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**OPERATING RESULTS FOR DAIRY FARMS
CLASSIFIED BY SIZE
FCRS Data, United States, 1987**

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ABSTRACT

Operating results for specialized dairy farms, where milk accounted for 50 percent or more of total sales, in USDA's Farm Costs and Returns Survey for 1987 were analyzed. Ten size classes were established on the basis of milk sales per farm. There was substantial variation in operating margin across farms in each of the size classes. The location of farms by region was not an important determinant of operating margin within a size class. Operating margins were highest when feed expense as a percentage of milk sales was low for nearly all size groups up to 300 cows or more. Somewhat surprisingly, average operating margins held quite consistently at 25 to 29 percent of gross farm income for a wide range of herd sizes, with sales of \$60,000 to \$500,000. Operating margin plus interest as a percent of farm assets held consistently between 8 and 11 percent for this same broad range of herd sizes.

OPERATING RESULTS FOR DAIRY FARMS CLASSIFIED BY SIZE
FCRS Data, United States, 1989¹

The purpose of this study is to examine the operating results of a comprehensive sample of dairy farms across the United States and to establish the nature of the variability that exists by region and management system within individual size classes. The data sources for this study are individual farm reports of costs and returns selected from the 1987 Farm Costs and Returns Survey (FCRS). This survey has been conducted since 1984 by the National Agricultural Statistics Service in cooperation with the Economic Research Service (Morehart, Johnson, and Banker; Agr. Info. Bull. 551).

Specialized dairy farms were defined from that basic sample as those where 50 percent or more of total commodity sales came from milk. Approximately 10 percent of all farms included in the FCRS Survey in 1987 qualified as specialized dairy farms by this definition. In total, they accounted for over 95 percent of the milk produced; farms excluded by this definition were those where crop sales and other livestock were more important than dairy in the structure of farm operations.

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Two general hypotheses are investigated in this study. First, it is postulated that the variation in performance within regions on dairy farms of a given size is substantial. Moreover, differences between regions across the country for farms of the same size and technology are relatively small and relatively unimportant in explaining variability in performance. Second, it is postulated that for the very large number of specialized dairy farms with less than 300 cows (milk sales of \$500,000 or less), the production and efficient use of forages and feed grains on individual farms is a major determinant of their relative profitability.

Classification of these specialized dairy farms into size groups was based on the value of milk sales per farm. Consistent data on the average number of cows milked for the year were not available. An approximation of cow numbers was made by assuming average sales of 13,350 pounds of milk per cow @ \$12.50 per cwt or \$1,668.75 per cow. Each increment of \$30,000 of milk sales corresponds to approximately 18 cows. The number of cows needed to provide \$30,000 of milk sales will, of course, vary depending on pounds of milk sold and the price received. The approximations of herd size are intended to help in interpretation of subsequent analysis.

Ten size classes were established on the basis of milk sales per farm from the FCRS database (Table 1). The relatively large numbers of farms with small herds is evident; over 60 percent of the dairy farms had milk sales of less than \$90,000 in 1987. More than 82 percent of the total number of farms had milk sales of less than \$150,000, roughly equivalent to less than 90 cows.

Table 1. NUMBER OF DAIRY FARMS* BY SIZE CLASS
FCRS Data, 1987

Size class		Approximate herd size	Number of farms	Percent of total
Milk sales per farm				
Under \$30,000		Under 18	24,404	17.7
\$ 30,000 - 59,999		18- 35	32,292	23.4
60,000 - 89,999		36- 53	28,144	20.4
90,000 - 119,999		54- 71	17,607	12.8
120,000 - 149,999		72- 89	11,590	8.4
Subtotal			114,275	82.7
\$ 150,000 - 199,999		90-119	9,347	6.8
200,000 - 249,999		120-149	5,098	3.7
\$ 250,000 - 499,999		150-299	6,903	5.0
500,000 - 999,999		300-599	1,579	1.1
\$1,000,000 and over		600 and over	916	0.7
Total			137,881	100.0

* Dairy farms are defined as those where milk sales accounted for more than 50 percent of total sales.

When aggregate milk sales by size class are examined, the relative importance of the different size groups in supplying national production is suggested (Table 2). The relatively large number of dairy farms with milk sales of \$60,000 or less account for a little less than 12 percent of total sales. For each of the ten size classes except for the under \$30,000 group, there is an important share of national production represented. The four \$30,000 intervals after the first one each represent from 9 to 13 percent of national output.

Table 2. AGGREGATE MILK SALES BY SIZE CLASS
FCRS Data, 1987

Size class		Approximate herd size	Aggregate milk sales	Percent of total
Milk sales per farm				
			<u>millions</u>	
Under \$30,000	Under 18		\$ 464	2.9
\$ 30,000 - 59,999	18- 35		1,436	9.0
60,000 - 89,999	36- 53		2,102	13.1
90,000 - 119,999	54- 71		1,850	11.5
120,000 - 149,999	72- 89		1,546	9.6
Subtotal			7,398	46.1
\$ 150,000 - 199,999	90-119		1,594	9.9
200,000 - 249,999	120-149		1,123	7.0
\$ 250,000 - 499,999	150-299		2,296	14.3
500,000 - 999,999	300-599		1,104	6.9
\$1,000,000 and over	600 and over		<u>2,527</u>	<u>15.8</u>
Total			16,042	100.0

The five larger size categories use larger and unequal sales intervals. These are developed to include important groups within the industry where change has been quite rapid in the last two decades. It is probable that sales per cow is somewhat larger than the national average for these herds. Thus, the approximate herd size listed in Table 2 may somewhat overstate the actual numbers. Milk sales is the basis for grouping farms into size categories.

One way to summarize Tables 1 and 2 is to emphasize that over 36 percent of the national milk supply is produced by relatively small farms with annual milk sales of \$120,000 or less (under 72 cows per farm); these account for nearly 75 percent of farm numbers. A second group of mid-sized farms with milk sales between \$120,000

and \$250,000 annually (72-150 cows), account for 26.5 percent of the total milk produced from 19 percent of farm numbers. Finally, the large farms with milk sales of \$250,000 or more annually (150 cows or more), account for 37 percent of total sales, but from less than seven percent of total dairy farms.

Characteristics of the Average Specialized Dairy Farm

A substantial amount of information from the FCRS is published annually by ERS, USDA. A general summary for all dairy farms in 1987 was provided in the April 1989 Dairy Situation, Short and Morehart, "Financial Characteristics of Dairy Farms," pp. 20-26. The analysis presented here differs from Morehart and Short in two important ways. Only specialized dairy farms (50 percent of total sales from milk) were included in this analysis rather than farms with most of their sales from milk and dairy animals. The classification of farms by size groups is substantially different and based on milk sales, not total farm sales. In the report by Short and Morehart, 154,000 farms are represented; our sample of specialized dairy farms is smaller, 138,000 farms. Total crop and livestock sales are about five percent greater on these specialized dairy farms because more of the small farms with some milk sales are excluded from this study.

The average dairy farm included in this study had operator-controlled assets valued at slightly less than half a million dollars. Farm operator debt was reported to be slightly more than \$103,000. The average debt to asset ratio was 21 percent with a full range of positions from no debt to those with debts exceeding

assets. More farmers reported an increase in inventory value than a decrease.

Table 3. CHARACTERISTICS OF AVERAGE SPECIALIZED DAIRY FARM
FCRS Data, 1987

Description	Average for all dairy farms
Farm assets	\$491,641
Farm debts	103,429
Equity	388,212
Debt to asset ratio	21.2%
Increase in inventory value, 1987	7,587
Acres operated	338
Acres of pasture	70
Acres planted total	109
Acres cropland idle	16
Acres rented	116
Age of operator	47
Hours worked, operators	3,611
Hours, unpaid family labor	1,623

The average dairy farm had 338 acres of which 109 were planted to crops, 16 cropland acres were idle, most likely associated with government programs, and 70 acres in pasture. A substantial number of farmers rented some land, probably to increase cropland available to provide forage and feed grains. Many of the larger farms had more than one operator; nearly all the farms reported some amount of unpaid family labor.

Table 4. CASH INCOME AND EXPENSE STATEMENT, SPECIALIZED DAIRY FARMS
FCRS Data, 1987

Description	Average for all dairy farms	Percent of total
<u>Cash Income</u>		
Milk sales	\$116,345	82.0
All other sales	<u>18,412</u>	<u>13.0</u>
Gross sales	134,757	95.0
Other farm income, government payments	<u>7,171</u>	<u>5.0</u>
Gross cash farm income	\$141,928	100.0
<u>Cash Expenses</u>		
Feed purchases	\$ 35,453	33.1
Cash wages and benefits	12,302	11.5
Fertilizer, seed, chemicals	8,245	7.7
Maintenance and repairs	6,710	6.3
Fuel and oil	3,465	3.2
Livestock purchases	5,024	4.7
Livestock expense	5,791	5.4
Marketing	6,227	5.8
Utilities, insurance	6,978	6.5
Taxes, rent	6,315	5.9
Interest payments	9,916	9.3
Other	<u>691</u>	<u>0.6</u>
Total cash expense	\$107,117	100.0
Operating margin		\$34,810
Depreciation	\$13,861	
Interest on equity capital @ 5%	<u>19,411</u>	
	\$33,272	
Return to operator's labor and management		\$1,538

The average cash income and expense statement for these specialized dairy farms is presented in Table 4. Milk sales accounted for 82 percent of gross cash farm income and was easily the dominant source of cash income on all of these farms; (the definition required at least 50 percent of all sales be from milk.) Other cash sources of farm income including government payments were relatively unimportant on average.

The largest item of cash expense on most farms was purchased feed making up an average of one-third of the total. There was a wide range in this percentage depending on the proportion of the total feed supply produced on the farm. On the largest farms, this item was often 50 percent or more of the total. Cash wages and benefits were a large item in the total, usually the second most important, especially for farms with \$120,000 or more of milk sales (72 or more cows). Interest payments and fertilizer, seed and chemicals on average ranked as the third and fourth most important components of cost. These items were much more variable than items like marketing costs or utilities and insurance. The debt position and the cropping system strongly influenced interest and crop expenses.

The difference between gross cash farm income and total cash expenses is designated here as operating margin. It can be thought of as the net cash flow to the operator of the business to cover capital replacement, principal payments on debt, interest on equity capital, and returns to his own labor and management. An estimate of annual depreciation was provided by each farmer. If that average of \$13,861 is subtracted from average operating margin, there is a difference left of \$20,949. This must provide returns to labor, management and equity capital. Assuming even a modest return of five percent on equity, there was very little left to pay for labor and management on the "average farm" in 1987.

