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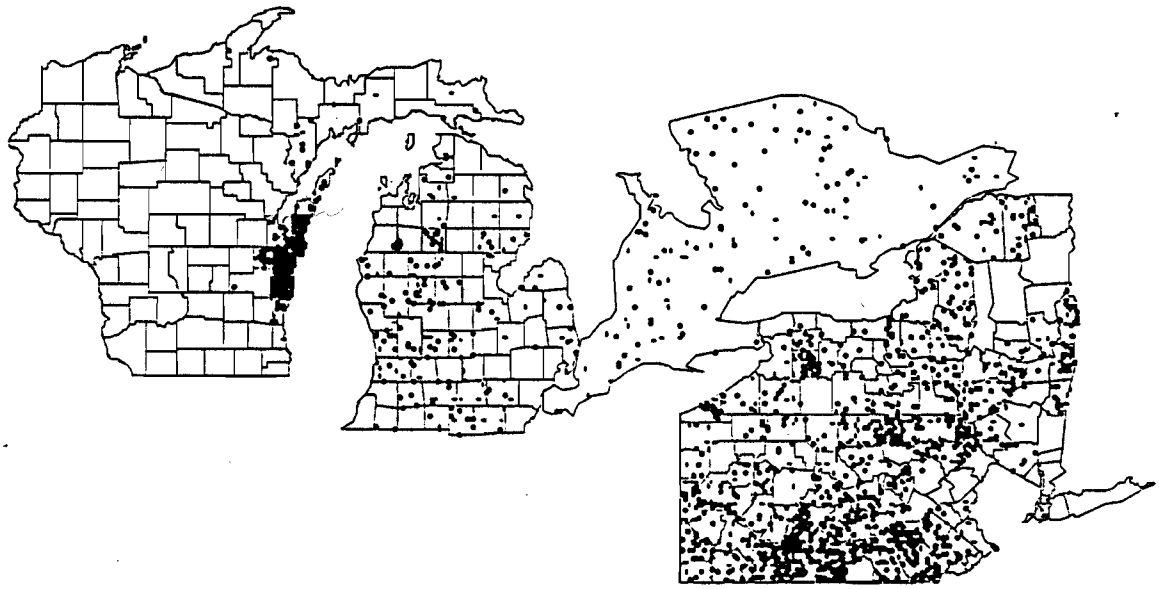
JULY 1996

R.B. 96-08

A DESCRIPTIVE ANALYSIS OF THE CHARACTERISTICS AND FINANCIAL PERFORMANCE OF DAIRY FARMS IN MICHIGAN, NEW YORK, ONTARIO, PENNSYLVANIA AND WISCONSIN



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ABSTRACT

In 1989, The Cornell Program on Dairy Markets and Policy collaborated with the Texas A&M Agricultural and Food Policy Center to form a National Institute for Livestock and Dairy Policy (NILDP). The Institute is a focal point for a neutral and objective analyses of the consequences of alternative government policies on the livestock, dairy, and poultry industries and the broader economics of livestock and dairy markets. Based on their respective strengths and emphases, Texas A&M is the lead institution on livestock and poultry sector analysis, and Cornell is the lead institution on dairy sector analysis. The Institute has been supported by a special research grant through the U.S. Department of Agriculture since 1989. The Dairy Farm Analysis Project (DFAP) is one particular effort in a larger set of objectives and core projects.

In 1992, under the umbrella of the Dairy Farm Analysis Project, researchers from New York, Pennsylvania, Wisconsin, Michigan, and Ontario met to discuss the possibility of creating a pooled data set from the represented states. Raw data would not be collected under this project, but rather would be merged from individual state efforts already in place.

From the four states and one province, a single data set was created which contains 2,200 individual farm level records with 92 basic and 15 calculated variables for the 1992 calendar year. This publication: describes the sources of the pooled data; discusses the representitiveness of the sample; provides a description of the definitions of variables; and summarizes the data with descriptive statistics.

With this project, we have shown that variables from different states' dairy farm record systems can be defined such that common variables can be obtained. We have developed a rich data set containing 1,818 farm records from four states and Ontario.

While there are differences in dairy farm performance and profitability between states, the differences are more related to herd size differences than to other factors. In other words, farms of similar herd sizes are more like farms in other states of the same size, than to different size farms within the state.

The pooled data set has shown that rates of production and profitabiltiy are higher on larger farms, even though operating cost of producing milk is higher. Labor efficiency on larger farms is significantly higher than on smaller farms. Larger farms have higher net worth, but also have higher debt to asset ratios and debt per cow.

The most common herd size category in the data set is 40 - 79 cows. This herd size is confronting high investments per cow, no advantage in debt per cow, and modest labor efficiencies in comparison to larger herd sizes. Their advantage is low operating costs, primarily due to most of the labor being provided by the operator and family. However, the return to labor and management per operator is negative, as is return on equity with appreciation. This herd size, perhaps more than any other, will be struggling with high feed costs and the decision to expand in the future.

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BACKGROUND AND INTRODUCTION

Change and evolution are found in the history of the dairy industry as much as in any aspect of American society. Nonetheless, the 1980s began a period of unusual transition and turmoil for dairy farmers and processors, a period which shows every sign of continuing through the 1990s. There has been an explosion of new technologies, changes in consumer food preferences and marketing systems, and serious reductions in government support programs. Ironically, the 1990s may also be a period of growing government regulatory programs designed not to provide support but to regulate production and marketing activities for other purposes. To respond to these transitions, the Cornell Program on Dairy Markets and Policy's mission is four-fold. The first mission is to educate current and future leaders on the basic economic principles and characteristics relevant to dairy markets and policy. This includes working with members of industry and government agencies and teaching undergraduate and graduate students. The second mission is to provide and interpret market and policy information. The third mission is to assist and advise members of industry and policy makers as they seek to understand or develop dairy policies or new marketing institutions, mechanisms, and practices. The fourth mission is to advance a broad and integrated approach to the economic issues and challenges confronting the dairy industry. This means interpreting information gleaned from other disciplines, such as food science, animal science, consumer economics, business management, and so on. Whenever appropriate and possible, we encourage working with researchers in other disciplines and in other areas of the country to achieve a broad, inclusive perspective.

In 1989, The Cornell Program on Dairy Markets and Policy collaborated with the Texas A&M Agricultural and Food Policy Center to form a National Institute for Livestock and Dairy Policy (NILDP). The Institute is a focal point for a neutral and objective analyses of the consequences of alternative government policies on the livestock, dairy, and poultry industries and the broader economics of livestock and dairy markets. Based on their respective strengths and emphases, Texas A&M is the lead institution on livestock and poultry sector analysis, and Cornell is the lead institution on dairy sector analysis. The Institute has been supported by a special research grant through the U.S. Department of Agriculture since 1989. The Dairy Farm Analysis Project (DFAP) is one particular effort in a larger set of objectives and core projects.

In 1992, under the umbrella of the Dairy Farm Analysis Project, researchers from New York, Pennsylvania, Wisconsin, Michigan, and Ontario met to discuss the possibility of creating a pooled data set from the represented states. Raw data would not be collected under this project, but rather would be merged from individual state efforts already in place.

From the four states and one province, a single data set was created which contains 2,200 individual farm level records with 92 basic and 15 calculated variables for the 1992 calendar year. This publication: describes the sources of the pooled data; discusses the representitiveness of the sample; provides a description of the definitions of variables; and summarizes the data with descriptive statistics.

DATA SOURCES AND REPRESENTATIVENESS OF THE SAMPLE

Data Sources

The following is a description of the data collection procedures used by each state or province.

Michigan - The financial, production and other figures illustrated in this report for Michigan were obtained from the TELFARM project, coordinated by the Agricultural Economics Department at Michigan State University. This computerized accounting system began in 1965. Initially, the system was a mail-in version, where producers mailed the financial transactions, production and other related information each month to the center processing center for analysis. From this data, a monthly summary report is produced and mailed back to the producer. At the conclusion of the financial year, inventory data is obtained and a crop reporting sheet completed. The composite data from the farm is used to generate the annual analysis report for each farm.

In 1983 a microcomputer version of TELFARM, called MICRO-TEL, was implemented. This version allows producers to keep the financial and other data on their own business microcomputer. MICRO-TEL software produces a duplicate data set which is forwarded to the central processing center. At year's end those on MICRO-TEL also supply data on inventories and cropping activities. As with the mail-in version, the annual business analysis is generated at the central processing center using the composite data. Currently the majority of the farms in TELFARM project utilize MICRO-TEL.

The mail-in and microcomputer versions of TELFARM were utilized by over 800 farms in 1992. Those enrolled in the system pay an annual fee for the service. About half of the farms are dairy operations. The enrolled farms are fairly representative of Michigan commercial dairy operations, the main difference being they are somewhat larger than the typical farm. Only farms with completed composite data sets were included in this report. This data was transformed slightly to make it consistent with the common data structure used in this study.

New York - Dairy farm business summary projects are an integral part of Cornell Cooperative Extension's agriculture educational program in New York State. The Department of Agricultural, Resource, and Managerial Economics of the New York State College of Agriculture and Life Sciences, and County Extension staff, cooperate in sponsoring DFBS projects. Business records submitted by dairy farmers from 46 counties provide the basis for continuing Extension programs, data for applied studies, and for use in the classroom. Regardless of the use of the data, confidentiality of individual farm data is maintained.

Cooperative Extension agents and specialists enroll the cooperators and collect the records. Each cooperator receives a detailed summary and analysis of his or her business. More than 95 percent of the agents and specialists are using a microcomputer in their offices and/or on the farm to process and return the individual farm business reports for immediate use. Regional reports are prepared by Cornell

faculty and used by DFBS cooperators and other farmers to compare their farm with regional averages. The DFBS program helps farmers develop managerial skills and solve business management problems.

Ontario - Data on the Ontario dairy farms was collected through the Ontario Dairy Farm Accounting Project (ODFAP). Funded through the Dairy Farmers of Ontario (formerly the Ontario Milk Marketing Board) along with the provincial and federal agricultural ministries, the major purpose of ODFAP has been to compute the average production cost of milk in Ontario. The value is used in the formula pricing of milk. To achieve this objective, physical, technical and financial data on approximately 1,500 variables are collected on a sample of random farms. The data are collected by government field service representatives who visit the participating farms several times annually.

The ODFAP sample is based on a regionally stratified random sample of approximately 120-140 farms selected from the files of the Dairy Farmers of Ontario. Each year, one-fifth of the annual sample is replaced by a new group of random farms. These selected participants become part of the project for five years after which time they are replaced by another group. Thus, each annual sample consists of five sub-samples of dairy farms that represent different years of beginning the project. The number of farms selected within a region for each sub-sample reflects the proportion of farms present in the population for that region at the time the sub-sample was drawn. Six regions are identified in the province on the basis of similar land capabilities, climatic factors and non-dairy opportunities.

Pennsylvania - The Pennsylvania data are collected from on-farm interviews by the Pennsylvania Farm Bureau as part of their Farm Management Services program on farm record keeping and tax preparation. The basic service provided includes four farm visits per year to enter transactions and maintain records for their clients. During the first quarter of the calendar year, the account supervisors prepare tax returns and a final accounting for each farm. These data are then sent to their central processing facility for compilation. A summary data set is then prepared and forwarded to Penn State University for further analysis. At that point, the data set is reduced to only include specialized dairy farms and to delete any farm cases that have obvious errors.

Wisconsin - Until recently, the University of Wisconsin has not made a concerted effort to collect farm level records for many years. In the early 1980s, the University of Wisconsin helped to develop a computerized bookkeeping system that was used by two cooperative organizations for tax preparation and to provide farm-level summaries for participants. Although the relationship was not exercised for nearly a decade, the Fox Valley and Lakeshore Farm Management Associations continued to provide services to their farmer members. In 1993, working with faculty from the Dairy Center for Profitability at Madison and the Agricultural Resource Center at River Falls, the relationship was renewed. The 1992 Wisconsin data set for the Dairy Farm Analysis Project was obtained from these two cooperative organizations.

