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# CHANGES ON 112 NEW YORK DAIRY FARMS FROM 1974 THROUGH 1983

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## CHANGES ON 112 NEW YORK DAIRY FARMS FROM 1974 THROUGH 1983

The purpose of this report is to examine the changes on 112 New York dairy farms during the period from 1974 through 1983, and compare those farms with dairy farm business summary and Census of Agriculture farms during the same period. Tracking the identical 112 farms over a ten year period enabled an analysis of changes which would not have been possible by comparing annual business summaries over those ten years, since the summaries do not necessarily contain the same farms each year.<sup>1</sup> All dollar values are adjusted to 1983 values so that inflationary changes are eliminated in the comparisons. Thus, dollar changes are real rather than mere inflationary changes.

Farm business management projects in New York are sponsored jointly by the New York State College of Agriculture and Life Sciences at Cornell University, and County Cooperative Extension offices. Extension agents and farm management specialists enroll dairy farmer-cooperators and collect their business records annually. Information collected includes a fully itemized income statement and balance sheet, as well as numerous business factors and production information useful in studies of dairy farming. These records provide the basis for extension education programs and data for applied research such as the present study.<sup>2</sup>

During the ten year period from 1974 to 1983, an average of 579 farm business records have been included in each annual "Dairy Farm Management Business Summary" (DFBS) (Bratton, 1975, 1976, 1977, 1978, and 1979; Smith, 1980, 1981, 1982; Smith and Putnam, 1983 and 1984). Because participation is voluntary, new cooperators are enrolled every year while some former cooperators drop out. Hence, the number of different farms that have been DFBS participants over the years is significantly greater than the yearly average. There are, however, a number of farmers who participate quite consistently. DFBS data from the most recent ten-year period available contain a panel of 112 farms that have participated each and every year

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<sup>1</sup>This is the case even though, statistically, the same type of farm may be included in a farm summary program over a ten year period.

<sup>2</sup>Farm records data have been utilized for many years in agricultural research and extension. Some of the earliest work of this type was pioneered at Cornell University by George F. Warren. Warren believed that there were certain kinds of agricultural information that could only be obtained from farmers. "The facts exist on the farms and nowhere else," he wrote, citing production costs as an example: "The cost of producing a crop may be determined for a college farm, but this tells very little about the cost on regular farms" (Warren, 1914:421).

from 1974 to 1983. It is this group of farms which will be examined in this study, and compared to the average DFBS farm and to averages from the Census of Agriculture data for New York and the United States.

### Methodology

Reporting of the farm records in the annual DFBS as well as the calculation of performance measures varied slightly from year to year during the sample decade.<sup>3</sup> In order to obtain a consistent definition of terms, this study utilizes the raw data for the ten-year period to compute annual measures consistent with those of the 1983 DFBS.

For the purpose of describing the 112 farms and the ways in which they have changed as a group over the sample decade, a composite farm is generated wherever averages are needed. This procedure was followed to remain consistent with the procedure used in the DFBS reports. The advantage of using this method, both here and in the DFBS reports, is that it allows the reader to follow the calculations required to arrive at a given measure. This procedure, however, can result in different values than those obtained by averaging all the farms. For example, the rate of return on equity capital calculated in Table 5 is the rate of return for the average farm (i.e. the composite farm); this is not the same value as the average of the rates of return on each of the farms. The distinction between the two procedures can be demonstrated with a hypothetical example. Five farms (A,B,C,D,E) have the following levels of (1)dollar return on equity capital, (2)dollar amount of equity capital, and (3)rate of return on equity capital:

	(1)	(2)	(3)
A	\$40,500	\$450,000	9.0%
B	28,000	400,000	7.0
C	9,000	300,000	3.0
D	3,000	300,000	1.0
E	17,000	425,000	4.0
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Average	\$19,500	\$375,000	4.8%

The rate of return on equity capital is obtained by dividing the return on equity capital by the amount of equity capital, i.e. (1) / (2) = (3). For these five farms, the average of the rates of return on each farm is  $(9+7+3+1+4)/5 = 4.8\%$ . However, if one creates a composite farm by first totaling the dollar return on equity capital and the amount of equity

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<sup>3</sup>"Decade" is used here and throughout this report as it is strictly defined - a period of ten years; it refers not to the 1970's or 1980's but to the sample period, 1974-1983.

capital and then dividing these sums, the rate of return is  $\$97,500/\$1,875,000 = 5.2\%$ . With a large number of farms, the results from the two methods can be substantially different.