Regional Comparisons With Size of Herd Held Constant

One of the basic hypotheses of the authors is that variations in operating costs and returns within given regions is much more

important than variations across regions. To examine this idea more closely, regional averages were developed within each size class whenever the data provided enough observations to allow such regional averages to be constructed. These results are reported in a series of similar tables starting with the smallest size classes and continuing to the largest specialized dairy farms. A few comments about each of the size classes and differences observed are made in each case.

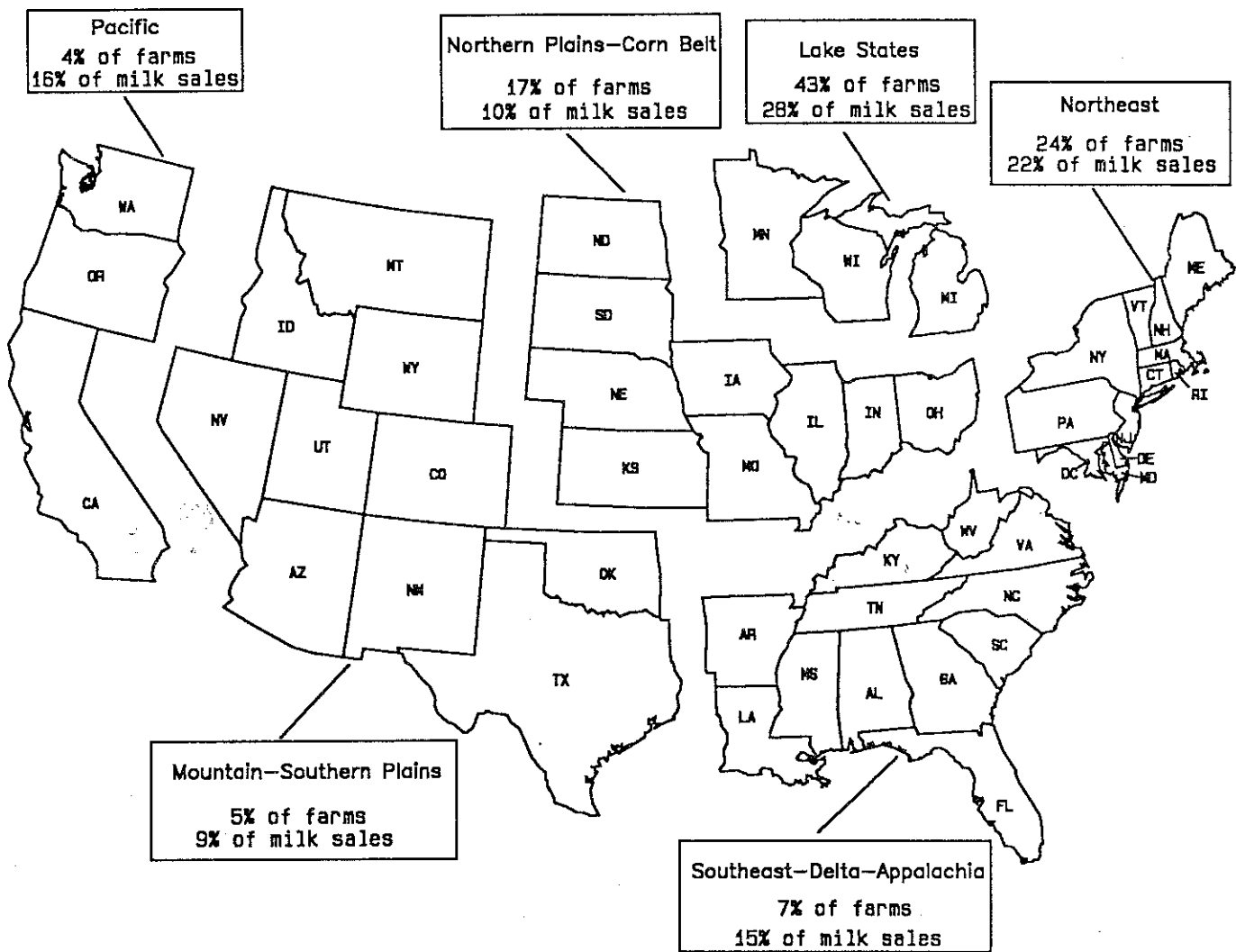
The FCRS commonly reports results for the United States in 10 regions (Map 1). Because the numbers of specialized dairy farms included in the FCRS in some of these regions are relatively few in number, they have been combined in this report into six groups:

- (1) Northeast.
- (2) Lake States.
- (3) Corn Belt and Northern Plains.
- (4) Appalachia, Southeast and Delta.
- (5) Mountain and Southern Plains.
- (6) Pacific.

The Northeast, Lake States and Pacific regions continue as presented in other USDA reports. The Corn Belt and Northern Plains dairy farms generally combine more acres of cash grains with a dairy enterprise than in other regions. Appalachia, the Southeast and Delta States includes most of the southeastern United States into one large, rather heterogenous group. The size of farms and technology of dairy farming in the Southern Plains is quite similar to that in the Mountain States.

FIGURE 1.

Regional Distribution of Specialized Dairy Farms, Numbers of Farms and Sales of Milk, FCRS 1987



Under \$30,000 Milk Sales -- (Less than 18 Cows). This group of farms consists of small, necessarily part-time, operations where an important part of family income must come from other sources. More than half of the farms in this size group are located in the Lake States. On average, milk sales make up less of gross cash farm income in this size category than in any other. Operating margins are relatively small but positive. Debt is small; many farms have none. Average cash expenses in total are strikingly similar for the two separate regions.

Table 5. REGIONAL AVERAGES COMPARED WITH NATIONAL AVERAGE
Specialized Dairy Farms, Milk Sales Under \$30,000, 1987
(Less Than 18 Cows)

Description	All farms	Lake States	Corn Belt and Northern Plains
Number of farms	24,404	13,185	5,621
Milk sales	\$19,015	\$20,360	\$17,808
Gross cash farm income	27,022	28,939	23,080
Milk as percent of gross	70%	70%	77%
Assets	\$184,300	\$182,700	\$135,500
Debts	21,100	24,600	6,600
Equity	\$163,200	\$158,100	\$128,900
Debt/Asset ratios	11%	13%	5%
Acres operated	176	174	150
Acres of pasture	49	43	45
Acres planted	37	37	44
Operating margin	\$ 5,876	\$ 7,233	\$4,593
Off-farm income	10,349	11,507	7,446
Feed purchases	\$5,056	\$5,030	\$5,334
Cash wages	778	669	604
Interest	1,937	2,195	959
Utilities, insurance	2,323	2,654	1,672
Marketing	1,505	1,424	1,206
Rent, taxes	1,866	2,090	1,536
Fertilizer, seed, chemicals	1,793	1,672	2,307
Cash expenses	\$21,146	\$21,706	\$20,028

Milk Sales \$30,000-59,999 -- (18-35 Cows). Operators of these small dairy farms most commonly are full-time farmers with someone in the family working off the farm to provide additional family income. Most of these farms hire seasonal or part-time labor. Crop sales are an important source of cash farm income especially in the Corn Belt, Northern Plains.

Table 6. REGIONAL AVERAGES COMPARED WITH NATIONAL AVERAGE
Specialized Dairy Farms, Milk Sales \$30,000-59,999, 1987
18-35 Cows

Description	All farms	Northeast	Lake States	Corn Belt Northern Plains	Southeast Appalachia Delta
Number of farms	32,292	7,078	14,537	8,112	2,072
Milk sales	\$44,460	\$46,435	\$45,128	\$41,062	\$45,332
Gross cash farm income	58,676	51,623	59,546	62,777	59,557
Milk as a percent of gross	76%	90%	76%	65%	76%
Assets	\$302,000	\$415,800	\$259,000	\$295,700	\$222,300
Debts	63,000	42,900	65,100	82,300	45,800
Equity	239,000	372,900	193,900	213,400	176,500
Debt/Asset ratios	21%	10%	25%	28%	21%
Acres operated	272	198	239	393	242
Acres of pasture	68	41	33	139	88
Acres planted	75	34	77	119	33
Operating margin	\$11,395	*	\$14,351	\$12,250	*
Off-farm income	10,044	13,820	8,392	10,581	7,743
Feed purchases	\$11,822	\$14,908	\$9,024	\$11,982	\$20,149
Wages, benefits	2,643	2,276	2,637	2,157	5,223
Interest	5,767	3,773	5,844	7,607	4,880
Utilities, insurance	4,017	4,747	4,033	3,568	3,139
Marketing	2,777	3,231	2,526	2,588	3,437
Taxes, rent	3,209	1,969	3,537	4,103	1,009
Fertilizer, seed, chemicals	4,431	2,698	4,454	6,083	4,188
Cash expenses	\$47,281	\$45,940	\$45,194	\$50,527	\$53,013

* t-statistic less than 2.0.

Operating margins for this size of farm are highest in the Lake States which accounts for the largest number of this size of farm. The importance of acres planted to crops may partially explain the differences in operating margins across regions. Average milk sales are quite consistent from region to region but their relative importance in gross cash farm income differs considerably.

Milk Sales \$60,000-89,999 -- (36 to 53 Cows). This size group is one of the most important nationally in terms of farm numbers,

Table 7. REGIONAL AVERAGES COMPARED WITH NATIONAL AVERAGE
Specialized Dairy Farms, Milk Sales \$60,000-89,999, 1987
36-53 Cows

Description	All farms	Northeast	Lake States	Corn Belt and Northern Plains	Southeast Appalachia Delta
Number of farms	28,144	6,792	15,221	3,333	1,809
Milk sales	\$74,688	\$74,849	\$74,143	\$76,748	\$73,527
Gross cash farm income	90,927	84,088	92,182	100,748	87,105
Milk as a percent of gross	82%	89%	80%	76%	84%
Assets	\$338,100	\$391,300	\$311,400	\$311,700	\$344,700
Debts	84,800	64,100	94,000	84,600	99,300
Equity	253,300	327,200	217,400	227,100	245,400
Debt/Asset ratios	25%	16%	30%	27%	29%
Acres operated	286	273	275	309	249
Acres of pasture	50	49	28	73	97
Acres planted	87	61	101	122	36
Operating margin	\$26,203	\$24,003	\$28,069	\$24,736	\$24,787
Off-farm income	10,216	10,425	6,828	*	*
Feed purchases	\$18,557	\$18,619	\$15,325	\$22,632	\$31,170
Wages, benefits	3,815	4,395	3,619	*	*
Interest	7,585	5,317	7,913	11,846	6,444
Utilities, insurance	5,087	5,083	5,320	4,210	4,446
Marketing	4,038	3,968	4,054	4,083	3,595
Taxes, rent	5,320	3,873	6,390	5,782	1,551
Fertilizer, seed, chemicals	5,858	4,702	6,454	6,581	5,480
Cash expenses	\$64,724	\$60,084	\$64,113	\$76,012	\$62,318

* t-statistic less than 2.0.

total milk produced, and political interest. Most of these dairymen operate on "traditional" farms with stall or stanchion barns, and little investment in new technology for milking equipment except for milking machines and a bulk tank.^{1/} Relatively few have around the barn pipeline milking systems. Most have mechanical gutter cleaners and produce an important part of the forage their cows consume. These are predominantly full-time farmers; many still rely on a family member working off the farm for additional family income.

