest cash cost farms in the Upper Midwest had total variable cash costs that were \$221 per cow lower, on average, than farms with the highest returns, and \$717 per cow lower than farms with the highest marketings per cow in the region. Much of this result is due to differences in feed costs. From a profit maximizing point of view, it appears that the least cost farms did not feed enough (\$488 per cow invested in feed), while farms with the highest marketings per cow over-fed (\$1,008 per cow invested in feed). The least cash cost farms in the Upper Midwest also had the lowest fixed cash costs averaging \$153 per cow, compared to \$281 per cow for farms with the highest returns, and \$350 per cow for farms with the highest marketings per cow. It is interesting that there was virtually no difference in total economic costs between the lowest cash cost and highest return farms in the Upper Midwest. The lowest cash cost per cow farms had economic costs that averaged \$1,562 per cow, while farms with the highest returns had economic costs averaging \$1,595 per cow. The top farms in the region in terms of marketings per cow, however, had substantially higher economic costs, which averaged \$2,473 per cow.

Table 7. Average Returns and Costs for Upper Midwest Farms in the Top 20% of the Sample in Terms of Highest Returns, Lowest Costs, and Highest Marketings per Cow, 1989.

Item	Highest returns	Lowest cash costs	Highest mktings
No. of sample farms	56	33	56
Average number of cows	61	40	54
Marketings per cow	15,410	14,179	18,017
	-----	----- per cow -----	-----
Milk sales	2,052.88	1,886.78	2,388.78
Calves and other	343.27	299.31	319.03
Total income	2,396.15	2,186.09	2,707.81
Variable cash costs:			
Total feed	631.57	487.89	1,007.50
- Purchased feed	256.77	241.25	390.85
Hired labor	51.53	21.71	90.75
Other	258.01	210.61	339.06
Total variable cash costs	941.11	720.21	1,437.31
Fixed costs:			
General farm overhead	69.75	56.33	98.58
Taxes and insurance	57.94	44.56	75.00
Interest	153.73	51.71	176.04
Total fixed costs	281.42	152.60	349.62
Total cash costs	1,222.53	872.81	1,786.93
Economic costs:			
Variable cash expenses	941.11	720.21	1,437.31
General farm overhead	69.75	56.33	98.58
Taxes and insurance	57.94	44.56	75.00
Capital replacement	190.69	204.43	268.13
Nonland capital	122.43	134.52	155.57
Operating capital	9.46	7.24	14.45
Unpaid labor	167.67	354.03	335.14
Land	35.80	40.27	88.57
Total economic costs	1,594.85	1,561.59	2,472.75
Cash flow	1,173.62	1,313.28	920.88
Return to management & capital	801.30	624.50	235.06
Return on assets (%)	15.4%	12.1%	6.7
Return on equity (%)	19.7%	11.5%	4.8
Assets per cow	6,384.16	6,744.18	7,409.55
Land value per cow	653.70	477.36	1,390.91
Acres per cow	1.08	1.27	2.25
Building value per cow	2,432.27	2,799.41	2,093.80
Equity per cow	4,135.55	5,506.79	4,861.56

In terms of profitability measures, the top farms in all three performance measures out-performed the overall average for the Upper Midwest. The least cash cost farms had the highest cash flow per cow (\$1,313), followed by the highest return farms (\$1,174 per cow), and highest marketings per cow farms (\$921 per cow). Farms with the highest returns averaged \$801 per cow in returns to management and capital, while farms with the least cash costs and highest marketings per cow averaged \$625 and \$235 per cow, respectively. Average return on assets and on equity were highest for the highest return farms, followed by farms with least cash cost and highest marketings per cow. Therefore, in terms of return on assets and equity, farms should concentrate more on maximizing returns to management and capital, rather than minimizing cash costs, or maximizing marketings per cow.

Summary

The purpose of this paper was to compare costs and returns of the top dairy producers in the Upper Midwest to those in other major dairy regions of the U.S. The analysis was based on the 1989 Farm Costs and Returns Survey conducted by the U.S. Department of Agriculture. The top dairy farmers were defined in three ways, including: (1) highest returns to capital and management, (2) lowest total cash costs, and (3) highest milk marketings per cow. States were aggregated into regions to increase the number of observations in the USDA sample and satisfy disclosure conditions. The following regions were represented in this study:

West	California, Texas, Idaho, Washington
Upper Midwest	Wisconsin, Minnesota, Iowa, South Dakota
Northeast	New York, Pennsylvania, Vermont

Several conclusions emerged from the analysis. First, farms in the West were substantially larger in terms of cows per farm than farms in the Upper Midwest and Northeast. Based on the four comparisons made in this paper, farm size in the West (based on cow numbers) was at least four times larger than Upper Midwest and Northeast farms. Second, average cow productivity was significantly higher in the West than in the Upper Midwest or Northeast. This was likely due to better quality feed, management, and technology in the West. Third, the West had higher total income per cow than the Upper Midwest. Since the milk price was higher in the Upper Midwest, higher income per cow in the West was exclusively due to higher cow productivity. Fourth, the Upper Midwest had a large advantage over the West and Northeast in terms of variable cash costs. This advantage was due exclusively to lower costs for feed and hired labor in the Upper Midwest. Fifth, the Upper Midwest had higher cash flow per cow, while the West had the lowest cash flow per cow, on average. This was due to lower total cash costs in both the Upper Midwest and Northeast relative to the West. Sixth, the West had higher returns to management and capital per cow, on average, than the other two regions. This was due to lower total economic costs in the West. There is a trade-off between cash expenses for goods and services and using own labor and

capital. Finally, the West had a higher rate of return to both assets and equity than the Upper Midwest and Northeast. All of these observations were true regardless of how the farms were sorted in terms of overall average comparisons, or comparisons based on the three performance measures.

Farmers in the Upper Midwest had significant advantages in feed costs. To improve their relative position, the Upper Midwest will need to considerably expand the number and proportion of farms in the larger herd categories, which will have considerable implications for the tradition of producing the majority of feed on the farm (i.e., maintaining this type of feed management approach may not be technically or economically feasible under substantially larger herd sizes). Modern, larger farms in the Upper Midwest should have some of the economies of scale that the Western farms have, thereby reducing economic costs as well as the amount of assets per cow over current levels in this region. While maximizing yields is not necessarily the way to go, competitive farmers in this region will also need to narrow the gap in production per cow with their counterparts in the West. Improving cow productivity will improve total income and returns in the region.

In terms of future research, it would be extremely useful to investigate how farms in the 200+ cow range in both the Upper Midwest and Northeast compare with their Western counterparts. The largest size categories in both of these traditional dairy regions is rapidly growing. Unfortunately, since this report was based on 1989 data, the largest size farms in the Upper Midwest and Northeast did not fall into the 200+ category. Perhaps when the 1993 USDA survey is completed, one will be able to shed more light on this question.

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