The implicit price deflator for personal consumption expenditures (PCE) is used throughout the report for adjusting dollar values to reflect 1983 purchasing power. The PCE deflator is superior to the Consumer Price Index (CPI); the latter is a fixed weight index and tends to overstate the rate of inflation during periods of rising interest rates. The same criticism can be leveled at the Producer Price Index (PPI) and various farm price indexes (Prentice and Schertz, 1981:4-6). The PCE deflator is also a preferred alternative to the gross national product (GNP) implicit price deflator; the GNP deflator includes such irrelevant components as the salaries of federal civilian and military employees and the prices of military hardware (Melichar, 1984:24). The values of the PCE deflator used for making adjustments in this study are as follows:

1974	.5455	1979	.7615
1975	.5872	1980	.8388
1976	.6172	1981	.9096
1977	.6528	1982	.9620
1978	.6987	1983	1.0000

#### Examination of the 112 Farms

The 112 dairy farms are well dispersed geographically, located in 34 of the 55 upstate New York counties (Figure 1). The maximum number of farms in any one county is nine.

Table 1 presents some important business characteristics and data on resources used. There was some change in the form of business organization chosen by the 112 farms during the ten-year period. The decrease in the number of sole proprietorships (76% of the farms in 1974 to 71% in 1983) coincided with an increase in the number of partnerships. The number of corporations remained between four and six out of the 112 farms throughout the period. There was a movement away from the use of stanchion-type barns in favor of freestall barns; in 1974, 52% of the barns were stanchion and 48% freestall and other types; by 1983, only 45% were stanchion while 55% were freestall and other types.

Labor use on the sample farm increased each year during the period, from a starting level of 29.3 months in 1974 to 36.7 months in 1983. Very little of this increase was due to additional operator labor. Months of hired labor increased by about 30%. The most significant change in the labor force was the nearly threefold increase in the use of paid family labor. There was a coinciding, though not commensurate, drop in months of unpaid family labor. This change could be interpreted to reflect a growing awareness of the importance of tax management