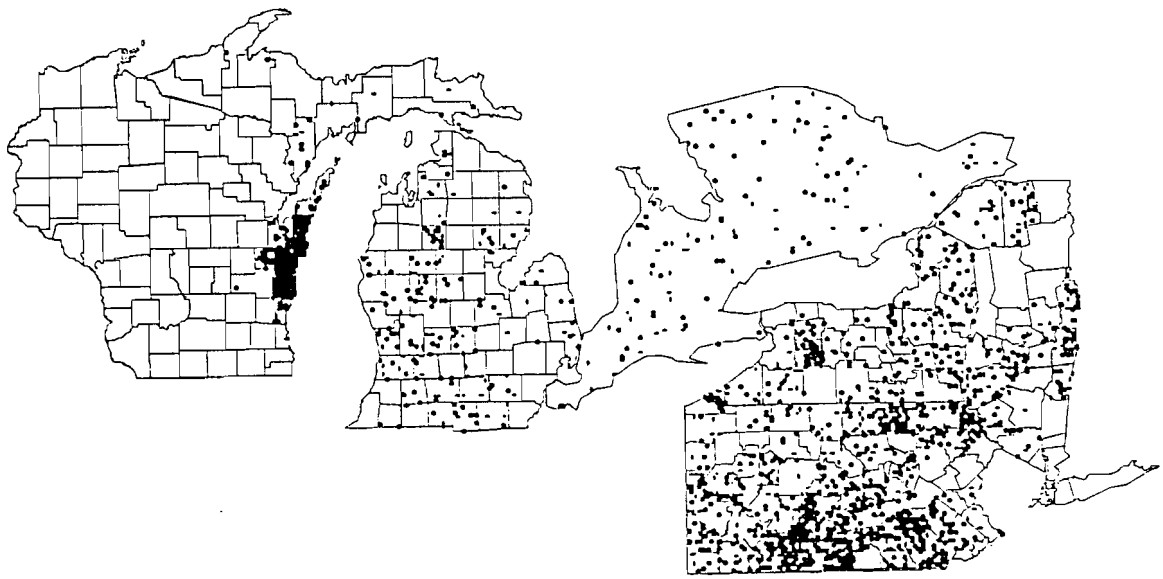
Farm level data from Wisconsin continues to be collected from these associations and from two additional sources. The Agricultural Management Information System (AIMS) is a project to develop farm accounting software. Although the primary goal is to provide a good record keeping system for farms, collection of research data is a secondary goal. In 1992, a pilot program was instituted to bring Cornell University's Dairy Farm Business Summary (DFBS) program to the University of Wisconsin Extension program as well. Currently, there are several agents in the state collecting and summarizing about 100 farms using this program.

Representativeness of the Sample

One of the recurring questions regarding studies of this type is how representative are the sample farms. If one would like to make statistical inference to the total population of dairy farms in the four states and one province, then this may not be a trivial issue. It is best to measure a sample against a census of data and, for the United States, 1992 was a year of an agricultural census and is the year of our pooled data set. Benchmarks other than the census are used where census data are not available. The Canadian census of agriculture was taken in 1991 and is not directly comparable to the year of our data set. The 1992 data from Statistics Canada are used for most Ontario comparisons. The Ontario farms in our study are farms that have been randomly selected to take part in the Ontario Dairy Farm Accounting Project (ODFAP). One of the objectives of the ODFAP is to obtain representative farms from six regions of Southern Ontario. By its construct, the Ontario data are fairly representative of the industry in that province.

Geographically, the farms in the DFAP are dispersed across the states and province with the exception of Wisconsin (see the description of the Wisconsin data set). It could not be said that the geographic density of the sample farms matches the census locations perfectly, but farms in all parts of the dairy regions are generally represented. The dots below in Figure 1 represent the actual number of farms within a county but not actual farm locations. The Ontario farms are not shown within county boundaries but the milk-weighted selection of their farm data set corresponds to their milk producing regions.

Figure 1. Location of DFAP Farms.



Several of the variables in the sample farm data are used to determine if the data set is representative. Table 1 shows the number of dairy farms and milk produced by those farms in the data set by state and province. It can be seen that the Pennsylvania data covers a much larger percentage of the total farms than any other region and that the percent of Pennsylvania milk represented in the data set most closely corresponds to the percent of farms than any other state. That is, milk production per farm in the Pennsylvania data set is similar to the state average. It should also be noticed that there is a consistent bias toward larger farms in DFAP data, even in Pennsylvania. In fact, t-tests of individual mean herd size show that the sample data set farms statistically produce more milk in each state and province than average farms of their region at the 99% level of confidence.

Table 1. Comparison of the Number of Farms and Milk Produced.

	Number of Dairy Farms		Milk Production (mil lbs)		Percent of Total	
	DFAP[1]	Total[2]	DFAP[1]	Total[3]	Farms	Milk
Michigan	210	4,836	438	5,435	4.4%	8.1%
New York	408	10,066	900	11,557	4.1%	7.8%
Pennsylvania	985	11,593	1,179	10,368	8.6%	11.3%
Wisconsin	476	30,048	605	23,844	1.6%	2.5%
Ontario	121	10,002	81	5,088	1.2%	1.6%

[1]Represents number of farms in the sample database.
[2]From US Census. Dairy farms defined as having more than $1,000 of annual sales.
[3]From National Agricultural Statistics Service, Milk Production-Final Estimates.

The boxplots in figure 2 delineate the quartiles of observations by region for herd size. The gray-shaded box in the center displays a 95% confidence interval that the true mean would lie within if the sample were drawn at random. The census mean is shown next to the plots as an arrow and provides an indication as to whether herd size is statistically different from the mean in all regions. Part of the greater milk production on the sample farms is explained by larger farm sizes in each of the states, but not in Ontario where the sample farms are smaller than average.

Figure 2. Distribution of Herd Size in the Sample Farms.

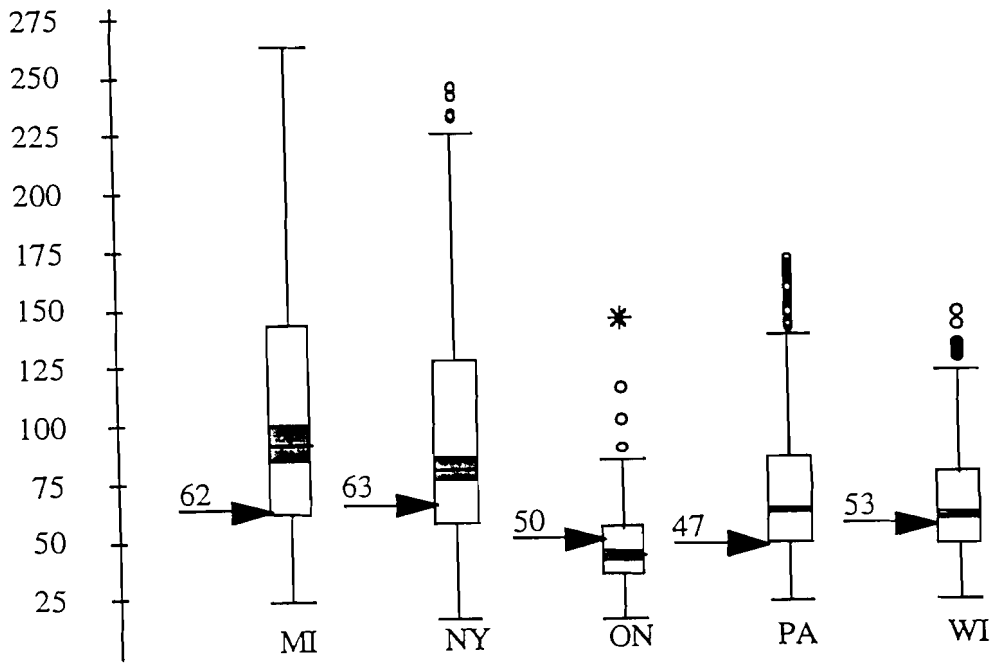
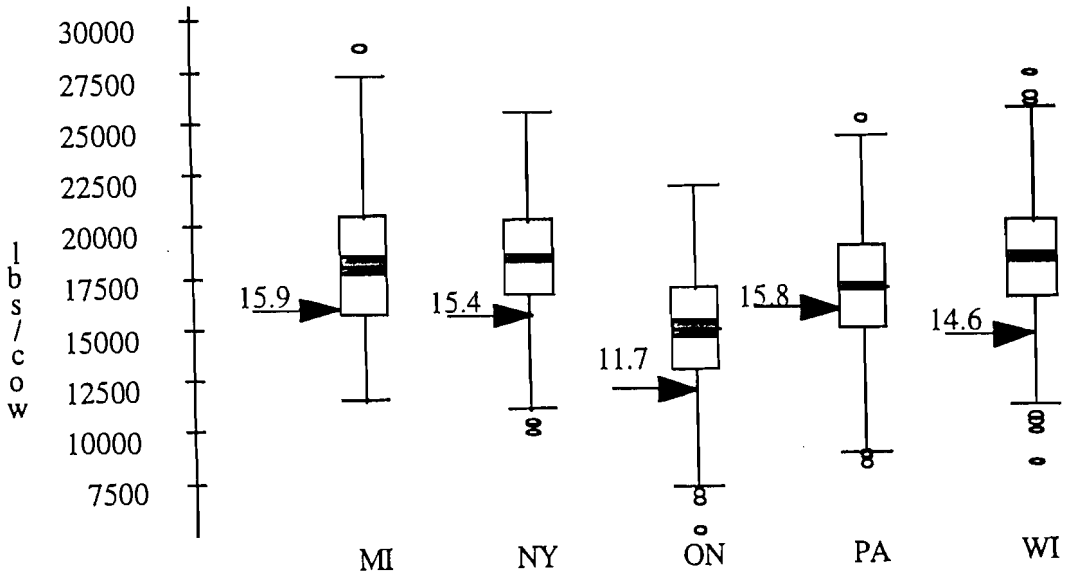


Figure 3 shows the distribution of milk per cow in the DFAP data. Data for the means of per cow milk production is taken from the National Agricultural Statistics Service (NASS) and Statistics Canada and is identified with an arrow. Again, it can be seen that the sample farms differ statistically from the population and that much of the difference in milk production is a result of greater productivity and not just farm size.

Figure 3. Distribution of Milk per Cow in the Sample Farms.



For the rest of the section on representativeness, Ontario comparisons are not made. The United States Agricultural Census provides many more potential benchmarks that are difficult to replicate with the Canadian data.

The United States Agricultural Census uses five definitions of a dairy farm. From least to most restrictive they are: (1) any farm with milk cows producing $1,000 of sales annually; (2) any farm with more than $10,000 of sales annually; (3) more than 50% of receipts in a Standard Industrial Classification (SIC) category; (4) more than $10,000 sales and 50% of receipts from dairy; and lastly, (5) $50,000 and 50% of total receipts from dairy sales. Table 2 shows the census number of farms in each of the definitions for the four states in the study.

Table 2. Number of Farms Meeting Sales and Percent Receipts Restriction from Census.

	(1)	(2)	(3)	(4)	(5)
	> $1,000	> $10,000	> 50%	> $10,000 $ 50%	> $50,000 $ 50%
Michigan	4,836	4,755	4,271	4,216	3,107
New York	10,066	9,948	9,698	9,611	7,971
Pennsylvania	11,593	11,394	10,799	10,659	8,542
Wisconsin	30,048	29,804	28,264	28,064	21,178

When drawing comparisons to the census data, it makes a difference as to which definition is used. The DFAP data has only 5 farms out of 2,200 that do not meet the criteria of more than 50% of receipts from dairy sales, however, 70 farms are lost with the most restrictive definition of $50,000 in sales of dairy products. This would argue in favor of either definition three or four and because the census contains the most information about dairy farms meeting the criteria of simply more than 50% of sales, the third definition is chosen for most comparisons.