Average operating margins are quite similar across the four different regions. Farms in the Northeast are heavily dependent on milk sales as the source of gross cash farm income. Real estate values are somewhat higher on average in the Northeast; more crops are grown in the Lake States and the Corn Belt, Northern Plains. One is struck by the consistency of the average operating margins for this size group across the country.

Milk Sales \$90,000-119,999 -- (54-71 Cows). A typical dairy farm of this size will have a full-time hired man or two family members actively involved in the work of the business. Stall or stanchion barns are the general rule. Around the barn pipelines, dumping stations and some labor saving systems are commonly employed. Relatively few farms of this size have invested in free stall systems and milking parlors.

^{1/}Comments in the text about technology found on farms was not obtained as part of the FCRS interview but is provided to put the financial information into context.

Table 8. REGIONAL AVERAGES COMPARED WITH NATIONAL AVERAGE
Specialized Dairy Farms, Milk Sales \$90,000-119,999, 1987
54-71 Cows

Description	All farms	Northeast	Lake States	Corn Belt and Northern Plains	Southeast Appalachia Delta
Number of farms	17,607	5,720	7,453	1,775	799
Milk sales	\$105,052	\$105,519	\$104,583	\$103,024	\$99,229
Gross cash farm income	126,861	115,041	135,059	126,381	112,595
Milk as a percent of gross	83%	92%	77%	82%	88%
Assets	\$542,700	\$601,700	\$509,500	\$530,800	\$407,000
Debts	116,800	105,700	145,500	125,800	123,400
Equity	425,900	496,000	364,000	405,000	283,600
Debt/Asset ratios	22%	18%	29%	24%	30%
Acres operated	360	312	369	297	285
Acres of pasture	80	69	29	65	143
Acres planted	108	100	142	98	49
Operating margin	\$34,500	\$23,225	\$45,380	\$33,643	\$21,473
Off-farm income	9,261	10,600	6,868	18,332	9,118
Feed purchases	\$24,847	\$26,940	\$17,472	\$27,718	\$40,435
Wages, benefits	7,657	8,951	8,304	4,696	5,758
Interest	10,352	8,936	12,497	12,314	12,641
Utilities, insurance	7,250	7,359	7,395	6,490	5,894
Marketing	5,580	5,663	5,424	3,180	6,457
Taxes, rent	6,779	5,021	9,677	5,299	1,712
Fertilizer, seed, chemicals	8,892	7,854	10,326	10,916	7,194
Cash expenses	\$92,362	\$91,816	\$89,679	\$92,738	\$91,122

There is more of a contrast in the average operating margin for the Northeast and the Lake States than was the case for the two smaller size classes in the same two regions. The large apparent difference in operating margins, \$23,225 compared with \$45,380 is not explained by comparing total cash expenses but by average gross cash farm income. Sources of cash farm income other than milk sales

are much smaller in the Northeast than in the Lake States. Cash farm expenses in total are consistent across the four regions but quite different in components, especially feed purchases.

Milk Sales, \$120,000-149,999 -- (72-89 Cows). This size group includes a mixture of dairy farms, some of which have conventional stall barns and others with free-stall, milking parlor operations.

Table 9. REGIONAL AVERAGES COMPARED WITH NATIONAL AVERAGE
Specialized Dairy Farms, Milk Sales \$120,000-149,999, 1987
72-89 Cows

Description	All farms	Northeast	Lake States	Corn Belt and Northern Plains
Number of farms	11,590	3,427	4,891	1,821
Milk sales	\$133,415	\$133,143	\$134,098	\$130,199
Gross cash farm income	171,144	152,087	180,873	180,051
Milk as a percent of gross	78%	88%	74%	72%
Assets	\$653,600	\$707,200	\$629,400	\$578,400
Debts	128,600	89,200	170,100	96,100
Equity	525,000	618,000	459,300	482,300
Debt/Asset ratios	20%	13%	27%	17%
Acres operated	463	464	429	552
Acres of pasture	56	69	23	47
Acres planted	174	114	193	250
Operating margin	\$46,455	\$40,427	\$53,562	\$53,135
Off-farm income	8,116	7,398	8,706	2,660
Feed purchases	\$32,689	\$33,457	\$29,332	\$27,830
Wages, benefits	12,810	13,251	12,088	14,279
Interest	14,961	9,938	21,378	9,921
Utilities, insurance	8,246	8,751	8,290	7,862
Marketing	7,415	7,155	7,203	6,294
Taxes, rent	9,467	5,368	12,643	11,591
Fertilizer, seed, chemicals	13,579	10,595	14,154	21,279
Cash expenses	\$124,689	\$111,660	\$127,310	\$126,916

Most farms of this size would either have a pipeline installed around their stanchion or stall barn or operate with a milking parlor system. Likewise, most employ hired labor for both milking and cropping operations.

Some regional differences in the degree to which farms are specialized in milk production are suggested in the averages. Crop sales provide additional cash income on a number of farms in both the Lake States and Corn Belt, Northern Plains. Average expenditure for fertilizer, seed and chemicals is least in the Northeast, greatest in the Corn Belt, Northern Plains. This general difference is also reflected in acres planted to crops. Outlays for interest on debt are substantially larger on the sample of farms in the Lake States.

Milk Sales, \$150,000-199,999 -- (90-119 Cows). The majority of farms this size utilize a milking parlor; a few operate in conventional barns. Off-farm income is not an important source of family income on most of these operations. A substantial number involve two operators or some kind of partnership arrangement.

Average operating margins for farms of this size were largest in the Northeast and Lake States and smallest in the Southeast and Mountain-Southern Plains areas. More of the feed for the dairy herds were purchased rather than produced on the farms in the regions with lower, average operating margins.

Table 10.
REGIONAL AVERAGES COMPARED WITH NATIONAL AVERAGE
Specialized Dairy Farms, Milk Sales \$150,000-199,999, 1987
90-119 Cows

Description	All farms	Northeast	Lake States	Corn Belt and Northern Plains	Southeast Appalachia Delta	Mountain States, Southern Plains
Number of farms	9,347	3,351	2,097	1,197	1,240	901
Milk sales	\$170,551	\$166,471	\$169,581	\$175,160	\$172,859	\$178,185
Gross cash farm income	213,445	208,827	214,581	248,231	209,101	204,546
Milk as a percent of gross	80%	80%	79%	71%	83%	87%
Assets	\$652,300	\$617,000	\$730,000	\$801,500	\$713,600	\$422,000
Debts	127,600	95,400	145,300	183,600	108,300	198,500
Equity	524,700	521,600	584,700	617,900	605,300	223,500
Debt/Asset ratios	20%	15%	20%	23%	15%	47%
Acres operated	415	400	472	566	424	232
Acres of pasture	83	52	49	101	142	111
Acres planted	160	150	227	253	107	86
Operating margin	\$61,658	\$ 78,616	\$72,776	\$51,046	\$38,569	\$37,835
Off-farm income	5,241	3,876	4,215	5,768	*	4,507
Feed purchases	\$44,969	\$33,370	\$29,973	\$51,776	\$60,789	\$70,885
Cash wages, benefits	18,394	22,008	21,756	11,248	17,528	11,371
Interest	13,271	7,336	17,952	24,250	14,340	14,304
Utilities, insurance	9,356	9,174	12,165	9,038	7,764	6,445
Marketing	8,180	7,312	7,863	5,357	11,910	12,351
Rent, taxes	9,931	7,698	14,043	12,284	7,626	4,100
Fertilizer, seed, chemicals	14,585	12,759	14,213	31,587	17,338	4,080
Cash expenses	\$151,786	\$130,211	\$141,825	\$197,185	\$170,532	\$166,711

* t-statistic less than 2.0.

Milk Sales, \$200,000-249,999 -- (120-149 Cows). Nearly all farms of this size use some form of loose housing arrangement and milk in a milking parlor with some specialization in milking labor. For nearly all of these farms, feed purchases are the most important annual expenditures with this cash outlay increasing rapidly when few crops are grown (Table 11). The importance of hired labor also varies substantially across the four regions.

Table 11. REGIONAL AVERAGES COMPARED WITH NATIONAL AVERAGE
Specialized Dairy Farms, Milk Sales \$200,000-249,999
120-149 Cows

Description	All farms	Northeast	Lake States	Southeast Appalachia Delta	Mountain (Southern Plains)
Number of farms	5,098	1,329	1,049	1,036	817
Milk sales	\$220,201	\$219,753	\$211,563	\$227,419	\$228,855
Gross cash farm income	271,743	252,282	298,380	280,137	250,598
Milk as a percent of gross	81%	87%	71%	81%	91%
Assets	\$910,500	\$942,100	\$1,036,200	\$1,022,600	\$524,200
Debts	186,900	124,000	223,900	298,800	154,600
Equity	723,600	818,100	812,300	723,800	369,600
Debt/Asset ratios	21%	13%	22%	29%	29%
Acres operated	576	567	656	870	182
Acres of pasture	79	40	32	155	91
Acres planted	254	196	382	*	27
Operating margin	\$69,726	\$60,509	\$112,073	\$55,634	\$43,825
Off-farm income	*	16,075	9,815	*	5,213
Feed purchases	\$60,573	\$50,444	\$32,201	\$67,112	\$107,901
Cash wages, benefits	32,139	44,429	18,960	49,541	*
Interest	13,449	11,458	14,542	12,360	14,495
Utilities, insurance	13,710	13,893	17,159	15,081	9,255
Marketing	11,668	8,141	14,268	12,218	15,500
Rent, taxes	10,585	9,022	23,600	5,139	2,677
Fertilizer, seed, chemicals	19,513	19,872	26,993	24,557	2,910
Cash expenses	\$202,017	\$191,773	\$186,307	\$224,504	\$206,773

* t-statistic less than 2.0.