Figure 1. Locations of the 112 Farms

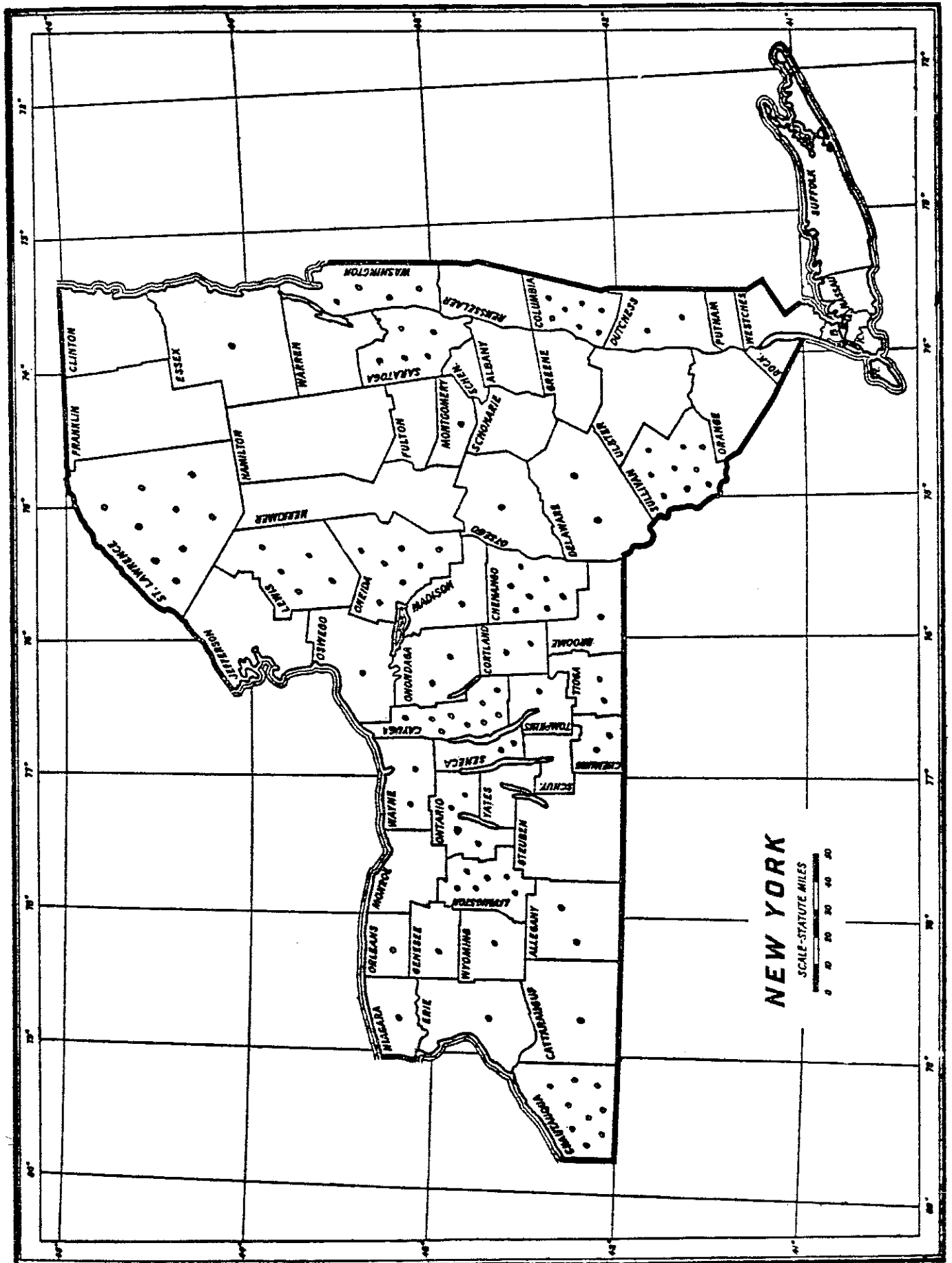




Table 1. Selected Business Characteristics of  
112 New York State Dairy Farms, 1974-1983

Business Characteristics	1974	1975	1976	1977	1978
Type of Business (no.)					
Sole proprietorship	85	84	85	86	87
Partnership	22	23	22	22	21
Corporation	5	5	5	4	4
Barn Type (no.)					
Stanchion	58	57	53	50	51
Freestall & other	53	55	59	62	61
Labor Force (months)					
Operator(s)	14.9	14.9	14.9	15.0	14.9
Family paid	2.3	2.9	3.3	3.1	4.0
Family unpaid	2.7	2.4	2.1	2.6	2.4
Hired	9.4	9.3	10.4	11.1	11.7
Total months	29.3	29.5	30.7	31.8	33.0
Operators (no.)	1.26	1.26	1.26	1.27	1.26
Age (years)	41	42	42	42	43
Education (years)	NA	NA	NA	NA	11.2
Estimated value labor & mgmt.*	\$18,684	\$18,919	\$19,115	\$18,952	\$19,127
Dairy Records (no.)					
D.H.I.C	60	63	68	71	71
Owner sampler	25	21	22	18	18
Other	12	11	9	9	10
None	15	17	13	14	13

\*Values are adjusted by PCE deflator (1983=100).

Table 1 (continued). Selected Business Characteristics  
of 112 New York State Dairy Farms, 1974-1983

Business Characteristic	1979	1980	1981	1982	1983
Type of Business (no.)					
Sole proprietorship	86	85	85	82	79
Partnership	22	22	23	25	27
Corporation	4	5	4	5	55
Barn Type (no.)					
Stanchion	49	47	48	49	50
Freestall & other	63	65	64	63	62
Labor Force (months)					
Operator(s)	15.1	15.2	15.2	15.5	15.5
Family paid	4.5	5.3	5.5	6.1	6.6
Family unpaid	2.4	2.3	2.2	2.4	2.1
Hired	12.9	12.7	12.7	12.7	12.5
Total months	34.9	35.5	35.6	36.7	36.7
Operators (no.)	1.28	1.27	1.28	1.29	1.29
Age (years)	44	46	46	47	48
Education (years)	12.8	13.3	13.5	13.8	13.8
Estimated value labor & mgmt.*	\$18,922	\$18,263	\$17,320	\$16,398	\$16,013
Dairy Records (no.)					
D.H.I.C	75	75	73	71	74
Owner sampler	17	16	16	19	15
Other	8	11	11	11	11
None	12	10	12	11	12

\*Values are adjusted by the PCE deflator (1983=100).

as well as a movement towards more business-like transactions among family members. Remunerating previously unpaid family workers would shift farm income into lower tax brackets and reward family members financially for efforts which are often essential to the farm operation.

The average number of operators per farm changed insignificantly through the period. The average age of the operators increased 7 years during the 10 year span, indicating that the pool of operators of the 112 farms was not static but included the entry of younger operators and the exit (retirement) of older operators. The value estimated by the operators for their labor and management remained relatively stable through 1980, in constant 1983 dollars, but fell during the latter years of the period.

The number of farms utilizing some type of dairy herd production records increased only slightly during the period. However, there was a significant shift from "owner-sampler" type records to Dairy Herd Improvement Cooperative (D.H.I.C.) records. Operations using D.H.I.C. records increased from 54% to 66% of the sample farms.

Capital investment on the 112 farms in 1983 dollars (Table 2) shows average total investment peaking in 1980, nearly 30% above its 1974 level and then falling off almost 9% by 1983. This information, coupled with that in Table 3, describing various measures of size, provides a good indication of how real farm asset values have changed during the decade relative to changes in the price level for the economy as a whole.