Because the sample farms produce more milk on average than the general population, it is not unexpected that they would have greater sales of dairy products (milk and cattle). Table 3 indicates that at even the most strict census definition of a dairy farm, the DFAP farms have statistically greater sales. The table also shows that the greater revenues are a result of volume and not price. Only the Pennsylvania farms have a somewhat lower price than the National Agricultural Statistics Service all milk price and that may be due to non-random geographic sampling of the data set.

Herd sizes are larger and we may reasonably expect the land base per farm to be larger as well. The U.S. DFAP farms in fact tend to be smaller on an acreage basis than the census farms with at least 50 percent of their income from dairy. Only Michigan shows a farm size that was not statistically different from the average census farm at the 95 percent level of significance, all other states were smaller. A hypothesis might be that these farms are more specialized in dairy and grow a smaller proportion of their feed. This in fact seems to be the case. As shown in Table 4, the average expenditure for purchased feed per cow is statistically and in absolute terms much higher than the census farms.

Dairy farms in the DFAP sample set do not appear to be representative of the population in general. While this makes inference to all farms in the states more difficult, it does not make comparisons between the farms or even the states less interesting or valid. Each of the state data sets can be characterized as containing information on farms that are larger and more specialized than the population at large. The Ontario data appears to hold a unique place in the data set and should perhaps be used for special purposes. One such purpose may be to examine the competitiveness of the Ontario farms in a freer dairy trade scenario.

Table 3. Average Dollars of Dairy Products Sold per Farm and Milk Price.

	> 50%[1]	> $50,000 & 50%[1]	DFAP Average	All Milk Price[2]	DFAP Average
Michigan	$136,574	$177,142	$328,044*	$13.30	$13.33
New York	$145,812	$170,867	$334,217*	$13.40	$13.40
Pennsylvania	$110,609	$132,141	$171,165*	$14.05	$13.98**
Wisconsin	$97,445	$119,825	$191,698*	$13.28	$13.30

* Statistically different at the 99% level.
**Statistically different at the 95% level.

[1]Census Definition.
[2]Agricultural Prices Annual Summary, National Agricultural Statistics Service.

Table 4. Comparison of Acres per Farm and Feed Cost per Cow.

	Acres per Farm		Feed Cost per Cow	
	Census	DFAP	Census	DFAP
Michigan	405	424	$448	$574*
New York	393	321*	$544	$722*
Pennsylvania	254	231*	$538	$636*
Wisconsin	293	214*	$385	$603*

* Statistically different at the 99% level.

DEFINITIONS OF VARIABLES IN THE POOLED DATA SET

This data set includes production and financial information from renters, part time farmers and full time farmers who own or lease at least 10 milking and dry cows and receive at least 90 percent of their accrual gross receipts from the sale of milk, dairy cattle and calves. Accrual Receipts is calculated as total sales of all farm products and services accounting for changes in accounts receivable and quantity and value of goods held for sale. Accrual Expenses is calculated as cash expense plus changes in accounts payable and inventory of purchased inputs.

The following is the complete list of variables and their definition as contained in the pooled data set.

General Information:

1. County Code: County identification using FIPS codes.
2. Farm Identification Number: State or Provincial specific code that uniquely identifies each individual farm.
3. Beginning of Year Herd Size: Total owned and leased milking and dry cows in farmer's possession January 1.
4. End of Year Herd Size: Total owned and leased milking and dry cows in farmer's possession December 31.
5. Average Herd Size: Average monthly herd size or average of beginning and ending herd sizes.
6. Total Pounds of Milk Sold: Pounds of milk sold as reported by the milk plant.
7. Hours of Unpaid Owner/Operator Labor: Hours of operator's labor contributed to the operation. The average full time owner/operator contributes 2800 hours per year.
8. Hours of Unpaid Family Labor per Year: Hours of family labor contributed to the operation. The average full time employee contributes 2800 hours per year.
9. Hours of Hired Labor per Year: Hours of family and non-family labor contributed to the operation where a wage is paid in return. The average full time employee contributes 2800 hours per year.
10. Number of Hay and Other Forage Acres: Total owned and rented acres harvested for use as hay or forage. This does not include acres pastured or corn silage acres. Thirty acres of alfalfa pastured for first cutting and harvested for two cuttings would be considered 10 acres pasture and 20 acres hay.
11. Number of Corn Silage Acres: Total owned and rented acres harvested as corn silage.

12. Number of Pasture Acres: Total tillable and non-tillable acres owned and rented where animals are allowed to graze. Thirty acres of alfalfa pastured for first cutting and harvested for two cuttings would be considered 10 acres pasture and 20 acres hay.
13. Number of Corn Grain Acres: Total owned and rented acres used for the production of corn for grain.
14. Total Tillable Crop Acres: Total owned and rented acres which are capable of having crops planted and harvested.
15. Total Farm Acres: Total tillable and non-tillable acres owned and rented.
16. Total Rented Acres: Total tillable and non-tillable acres not owned by the farmer, yet under his control.
17. Family Living Expenses: Total personal expenses incurred in the support of family living, includes state and federal income taxes.
18. Cash Off-Farm Income: Total wages available to the farm operation and family living expenses.
19. Non-farm Capital Contributions: Non-wage contributions to the farm business such as from inheritances, gifts and sale of non-farm assets. Non-monetary contributions are valued at market price.
20. Barn Type: Predominant housing system for milk cows. 0=Unknown, 1=Conventional Stanchion, 2=Free Stall, 3=Combination.
21. Milking System: 0=Unknown, 1=Pipeline, 2=Herringbone Parlor, 3=Dumping Station, 4=Other Parlor, 5=Other.
22. Milkings per Day: 0=Other, 2=Two, 3=Three.
23. Corn Silage Yield per Acre: Average tons corn silage harvested per acre as reported by operators on an as fed basis. Yields are standardized to a 65% dry matter basis.
24. Hay (or equivalent) Yield per Acre: Average tons grass, alfalfa and small grain forage harvested per acre as reported by operator on an as fed basis. Yields are standardized to a 90% dry matter basis.
25. Corn Grain Yield per Acre: Average bushels dry, shelled and stored or marketed corn per acre. Yields are standardized to a 86% dry matter basis.

Financial Information

26. Beginning Market Value of Land and Buildings: Market value of owned and leased real estate including living accommodations as of January 1.
27. Ending Market Value of Land and Buildings: Market value of owned and leased real estate including living accommodations on December 31.
28. Beginning Market Value of Livestock: Market value of all owned and leased livestock as of January 1.
29. Ending Market Value of Livestock: Market value of all owned and leased livestock as of December 31.
30. Beginning Market Value of Machinery and Equipment: Market value of all owned and leased machinery and equipment as of January 1.
31. Ending Market Value of Machinery and Equipment: Market value of all owned and leased machinery and equipment as of December 31.
32. Beginning Total Assets: Market value of all owned and leased assets as of January 1.
33. Ending Total Assets: Market value of all owned and leased assets as of December 31.

34. Beginning Total Debt: Total money owed to outside parties as of January 1.
35. Ending Total Debt: Total money owed to outside parties as of December 31.

Returns:

36. Total Farm Receipts: Total cash received from sale of farm products or services.
37. Accrual Farm Receipts Adjustment: Adjustments to farm receipts recognizing changes accounts receivable and in quantity and value of goods held for sale.
38. Milk Sales: Cash sales of milk as reported by the milk plant.
39. Accrual Milk Sales Adjustment: Adjustments of milk sales recognizing changes in accounts receivable.
40. Dairy Livestock Sales: Cash sales of milking and dry cows, dairy heifers, bulls and steers.
41. Accrual Dairy Livestock Sales Adjustment: Adjustments to dairy livestock sales accounting for changes in accounts receivable and value of dairy livestock inventories excluding purchases.
42. Other Livestock Sales; Cash sales of livestock and livestock products not considered dairy livestock as defined above.
43. Accrual Other Livestock Sales Adjustment: Adjustments to other livestock sales accounting for changes in accounts receivable and value of other livestock inventories excluding purchases.
44. Crop Sales: Cash sales of plant products.
45. Accrual Crop Sales Adjustment: Adjustments to crop sales accounting for changes in quantity (excluding purchases), accounts receivable and crop appreciation.
46. Government Payments: Payments received from government program participation.
47. Accrual Government Payments Adjustment: Adjustments accounting for government payments that will be received in the future in payment for government program participation in the year examined.

Inventory Changes:

48. Dairy Livestock: Changes in value of all dairy cattle from beginning to end of year accounting for changes in quantity, quality and appreciation.
49. Other Livestock: Changes in value of all nondairy livestock from beginning to end of year accounting for changes in quantity, quality and appreciation.
50. Stored Crops: Changes in value of all stored crops from beginning to end of year accounting for changes in quantity, quality and appreciation.
51. Purchased Feed: Changes in value of all purchased grain and roughage to be used for feed from beginning to end of year accounting for changes in quantity, quality and appreciation.
52. Other Supplies: Changes in value of all other supplies from beginning to end of year accounting for changes in quantity, quality and appreciation.
53. Prepaid Expenses: Changes in amount of prepaid expenses from beginning to end of year.
54. Accounts Receivable: Changes in amount of accounts receivable from beginning to end of year.
55. Accounts Payable: Changes in amount of accounts payable from beginning to end of year.

Expenses:

56. Milk Marketing Expense: Cost of hauling, cooperative dues, milk assessment, milk quota, etc. related to the marketing of milk.
57. Accrual Milk Marketing Adjustment: Adjustment to milk marketing expenses accounting for changes in prepaid expenses and accounts payable.
58. Crop Expenses: Costs of crop supplies such as seed, fertilizer, lime and chemicals.
59. Accrual Crop Expense Adjustment: Adjustment to crop expenses accounting for changes in value of the crop supply inventory, prepaid expenses and accounts payable.
60. Purchased Dairy Feed Expense: Cost of grain and roughage bought for feeding to dairy cattle.
61. Accrual Dairy Feed Expense Adjustment: Adjustment to dairy feed expenses accounting for changes in value of the inventory, prepaid expenses and accounts payable.
62. Total Feed Purchased: Cost of grain and roughage bought for feeding to all livestock including dairy cattle.
63. Accrual Total Feed Adjustment: Adjustment to total feed expenses accounting for changes in quantity and value of feed stocks, prepaid expenses and accounts payable.
64. Veterinary and Medicine Expense: Cost of all veterinary visits, veterinary medical supplies and related livestock health expenses.
65. Accrual Veterinary and Medicine Expense: Adjustment to veterinary and medicine expenses accounting for changes in accounts payable and value of veterinary medical supply inventories.
66. Breeding Expense: Cost of breeding supplies and services.
67. Accrual Breeding Expense Adjustment: Adjustment to breeding expenses recognizing changes in accounts payable and inventory.
68. Fuel Expense: Cost of fuel, oil and lubrication of farm machinery.
69. Accrual Fuel Expense Adjustment: Adjustment to fuel expenses accounting for changes in accounts payable and value of the inventory.
70. Utilities: Costs of telephone service, gas and electricity allocated to the farm business.
71. Accrual Utilities Adjustment: Adjustment to utility expenses accounting for changes in prepaid expenses and accounts payable
72. Building Repairs: Costs incurred in maintaining the functionality of existing buildings.
73. Accrual Building Repairs Adjustment: Adjustment to building repairs costs accounting for changes in quantity and value of building supplies and accounts payable.
74. Machinery Repairs: Cost incurred in maintaining the functionality of existing machinery excluding fuel and oil charges.
75. Accrual Machinery Repairs Adjustment: Adjustment to machinery repair costs accounting for changes in quantity and value of machinery supplies and accounts payable.
76. Hired Labor Expense: Costs of wages and benefits paid to employees.
77. Accrual Hired Labor Expense Adjustment: Adjustment to hired labor expenses accounting for changes in accounts payable and prepaid expenses.
78. Taxes: Property tax costs related to farm business.