Average operating margins are fairly consistent in three of the four regions. The Lake States sample includes a number of farms with important cash crop enterprises and much larger operating margins. Average interest payments are quite uniform across the four regions as are total cash expenses. Even though the return to labor and management on many of these farms is quite small after covering depreciation and a five percent charge for the use of equity capital, the returns to equity are large enough to provide necessary funds for family living in most cases.

Milk Sales, \$250,000-499,999 -- (150-299 Cows). Farms included in this size category produce more than 14 percent of the national milk supply. Essentially all dairy farms of this size use milking parlors and specialization of labor for different functions on the farm. Many of these farms produce the bulk of the forages and part of the feed grains used by the dairy herd. This is less common in the Pacific region where feed purchases, on the average, make up about 48 percent of total cash expenses.

While there is substantial variability in operating margins within each region, the averages for this key indicator across regions are in reasonable agreement with the national average in this size class. The Lake States and the Southeast have the highest averages while the Pacific, Northeast and Mountain-Southern Plains regions have similar lower averages. The greatest variability among the regions is in cash expenditures for feed. The Lake States have the lowest average feed expense followed by the Northeast. Most of the forage used on farms of this size in the Northeast and Lake States is produced on the farm. In contrast, a number of the farms in the Southeast, Mountain and Pacific regions buy large portions of their forage as well as their concentrates.

Table 12. REGIONAL AVERAGES COMPARED WITH NATIONAL AVERAGE
Specialized Dairy Farms, Milk Sales \$250,000-499,999, 1987
150-299 Cows

Description	All farms	Northeast	Lake States	Southeast		Mountain, Southern Plains	Pacific
				Appalachia	Delta		
Number of farms	6,903	2,316	993	1,429	547	1,084	
Milk sales	\$332,632	\$317,314	\$318,193	\$335,933	\$333,715	\$362,351	
Gross cash farm income	406,424	374,720	389,319	416,320	388,039	423,351	
Milk as a percent of gross	82%	85%	82%	81%	86%	86%	
Assets	\$1,364,900	\$1,751,800	\$1,171,400	\$1,124,500	\$965,300	\$1,244,700	
Debts	285,600	258,100	435,100	179,900	219,500	182,400	
Equity	1,079,300	1,493,700	736,300	944,600	745,800	1,062,300	
Debt/Asset ratios	21%	15%	37%	16%	23%	15%	
Acres operated	713	861	739	651	1,003	279	
Acres of pasture	149	93	12	210	422	151	
Acres planted	257	284	393	234	256	81	
Operating margin	\$100,547	\$80,938	\$115,664	\$111,263	\$75,145	\$80,853	
Off-farm income	12,190	3,373	9,992	*	9,928	3,663	
Feed purchases	\$99,341	\$84,180	\$53,064	\$111,581	\$124,966	\$164,581	
Cash wages, benefits	47,391	45,989	41,121	47,843	47,253	40,271	
Interest	27,963	23,457	51,358	18,926	23,939	16,672	
Utilities, insurance	17,651	19,554	15,626	15,541	16,251	15,890	
Marketing	17,506	18,066	11,229	18,325	19,608	19,680	
Rent, taxes	15,580	15,446	23,748	9,706	10,167	15,460	
Fertilizer, seed, chemicals	23,795	29,050	28,811	26,390	18,057	7,439	
Cash expenses	\$305,877	\$293,783	\$273,655	\$305,056	\$312,894	\$342,498	

* t-statistic less than 2.0.

Milk Sales, \$500,000-999,999 -- (300-599 Cows). Dairy farms of this size are specialized operations where milk sales and dairy animals account for 85-90 percent of gross sales in most cases. Feed and labor are the two big items of cash expense. Milking labor is specialized. Feed is brought to the cows. Pasture is used for young cattle and dry cows. Much of the required forage is typically produced on the farm in the humid East but much less commonly in the irrigated West.

Table 13. REGIONAL AVERAGES COMPARED WITH NATIONAL AVERAGE
Specialized Dairy Farms, Milk Sales \$500,000-999,999, 1987
300-599 Cows

Description	All farms	Northeast	Mountain, Southern Plains	Pacific
Number of farms	1,579	86	215	913
Milk sales	\$699,345	\$688,163	\$689,317	\$730,182
Gross cash farm income	817,284	776,658	786,853	815,979
Milk as a percent of gross	86%	89%	88%	89%
Assets	\$1,696,800	\$2,168,500	\$1,581,700	\$1,664,500
Debts	388,500	610,100	294,700	294,300
Equity	1,308,300	1,558,400	1,287,000	1,370,200
Debt/Asset ratios	23%	28%	19%	17%
Acres operated	519	996	446	301
Acres of pasture	88	147	127	*
Acres planted	278	566	102	173
Operating margin	\$141,881	\$101,829	\$111,415	\$138,337
Off-farm income	11,246	2,244	*	4,984
Feed purchases	\$305,441	\$199,156	\$325,802	\$351,730
Cash wages, benefits	99,716	121,478	106,414	88,670
Interest	42,419	60,087	25,013	38,300
Utilities, insurance	30,560	39,558	33,279	28,249
Marketing	32,453	40,667	44,243	30,119
Rent, taxes	30,087	24,212	9,943	23,634
Fertilizer, seed, chemicals	24,194	52,197	14,641	13,033
Cash expenses	\$675,402	\$674,829	\$675,439	\$677,642

* t-statistic less than 2.0.

All of the average operating margins reported for the three regional averages are less than the national average. More than half the sample observations are in the Pacific region; hence, some of the more "profitable operations" are located elsewhere. If one compares the average results from Tables 12 and 13 for operating margin, one is struck by the fact that there is not a proportional increase in operating margin compared to the increase in size of farm. Milk sales and gross cash farm income are at least double for the national averages in Table 13 compared with Table 12. Operating margins do not increase accordingly. The resource combinations, of course, are not fully comparable. This lack of increased margin, nevertheless, is worthy of note.

Milk Sales, \$1,000,000 or more -- (600 cows and over). The largest dairy farms account for nearly 16 percent of the milk supply and are located largely in the West. Most of these farms buy nearly all of the feed they use. There is considerable variability among these operations but most are highly specialized in milk production.

The operating margins for some of the farms outside the Mountain-Southern Plains and Pacific regions are among the largest obtained with greater milk sales per farm and more cows; hence, the larger margins. Feed expense consistently accounts for 40 to 60 percent of cash expenditures. Cash wages and benefits are the second big item.

Table 14. REGIONAL AVERAGES COMPARED WITH NATIONAL AVERAGE
Specialized Dairy Farms, Milk Sales \$1,000,000 and Over, 1987
600 Cows and Over

Description	All farms	Mountain, Southern Plains	Pacific
Number of farms	916	151	623
Milk sales	\$2,758,227	\$1,990,213	\$1,976,580
Gross cash farm income	3,014,939	2,224,765	2,172,305
Milk as a percent of gross	91%	89%	91%
Assets	\$4,425,700	\$4,421,600	\$3,074,900
Debts	1,145,700	1,416,500	718,300
Equity	3,280,000	3,005,100	2,356,600
Debt/Asset ratios	26%	32%	23%
Acres operated	1,261	*	447
Acres of pasture	*	*	127
Acres planted	322	*	277
Operating margin	\$605,906	\$345,276	\$540,043
Off-farm income	12,911	*	*
Feed purchases	\$1,252,345	\$935,306	\$881,204
Cash wages, benefits	365,134	241,119	211,920
Interest	122,242	153,709	85,888
Utilities, insurance	89,440	77,033	69,165
Marketing	137,837	135,531	86,124
Rent, taxes	44,623	26,606	38,609
Fertilizer, seed, chemicals	36,035	3,758	23,105
Cash expenses	\$2,409,033	\$1,879,488	\$1,632,262

* t-statistic less than 2.0.

Average operating margins in the Mountain States are somewhat below the average for the size class and that of the Pacific region. Part of this may be attributed to interest costs associated with greater debt and marketing costs; however, gross cash farm income is higher than for the Pacific region. The technology used and feeding

systems are similar in the two regions. Important differences can likely be attributed to cost control, output per cow, and management on individual operations.

Operating Margin as Percentage of Gross Cash Farm Income

One way of summarizing some of these results across size classes is to compare average operating margins as percentages of gross cash farm incomes as size of farm increases (Table 15). Operating margin is the cash remaining after paying all operating expenses. This remainder must cover depreciation and payments for the use of family labor, equity capital and management. Thus, on small farms more of the labor is provided by family labor; hence, the percentage remaining should be somewhat higher if net returns are considered somewhat comparable.

As shown in Table 15, once sales reach the \$60,000-89,999 category, this ratio holds quite steady on the average between 27 and 29 percent for the four size classes which include a large number of the small, full-time dairy farms in the United States; those with approximately 36 to 120 cows. This percentage then declines modestly for the next two size classes (120 to 300 cows). The lowest average percentage is calculated for the farms with sales of \$500,000-999,999 (300-599 cows) and then rises modestly for the largest size category to 20 percent.

Table 15. COMPARISON OF OPERATING MARGIN AS PERCENTAGE OF
GROSS CASH FARM INCOME BY SIZE CLASS
FCRS Data, United States, 1987

Size class, milk sales per farm	Average operating margin	Gross cash farm income	Percent operating margin is of gross income
			<u>percent</u>
Under \$30,000	\$ 5,876	\$ 27,022	21.7
\$ 30,000 - 59,999	11,395	58,676	19.4
60,000 - 89,999	26,203	90,927	28.8
90,000 - 119,999	34,500	126,861	27.2
120,000 - 149,999	46,455	171,144	27.1
\$ 150,000 - 199,999	\$ 61,658	\$ 213,445	28.9
200,000 - 249,999	69,726	271,743	25.7
250,000 - 499,999	100,547	406,424	24.7
500,000 - 999,999	141,881	817,284	17.4
\$1,000,000 and over	605,906	3,014,939	20.0

Within each of these size categories there is substantial variation from farm to farm around these averages. The rather consistent stability of this percentage for the smaller, full-time dairy farms (36-120 cows) in 1987 suggests one of the reasons why many of these farms continue to stay in business in competition with larger farms which are generally assumed to have greater economies associated with the larger size of their operations and the use of labor-saving technology.