Table 2. Average Capital Investment on 112  
New York State Dairy Farms, 1974-1983

Year	Livestock	Feed and Supplies	Machinery and Equipment	Land and Buildings	TOTAL ASSETS
1974	\$93,910*	\$42,845	\$83,789	\$246,972	\$467,516
1975	92,629	44,353	84,864	242,788	464,634
1976	94,473	44,401	93,589	257,124	489,587
1977	93,125	41,820	98,816	265,574	499,335
1978	123,382	43,144	105,337	267,495	539,359
1979	151,576	47,769	113,778	274,582	587,705
1980	153,907	52,155	117,752	280,306	604,120
1981	142,438	48,530	122,290	275,384	588,642
1982	136,510	44,832	115,488	269,497	566,326
1983	123,235	45,110	116,131	266,704	551,180

\*All values are at year end and are adjusted by the PCE deflator (1983=100).



Table 3. Average Size of 112 New York State Dairy Farms By Various Measures, 1974-1983

Measure of Size	Year				
	1974	1975	1976	1977	1978
Number of cows	77	79	80	82	82
Number of heifers	57	60	62	62	63
Total acres owned	295	308	319	325	337
Total tillable acres	238	247	251	260	260
Person-years labor	2.45	2.46	2.56	2.65	2.75
Cwt. of milk sold	9912	10395	10802	11199	11542
Cash receipts*	\$176	\$171	\$195	\$187	\$200
Total investment*	\$468	\$465	\$490	\$499	\$539
	Year				
	1979	1980	1981	1982	1983
Number of cows	85	87	88	90	95
Number of heifers	64	68	70	74	79
Total acres owned	342	352	344	360	373
Total tillable acres	269	295	307	313	318
Person-years labor	2.9	2.95	2.98	3.05	3.06
Cwt. of milk sold	12304	12754	12909	13228	14381
Cash receipts*	\$226	\$225	\$223	\$215	\$225
Total investment*	\$588	\$604	\$589	\$566	\$551

\*Values are in thousands of 1983 dollars.

Farm size - as measured by herd size, labor use, acres, and milk sales - increased steadily over the sample period. This contrasts with the rise and fall in capital investment mentioned above. Clearly, the value of farm assets has neither remained constant nor shown the continual growth many anticipated. Instead, real asset values rose until 1980 and then began falling. The variation in the value of livestock was the most dramatic. This can be attributed to the expectations of rising profits in the dairy industry. Of the 64% increase in investment in livestock between 1974 and 1980, nearly two-thirds can be attributed to the rising value of the livestock (the remaining one-third being due to larger herd size). By 1983, however, most of this gain had been lost, the average value in constant 1983 dollars per head (cows and heifers) being only \$7 greater than the 1974 value per head. A similar pattern occurred with investment in land and buildings and feed and supplies. Both of these sets of assets peaked in value in 1980 and then declined. Machinery and equipment investment reached its highest point one year later than the other capital investment categories.

Tables 4 and 5 present two measures of farm profitability. Both labor and management income and rate of return on equity capital vary significantly during the decade. The direction of movement in labor and management income, adjusted for inflation, changed five times in ten years, with the highest observation (1979) being 3.7 times as large as the lowest (1981). Rate of return on equity capital showed an even greater range of variability. This variability in profits originated from changes in both expenses and receipts. Influential expense items include hired labor and purchased feed; influential receipt items include milk sales and changes in feed and supplies inventory. Complete, itemized data on annual receipts and expenses can be found in the appendix.

Changes in various business factors can serve as indicators of improvement or lack thereof in the performance of the farm operation and its management. Tables 6, 7, 8, and 9 offer descriptions of some of these business factors. Productivity of farm inputs has a major effect on farm profits. With the exception of 1981, milk sold per cow on the average sample farm increased each year from a starting level of 12,806 lbs. in 1974 to 15,186 lbs. in 1983. Crop yields per acre, however, did not show consistent gains. Corn silage production, for example, varied only between 13.3 and 15.6 tons per acre and ended the period at virtually the same level at which it began (Table 6).

The efficiency with which farms utilize labor and capital is an important barometer of management performance. Measures of labor efficiency shown in Table 7 are number of cows per worker, pounds of milk sold per worker, tillable acres per worker, and total capital per worker. Of these, only pounds of milk sold per worker increased significantly during the decade. Number of cows per worker remained virtually unchanged, implying that the increase in milk sold per worker was more a function of increased production per cow than of improved labor productivity. Capital efficiency was measured by total capital per worker, per cow, and per hundred weight of milk sold, and by capital turnover. Capital turnover is the number of years of farm receipts required to equal or "turnover" capital investment. It is computed by dividing year-end total farm investment by the year's total farm receipts (Smith & Putnam, 1983:21). All of these measures remained relatively stable over the sample period. The interaction of capital and labor is illustrated by the total capital per worker measure. This variable increased with asset values from \$190,823 in 1974 to \$204,786 in 1980, then fell to \$180,124 by 1983. These data indicate that there have been no measurable gains in either cows per worker or capital efficiency over the period.