79. Accrual Tax Adjustment: Adjustment to property tax cost accounting for changes in prepaid expenses and accounts payable.
80. Lease Payments: Costs incurred for the right to use machinery, equipment or livestock of another.
81. Accrual Lease Payment Adjustment: Adjustment to lease payments accounting for changes in prepaid expenses and accounts payable.
82. Insurance: Premiums paid to protect against liability and personal property losses as it relates to the farm business. This does not include crop or employee related insurance.
83. Accrual Insurance Adjustment: Adjustment to insurance costs accounting for changes in prepaid expenses and accounts payable.
84. Land Rent: Costs incurred for the right to use land owned by another.
85. Accrual Land Rent Adjustment: Adjustment to land rent costs accounting for changes in prepaid expenses and accounts payable.
86. Interest: Amount paid for the use of loan money received.
87. Accrual Interest Expense Adjustment: Adjustment to interest expenses accounting for changes in prepaid expenses and accounts payable.
88. Custom Machinery Expense: Costs incurred for the hired operation of another's machinery for the farm business.
89. Accrual Custom Machinery Expense: Adjustment to custom machinery expenses accounting for changes in prepaid expenses and accounts payable.
90. Total Cash Expenses: Total cash costs incurred related to operation of the farm business.
91. Accrual Adjustment for Total Expenses: Adjustment to total cash expenses accounting for changes in quantity and value of purchased goods, accounts receivable and prepaid expenses.
92. Depreciation: Tax credits taken accounting for the decline in economic value of an eligible limited life asset.

CALCULATION OF PRODUCTION AND FINANCIAL FACTORS

The production and financial factors used in this analysis were calculated as follows:

Size of Business:

Average Number of Cows - Average monthly number of cows or average of beginning and end of year number of cows.

Milk Sold, lbs. - Total pounds of milk sold during the calendar year.

Worker Equivalent - Total hours of labor provided by the operator/manager, family unpaid and hired labor divided by 2,800 hours per year specified for a full-time equivalent.

Total Tillable Acres - Total tillable acres or acres capable of being tilled.

Rates of Production:

Milk Sold Per Cow - Milk sold, pounds divided by average number of cows.

Hay DM Per Acre, tons - Tons of 90 percent DM hay harvested per acre.

Corn Silage, tons - Tons of 65 percent DM corn silage, harvested per acre.

Labor Efficiency:

Cows Per Worker - Average number of cows divided by the worker equivalent.

Milk Sold per Worker - Milk sold, pounds divided by the worker equivalent.

Cost Control:

Grain and Concentrate Purchase % Milk Sales - Accrual grain and concentrate purchased as a percentage of accrual milk receipts.

Feed and Crop Expense/cwt. - Accrual feed and crop expense divided by the hundredweight of milk sold.

Labor and Machinery Costs Per Cow - Labor cost is the value of operator and family labor at $1,350 per month plus actual hired labor cost. Machinery cost is the sum of fuel, oil and grease; repairs; machinery hire, rent and lease; farm share of auto expenses; interest at 5 percent on market value of machinery; and depreciation on machinery. Labor cost and machinery cost are summed and then divided by the average number of cows.

Operating Cost of Producing Milk - Total accrual expenses less depreciation and non-milk, accrual receipts divided by hundredweight of milk sold.

Capital Efficiency:

Farm Capital Per Cow - Total assets from the balance sheet (average) divided by the average number of cows.

Machinery and Equipment Per Cow - Market value of machinery and equipment (average) divided by the average number of cows.

Asset Turnover Ratio - Total accrual receipts divided by total assets (average) from the balance sheet.

Profitability:

Net Farm Income Without Appreciation - Return to the operator(s) and unpaid family labor, management and equity.

Net Farm Income With Appreciation - Return to the operator(s) and unpaid family labor, management and equity plus appreciation on real estate and machinery.

Labor and Management Income Per Operator/Manager - Net farm income without appreciation, minus a charge for the use of average equity at 5 percent, then divided by the number of operators.

Rate of Return on Equity Capital With Appreciation - Net farm income with appreciation minus the value of operator(s) and unpaid family labor divided by average equity, multiplied by 100.

Rate of Return on All Capital With Appreciation - Net farm income with appreciation plus interest paid, minus the value of operator and family labor, divided by average total assets, multiplied by 100.

Financial Summary:

Farm Net Worth, End Year - Assets minus liabilities, end year.

Debt to Asset Ratio - Total farm liabilities divided by total farm assets, end year.

Debt Per Cow - Total farm liabilities, end year, divided by end of year number of cows.

RESULTS

The characteristics and financial performance data attained by combining the individual states and province data into a pooled data set are presented for both the pooled data set as well as for the individual states. Both means of presenting the data are also used to describe the data by herd size category, by labor and management income per operator/manager and by rate of return on all capital with appreciation.

Pooled Data Set By Herd Size

Dairy farms in the pooled data set represent a wide range in herd sizes. However, 53.2 percent of the 1,818 dairy farms in the pooled data set had between 40 and 79 cows (Table 5). Only 2.6 percent of the farms had herd sizes in excess of 250 cows. Ontario has the highest percentage of small farms and New York the highest percentage of large farms.

Size of Business

Size of business, as measured by number of cows in the herd, ranged from a 32 cow average at the small herd size category (10 to 39 cows) to a 429 cow average for the largest herd size category (250 cows and over) (Table 6). The average herd size for all farms in the pooled data set was 84 cows. Total pounds of milk sold, worker equivalent, and total tillable acres all increased with herd size.

Rates of Production

The results from the pooled data set show that as average herd size increases, pounds of milk sold per cow also increases (Table 6). Interestingly, corn silage yield was constant over most herd sizes, but was lowest for the small herd size category and highest for the largest herd size category.

Pounds of milk sold per cow averaged 19,191 pounds for the 250 and over herd size category. This is 20 percent greater than the smallest herd size category. The average for all farms was 17,348 pounds of milk sold per cow.

Labor Efficiency

Labor efficiency, whether measured as cows per worker or pounds of milk sold per worker, increased as herd size increased (Table 6). Cows per worker ranged from 25 to 46 as herd size increased from the smallest to the largest herd size category. Pounds of milk sold per worker ranged from 391,349 to over 881,000 from the smallest to the largest herd size categories.

Cost Control

Grain and concentrate purchased as a percent of milk sales, and feed and crop expense per cwt. of milk sold generally increased, but only by a small amount, as herd size increased (Table 6). Labor and machinery costs per cow decreased as herd size increased. Operating cost of producing milk increased as herd size increased. Operating costs increase as a result of a greater portion of the total labor becoming a cash cost on larger farms, whereas most of the labor is provided by the operator and family on smaller farms.

Capital Efficiency

Farm capital per cow decreased dramatically as herd size increased (Table 6). Farm capital per cow is one third less on large farms, than on the smallest farms. A similar pattern exists for machinery and equipment investment per cow. As would be expected, asset turnover ratio increases as herd size increases indicating that each dollar of investment is being used more productively on larger farms.

Profitability

Net farm income, with or without appreciation, is more than 10 times larger on the largest farms than on the smallest farms (Table 6). Labor and management income per operator shows an even more striking difference, ranging from -$6,862 on the smallest farms to over $90,000 on the largest farms. Rate of return on equity capital with appreciation is negative for the smallest farms, but a return of almost 9 percent is attained on the largest farms. Rate of return on all capital with appreciation shows a similar pattern, but with a somewhat smaller range than rate of return on equity.

Financial Summary

Farm net worth ranges from $213,198 on the smallest farms to over $1,675,000 on the largest farms (Table 6). Debt to asset ratio increases, while farm debt per cow remains relatively constant moving from the smallest to the largest herd size categories.

Individual States By Herd Size

The mean values of the characteristics and financial performance data show that the Michigan and New York farms in the data set are larger than the farms in Ontario, Pennsylvania and Wisconsin (Table 7). Farms in Michigan and New York also had higher rates of milk production and profitability.

Michigan

Farms in Michigan are similar to the pooled data set in regards to level and change in performance factors with herd size except for labor and management income, rate of return on equity and all capital, and farm debt per cow at the highest herd size category (Table 8). In Michigan, the largest herd size category exhibits a decrease in rate of return on equity and all capital, and a decrease in debt to asset ratio and farm debt per cow from the next lower herd size category.

New York

Farms in New York deviate from the pooled data set averages in that pounds of milk sold per cow are higher, farm capital per cow is lower, and rates of return are higher for the largest herd size category (Table 9).

Ontario

Farms in Ontario have the highest investment per cow, labor and management income is negative regardless of herd size, rates of return on investment are low, and farm debt per cow is high, especially on the small herd size group (Table 10).

Pennsylvania

Pennsylvania deviates from the pooled data set averages in that farm capital per cow is higher, and rates of return on equity and all capital are lower (Table 11). Debt to asset ratios and debt per cow is lower than the pooled data set average.

Wisconsin

Farms in Wisconsin exhibit similar patterns to dairy farms in Michigan and New York (Table 12). However, rates of return are lower in Wisconsin and debt per cow is higher.

What stands out in the analysis is that farms within a herd size category have more performance factors in common with other farms of similar size in other states than they do with other farms of different herd sizes in the same state. Ontario is an exception to this, but this is largely due to the larger investments and higher debt per cow that exists under the Ontario milk marketing system.

Table 5: Size Distribution of Farms in Pooled Data Set, By Herd Size, 1992

State	Total Farms	Herd Size Categories: 10-39 Cows	40-79 Cows	80-119 Cows	120-159 Cows	160-249 Cows	250 Cows and Over
		Percent of Farms in Each Herd Size Category					
Michigan	141	7.1	29.8	20.6	22.7	15.6	4.3
New York	362	6.1	42.3	21.8	11.6	10.2	8.0
Ontario	44	40.9	50.0	9.1	0.0	0.0	0.0
Pennsylvania	898	13.9	57.7	18.2	6.6	2.8	0.9
Wisconsin	373	14.7	62.5	13.7	4.6	3.2	1.3
Total	1,818	12.7	53.2	17.9	8.3	5.3	2.6

Table 6: Characteristics and Financial Performance of Pooled Data Set, All Farms and By Herd Size, 1992.