Operating Margin Plus Interest as Percentage of Farm Assets

Another way to examine differences by size class is to express operating margin plus cash interest payments as a percentage of farm assets. This is a rough indicator of the return to capital plus all

other family resources provided. Thus, small farms must pay for their own labor and management out of this return as well as cover depreciation which is not deducted from operating margin (Table 16).

Table 16. COMPARISON OF OPERATING MARGIN PLUS INTEREST PAYMENTS
AS A PERCENTAGE OF FARM ASSETS ACROSS SIZE CLASSES
FCRS Data, United States, 1987

Size class, milk sales per farm	Average operating margin plus interest	Farm assets	Percent that operating margin plus interest is of farm assets
			<u>percent</u>
Under \$30,000	\$ 7,813	\$184,300	4.2
\$ 30,000 - 59,999	17,162	302,000	5.7
60,000 - 89,999	33,788	338,100	10.0
90,000 - 119,999	44,852	542,700	8.3
120,000 - 149,999	61,416	653,600	9.4
\$ 150,000 - 199,999	\$ 74,929	\$ 652,300	11.5
200,000 - 249,999	83,175	910,500	9.1
250,000 - 499,999	128,510	1,364,900	9.4
500,000 - 999,999	184,300	1,696,800	10.9
\$1,000,000 and over	728,148	4,425,700	16.4

The first important conclusion is that these average rates of return to borrowed and equity capital plus family labor and management are relatively low given that depreciation on non-land assets has not been deducted from operating margins. The second key observation is that once milk sales reach the \$60,000-89,999 size class (36-53 cows), the percentages are surprisingly similar except for the largest size group. Again, the variation within each of the size classes is large. The variability within each size group is

much greater than the differences observed among the seven middle size groups. This indicates again that the differences in average profitability per cow associated with increased size are quite modest. The exception to this generalization is for an important number of large operations in the West and scattered across the rest of the country with 600 cows or more.

**THE EFFECT OF FEED EXPENSE
AS A PERCENTAGE OF MILK SALES ON PERFORMANCE**

One of the basic hypotheses of the authors was that the amounts of forage and feed grains produced on the farm relative to milk sales for most dairy farms, outside the irrigated west, is an important determinant of profitability. One way to examine this proposition using the FCRS records was to sort farms in each size class on the basis of feed expenditure as a percentage of milk sales. In general, farms with low feed cost per dollar of milk sales would be those with relatively good feeding efficiency or those that produce a large proportion of their own feed. At least outlays for feed are less per unit of sales while crop expenses and acres planted to crops on these farms would be expected to be somewhat larger than for those with higher feed expenses. An examination of these relationships within each of the ten size classes follows.

Milk Sales, Under \$30,000. The results of this analysis for the part-time farms with very small milking herds does not show any relationship between expenditures for feed and operating margin. Almost half of these small farms spent less than 20 percent of their milk sales income for feed. While acres planted to crops declines

and feed purchases rise, the average operating margin is greatest for those spending 30-39 percent of the value of milk sales for feed. Other factors on these small farms determine the size of operating margins.

Table 17.

THE EFFECT OF FEED EXPENDITURE
AS A PERCENTAGE OF MILK SALES ON PERFORMANCE
Milk Sales, Under \$30,000, 1987
Less than 18 Cows

Description	All farms	Feed as a percentage of milk sales			
		Less than 20%	20-29%	30-39%	40% or more
Milk sales	\$19,015	\$18,791	\$20,290	\$19,713	\$17,976
Gross cash farm income	27,022	25,269	26,383	35,429	25,167
Assets	\$184,300	\$223,100	\$169,700	\$147,900	\$144,400
Debts	21,100	22,600	21,000	32,400	10,300
Debt/Asset ratios	12%	10%	12%	22%	7%
Acres operated	176	207	181	147	131
Acres of pasture	49	64	33	39	39
Acres planted	37	49	47	21	16
Value of crops used on farm	\$6,873	\$8,236	\$9,100	\$6,844	\$2,470
Operating margin	\$ 5,876	\$ 5,122	*	*	*
Off-farm income	10,349	11,052	8,407	9,282	11,228
Feed purchases	\$5,056	\$2,250	\$5,034	\$6,864	\$9,340
Wages, benefits	*	*	*	*	*
Interest	1,937	2,213	2,256	2,545	*
Utilities, insurance	2,323	2,531	2,504	2,387	1,727
Marketing	1,505	1,412	1,681	1,466	1,575
Rent, taxes	1,866	2,225	*	*	*
Fertilizer, seed, chemicals	1,793	2,188	2,622	1,308	701
Cash expenses	\$21,146	\$20,146	\$22,204	\$23,152	\$20,897

*t-statistic less than 2.0.

Milk Sales, \$30,000-59,999. On these specialized dairy farms with relatively small sales, the first evidence of the importance of producing an important part of the feed supply on the farm is

suggested in this size group. Acres of crops planted is greatest for the farms with the smallest feed purchases relative to milk sales; operating margins on these farms are well above average. In contrast, those who required 40 percent or more of the value of milk sales to buy feed had low operating margins on the average. Crop failures and poor control of costs are likely to affect these results as well.

Table 18.

THE EFFECT OF FEED EXPENDITURE
AS A PERCENTAGE OF MILK SALES ON PERFORMANCE
Milk Sales, \$30,000-59,999, 1987
18-35 Cows

Description	All farms	Feed as a percentage of milk sales			
		Less than 20%	20-29%	30-39%	40% or more
Milk sales	\$44,460	\$45,996	\$44,735	\$43,230	\$42,490
Gross cash farm income	58,676	63,651	56,193	55,564	57,339
Assets	\$302,000	\$295,500	\$318,300	\$273,700	\$318,500
Debts	63,000	60,100	72,900	59,000	55,300
Debt/Asset ratios	21%	20%	23%	22%	17%
Acres operated	272	311	222	317	237
Acres of pasture	68	51	58	94	90
Acres planted	75	105	64	73	41
Value of crops used on farm	\$12,895	\$14,457	\$12,834	\$11,529	\$11,642
Operating margin	\$11,395	\$21,652	\$ 9,395	\$9,097	*
Off-farm income	10,044	6,059	14,175	7,558	13,172
Feed purchases	\$11,822	\$5,762	\$10,960	\$14,699	\$21,529
Wages, benefits	2,643	3,124	*	*	3,153
Interest	5,767	5,627	6,943	5,128	4,678
Utilities, insurance	4,017	4,111	4,262	3,289	4,257
Marketing	2,777	2,529	2,633	2,863	3,408
Rent, taxes	3,209	3,696	3,021	3,539	*
Fertilizer, seed, chemicals	4,431	5,364	4,220	3,780	3,805
Cash expenses	\$47,281	\$42,000	\$46,798	\$46,467	\$59,196

*t-statistic is less than 2.0.

Milk Sales, \$60,000-89,999. Most farms of this size are operated by full-time dairymen. Acres planted to crops and the value of crops used on the farm decrease consistently as the size of feed expenditures increases. Operating margin is higher in the two categories with the lower percentages of feed expense to milk sales. Off-farm income seems to be associated with higher expenditures for feed. Time spent away from the farm may contribute to these results. Costs of hired labor do not seem to increase with added off-farm income.

Table 19.

THE EFFECT OF FEED EXPENDITURE
AS A PERCENTAGE OF MILK SALES ON PERFORMANCE
Milk Sales, \$60,000-89,999, 1987
36-53 Cows

Description	All farms	Feed as a percentage of milk sales			
		Less than 20%	20-29%	30-39%	40% or more
Milk sales	\$74,688	\$73,465	\$75,042	\$78,130	\$73,002
Gross cash farm income	90,927	90,276	92,952	90,800	88,039
Assets	\$338,100	\$334,700	\$334,900	\$354,500	\$334,000
Debts	84,800	86,200	78,900	99,800	71,500
Debts/Assets ratios	25%	26%	24%	28%	21%
Acres operated	286	298	306	269	205
Acres of pasture	50	38	52	53	86
Acres planted	87	109	88	73	49
Value of crops used on farm	\$15,879	\$18,480	\$15,474	\$13,999	\$9,671
Operating margin	\$26,203	\$32,632	\$28,260	\$14,290	*
Off-farm income	10,216	6,731	8,975	15,349	19,313
Feed purchases	\$18,557	\$9,948	\$18,865	\$26,450	\$39,310
Wages, benefits	3,815	3,816	4,159	4,720	*
Interest	7,585	6,980	7,072	8,918	9,285
Utilities, insurance	5,087	5,223	4,954	5,154	4,812
Marketing	4,038	4,071	3,559	4,432	4,611
Rent, taxes	5,320	6,490	5,316	4,335	2,246
Fertilizer, seed, chemicals	5,858	6,347	6,257	4,964	*
Cash expenses	\$64,724	\$57,644	\$64,692	\$76,511	\$74,009

*t-statistic is less than 2.0.

Milk Sales, \$90,000-119,999. The trade-off between expenditure for cropping activities against expenditures for feed is clearly illustrated for this size class in which 20 percent of the farms are located and 13 percent of the milk is produced. Those spending less than 20 percent of milk sales for feed have the highest average operating margin as well as the largest outlays for fertilizer, seed

Table 20.

THE EFFECT OF FEED EXPENDITURE
AS A PERCENTAGE OF MILK SALES ON PERFORMANCE
Milk Sales, \$90,000-119,999, 1987
54-71 Cows

Description	All farms	Feed as a percentage of milk sales			
		Less than 20%	20-29%	30-39%	40% or more
Milk sales	\$105,052	\$104,937	\$104,685	\$108,558	\$101,779
Gross cash farm income	126,861	132,075	121,485	126,965	121,353
Assets	\$542,700	\$609,800	\$514,700	\$474,400	\$424,300
Debts	116,800	128,300	117,500	72,900	123,200
Debt/Asset ratios	22%	21%	23%	15%	29%
Acres operated	360	374	319	478	265
Acres of pasture	80	39	71	214	103
Acres planted	108	142	106	54	52
Value of crops used on farm	\$23,473	\$28,067	\$18,468	\$28,884	\$11,777
Operating margin	\$34,500	\$46,766	\$29,614	\$26,308	*
Off-farm income	9,261	10,012	10,244	6,168	6,646
Feed purchases	\$24,847	\$13,999	\$25,770	\$37,662	\$54,442
Wages, benefits	7,656	8,188	10,112	4,697	*
Interest	10,352	11,762	9,485	7,379	11,135
Utilities, insurance	7,250	7,522	7,028	7,423	6,501
Marketing	5,580	5,106	5,367	6,906	6,673
Rent, taxes	6,779	9,037	5,979	3,666	3,473
Fertilizer, seed, chemicals	8,892	10,664	7,991	6,808	*
Cash expense	\$92,362	\$85,310	\$91,871	\$100,657	\$115,620

*t-statistic is less than 2.0.

and chemicals. Operating margins for the two middle groups were quite similar; those with large outlays for feed had lower operating margins. In general, for this size class assets per farm decrease as feed purchases increase.