Management of debt became increasingly important and difficult during the decade with real interest rates rising and interest rate risk being shifted to farmers through variable rate loans. Various measures of debt management are presented in Table 8. Total farm debt on the average

Table 4. Labor and Management Income Per Operator  
on 112 New York State Dairy Farms, 1974-1983

Measure	Year				
	1974	1975	1976	1977	1978
----- Thousands -----					
Total farm receipts excluding appreciation	\$193.0*	\$177.3	\$198.2	\$187.5	\$208.1
Total farm expenses	\$162.8	\$160.5	\$175.1	\$178.4	\$190.8
Labor & management income	\$30.2	\$16.8	\$23.1	\$9.1	\$17.3
Number of operators / farm	1.26	1.26	1.26	1.27	1.26
Labor & management income per operator	\$24.0	\$13.3	\$18.3	\$7.2	\$13.7
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	Year				
	1979	1980	1981	1982	1983
Total farm receipts excluding appreciation	\$238.4	\$236.3	\$224.8	\$221.0	\$229.9
Total farm expenses	\$208.1	\$211.1	\$216.7	\$211.9	\$218.0
Labor & management income	\$30.3	\$25.2	\$8.1	\$9.1	\$11.9
Number of operators / farm	1.28	1.27	1.28	1.29	1.29
Labor & management income per operator	\$23.7	\$19.8	\$6.3	\$7.1	\$9.2

\*Dollar values are in thousands of 1983 dollars (adjusted by PCE deflator).

Table 5. Return on Equity Capital on 112 New York  
State Dairy Farms, 1974-1983\*

Item	Year				
	1974	1975	1976	1977	1978
<hr/>					
Including	Thousands				
Appreciation					
Total farm receipts	\$202	\$193	\$219	\$204	\$256
Total farm expenses excluding interest on equity capital	\$149	\$147	\$160	\$164	\$175
Labor, mgmt. & ownership income per farm	\$54	\$47	\$59	\$41	\$82
Operators labor & mgmt.	\$23	\$23	\$24	\$24	\$24
RETURN ON EQUITY CAPITAL	\$30	\$23	\$35	\$17	\$57
Amount of equity capital	\$333	\$337	\$362	\$358	\$396
RATE OF RETURN ON EQUITY CAPITAL	9.0%	6.8%	9.6%	4.6%	14.5%
<hr/>					
Excluding	Thousands				
Appreciation					
Return on equity capital	\$30	\$22	\$35	\$17	\$57
Less appreciation	\$10	\$17	\$21	\$17	\$48
RETURN ON EQUITY CAPITAL EXCLUDING APPRECIATION	\$20	\$6	\$13	-\$0.6	\$9
Amount of equity capital	\$333	\$337	\$362	\$358	\$396
RATE OF RETURN ON EQUITY CAPITAL EXCLUDING APPRECIATION	6.0%	1.9%	3.7%	-0.2%	2.3%

\*Dollar values are in thousands of 1983 dollars (adjusted  
by PCE deflator).

Table 5 (continued). Return on Equity Capital  
on 112 New York State Dairy Farms, 1974-1983\*

Item	Year				
	1979	1980	1981	1982	1983
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Including	Thousands				
Appreciation					
Total farm receipts	\$288	\$273	\$239	\$226	\$231
Total farm expenses excluding interest on equity capital	\$190	\$193	\$199	\$195	\$202
Labor, mgmt. & ownership income per farm	\$98	\$80	\$40	\$31	\$29
Operators labor & mgmt.	\$24	\$23	\$22	\$21	\$21
RETURN ON EQUITY CAPITAL	\$74	\$57	\$18	\$10	\$8
Amount of equity capital	\$451	\$457	\$445	\$413	\$401
RATE OF RETURN ON EQUITY CAPITAL	16.4%	12.4%	3.9%	2.3%	2.1%
<hr/>					
Excluding	Thousands				
Appreciation					
Return on equity capital	\$74	\$57	\$18	\$10	\$8
Less appreciation	\$50	\$36	\$14	\$5	\$1
RETURN ON EQUITY CAPITAL EXCLUDING APPRECIATION	\$24	\$21	\$4	\$5	\$7
Amount of equity capital	\$451	\$457	\$445	\$413	\$401
RATE OF RETURN ON EQUITY CAPITAL EXCLUDING APPRECIATION	5.3%	4.4%	0.8%	1.1%	1.8%

\*Dollar values are in thousands of 1983 dollars (adjusted  
by PCE deflator).