	Mean Values By Herd Size						
	All Farms	10-39 Cows	40-79 Cows	80-119 Cows	120-159 Cows	160-249 Cows	250 and Over
SIZE OF BUSINESS							
Average Number of Cows	84	32	57	95	136	193	429
Milk Sold, lbs.	1,502,715	519,390	969,236	1,702,880	2,535,201	3,558,784	8,274,866
Worker Equivalent	2.49	1.49	1.89	2.72	3.70	4.79	9.67
Total Tillable Acres	263	129	190	303	434	565	972
RATES OF PRODUCTION							
Milk Sold per Cow, lbs.	17,348	15,999	17,058	17,999	18,582	18,450	19,191
Hay DM per Acre, tons	2.84	2.32	2.76	3.05	3.19	3.26	3.46
Corn Silage per Acre, tons	15.74	14.25	15.82	16.23	15.80	15.64	16.97
LABOR EFFICIENCY							
Cows per Worker	34	25	33	38	42	44	46
Milk Sold per Worker, lbs.	595,572	391,349	555,126	678,577	768,247	795,944	881,696
COST CONTROL							
Grain & Conc Purc-% Milk Sales (%)	26	26	25	26	26	26	28
Feed & Crop Expense/cwt ($)	4.48	4.37	4.41	4.66	4.69	4.60	4.68
Labor & Mach Costs per Cow ($)	849	1,074	834	789	810	771	772
Oper Cost of Prod Milk ($)	10.04	10.01	9.82	10.32	10.39	10.51	10.52
CAPITAL EFFICIENCY (YEAR AVG.)							
Farm Capital per Cow ($)	7,798	8,819	8,053	7,368	6,879	6,525	6,108
Machinery & Equip per Cow ($)	1,363	1,572	1,391	1,347	1,229	1,062	960
Asset Turnover Ratio	0.40	0.36	0.38	0.43	0.46	0.49	0.56
PROFITABILITY							
Net Farm Income w/o Appr. ($)	33,047	11,396	22,510	35,342	54,694	68,570	195,022
Net Farm Income w/ Appre.($)	54,555	20,065	37,947	59,991	87,200	116,489	291,951
Labor & Mgmt Inc per Op/Mgr ($)	2,551	-6,862	-861	3,769	3,890	13,118	90,377
Rate of Return on Eq Cap w/Appr (%)	-1.30	-8.63	-2.01	-0.09	3.89	6.05	8.89
Rate of Return on All Cap w/ Appr (%)	1.96	-2.66	1.39	3.78	4.71	5.24	7.96
FINANCIAL SUMMARY							
Farm Net Worth, End Year ($)	443,355	213,198	336,625	495,188	713,151	857,061	1,676,021
Debt to Asset Ratio	0.30	0.26	0.29	0.32	0.28	0.39	0.39
Farm Debt per Cow ($)	2,143	2,098	2,139	2,264	1,818	2,330	2,216

Table 7: Characteristics and Financial Performance, By State, 1992.

	Mean Values By States				
	Michigan	New York	Ontario	Pennsylvania	Wisconsin
SIZE OF BUSINESS					
Average Number of Cows	122	121	48	71	69
Milk Sold, lbs.	2,286,976	2,273,051	707,888	1,205,514	1,267,909
Worker Equivalent	3.72	3.44	2.98	1.98	2.28
Total Tillable Acres	500	326	167	215	240
RATES OF PRODUCTION					
Milk Sold per Cow, lbs.	18,410	18,275	14,776	16,661	18,004
Hay DM per Acre, tons	3.02	2.70	3.09	2.95	2.59
Corn Silage per Acre, tons	12.10	14.56	13.65	17.12	15.06
LABOR EFFICIENCY					
Cows per Worker	37	33	16	37	30
Milk Sold per Worker, lbs.	676,823	601,837	242,511	618,880	244,091
COST CONTROL					
Grain & Conc Purc-% Milk Sales (%)	°°	29	12	26	25
Feed & Crop Expense/cwt ($)	°°	4.73	2.73	4.67	3.99
Labor & Mach Costs per Cow ($)	985	865	1,518	819	775
Oper Cost of Prod Milk ($)	9.82	10.10	10.85	10.44	8.99
CAPITAL EFFICIENCY (YEAR AVG.)					
Farm Capital per Cow ($)	7,465	6,693	11,603	8,534	6,776
Machinery & Equip per Cow ($)	1,308	1,346	2,613	1,403	1,159
Asset Turnover Ratio	0.46	0.48	0.27	0.35	0.46
PROFITABILITY					
Net Farm Income w/o Appr. ($)	53,041	52,368	27,677	23,394	30,613
Net Farm Income w/ Appre.($)	83,650	78,492	41,640	41,827	52,494
Labor & Mgmt Inc per Op/Mgr ($)	4,026	17,202	-18,249	-4,583	7,481
Rate of Return on Eq Cap w/Appr (%)	-1.71	1.63	-9.32	-1.76	-1.98
Rate of Return on All Cap w/ Appr (%)	4.02	4.06	-1.94	1.31	1.14
FINANCIAL SUMMARY					
Farm Net Worth, End Year ($)	730,270	488,101	449,091	439,200	300,796
Debt to Asset Ratio	0.29	0.35	0.25	0.26	0.35
Farm Debt per Cow ($)	1,951	2,220	2,944	2,064	2,210

°° = Not Available

Table 8: Characteristics and Financial Performance, Michigan, 1992.

	Mean Values By Herd Size					
	10-39 Cows	40-79 Cows	80-119 Cows	120-159 Cows	160-249 Cows	250 and Over
SIZE OF BUSINESS						
Average Number of Cows	31	61	98	140	202	423
Milk Sold, lbs.	557,849	1,050,816	1,806,474	2,853,113	3,689,323	7,983,064
Worker Equivalent	1.23	2.16	3.22	4.38	5.33	11.74
Total Tillable Acres	206	280	434	637	678	1,449
RATES OF PRODUCTION						
Milk Sold per Cow, lbs.	17,613	17,076	18,413	20,342	18,333	19,051
Hay DM per Acre, tons	2.44	2.56	3.42	3.03	3.27	4.32
Corn Silage per Acre, tons	10.66	10.63	13.33	11.48	12.90	17.50
LABOR EFFICIENCY						
Cows per Worker	27	33	34	42	41	39
Milk Sold per Worker, lbs.	459,355	555,050	626,649	879,499	745,681	764,516
COST CONTROL						
Grain & Conc Purc-% Milk Sales (%)	oo	oo	oo	oo	oo	oo
Feed & Crop Expense/cwt ($)	oo	oo	oo	oo	oo	oo
Labor & Mach Costs per Cow ($)	1,027	973	1,016	1,022	893	984
Oper Cost of Prod Milk ($)	9.67	9.94	9.02	9.81	10.51	10.53
CAPITAL EFFICIENCY (YEAR AVG.)						
Farm Capital per Cow ($)	8,789	8,542	7,117	7,020	6,184	6,467
Machinery & Equip per Cow ($)	1,150	1,618	1,325	1,346	818	918
Asset Turnover Ratio	0.41	0.34	0.52	0.49	0.55	0.63
PROFITABILITY						
Net Farm Income w/o Appr. ($)	12,265	19,723	58,781	66,455	62,594	219,911
Net Farm Income w/ Appre.($)	22,246	35,739	79,236	104,086	115,465	317,063
Labor & Mgmt Inc per Op/Mgr ($)	4,967	-10,013	20,362	-2,827	17,597	15,256
Rate of Return on Eq Cap w/Appr (%)	-0.28	-1.53	-15.14	3.14	6.87	2.14
Rate of Return on All Cap w/ Appr (%)	2.14	1.02	7.54	4.80	4.48	5.42
FINANCIAL SUMMARY						
Farm Net Worth, End Year ($)	227,439	408,232	573,328	869,064	997,228	2,862,069
Debt to Asset Ratio	0.23	0.27	0.35	0.26	0.36	0.32
Farm Debt per Cow ($)	2,007	2,056	2,208	1,568	1,893	1,762

oo = Not Available

Table 9: Characteristics and Financial Performance, New York, 1992.

	Mean Values By Herd Size					
	10-39 Cows	40-79 Cows	80-119 Cows	120-159 Cows	160-249 Cows	250 and Over
SIZE OF BUSINESS						
Average Number of Cows	32	58	96	137	193	472
Milk Sold, lbs.	557,580	1,033,079	1,753,044	2,614,997	3,670,499	9,254,750
Worker Equivalent	1.42	2.11	2.97	3.95	5.18	10.32
Total Tillable Acres	125	194	285	368	539	949
RATES OF PRODUCTION						
Milk Sold per Cow, lbs.	17,546	17,704	18,274	19,128	19,104	19,555
Hay DM per Acre, tons	1.75	2.57	2.82	2.92	2.97	3.11
Corn Silage per Acre, tons	12.16	14.27	14.44	15.39	15.04	15.69
LABOR EFFICIENCY						
Cows per Worker	24	29	34	36	39	46
Milk Sold per Worker, lbs.	423,277	509,037	616,490	686,312	734,746	895,058
COST CONTROL						
Grain & Conc Purc-% Milk Sales (%)	35	29	29	29	29	29
Feed & Crop Expense/cwt ($)	5.14	4.63	4.78	4.69	4.83	4.72
Labor & Mach Costs per Cow ($)	1,042	876	838	855	824	811
Oper Cost of Prod Milk ($)	10.70	9.76	10.22	10.24	10.52	10.41
CAPITAL EFFICIENCY (YEAR AVG.)						
Farm Capital per Cow ($)	7,928	6,967	6,602	6,326	6,301	5,593
Machinery & Equip per Cow ($)	1,384	1,442	1,453	1,221	1,181	911
Asset Turnover Ratio	0.51	0.44	0.47	0.52	0.50	0.60
PROFITABILITY						
Net Farm Income w/o Appr. ($)	10,404	24,176	37,187	59,706	74,498	235,425
Net Farm Income w/ Appre.($)	16,894	37,635	57,943	86,458	116,855	336,268
Labor & Mgmt Inc per Op/Mgr ($)	-12,161	3,570	10,947	14,624	17,774	131,440
Rate of Return on Eq Cap w/Appr (%)	-9.71	-2.04	2.79	7.54	6.14	12.08
Rate of Return on All Cap w/ Appr (%)	-0.55	2.17	4.68	6.32	6.26	9.72
FINANCIAL SUMMARY						
Farm Net Worth, End Year ($)	169,429	283,945	429,900	625,532	707,866	1,486,067
Debt to Asset Ratio	0.31	0.33	0.34	0.31	0.45	0.42
Farm Debt per Cow ($)	2,609	2,175	2,183	1,827	2,674	2,253

Table 10: Characteristics and Financial Performance, Ontario, 1992.

	Mean Values By Herd Size		
	10-39 Cows	40-79 Cows	80-119 Cows
SIZE OF BUSINESS			
Average Number of Cows	32	52	96
Milk Sold, lbs.	465,619	774,134	1,433,747
Worker Equivalent	2.92	3.01	3.09
Total Tillable Acres	169	150	258
RATES OF PRODUCTION			
Milk Sold per Cow, lbs.	14,463	14,990	15,003
Hay DM per Acre, tons	2.62	3.23	4.68
Corn Silage per Acre, tons	14.52	13.24	13.43
LABOR EFFICIENCY			
Cows per Worker	11	18	32
Milk Sold per Worker, lbs.	162,159	264,640	482,382
COST CONTROL			
Grain & Conc Purc-% Milk Sales (%)	14	11	11
Feed & Crop Expense/cwt ($)	3.05	2.55	2.29
Labor & Mach Costs per Cow ($)	1,842	1,342	1,026
Oper Cost of Prod Milk ($)	11.49	10.26	11.25
CAPITAL EFFICIENCY (YEAR AVG.)			
Farm Capital per Cow ($)	11,937	10,523	16,037
Machinery & Equip per Cow ($)	2,905	2,349	2,756
Asset Turnover Ratio	0.25	0.30	0.23
PROFITABILITY			
Net Farm Income w/o Appr. ($)	15,647	34,927	41,938
Net Farm Income w/ Appre.($)	25,287	49,279	73,221
Labor & Mgmt Inc per Op/Mgr ($)	-21,602	-10,825	-43,991
Rate of Return on Eq Cap w/Appr (%)	-17.90	-4.13	0.71
Rate of Return on All Cap w/ Appr (%)	-5.47	0.08	2.88
FINANCIAL SUMMARY			
Farm Net Worth, End Year ($)	275,419	449,763	1,226,919
Debt to Asset Ratio	0.30	0.23	0.17
Farm Debt per Cow ($)	3,713	2,339	2,808

Table 11: Characteristics and Financial Performance, Pennsylvania, 1992.