Milk Sales, \$120,000-149,999. There was a strong relationship between operating margin and feed purchases as a percentage of milk sales for this size group. The differences in average operating

Table 21.

THE EFFECT OF FEED EXPENDITURE
AS A PERCENTAGE OF MILK SALES ON PERFORMANCE
Milk Sales, \$120,000-149,999, 1987,
72-89 Cows

Description	All farms	Feed purchased as percentage of milk sales			
		Less than 20%	20-29%	30-39%	40% or more
Milk sales	\$133,415	\$134,031	\$132,761	\$132,250	\$134,272
Gross cash farm income	171,144	174,364	166,190	163,920	180,836
Assets	\$653,600	\$662,000	\$731,000	\$600,700	\$498,500
Debts	128,600	121,500	116,000	137,400	174,000
Debt/Asset ratios	20%	18%	16%	23%	35%
Acres operated	463	505	443	417	424
Acres of pasture	56	38	67	76	70
Acres planted	174	193	169	143	152
Value of crops used on farm	\$29,396	\$37,107	\$23,002	\$22,247	\$26,522
Operating margin	\$46,455	\$63,522	\$50,727	\$31,540	*
Off-farm income	8,116	8,290	7,572	5,468	12,103
Feed purchases	\$32,689	\$17,977	\$32,763	\$44,547	\$70,278
Wages, benefits	12,810	14,937	10,498	9,866	14,567
Interest	14,961	13,405	10,309	20,979	24,516
Utilities, insurance	8,246	8,205	7,944	8,260	9,115
Marketing	7,415	6,932	8,057	6,833	8,276
Rent, taxes	9,467	9,816	9,416	*	*
Fertilizer, seed, chemicals	13,579	15,649	13,648	8,758	12,008
Cash expenses	\$124,689	\$110,842	\$115,463	\$132,381	\$187,297

*t-statistic is less than 2.0.

margin among the three groups with feed purchases less than 40 percent of sales were consistent and important. Fertilizer, seed, and chemicals expense and the value of crops used on the farm declined as feed expense increased for the first three groups. The farms who spent 40 percent or more of their milk sales for feed also had high outlays for most of the other categories of expense. Hence, there may have been a basic problem of cost control and management in these businesses. Acres planted to crops was quite high given the amount of feed purchased. Operating margins were extremely variable on farms with feed purchases exceeding 40 percent of milk sales.

Milk Sales, \$150,000-199,999. For this group of farms where average herd size was a little more than 100 milkers, the division into four groups demonstrated some important differences in management strategies. Those with lowest feed purchases relative to milk sales had substantially more crop acres and used more of the crops produced for feed for the dairy herd. The positive effect on operating margin was clear. The middle two groups had similar results with respect to average operating margin; those with somewhat higher percentages of milk sales spent on feed purchases also planted more acres and spent more for fertilizer, seed and chemicals but used less crops for feed. Those with the largest feed purchases had the smallest operating margins on average and spent the least for fertilizer, seed and chemicals and planted the fewest acres.

Table 22.

THE EFFECT OF FEED EXPENDITURE
AS A PERCENTAGE OF MILK SALES ON PERFORMANCE
Milk Sales, \$150,000-199,999, 1987
90-119 Cows

Description	All farms	Feed purchased as percentage of milk sales			
		Less than 20%	20-29%	30-39%	40% or more
Milk sales	\$170,551	\$170,117	\$166,076	\$173,997	\$174,247
Gross cash farm income	213,445	225,574	191,267	209,544	211,322
Assets	\$652,300	\$681,500	\$638,200	\$652,500	\$594,700
Debts	127,600	111,900	156,400	179,400	95,200
Debt/Asset ratios	20%	16%	25%	27%	16%
Acres operated	415	466	420	290	376
Acres of pasture	83	57	89	58	164
Acres planted	160	218	114	132	87
Value of crops used on farm	\$35,604	\$47,088	\$36,550	\$16,407	\$19,817
Operating margin	\$61,658	\$ 93,130	\$40,525	\$39,821	\$22,820
Off-farm income	5,241	5,041	3,174	8,026	6,054
Feed purchases	\$44,969	\$23,572	\$41,382	\$60,388	\$91,700
Wages, benefits	18,394	21,338	18,509	15,781	12,767
Interest	13,271	11,995	14,429	17,558	11,954
Utilities, insurance	9,356	9,923	10,553	7,853	7,662
Marketing	8,180	7,160	8,732	9,822	8,894
Rent, taxes	9,931	12,349	6,830	6,329	10,093
Fertilizer, seed, chemicals	14,585	18,763	10,696	14,516	*
Cash expenses	\$151,786	\$132,444	\$150,743	\$169,722	\$188,502

*t-statistic is less than 2.0.

Milk Sales, \$200,000-249,999. Farms of this size are widely distributed across the country -- in both the northern and southern states of the humid East as well as the Southern Plains and the irrigated West. The four groups, when divided on the basis of feed purchases as a percent of milk sales, continue to follow the pattern found for the smaller herd sizes. Operating margins on average are highest when purchased feed is a relatively small part of total expenses.

Table 23.

THE EFFECT OF FEED EXPENDITURE
AS A PERCENTAGE OF MILK SALES ON PERFORMANCE
Milk Sales, \$200,000-249,999, 1987
120-149 Cows

Description	All farms	Feed purchased as percent of milk sales			
		Less than 20%	20-29%	30-39%	40% or more
Milk sales	\$220,201	\$216,319	\$219,702	\$222,370	\$226,258
Gross cash farm income	271,743	279,641	270,603	259,751	269,444
Assets	\$910,500	\$1,081,900	\$962,600	\$785,900	\$612,400
Debts	186,900	224,700	184,400	145,100	157,700
Debt/Asset ratios	21%	21%	19%	18%	26%
Acres operated	576	713	643	399	358
Acres of pasture	79	53	*	110	121
Acres planted	254	334	322	139	84
Value of crops used on farm	\$33,466	\$47,179	\$43,356	\$14,022	\$7,049
Operating margin	\$69,726	\$93,782	\$ 76,719	\$52,538	\$28,234
Off-farm income	*	8,073	*	4,340	7,778
Feed purchases	\$60,573	\$27,268	\$51,170	\$76,100	\$124,231
Cash wages, benefits	32,139	32,590	41,441	29,338	16,914
Interest	13,449	15,286	8,412	16,438	16,789
Utilities, insurance	13,710	14,578	14,000	14,246	11,205
Marketing	11,668	11,402	9,766	11,471	15,717
Rent, taxes	10,585	17,078	8,976	7,298	4,566
Fertilizer, seed, chemicals	19,513	26,999	20,638	14,193	*
Cash expenses	\$202,017	\$185,859	\$193,883	\$207,212	\$241,211

*t-statistic is less than 2.0.

There is a fairly substantial difference in average farm assets for the four groups. To provide much of the feed supply on the farm requires more land as well as equipment for cultivation of crops. An important part of the farms spending 40 percent or more of milk sales for feed are located in the western half of the country. In these cases, the operators may not have fully exploited the efficiencies possible with the technologies in place or may need to exert greater controls over their costs.

Milk Sales, \$250,000-499,999. The milking herds of 150-299 cows are also widely distributed across the United States. The group with the smallest feed purchases relative to milk sales again

Table 24.

THE EFFECT OF FEED EXPENDITURE
AS A PERCENTAGE OF MILK SALES ON PERFORMANCE
Milk Sales, \$250,000-499,999, 1987
150-299 Cows

Description	All farms	Feed purchased as percentage of milk sales			
		Less than 20%	20-29%	30-39%	40% or more
Milk sales	\$332,632	\$329,269	\$323,028	\$340,259	\$342,052
Gross cash farm income	406,424	436,025	371,280	410,573	406,493
Assets	\$1,364,900	\$1,749,600	\$1,081,500	\$1,452,400	\$1,103,300
Debts	285,600	473,300	236,800	230,200	142,500
Debt/Asset ratios	21%	27%	22%	16%	13%
Acres operated	713	739	813	742	514
Acres of pasture	149	105	152	162	192
Acres planted	257	319	285	241	149
Value of crops used on farm	\$47,776	\$77,387	\$57,552	\$28,440	\$18,931
Operating margin	\$100,547	\$153,722	\$92,812	\$80,244	\$56,824
Off-farm income	12,190	*	9,167	11,400	4,376
Feed purchases	\$99,341	\$44,673	\$82,239	\$120,603	\$176,769
Wages, benefits	47,391	49,241	44,418	52,646	39,356
Interest	27,963	44,028	23,997	25,215	13,374
Utilities, insurance	17,651	18,595	16,554	19,269	16,077
Marketing	17,506	12,650	17,167	21,170	20,990
Rent, taxes	15,580	22,386	14,776	13,067	12,421
Fertilizer, seed, chemicals	23,795	30,752	23,966	22,084	*
Cash expenses	\$305,877	\$282,304	\$278,467	\$330,329	\$349,669

*t-statistic is less than 2.0.

show the highest operating margins by a substantial amount. They also have the most acres planted to crops and the largest outlays

for fertilizer, seed and chemicals, and highest values for crops used on farm. The smallest operating margins on average are associated with the farms with the highest feed purchases relative to milk sales. While an average operating margin of \$56,824 indicates a positive return, the amount left after covering depreciation and a small return on equity capital is very small pay for operators' labor and management.

Milk Sales, \$500,000-999,999. About equal numbers of farms of this size in the FCRS sample were located in various parts of the East compared with those in the Mountain and Pacific States. More of the farms of this size in the West depend on both purchased forage and concentrate feed. In this case, the largest operating margins were achieved by those where feed purchases ranged between 20 and 29 percent of milk sales. The group of farms that had the smallest feed purchases included a number where debts were substantial and interest payments accordingly high. Depreciation accordingly should be expected to be higher. Cash rent and taxes were larger on the average as well. These factors were not enough to explain the large average difference in operating margins for the two groups with feed purchase ratios less than 30 percent. Those with ratios between 20 and 29 percent had substantially larger gross cash farm income relative to milk sales, which may be a key determinant of their relative success.

Table 25.