Table 6. Measures of Rates of Production on  
112 New York State Dairy Farms, 1974-1983

Measure	Year				
	1974	1975	1976	1977	1978
Milk sold per cow (lbs.)	12,806	13,142	13,519	13,707	14,058
All hay crops (tons dry matter/acre)	2.6	2.5	2.7	2.2	2.4
Corn silage (tons/acre)	13.9	14.8	13.3	14.1	14.0
Grain corn (bu./acre)	74.4	91.6	84.3	84.6	102.9
Measure	Year				
	1979	1980	1981	1982	1983
Milk sold per cow (lbs.)	14,424	14,626	14,603	14,665	15,186
All hay crops (tons dry matter/acre)	2.7	2.9	2.8	2.8	2.8
Corn silage (tons/acre)	14.5	15.0	15.6	14.3	13.8
Grain corn (bu./acre)	92.9	95.2	92.7	92.0	92.7



Table 7. Measures of Labor and Capital Efficiency  
on 112 New York State Dairy Farms, 1974-1983

Measure	Year				
	1974	1975	1976	1977	1978
Number of cows per worker	31.6	32.2	31.2	30.8	29.9
Cwt. milk sold per worker	4046	4226	4220	4226	4197
Tillable acres per worker	97	100	98	98	95
Capital per worker (\$1000's)	\$191*	\$189	\$191	\$188	\$196
Capital per cow	\$6,072	\$5,881	\$6,120	\$6,089	\$6,578
Capital per cwt. milk sold	\$47	\$45	\$45	\$45	\$47
Capital turnover (years)	2.30	2.40	2.23	2.44	2.10
Measure	Year				
	1979	1980	1981	1982	1983
Number of cows per worker	29.4	29.6	29.7	30.3	30.9
Cwt. milk sold per worker	4243	4323	4332	4337	4700
Tillable acres per worker	93	100	103	103	104
Capital per worker (\$1000's)	\$203	\$205	\$198	\$186	\$180
Capital per cow	\$6,914	\$6,944	\$6,689	\$6,293	\$5,802
Capital per cwt. milk sold	\$48	\$47	\$46	\$43	\$38
Capital turnover (years)	2.04	2.22	2.47	2.50	2.39

\*Dollar values are adjusted by the PCE deflator (1983=100).

Table 8. Measures of Debt Management for 112  
New York State Dairy Farms, 1974-1983

Measure	1974	1975	1976	1977	1978
Total debt	\$151.6*	\$148.7	\$148.4	\$164.8	\$169.6
Interest expense	\$9.4	\$10.0	\$9.7	\$10.7	\$11.1
Debt/Asset ratio	0.32	0.32	0.30	0.33	0.31
Interest paid as % of:					
Year end debt	6.2%	6.7%	6.6%	6.5%	6.6%
Cash farm expenses	5.3%	5.8%	5.0%	5.7%	5.6%
Cash farm receipts	7.4%	7.9%	7.0%	7.7%	7.4%
	1979	1980	1981	1982	1983
Total debt	\$164.6	\$174.1	\$171.4	\$186.1	\$178.7
Interest expense	\$11.5	\$14.1	\$16.3	\$16.0	\$17.2
Debt/Asset ratio	0.28	0.29	0.29	0.33	0.32
Interest paid as % of:					
Year end debt	7.0%	8.1%	9.5%	8.6%	9.6%
Cash farm expenses	5.1%	6.2%	7.3%	7.5%	7.7%
Cash farm receipts	7.0%	8.5%	9.4%	9.4%	9.8%

\*Values adjusted by PCE deflator, 1983=100.

Table 9. Cost Control Measures on 112  
New York State Dairy Farms, 1974-1983

Measure	1974	1975	Year 1976	1977	1978
Feed purchased per cow	\$563*	\$490	\$551	\$557	\$555
Feed purchased as % of milk sales	28%	25%	25%	27%	27%
Crop expense per cow	\$199	\$208	\$200	\$179	\$205
Feed & crop expense per cwt. milk sold	\$5.92	\$5.31	\$5.56	\$5.39	\$5.40
Machinery costs per cow	\$411	\$407	\$443	\$445	\$478
Machinery costs per cwt. milk sold	\$3.19	\$3.09	\$3.28	\$3.26	\$3.39
Labor costs per cow	\$328	\$320	\$342	\$346	\$363
Labor costs per cwt. milk sold	\$2.54	\$2.43	\$2.53	\$2.54	\$2.58
	1979	1980	Year 1981	1982	1983
Feed purchased per cow	\$597	\$561	\$538	\$500	\$514
Feed purchased as % of milk sales	26%	25%	24%	24%	25%
Crop expense per cow	\$219	\$213	\$226	\$200	\$181
Feed & crop expense per cwt. milk sold	\$5.64	\$5.28	\$5.21	\$4.76	\$4.59
Machinery costs per cow	\$491	\$518	\$511	\$479	\$449
Machinery costs per cwt. milk sold	\$3.39	\$3.53	\$3.48	\$3.26	\$2.97
Labor costs per cow	\$383	\$373	\$376	\$371	\$352
Labor costs per cwt. milk sold	\$2.65	\$2.55	\$2.65	\$2.52	\$2.33

\*Dollar values are adjusted by the PCE deflator (1983=100).

sample farm reached its lowest level in 1976 at \$148,425; within six years it rose by 25%, in constant 1983 dollars, to its highest level at \$186,077. While this increase was substantial, the increase in interest expense was far greater. From 1974 to 1983 interest expense grew from \$9430 to \$17,243, an 83% increment. This growth in interest expense is reflected in the rise in interest expense as a percentage of year-end debt. The increasing significance of interest expense to the farm business as a whole is evidenced in its growth as a proportion of both cash farm receipts and cash farm expenses.