	Mean Values By Herd Size					
	10-39 Cows	40-79 Cows	80-119 Cows	120-159 Cows	160-249 Cows	250 and Over
SIZE OF BUSINESS						
Average Number of Cows	32	57	94	135	185	309
Milk Sold, lbs.	511,881	939,522	1,638,882	2,318,509	3,360,944	5,492,576
Worker Equivalent	1.35	1.71	2.46	3.12	3.77	5.73
Total Tillable Acres	118	178	277	380	499	719
RATES OF PRODUCTION						
Milk Sold per Cow, lbs.	15,805	16,493	17,402	17,142	18,115	17,727
Hay DM per Acre, tons	2.40	2.89	3.18	3.57	3.82	3.61
Corn Silage per Acre, tons	14.86	17.04	17.79	18.95	18.45	20.78
LABOR EFFICIENCY						
Cows per Worker	26	36	42	47	54	54
Milk Sold per Worker, lbs.	414,285	592,146	730,620	797,669	960,595	939,276
COST CONTROL						
Grain & Conc Purc-% Milk Sales (%)	27	25	26	24	23	24
Feed & Crop Expense/cwt ($)	4.63	4.63	4.81	4.85	4.51	4.63
Labor & Mach Costs per Cow ($)	1,015	807	763	727	733	704
Oper Cost of Prod Milk ($)	10.21	10.27	10.84	11.19	10.53	10.55
CAPITAL EFFICIENCY (YEAR AVG.)						
Farm Capital per Cow ($)	9,339	8,779	7,755	7,290	7,568	8,151
Machinery & Equip per Cow ($)	1,647	1,419	1,292	1,173	1,162	1,319
Asset Turnover Ratio	0.32	0.33	0.38	0.41	0.39	0.38
PROFITABILITY						
Net Farm Income w/o Appr. ($)	9,596	19,271	29,172	41,040	71,854	106,625
Net Farm Income w/ Appre.($)	17,928	34,272	53,765	72,172	121,383	188,800
Labor & Mgmt Inc per Op/Mgr ($)	-7,674	-4,995	-2,392	-5,412	2,906	10,155
Rate of Return on Eq Cap w/Appr (%)	-8.34	-1.70	0.90	1.34	3.68	4.75
Rate of Return on All Cap w/ Appr (%)	-2.89	1.24	3.12	3.77	4.83	5.78
FINANCIAL SUMMARY						
Farm Net Worth, End Year ($)	234,624	378,269	519,315	715,022	1,084,081	1,899,194
Debt to Asset Ratio	0.21	0.26	0.30	0.27	0.25	0.27
Farm Debt per Cow ($)	1,837	2,085	2,284	1,869	1,784	2,022

Table 12: Characteristics and Financial Performance, Wisconsin, 1992.

	Mean Values By Herd Size					
	10-39 Cows	40-79 Cows	80-119 Cows	120-159 Cows	160-249 Cows	250 and Over
SIZE OF BUSINESS						
Average Number of Cows	33	55	92	132	197	377
Milk Sold, lbs.	531,784	997,090	1,791,922	2,491,685	3,387,178	7,393,365
Worker Equivalent	1.41	1.97	2.87	3.81	4.76	8.89
Total Tillable Acres	127	200	339	407	571	935
RATES OF PRODUCTION						
Milk Sold per Cow, lbs.	16,030	18,080	19,482	18,915	17,347	19,586
Hay DM per Acre, tons	2.27	2.59	2.65	2.85	2.96	4.23
Corn Silage per Acre, tons	14.01	15.12	15.67	13.95	16.67	17.40
LABOR EFFICIENCY						
Cows per Worker	25	30	34	35	43	45
Milk Sold per Worker, lbs.	390,312	530,425	653,337	660,882	733,762	864,195
COST CONTROL						
Grain & Conc Purc-% Milk Sales (%)	24	24	26	26	25	30
Feed & Crop Expense/cwt ($)	3.91	3.95	4.17	4.12	4.10	4.57
Labor & Mach Costs per Cow ($)	975	793	649	588	466	399
Oper Cost of Prod Milk ($)	8.86	8.78	9.51	9.03	10.45	11.07
CAPITAL EFFICIENCY (YEAR AVG.)						
Farm Capital per Cow ($)	6,979	6,830	6,782	6,554	5,665	5,398
Machinery & Equip per Cow ($)	1,116	1,163	1,261	1,224	936	719
Asset Turnover Ratio	0.41	0.46	0.49	0.46	0.54	0.58
PROFITABILITY						
Net Farm Income w/o Appr. ($)	14,332	27,946	38,358	67,556	54,404	72,256
Net Farm Income w/ Appre.($)	24,086	45,652	71,080	109,401	107,041	169,824
Labor & Mgmt Inc per Op/Mgr ($)	117	7,929	7,627	19,384	13,693	9,598
Rate of Return on Eq Cap w/Appr (%)	-7.32	-2.58	0.80	4.98	9.19	4.31
Rate of Return on All Cap w/ Appr (%)	-2.93	1.40	2.44	3.75	4.34	3.84
FINANCIAL SUMMARY						
Farm Net Worth, End Year ($)	159,057	255,044	417,384	629,646	587,148	997,418
Debt to Asset Ratio	0.33	0.34	0.35	0.29	0.52	0.48
Farm Debt per Cow ($)	1,967	2,229	2,300	1,875	2,882	2,582

Pooled Data Set By Labor and Management Income Per Operator/Manager By Quartile

New York has the highest percentage of farms in the high profitbility quartile, while Ontario has the highest percentage in the low rofitability quartile (Table 13). This is related to the relative erd size differences between the two states and the investments in airy farms in Ontario. Farms with higher labor and management inomes are larger, with greater labor efficiency, higher rates of prouction and significantly greater cost control even with larger milk utput per cow (Table 14).

Labor and Management Income Per Operator/Manager By State and Quartile

The same patterns as evidenced in the pooled data set can be oberved in the individual states data. However, Michigan, Ontario and ennsylvania have large average herd sizes in the least profitability ategories as well (Tables 15, 16, 17, 18 and 19).

Pooled Data Set By Rate of Return on all Capital with Appreciation, By Quartile

As with labor and management incomes, rate of return on all capial, with appreciation finds the largest percentage of farms in the ighest income quartile in New York and the highest number of farms in he lowest quartile in Ontario (Table 20). Unlike labor and manageent incomes, rate of return on all capital shows larger farms preominating the high rate of return quartiles (Tables 22, 23, 24, 25 nd 26).

Table 13: Percentage Distribution of Labor and Management & Income Per Operator/Manager, By Quartile, Pooled Data Set, 1992.

State	Total Farms	LABOR AND MANAGEMENT INCOME PER OPERATOR/MANAGER			
		0-25%	26-50%	51-75%	76-10%
		Percent of Farms in Each Quartile			
Michigan	118	37.3	18.6	16.1	28.0
New York	362	19.1	17.7	21.8	41.4
Ontario	44	59.1	20.5	9.1	11.4
Pennsylvania	894	30.0	29.8	24.4	15.9
Wisconsin	368	10.6	23.4	34.2	31.8
TOTAL	1,786	25.0	25.0	25.0	25.0

Table 14: Labor and Management Income Per Operator/Manager, By Quartile, Pooled Data Set, 1992.

	Mean Values By Labor and Management Income Per Operator/Manager			
	0-25%	26-50%	51-75%	76-100%
SIZE OF BUSINESS				
Average Number of Cows	81	65	71	113
Milk Sold, lbs.	1,374,687	1,104,042	1,264,234	2,165,313
Worker Equivalent	2.55	2.14	2.19	3.00
Total Tillable Acres	286	210	226	306
RATES OF PRODUCTION				
Milk Sold per Cow, lbs.	16,319	16,606	17,410	18,927
Hay DM per Acre, tons	2.91	2.75	2.66	2.98
Corn Silage per Acre, tons	15.47	15.54	15.62	16.37
LABOR EFFICIENCY				
Cows per Worker	33	32	34	37
Milk Sold per Worker, lbs.	542,716	525,703	582,558	702,737
COST CONTROL				
Grain & Conc Purc-% Milk Sales (%)	27	27	25	24
Feed & Crop Expense/cwt ($)	4.87	4.67	4.34	4.07
Labor & Mach Costs per Cow ($)	962	880	809	745
Oper Cost of Prod Milk ($)	11.89	10.40	9.33	8.48
CAPITAL EFFICIENCY (YEAR AVG.)				
Farm Capital per Cow ($)	9,686	8,003	7,095	6,472
Machinery & Equip per Cow ($)	1,667	1,385	1,281	1,138
Asset Turnover Ratio	0.30	0.36	0.42	0.54
PROFITABILITY				
Net Farm Income w/o Appr. ($)	3,658	17,670	31,662	77,122
Net Farm Income w/ Appre.($)	27,111	34,364	50,667	102,645
Labor & Mgmt Inc per Op/Mgr ($)	-33,468	-5,274	7,713	41,163
Rate of Return on Eq Cap w/Appr (%)	-9.18	-5.30	0.31	8.59
Rate of Return on All Cap w/ Appr (%)	-2.81	-0.84	2.28	9.07
FINANCIAL SUMMARY				
Farm Net Worth, End Year ($)	539,706	366,691	346,419	487,613
Debt to Asset Ratio	0.28	0.28	0.32	0.30
Farm Debt per Cow ($)	2,496	2,053	2,149	1,872

Table 15: Labor and Management Income Per Operator/Manager, By Quartile, Michigan, 1992.

	Mean Values By Labor and Management Income Per Operator/Manager			
	0-25%	26-50%	51-75%	76-100%
SIZE OF BUSINESS				
Average Number of Cows	125	111	87	127
Milk Sold, lbs.	2,253,536	2,001,270	1,655,379	2,416,732
Worker Equivalent	4.34	3.79	2.99	3.39
Total Tillable Acres	591	492	389	410
RATES OF PRODUCTION				
Milk Sold per Cow, lbs.	17,891	17,447	18,618	18,876
Hay DM per Acre, tons	2.73	3.09	2.77	3.01
Corn Silage per Acre, tons	10.76	11.92	11.65	12.67
LABOR EFFICIENCY				
Cows per Worker	29	30	30	40
Milk Sold per Worker, lbs.	521,600	522,427	553,745	742,582
COST CONTROL				
Grain & Conc Purc-% Milk Sales (%)				
Feed & Crop Expense/cwt ($)				
Labor & Mach Costs per Cow ($)	1,091	1,064	1,037	800
Oper Cost of Prod Milk ($)	12.00	10.51	8.62	7.52
CAPITAL EFFICIENCY (YEAR AVG.)				
Farm Capital per Cow ($)	9,847	7,807	7,322	5,321
Machinery & Equip per Cow ($)	1,607	1,407	1,435	906
Asset Turnover Ratio	0.32	0.39	0.43	0.66
PROFITABILITY				
Net Farm Income w/o Appr. ($)	6,074	28,960	48,351	109,814
Net Farm Income w/ Appre.($)	35,786	58,136	72,528	137,903
Labor & Mgmt Inc per Op/Mgr ($)	-55,740	-12,681	8,106	78,339
Rate of Return on Eq Cap w/Appr (%)	-7.17	-2.86	2.60	-5.09
Rate of Return on All Cap w/ Appr (%)	-2.04	0.16	3.89	14.02
FINANCIAL SUMMARY				
Farm Net Worth, End Year ($)	880,558	672,201	525,724	574,741
Debt to Asset Ratio	0.31	0.33	0.21	0.30
Farm Debt per Cow ($)	2,661	2,533	1,385	1,40

Table 16: Labor and Management Income Per Operator/Manager, By Quartile, New York, 1992.