THE EFFECT OF FEED EXPENDITURE
AS A PERCENTAGE OF MILK SALES ON PERFORMANCE
Milk Sales, \$500,000-999,999, 1987
300-599 Cows

Description	All farms	Feed purchased as percentage of milk sales			
		Less than 20%	20-29%	30-39%	40% or more
Milk sales	\$699,345	\$605,799	\$676,963	\$701,584	\$735,289
Gross cash farm income	817,284	742,150	959,403	806,877	819,855
Assets	\$1,696,800	\$1,598,900	\$1,920,600	\$2,086,800	\$1,575,100
Debts	388,500	716,700	423,700	381,200	270,300
Debt/Asset ratios	23%	45%	22%	18%	15%
Acres operated	519	837	1,017	601	292
Acres of pasture	88	27	145	69	103
Acres planted	278	578	475	386	105
Value of crops used on farm	\$40,210	\$76,667	\$49,102	\$46,290	\$24,139
Operating margin	\$141,881	\$247,359	\$343,427	\$161,232	*
Off-farm income	11,246	9,186	13,605	5,471	13,207
Feed purchases	\$305,441	\$ 94,321	\$175,234	\$255,903	\$417,371
Wages, benefits	99,716	126,345	138,196	104,468	81,921
Interest	42,419	71,412	43,342	47,712	30,652
Utilities, insurance	30,560	29,539	30,997	30,515	30,845
Marketing	32,453	23,625	39,284	30,608	34,779
Rent, taxes	30,087	54,400	24,485	26,272	23,074
Fertilizer, seed, chemicals	24,194	46,058	*	35,772	9,664
Cash expenses	\$675,402	\$494,791	\$615,976	\$645,645	\$757,778

*t-statistic is less than 2.0.

The group of farms with the largest feed purchases also had the smallest operating margins on average with substantial variability among them. Feed purchases averaged 55 percent of total cash expenses. Other classes of expenditure for this group of farms were not out of line in comparative terms with the other groups and the overall averages. The wide range in results for the four groups is

instructive as well. Increased size by itself does not insure profitability in dairy operations.

Milk Sales, \$1,000,000 and over. Farms with 600 cows or more are scattered across the country but most are in the Southeast, Southwest and Pacific regions. The majority of these farms can be thought of as dry lot dairies; most of the forages are produced on nearby crop farms; milking is the principal enterprise.

Table 26.

THE EFFECT OF FEED EXPENDITURE
AS A PERCENTAGE OF MILK SALES ON PERFORMANCE
Milk Sales, \$1,000,000 and Over
600 Cows and Over

Description	All farms	Feed as a percentage of milk sales			
		Less than 20%	20-29%	30-39%	40% or more
Milk sales	\$2,758,227				\$3,018,425
Gross cash farm income	3,014,939				3,288,768
Assets	\$4,425,700				\$4,355,300
Debts	1,145,700				1,344,100
Debt/Asset ratios	26%				31%
Acres operated	1,261				*
Acres of pasture	*				*
Acres planted	322				306
Value of crops used on farm	*				*
Operating margin	\$605,906				\$496,503
Off-farm income	12,911				15,783
Feed purchases	\$1,252,345				\$1,523,922
Wages, benefit	365,134				*
Interest	122,242				137,933
Utilities, insurance	89,440				92,699
Marketing	137,837				148,679
Rent, taxes	44,623				46,360
Fertilizer, seed, chemicals	36,035				*
Cash expenses	\$2,409,033				\$2,792,265

*t-statistic is less than 2.0.

More than half of the farms had feed purchases that exceeded 40 percent of milk sales. There were insufficient numbers in the other three categories to calculate a meaningful average for any one of the groups. In general, the farms with the largest feed purchases had lower operating margins than those who spent less than 40 percent of milk sales on feed. In most other respects, the pattern of expenditures was similar. There was substantial variation within the group of farms with high feed purchases in respect to acres planted to crops, amount of debt, and operating margin. The great majority could be described as profitable businesses.

Distribution of Farms Within Size Classes

An overview of the distribution of farms within each of the size classes, grouped on the basis of feed purchases, is provided in Table 27. The distributions were quite similar within size classes for the six smallest size categories (under \$200,000 of milk sales). A large number of these farms are in the eastern half of the country where it is typical to produce most of the forage fed to the dairy herd on the farm. More than 40 percent of these farmers spent less than 20 percent of income from milk sales to purchase feed.

Much smaller proportions of farms in the four largest size classes were located in the Northeast and Lake States. More of these larger farms relied on other sources of feed than on their own farm production. In the two largest size classes, the "typical" farm purchased most of their forages as well as their concentrates. Farms with approximately 150-300 cows (\$250,000-499,999 of milk sales) had the most even distribution across the feed purchase

categories. Herds of this size are found across the country in all regions with quite different methods of providing forage and concentrate needs.

Table 27. DISTRIBUTION OF DAIRY FARMS
BY SIZE CLASS AND FEED PURCHASES AS PERCENT OF MILK SALES
FCRS Data, Expanded Sample, 1987

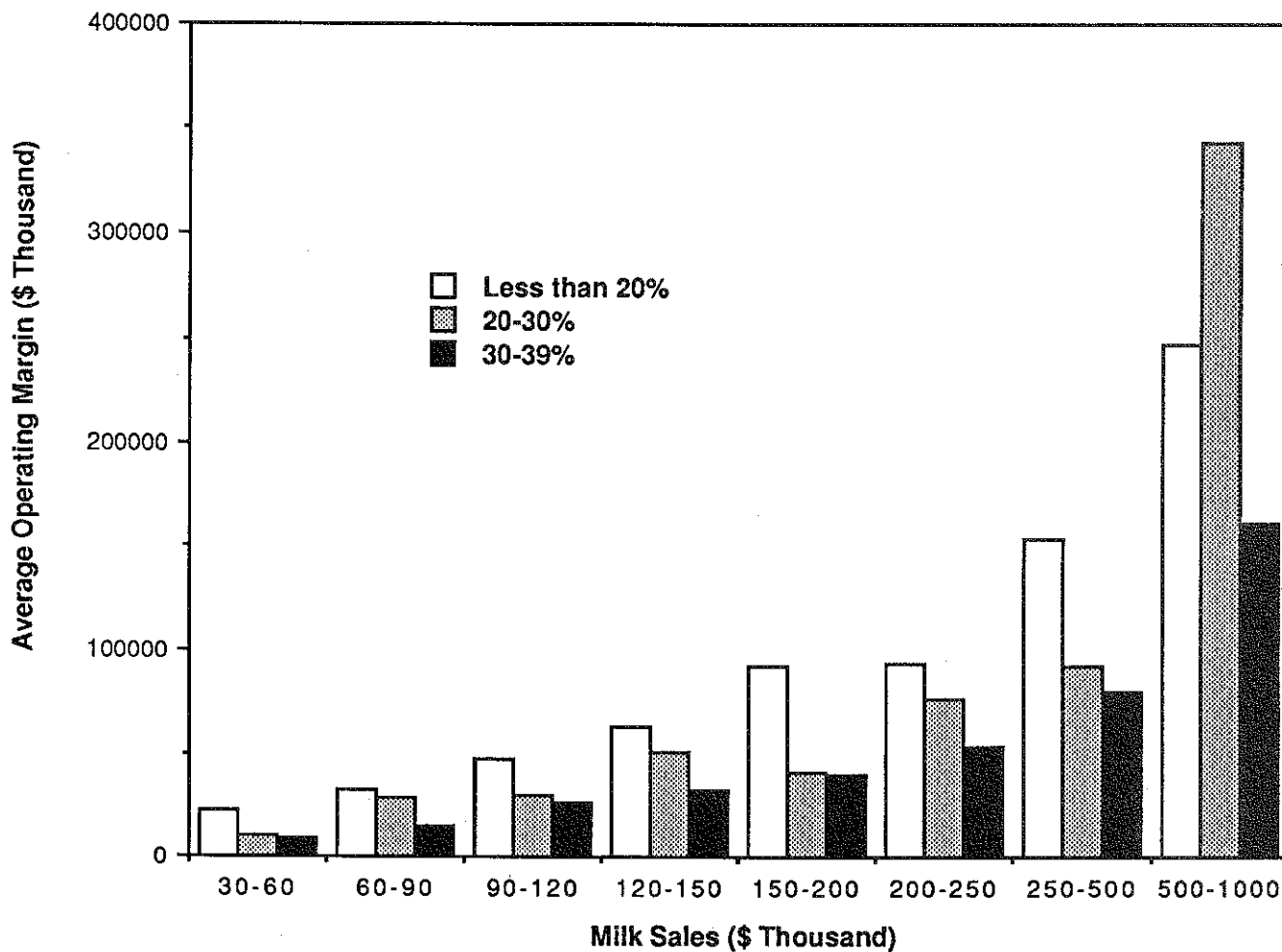
Size class, milk sales per farm	Number of farms	Feed purchases as percent of milk sales			
		Less than 20%	20-29%	30-39%	40% or more
<u>- percents of total -</u>					
Under \$30,000	24,404	44.3	17.7	15.5	22.5
\$ 30,000 - 59,999	32,292	32.4	30.5	20.1	17.0
60,000 - 89,999	28,144	42.4	29.8	17.2	10.6
90,000 - 119,999	17,607	43.9	33.4	13.5	9.2
120,000 - 149,999	11,590	43.1	29.8	15.0	12.1
\$ 150,000 - 199,999	9,347	46.5	21.3	13.8	18.4
200,000 - 249,999	5,098	33.1	33.3	15.1	18.5
250,000 - 499,999	6,903	29.6	27.6	21.8	21.0
500,000 - 999,999	1,579	19.0	10.2	16.0	54.8
\$1,000,000 and over	916	2.7	10.6	15.6	71.1
Total	137,881				

Operating Margin and Feed Purchases as a Percentage of Milk Sales

The effect of feed purchases as a percentage of milk sales on average operating margin is summarized in Figure 2 for the different sizes of dairy herds. Those farms spending lower percentages of milk sales for feed had the higher operating margins. Clearly, the combination of land and other resources available to the individual dairyman determines the appropriate management strategy. Home

production of an important share of forages and some feed grains was a good strategy for many small and mid-sized dairy farms in 1987.

FIGURE 2. FEED PURCHASES AS A PERCENTAGE OF MILK SALES AND AVERAGE OPERATING MARGIN, 1987



On larger farms with 300 cows or more, reliance on others to produce feed was much more common. Some farms with 300-600 cows (\$500,000-999,999 milk sales) are quite successful in combining feed production with milk production. As the number of cows milked continues to increase, specialization in feeding and milking without growing forages becomes the more general rule. Cost control continues to be important; feed purchases as a percentage of milk sales is shown to be an important index in examining management and performance on dairy farms of a given size and type.