Interest is only one of the many costs dairy farmers must manage. A number of measures of cost control are presented in Table 9. Crop expense is the total amount spent for fertilizer and lime, seeds and plants, spray, and other crop items. It does not include charges for the use of land, machinery, or fuel. Machinery costs are computed by summing depreciation, interest at 4% (real rate) on average investment, machine hire, machinery repairs, auto expense (farm share), and gas and oil.<sup>4</sup> Operator's labor, at \$750/month, hired labor expense, and unpaid family labor at \$500/month comprise the labor costs. All of these costs are measured in constant 1983 dollars. Perhaps the most interesting aspect of some of these cost data is how little change there has been during the decade. No sustained upward or downward movement occurred in feed purchased or crop expense on a per cow basis. Machinery costs and labor costs trend upward through the middle years of the period and then fall off slightly towards the end. This movement could be viewed as a gradual relaxing of restraints on spending by managers during the more profitable years followed by more strictly controlled spending in the latter, less profitable years.

#### Comparison of Sample, DFBS, and Census Farms

Comparing the 112 farms to other summarized groups of farms will provide a context for comparison and contrast with other dairy farms. The 112 farms are a subset of all the dairy farms which are summarized annually in the dairy farm business summary (DFBS). During the sample period, the DFBS group of farms was about five times as large as the sample group in an average year. As voluntary participants in the farm business management project, this larger group of farmers could be considered likely users of cooperative extension information.

The sample decade also includes three years in which a nationwide census of agriculture was taken: 1974, 1978, and 1982. Examination of New York and United States data will

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<sup>4</sup>The long-run real interest rate is considered to be between 3 and 5% (Melichar, 1979:1085). For this reason, all charges for interest on long-term investment (e.g. interest on equity capital) are computed at 4%.

provide an indication of how the 112 farms compare with all dairy farms (meeting the Census' definition of a "farm") primarily selling or producing milk in the state and the country.

Table 10 presents data on a number of variables for the four groups of farms mentioned above - U.S. and N.Y. census farms, DFBS farms, and the sample farms - for the years 1974, 1978, and 1982. The variables presented are all those for which direct comparisons could be made among the four groups. Since the 112 sample farms are a subset of the DFBS farms, they were removed from the DFBS group presented in the table to enable comparisons to be drawn between the two independent groups. This makes it possible to determine if the sample is different from the DFBS farms which did not participate for ten consecutive years. The sample farms are also a subset of the N.Y. and U.S. census groups, but they are an extremely small proportion of these groups and, therefore, do not significantly bias the comparisons.

In general, the differences between the sample farms and the other groups are smaller than might have been expected. The relationships among the groups remain relatively consistent over the years. The differences are emphasized in the discussion which follows, but one should not dismiss the basic similarities.

The first observation that can be made regarding type of business organization used by the four groups is that a greater percentage of the sample farms chose to organize in a form other than individual proprietorship. The percentage of sample farm partnerships is consistently larger than the U.S. or N.Y. census percentage and larger than the DFBS percentage until 1982. In 1974, all three New York groups had a larger percentage of dairy farm corporations than the U.S. census group. However, the proportion of farm corporations nationwide grew faster than that for New York, resulting in the U.S. census group having the largest percentage of corporations in 1978 and 1982.

Value of land and buildings, value of machinery and equipment, total crop land, number of cows, hired labor expense, and value of dairy products sold can all be used as measures of size. On the basis of these measures, the sample farms are larger, on average, than the farms in the other groups. An exception to this statement is the value of land and buildings on the average U.S. census farms; this value is greater than that for the average sample farm in all three comparison farms.