	Mean Values By Labor and Management Income Per Operator/Manager			
	0-25%	26-50%	51-75%	76-100%
SIZE OF BUSINESS				
Average Number of Cows	94	87	100	201
Milk Sold, lbs.	1,691,385	1,513,185	1,897,968	3,977,193
Worker Equivalent	3.02	2.73	3.04	4.97
Total Tillable Acres	299	255	302	447
RATES OF PRODUCTION				
Milk Sold per Cow, lbs.	17,682	17,115	18,601	19,694
Hay DM per Acre, tons	2.61	2.57	2.67	2.95
Corn Silage per Acre, tons	13.47	14.25	15.40	15.09
LABOR EFFICIENCY				
Cows per Worker	31	32	32	38
Milk Sold per Worker, lbs.	536,910	535,847	598,197	735,628
COST CONTROL				
Grain & Conc Purc-% Milk Sales (%)	32	29	28	28
Feed & Crop Expense/cwt ($)	5.06	4.77	4.58	4.50
Labor & Mach Costs per Cow ($)	955	851	852	803
Oper Cost of Prod Milk ($)	12.13	10.47	9.17	8.64
CAPITAL EFFICIENCY (YEAR AVG.)				
Farm Capital per Cow ($)	8,029	6,654	6,160	5,923
Machinery & Equip per Cow ($)	1,559	1,336	1,304	1,185
Asset Turnover Ratio	0.38	0.43	0.53	0.59
PROFITABILITY				
Net Farm Income w/o Appr. ($)	-521	24,288	49,584	135,780
Net Farm Income w/ Appre.($)	22,383	42,424	71,546	177,141
Labor & Mgmt Inc per Op/Mgr ($)	-27,505	1591	16,632	77,913
Rate of Return on Eq Cap w/Appr (%)	-11.50	-3.72	5.10	16.62
Rate of Return on All Cap w/ Appr. (%)	-2.38	0.83	5.60	12.15
FINANCIAL SUMMARY				
Farm Net Worth, End Year ($)	427,871	365,917	416,093	740,388
Debt to Asset Ratio	0.37	0.34	0.33	0.34
Farm Debt per Cow ($)	2,882	2,168	1,940	1,886

Table 17: Labor and Management Income Per Operator/Manager, By Quartile, Ontario, 1992.

	Mean Values By Labor and Management Income Per Operator/Manager			
	0-25%	26-50%	51-75%	76-100%
SIZE OF BUSINESS				
Average Number of Cows	53	35	47	56
Milk Sold, lbs.	728,726	443,576	749,630	909,620
Worker Equivalent	3.30	2.80	2.91	2.92
Total Tillable Acres	217	164	149	139
RATES OF PRODUCTION				
Milk Sold per Cow, lbs.	13,227	13,088	15,978	16,809
Hay DM per Acre, tons	3.27	2.54	3.22	3.54
Corn Silage per Acre, tons	10.48	15.48	13.54	13.99
LABOR EFFICIENCY				
Cows per Worker	16	13	17	19
Milk Sold per Worker, lbs.	221,020	164,475	269,941	314,607
COST CONTROL				
Grain & Conc Purc-% Milk Sales (%)	14	15	9	10
Feed & Crop Expense/cwt ($)	2.77	3.01	2.53	2.62
Labor & Mach Costs per Cow ($)	1,644	1,739	1,383	1,306
Oper Cost of Prod Milk ($)	12.61	12.37	10.11	8.32
CAPITAL EFFICIENCY (YEAR AVG.)				
Farm Capital per Cow ($)	14,404	10,178	11,260	10,570
Machinery & Equip per Cow ($)	2,767	2,736	2,334	2,617
Asset Turnover Ratio	0.20	0.25	0.29	0.34
PROFITABILITY				
Net Farm Income w/o Appr. ($)	11,022	9,866	31,829	57,971
Net Farm Income w/ Appre.($)	27,443	17,960	47,210	73,948
Labor & Mgmt Inc per Op/Mgr ($)	-51,275	-23,788	-9,254	11,320
Rate of Return on Eq Cap w/Appr (%)	-8.76	-26.51	-5.05	3.02
Rate of Return on All Cap w/ Appr (%)	-5.94	-6.66	0.39	4.46
FINANCIAL SUMMARY				
Farm Net Worth, End Year ($)	690,177	203,450	403,595	499,142
Debt to Asset Ratio	0.16	0.42	0.27	0.16
Farm Debt per Cow ($)	2,336	4,591	3,235	1,614

Table 18: Labor and Management Income Per Operator/Manager, By Quartile, Pennsylvania, 1992.

	Mean Values By Labor and Management Income Per Operator/Manager			
	0-25%	26-50%	51-75%	76-100%
SIZE OF BUSINESS				
Average Number of Cows	74	64	65	79
Milk Sold, lbs.	1,209,832	1,045,387	1,102,016	1,431,014
Worker Equivalent	2.13	1.92	1.88	1.98
Total Tillable Acres	229	211	190	221
RATES OF PRODUCTION				
Milk Sold per Cow, lbs.	16,039	15,946	16,734	17,883
Hay DM per Acre, tons	3.09	2.87	2.82	3.04
Corn Silage per Acre, tons	16.76	16.88	16.87	17.96
LABOR EFFICIENCY				
Cows per Worker	36	35	36	42
Milk Sold per Worker, lbs.	576,521	559,899	594,611	744,786
COST CONTROL				
Grain & Conc Purc-% Milk Sales (%)	28	26	26	22
Feed & Crop Expense/cwt ($)	5.10	4.84	4.64	4.11
Labor & Mach Costs per Cow ($)	906	844	804	722
Oper Cost of Prod Milk ($)	11.98	10.73	10.00	8.99
CAPITAL EFFICIENCY (YEAR AVG.)				
Farm Capital per Cow ($)	10,400	8,665	7,824	7,262
Machinery & Equip per Cow ($)	1,672	1,433	1,367	1,145
Asset Turnover Ratio	0.27	0.30	0.36	0.45
PROFITABILITY				
Net Farm Income w/o Appr. ($)	2,362	15,798	24,441	51,319
Net Farm Income w/ Appre.($)	24,960	32,043	40,292	69,827
Labor & Mgmt Inc per Op/Mgr ($)	-35,808	-8,741	2,844	23,491
Rate of Return on Eq Cap w/Appr (%)	-7.55	-4.73	-2.00	7.29
Rate of Return on All Cap w/ Appr (%)	-2.79	-0.37	1.51	6.89
FINANCIAL SUMMARY				
Farm Net Worth, End Year ($)	574,672	406,061	353,282	414,772
Debt to Asset Ratio	0.24	0.24	0.29	0.27
Farm Debt per Cow ($)	2,238	1,928	2,124	1,964

Table 19: Labor and Management Income Per Operator/Manager, By Quartile, Wisconsin, 1992.

	Mean Values By Labor and Management Income Per Operator/Manager			
	0-25%	26-50%	51-75%	76-100%
SIZE OF BUSINESS				
Average Number of Cows	68	55	69	85
Milk Sold, lbs.	1,194,517	993,178	1,277,025	1,631,889
Worker Equivalent	2.29	2.06	2.23	2.55
Total Tillable Acres	254	203	236	269
RATES OF PRODUCTION				
Milk Sold per Cow, lbs.	17,051	17,586	18,185	19,251
Hay DM per Acre, tons	2.39	2.53	2.50	2.94
Corn Silage per Acre, tons	14.61	14.54	14.91	16.01
LABOR EFFICIENCY				
Cows per Worker	30	28	31	33
Milk Sold per Worker, lbs.	502,824	488,081	560,354	625,106
COST CONTROL				
Grain & Conc Purc-% Milk Sales (%)	27	25	23	22
Feed & Crop Expense/cwt ($)	4.45	4.04	3.84	3.63
Labor & Mach Costs per Cow ($)	867	850	754	637
Oper Cost of Prod Milk ($)	10.72	9.08	8.36	7.77
CAPITAL EFFICIENCY (YEAR AVG.)				
Farm Capital per Cow ($)	7,272	6,775	6,789	6,242
Machinery & Equip per Cow ($)	1,274	1,128	1,203	1,025
Asset Turnover Ratio	0.40	0.44	0.45	0.55
PROFITABILITY				
Net Farm Income w/o Appr. ($)	5,425	21,828	34,861	60,955
Net Farm Income w/ Appre.($)	29,195	40,700	57,590	83,578
Labor & Mgmt Inc per Op/Mgr ($)	-17,495	2,214	12,735	32,469
Rate of Return on Eq Cap w/Appr (%)	-12.15	-3.98	2.60	5.61
Rate of Return on All Cap w/ Appr.(%)	-4.85	-1.53	2.55	8.40
FINANCIAL SUMMARY				
Farm Net Worth, End Year ($)	299,130	254,044	306,652	350,779
Debt to Asset Ratio	0.37	0.36	0.33	0.32
Farm Debt per Cow ($)	2,500	2,259	2,116	1,879

Table 20: Percentage Distribution of Rate of Return on all Capital with Appreciation, By Quartile, Pooled Data Set, 1992.

State	Total Farms	RATE OF RETURN ON ALL CAPITAL WITH APPRECIATION (%)			
		0-25%	26-50%	51-75%	76-100%
		Percent of Farms in Each Quartile			
Michigan	141	22.0	22.7	20.6	34.8
New York	362	19.6	19.6	16.9	43.9
Ontario	44	52.3	13.6	22.7	11.4
Pennsylvania	894	33.0	29.4	30.1	17.4
Wisconsin	368	33.1	21.7	22.6	22.6
TOTAL	1,809	25.0	25.0	25.0	25.0

Table 21: Rate of Return on all Capital with Appreciation, By Quartile, Pooled Data Set, 1992.

	Mean Values By Rate of Return on all Capital with Appreciation (%)			
	0-25%	26-50%	51-75%	76-100%
SIZE OF BUSINESS				
Average Number of Cows	57	74	85	120
Milk Sold, lbs.	931,645	1,267,226	1,492,955	2,313,711
Worker Equivalent	2.12	2.32	2.39	3.13
Total Tillable Acres	211	250	260	328
RATES OF PRODUCTION				
Milk Sold per Cow, lbs.	15,803	17,045	17,464	19,064
Hay DM per Acre, tons	2.53	2.83	2.95	3.03
Corn Silage per Acre, tons	13.92	15.90	16.65	16.32
LABOR EFFICIENCY				
Cows per Worker	28	33	37	39
Milk Sold per Worker, lbs.	447,311	560,931	634,598	739,449
COST CONTROL				
Grain & Conc Purc-% Milk Sales (%)	28	26	24	24
Feed & Crop Expense/cwt ($)	4.80	4.67	4.31	4.14
Labor & Mach Costs per Cow ($)	996	862	793	747
Oper Cost of Prod Milk ($)	11.49	10.36	9.64	8.63
CAPITAL EFFICIENCY (YEAR AVG.)				
Farm Capital per Cow ($)	7,668	8,878	8,080	6,576
Machinery & Equip per Cow ($)	1,415	1,503	1,391	1,149
Asset Turnover Ratio	0.37	0.34	0.37	0.53
PROFITABILITY				
Net Farm Income w/o Appr. ($)	222	18,722	33,696	79,985
Net Farm Income w/ Appre.($)	16,463	38,277	56,433	107,356
Labor & Mgmt Inc per Op/Mgr ($)	-21,666	-10,988	3,026	40,173
Rate of Return on Eq Cap w/Appr (%)	-13.25	-1.85	1.52	8.40
Rate of Return on All Cap w/ Appr (%)	-5.42	0.57	3.32	9.36
FINANCIAL SUMMARY				
Farm Net Worth, End Year ($)	288,671	467,736	477,131	539,505
Debt to Asset Ratio	0.32	0.28	0.30	0.30
Farm Debt per Cow ($)	2,259	2,168	2,245	1,877

Table 22: Rate of Return on all Capital with Appreciation, By Quartile, Michigan, 1992.