General Summary Comments

This analysis of the FCRS data for specialized dairy farms in 1987 was undertaken to examine in more detail the structure and variability of costs and returns for different sizes of herds. All farms which obtained 50 percent or more of gross cash farm income from milk sales were included in the study. Size of farm was determined by value of milk sales. The class interval chosen for the large number of smaller dairy farms was \$30,000 (approximately equal to 18 cows). Ten size groups were examined with the two largest categories being \$500,000-999,999 of milk sales and \$1,000,000 or more.

Regional Differences. The authors hypothesized that regional differences within size classes would be small relative to the variability among farms within each of the regions. The evidence for this one year supported this proposition especially among farms with 18-150 milking cows (\$30,000-250,000 milk sales). When the same technology and housing systems were used, regional differences

in operating margins were measurable but not as important as the variability in performance within any given region for a given size of farm. The amount of land in crops seemed to be generally associated with higher operating margins with size held constant. While there is wide variation in this characteristic within each region, more dairy farms in the Corn Belt and Lake States had important areas in forages and grains.

The more significant regional differences are evident in the two largest size categories where the structure of costs differ more than differences in average operating margins between regions. Again this is related to the relative importance of cropping programs and the amount of feed purchased in the way these businesses are organized. A drylot dairy with 500 cows in the West buying essentially all its feed is significantly different from a 500-cow unit in most parts of the eastern United States where most of the forage consumed is produced on the farm.

Operating Margin and Feed Purchases. The basic hypothesis that the way the feed supply for milk production was obtained was important in determining operating margin was strongly supported in this analysis. Grouping dairy farms on the basis of the percentage which feed purchases were of milk sales yielded rather consistent results with size held constant. For essentially all of the size categories with from 20 to 300 cows, the groups which spent less than 20 percent of milk sales on feed purchases had the highest operating margins. The costs of producing homegrown feed are reflected in other cash expense categories, especially fertilizer, seed and chemicals, maintenance and repairs, fuel and oil, and

interest. Depreciation associated with added machinery is not included. The results were consistent across each of the four feed purchase categories for each size class. Even for the two largest size groups, those who maintained control over purchased feed costs had the best operating results.

Concluding Observation. This report has given attention to the structure of costs on specialized dairy farms using survey data from a national sample obtained by personal interview. It suggests that regional differences in costs in the dairy industry may often have been given too much attention. The key differences among regions are in size of operation, the amount of feed produced on the farm versus purchases of the feed supply, and the technology employed, especially housing and milking systems. There are important differences in these characteristics among farms in nearly every state and region especially for farms with 300 cows or less.

In thinking about potential change in the structure of the dairy industry in the next two decades, more attention should be focused on these differences than where farms are located. Clearly, regions have different proportions of farms when grouped by size, feed purchases, and milking systems. Analysis will be most useful if more attention is given to impacts of policy change on farms of various sizes using different technologies and associated feeding systems. Regional differences are a result of these factors, not a reason for their existence.

References

1. NASS & ERS, USDA. 1987 Farm Costs and Returns Survey Data: Selected State and Regional Highlights, ERS Staff Report No. AGES 89-1, January 1989.
2. Morehart, Mitchell J., et. al. Financial Characteristics of U. S. Farms, January 1, 1988, Agr. & Rural Econ. Div, ERS, USDA, Agr. Info. Bull. No. 551, October 1988.
3. Ahearn, Mary, et. al. Economic Indicators of the Farm Sector: Cost of Production, 1987, Agr. & Rural Econ. Div., ERS, USDA, ECIFS 7-3, February 1989.
4. Bertelsen, Diane, et. al. Economic Indicators of the Farm Sector: Farm Sector Review, 1987, Agr. & Rural Econ. Div., ERS, USDA, ECIFS 7-4, April 1989.
5. Hanson, Gregory D., et. al. Alternative Measures of Farm Output to Classify Farms by Size, Agr. & Rural Econ. Div., ERS, USDA, Technical Bull. No. 1749, January 1989.
6. Short, Sara D. and Mitchell J. Morehart. "Financial Characteristics of Dairy Farms," Dairy Situation, ERS, USDA, DS-419, April 1989, pp. 20-26.
7. Stanton, B. F. What Needs to be Done to Remain Competitive in Milk Production? Cornell Agricultural Economics Staff Paper No. 88-4, March 1988.

APPENDIX A
Standard Errors of the Mean for Each Variable
When Sorted into Ten Size Classes
FCRS Data, United States, 1987

	Milk sales of:		
	< \$30,000	\$30-60,000	\$60-90,000
	- standard deviations -		
Assets	\$17,391	\$21,084	\$14,000
Debt	3,613	7,575	8,469
Equity	16,803	22,058	15,817
Debt/Asset ratio	0.02	0.03	0.03
Change in inventory	1,399	1,052	942
Acres operated	11.9	22.8	15.6
Acres of pasture	5.8	10.7	4.9
Acres planted	4.3	7.2	8.1
Acres idle	1.2	2.9	2.6
Acres rented	9.5	11.6	12.2
Operator age	1.6	1.3	1.0
Operator hours	129	99.1	73.0
Unpaid hours	247	152.2	136.7
Milk sales	\$ 753	\$ 954	\$ 718
Gross sales	1,309	1,335	1,196
Gross cash income	1,763	1,763	1,558
Feed purchases	445.9	613.9	849.5
Wages	230.8	391.4	461.0
Crop costs	229.8	330.8	395.9
Maintenance and repairs	193.6	407.0	276.5
Fuel and oil	84.4	121.7	122.2
Livestock purchases	239	473.8	437.5
Marketing	119.8	154.9	164.6
Livestock costs	114.8	267.3	234.0
Utilities and insurance	152	256.6	164.7
Tax and rent	158.7	303.1	434.2
Interest	369	679.7	816.0
Operating margin	\$ 1,524	\$ 1,547	\$1,488.2
Cash expense	1,010.4	1,682.5	1,990.9
Depreciation	313.3	721.5	635.8
Return to equity	840.1	1,103	790.8
Net farm income	1,722.2	1,643.5	1,797.4
Off-farm income	1,165.2	1,366.6	1,654.9

APPENDIX A (Continued)
 Standard Errors of the Mean for Each Variable
 When Sorted into Ten Size Classes
 FCRS Data, United States, 1987

	Milk sales of:		
	\$90-120,000	\$120-150,000	\$150-200,000
Assets	\$ 30,771	\$ 53,930	\$ 51,380
Debt	11,351	14,989	18,758
Equity	33,019	57,945	48,183
Debt/Asset ratio	0.03	0.03	0.03
Change in inventory	7,343	4,112	10,202
Acres operated	29.9	25.1	24.2
Acres of pasture	23.2	7.9	12.4
Acres planted	8.6	13.4	13.8
Acres idle	2.0	5.0	3.3
Acres rented	24.7	24.1	16.3
Operator age	1.2	1.3	1.7
Operator hours	89.4	127.2	123
Unpaid hours	149.5	420.5	286.3
Milk sales	\$ 950	\$ 930	\$ 2,228
Gross sales	1,785	2,723	6,016
Gross cash income	2,044	4,000	5,957
Feed purchases	1,345.4	2,099	3,538
Wages	951.4	1,281.6	2,212.6
Crop costs	651.0	1,026.3	1,420.1
Maintenance and repairs	439.2	615.6	824.3
Fuel and oil	214.1	376.8	370.1
Livestock purchases	633.0	772.2	2,941
Marketing	311.6	343.4	549
Livestock costs	463.7	946.3	1,046.9
Utilities and insurance	243.0	344	539.1
Tax and rent	611.1	1,128.4	1,268.1
Interest	997.2	2,299	2,268
Operating margin	\$ 2,084	\$ 4,182	\$ 12,141
Cash expense	2,242	5,569	8,794
Depreciation	897	2,452	1,603
Return to equity	1,651	2,897	2,409
Net farm income	7,645	6,602	14,417
Off-farm income	1,266	1,545	991

APPENDIX A (Continued)
Standard Errors of the Mean for Each Variable
When Sorted into Ten Size Classes
FCRS Data, United States, 1987

	Milk sales of:			
	\$200-250,000	\$250-500,000	\$500,000-1,000,000	> \$1,000,000
Assets	\$ 71,036	\$163,513	\$141,687	\$1,007,120
Debt	36,822	35,303	51,913	355,516
Equity	65,764	168,178	139,747	716,716
Debt/Asset ratio	0.03	0.03	0.05	0.04
Change in inventory	3,788	6,830	11,339	81,150
Acres operated	58.0	42.1	75.5	614.3
Acres of pasture	14.8	19.1	25.2	361.9
Acres planted	51.7	20.7	48.7	100.6
Acres idle	9.1	5.7	8.3	4.1
Acres rented	47.9	32	50	186
Operator age	1.6	1.2	2.1	2.1
Operator hours	186.5	109.2	130.1	176.0
Unpaid hours	606.9	223.2	189.0	308.5
Milk sales	\$ 2,468	\$ 6,639	\$ 22,319	\$ 839,510
Gross sales	3,179	11,425	27,720	892,164
Gross cash income	5,489	13,617	33,341	891,777
Feed purchases	4,481	5,471	30,931	381,600
Wages	3,864	3,130	7,637	144,454
Crop costs	1,934	2,011	4,068	15,666
Maintenance & repairs	1,382	1,926	3,359	17,480
Fuel and oil	674	587	972	6,599
Livestock purchases	1,875	2,612	13,790	37,999
Marketing	719	1,183	3,268	40,799
Livestock costs	1,250	1,388	3,493	44,539
Utilities & insurance	914	887	2,643	22,067
Tax and rent	1,695	1,197	4,615	11,913
Interest	1,660	3,181	5,714	31,057
Operating margin	\$ 7,032.8	\$ 8,687	\$ 34,029	\$ 178,644
Cash expense	5,813.3	11,423	46,655	748,263
Depreciation	4,042.0	2,596	10,552	56,025
Return to equity	3,288.2	8,409	6,987	35,836
Net farm income	6,627.0	10,503	35,358	196,108
Off-farm income	34,040.1	5,214	3,332	5,309

Other Agricultural Economics Research Publications

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No. 89-12	Dairy Farm Management Business Summary, New York 1988	Stuart F. Smith Wayne A. Knoblauch Linda D. Putnam
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