	Mean Values By Rate of Return on all Capital with Appreciation (%)			
	0-25%	26-50%	51-75%	76-100%
SIZE OF BUSINESS				
Average Number of Cows	104	111	123	151
Milk Sold, lbs.	1,818,462	2,005,448	2,440,601	2,891,435
Worker Equivalent	3.55	3.78	3.73	3.79
Total Tillable Acres	488	515	519	475
RATES OF PRODUCTION				
Milk Sold per Cow, lbs.	17,189	17,840	19,837	18,792
Hay DM per Acre, tons	2.72	2.83	3.24	3.29
Corn Silage per Acre, tons	10.58	11.67	12.83	13.32
LABOR EFFICIENCY				
Cows per Worker	29	31	34	51
Milk Sold per Worker, lbs.	501,072	560,543	668,472	975,504
COST CONTROL				
Grain & Conc Purc-% Milk Sales (%)				
Feed & Crop Expense/cwt ($)				
Labor & Mach Costs per Cow ($)	1,071	1,071	1,015	780
Oper Cost of Prod Milk ($)	12.51	9.97	9.18	7.60
CAPITAL EFFICIENCY (YEAR AVG.)				
Farm Capital per Cow ($)	7,660	9,249	7,565	5,333
Machinery & Equip per Cow ($)	1,260	1,659	1,418	886
Asset Turnover Ratio	0.40	0.35	0.44	0.66
PROFITABILITY				
Net Farm Income w/o Appr. ($)	-10,139	29,460	58,212	135,303
Net Farm Income w/ Appre.($)	15,675	56,542	93,492	169,667
Labor & Mgmt Inc per Op/Mgr ($)	-38,381	-22,858	3,060	81,360
Rate of Return on Eq Cap w/Appr (%)	-7.77	-0.59	3.28	-1.81
Rate of Return on All Cap w/ Appr (%)	-3.91	1.05	4.85	14.19
FINANCIAL SUMMARY				
Farm Net Worth, End Year ($)	472,473	859,625	760,106	825,181
Debt to Asset Ratio	0.37	0.21	0.30	0.28
Farm Debt per Cow ($)	2,254	2,105	2,156	1,311

Table 23: Rate of Return on all Capital with Appreciation, By Quartile, New York, 1992.

	Mean Values By Rate of Return on all Capital with Appreciation (%)			
	0-25%	26-50%	51-75%	76-100%
SIZE OF BUSINESS				
Average Number of Cows	71	94	127	190
Milk Sold, lbs.	1,195,369	1,692,714	2,438,863	3,769,864
Worker Equivalent	2.46	2.99	3.64	4.69
Total Tillable Acres	234	283	368	418
RATES OF PRODUCTION				
Milk Sold per Cow, lbs.	16,739	17,947	18,761	19,653
Hay DM per Acre, tons	2.48	2.66	2.82	2.83
Corn Silage per Acre, tons	13.11	14.08	15.70	15.22
LABOR EFFICIENCY				
Cows per Worker	29	32	33	38
Milk Sold per Worker, lbs.	482,025	562,025	627,413	736,042
COST CONTROL				
Grain & Conc Purc-% Milk Sales (%)	32	29	27	29
Feed & Crop Expense/cwt ($)	5.15	4.77	4.39	4.62
Labor & Mach Costs per Cow ($)	933	877	865	785
Oper Cost of Prod Milk ($)	11.90	10.45	9.48	8.58
CAPITAL EFFICIENCY (YEAR AVG.)				
Farm Capital per Cow ($)	7,095	7,430	6,629	5,611
Machinery & Equip per Cow ($)	1,474	1,474	1,311	1,124
Asset Turnover Ratio	0.39	0.40	0.48	0.64
PROFITABILITY				
Net Farm Income w/o Appr. ($)	-1,374	25,713	53,637	131,776
Net Farm Income w/ Appre.($)	15,324	46,907	82,202	169,844
Labor & Mgmt Inc per Op/Mgr ($)	-18,881	-5,816	16,372	77,399
Rate of Return on Eq Cap w/Appr (%)	-13.61	-1.68	4.93	16.88
Rate of Return on All Cap w/ Appr (%)	-3.85	1.91	5.67	12.50
FINANCIAL SUMMARY				
Farm Net Worth, End Year ($)	303,160	455,166	535,284	658,635
Debt to Asset Ratio	0.35	0.32	0.34	0.38
Farm Debt per Cow ($)	2,459	2,224	2,216	1,981

Table 24: Rate of Return on all Capital with Appreciation, By Quartile, Ontario, 1992.

	Mean Values By Return on all Capital with Appreciation (%)			
	0-25%	26-50%	51-75%	76-100%
SIZE OF BUSINESS				
Average Number of Cows	36	37	58	60
Milk Sold, lbs.	417,583	544,397	919,315	950,258
Worker Equivalent	3.22	2.74	3.17	2.79
Total Tillable Acres	192	148	191	140
RATES OF PRODUCTION				
Milk Sold per Cow, lbs.	11,839	14,542	16,352	16,369
Hay DM per Acre, tons	2.23	3.36	3.08	3.79
Corn Silage per Acre, tons	11.15	14.25	13.75	14.06
LABOR EFFICIENCY				
Cows per Worker	11	14	18	22
Milk Sold per Worker, lbs.	128,963	201,633	290,252	349,195
COST CONTROL				
Grain & Conc Purc-% Milk Sales (%)	14	12	13	8
Feed & Crop Expense/cwt ($)	2.58	3.11	2.83	2.39
Labor & Mach Costs per Cow ($)	1,921	1,510	1,454	1,187
Oper Cost of Prod Milk ($)	13.07	12.02	9.99	8.33
CAPITAL EFFICIENCY (YEAR AVG.)				
Farm Capital per Cow ($)	10,158	10,645	14,085	11,524
Machinery & Equip per Cow ($)	2,251	2,660	2,898	2,645
Asset Turnover Ratio	0.24	0.28	0.27	0.29
PROFITABILITY				
Net Farm Income w/o Appr. ($)	4,895	12,735	35,724	57,353
Net Farm Income w/ Appre.($)	13,196	22,823	54,566	75,977
Labor & Mgmt Inc per Op/Mgr ($)	-34,491	-19,092	-28,459	9,046
Rate of Return on Eq Cap w/Appr (%)	-21.35	-17.08	-1.75	2.89
Rate of Return on All Cap w/ Appr (%)	-10.66	-2.98	1.17	4.71
FINANCIAL SUMMARY				
Farm Net Worth, End Year ($)	276,146	233,099	727,044	560,075
Debt to Asset Ratio	0.22	0.41	0.21	0.18
Farm Debt per Cow ($)	2,154	4,718	2,686	2,219

Table 25: Rate of Return on all Capital with Appreciation, By Quartile, Pennsylvania, 1992.

	Mean Values By Rate of Return on all Capital with Appreciation (%)			
	0-25%	26-50%	51-75%	76-100%
SIZE OF BUSINESS				
Average Number of Cows	53	65	80	85
Milk Sold, lbs.	805,997	1,069,215	1,363,442	1,549,400
Worker Equivalent	1.87	1.91	2.10	2.02
Total Tillable Acres	179	208	223	240
RATES OF PRODUCTION				
Milk Sold per Cow, lbs.	15,052	16,377	16,970	18,200
Hay DM per Acre, tons	2.68	2.93	3.07	3.13
Corn Silage per Acre, tons	15.09	16.96	18.07	18.28
LABOR EFFICIENCY				
Cows per Worker	30	35	39	44
Milk Sold per Worker, lbs.	450,612	572,361	659,302	793,215
COST CONTROL				
Grain & Conc Purc-% Milk Sales (%)	29	26	25	22
Feed & Crop Expense/cwt ($)	5.14	4.79	4.64	4.13
Labor & Mach Costs per Cow ($)	966	837	766	707
Oper Cost of Prod Milk ($)	11.72	10.58	10.21	9.20
CAPITAL EFFICIENCY (YEAR AVG.)				
Farm Capital per Cow ($)	8,379	9,494	8,695	7,593
Machinery & Equip per Cow ($)	1,494	1,539	1,375	1,209
Asset Turnover Ratio	0.33	0.29	0.33	0.43
PROFITABILITY				
Net Farm Income w/o Appr. ($)	-858	15,854	27,822	50,996
Net Farm Income w/ Appre.($)	13,615	32,742	48,809	71,867
Labor & Mgmt Inc per Op/Mgr ($)	-24,924	-12,797	-2,704	22,066
Rate of Return on Eq Cap w/Appr (%)	-12.01	-2.26	0.40	6.86
Rate of Return on All Cap w/ Appr (%)	-5.37	0.55	2.84	7.21
FINANCIAL SUMMARY				
Farm Net Worth, End Year ($)	327,572	474,032	502,452	445,427
Debt to Asset Ratio	0.24	0.23	0.28	0.29
Farm Debt per Cow ($)	1,854	1,926	2,232	2,241

Table 26: Rate of Return on all Capital with Appreciation, By Quartile, Wisconsin, 1992.

	Mean Values By Rate of Return on all Capital with Appreciation (%)			
	0-25%	26-50%	51-75%	76-100%
SIZE OF BUSINESS				
Average Number of Cows	50	72	76	79
Milk Sold, lbs.	858,376	1,295,941	1,405,078	1,537,213
Worker Equivalent	1.87	2.33	2.43	2.51
Total Tillable Acres	188	260	257	256
RATES OF PRODUCTION				
Milk Sold per Cow, lbs.	16,636	17,795	18,283	19,318
Hay DM per Acre, tons	2.29	2.52	2.56	2.99
Corn Silage per Acre, tons	13.49	15.23	15.39	15.85
LABOR EFFICIENCY				
Cows per Worker	28	31	31	31
Milk Sold per Worker, lbs.	463,935	545,802	566,418	600,209
COST CONTROL				
Grain & Conc Purc-% Milk Sales (%)	28	26	22	22
Feed & Crop Expense/cwt ($)	4.40	4.20	3.76	3.59
Labor & Mach Costs per Cow ($)	935	794	731	649
Oper Cost of Prod Milk ($)	10.53	9.51	8.39	7.50
CAPITAL EFFICIENCY (YEAR AVG.)				
Farm Capital per Cow ($)	6,304	7,299	7,022	6,454
Machinery & Equip per Cow ($)	1,093	1,187	1,244	1,107
Asset Turnover Ratio	0.46	0.41	0.44	0.54
PROFITABILITY				
Net Farm Income w/o Appr. ($)	5,144	19,630	36,779	61,516
Net Farm Income w/ Appre.($)	21,736	43,787	62,498	83,041
Labor & Mgmt Inc per Op/Mgr ($)	-12,846	-1,190	12,387	31,571
Rate of Return on Eq Cap w/Appr (%)	-14.76	-2.20	2.73	6.32
Rate of Return on All Cap w/ Appr (%)	-6.35	-0.59	2.88	8.64
FINANCIAL SUMMARY				
Farm Net Worth, End Year ($)	172,227	309,052	346,079	383,248
Debt to Asset Ratio	0.46	0.38	0.30	0.24
Farm Debt per Cow ($)	2,778	2,611	1,992	1,363

Summary and Conclusions

With this project, we have shown that variables from different states' dairy farm record systems can be defined such that common variables can be obtained. We have developed a rich data set containing 1,818 farm records from four states and Ontario.

While there are differences in dairy farm performance and profitability between states, the differences are more related to herd size differences than to other factors. In other words, farms of similar herd sizes are more like farms in other states of the same size, than to different size farms within the state.

The pooled data set has shown that rates of production and profitabiltiy are higher on larger farms, even though operating cost of producing milk is higher. Labor efficiency on larger farms is significantly higher than on smaller farms. Larger farms have higher net worth, but also have higher debt to asset ratios and debt per cow.

The most common herd size category in the data set is 40 - 79 cows. This herd size is confronting high investments per cow, no advantage in debt per cow, and modest labor efficiencies in comparison to larger herd sizes. Their advantage is low operating costs, primarily due to most of the labor being provided by the operator and family. However, the return to labor and management per operator is negative, as is return on equity with appreciation. This herd size, perhaps more than any other, will be struggling with high feed costs and the decision to expand in the future.

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