No measure of variance is reported with the DFBS or census data. To statistically compare the sample farms with the other groups, the DFBS and census variables were assumed to have variances equal to those of the sample farms, and Student's t tests were computed to test the null hypothesis that the means

Table 10. Comparison of Sample, DFBS, and New York  
and U.S. Census Dairy Farms, 1974, 1978, and 1982

Characteristic	U.S. Census	N.Y. Census	DFBS Farms	Sample Farms
- - - - - 1974 - - - - -				
Number of dairy farms	196,057	17,247	516	112
Type business organization:				
Individual	88.2%	87.7%	83.0%	76.0%
Partnership	10.7%	11.0%	15.0%	20.0%
Corporation and other	1.1%	1.3%	2.0%	2.0%
Value of investment: <sup>a</sup>				
Land and bldgs. (\$1000's)	\$251*	\$242	\$219*	\$247
Mach. and equip (\$1000's)	\$57*	\$66*	\$74*	\$84
Total crop acres	185*	200*	208	237
Number of cows	48*	51*	71	77
Hired labor expense	\$8699*	\$8491*	\$11500	\$13192
Interest expense	NA	NA	\$9912	\$9430
Milk sold (\$1000's):				
All farms	\$72*	\$79*	\$140	\$155
Farms with sales >\$40,000	\$164	\$131*	NA	\$168
Milk sales per cow	\$1495	\$1556	\$1970	\$1982
Corn grain (bu./acre)	69*	79*	73	74
Dry hay (tons/acre)	2.4	2.2*	2.6	2.6

\*Differences between means of comparison farms and sample farms significant at the 5% alpha level (Student's t test).

<sup>a</sup>All dollar values are adjusted by PCE deflator (1983=100).

NA = not available



Table 10 (continued). Comparison of Sample, DFBS, and New York and U.S. Census Dairy Farms, 1974, 1978, and 1983

Characteristic	U.S. Census	N.Y. Census	DFBS Farms	Sample Farms
	- - - - - 1978 - - - - -			
Number of dairy farms	169,321	15,680	415	112
Type business organization:				
Individual	82.5%	84.1%	81.9%	77.7%
Partnership	13.3%	13.9%	16.5%	18.7%
Corporation and other	4.2%	2.0%	1.6%	3.6%
Value of investment: <sup>a</sup>				
Land and bldgs. (\$1000's)	\$371*	\$274	\$226	\$267
Mach. and equip (\$1000's)	\$75*	\$80*	\$81*	\$105
Total crop acres	203*	220*	205*	260
Number of cows	54*	54*	68*	82
Hired labor expense	\$9807*	\$9942*	\$11551*	\$17431
Interest expense	NA	NA	\$11776	\$11132
Milk sold (\$1000's):				
All farms	\$88*	\$99*	\$141*	\$172
Farms with sales >\$40,000	\$142*	\$122*	NA	\$177
Milk sales per cow	\$1630*	\$1698*	\$2070	\$2087
Corn grain (bu./acre)	93*	90*	90*	103
Dry hay (tons/acre)	2.6	2.1*	2.4	2.4

\*Differences between means of comparison farms and sample farms significant at the 5% alpha level (Student's t test).

<sup>a</sup>All dollar values are adjusted by PCE deflator (1983=100).

NA = not available

Table 10 (continued). Comparison of Sample, DFBS, and New York and U.S. Census Dairy Farms, 1974, 1978, and 1982

Characteristic	U.S. Census	N.Y. Census	DFBS Farms	Sample Farms
	- - - - - 1982 - - - - -			
Number of dairy farms	163,382	14,327	460	112
Type business organization:				
Individual	79.6%	81.8%	76.7%	73.0%
Partnership	15.0%	15.8%	22.0%	22.0%
Corporation and other	5.4%	2.4%	1.3%	5.0%
Value of investment: <sup>a</sup>				
Land and bldgs. (\$1000's)	\$345*	\$245	\$231*	\$269
Mach. and equip (\$1000's)	\$75*	\$81*	\$88*	\$119
Total crop acres	213*	230*	250*	313
Number of cows	60*	60*	80*	90
Hired labor expense	\$10865*	\$11139*	\$15223*	\$19832
Interest expense	\$14195	\$11914*	\$20214*	\$15992
Milk sold (\$1000's):				
All farms	\$97*	\$99*	\$167*	\$186
Farms with sales >\$40,000	\$130*	\$117*	NA	\$186
Milk sales per cow	\$1611*	\$1652*	\$2083	\$2057
Corn grain (bu./acre)	98*	96	94	92
Dry hay (tons/acre)	2.6	2.2*	2.6	2.8

\*Differences between means of comparison farms and sample farms significant at the 5% alpha level (Student's t test).

<sup>a</sup>All dollar values are adjusted by PCE deflator (1983=100).

NA = not available

for the sample and each of the other groups were equal. The results of the "t" tests support the observations made above. Compared to the average U.S. and N.Y. census farm, the average sample farm is statistically significantly larger (at an alpha level of 5%) as measured by value of machinery and equipment, total crop land, number of cows, hired labor expense, and value of dairy products sold in each of the three census years.

Differences in rates of production between both census groups and the sample group were consistent only in milk sales per cow, with the sample farms selling significantly more milk per cow each year than either the N.Y. or U.S. census group. Corn yields obtained by the sample group differed from at least one of the census groups in each of the three years; however, the differences were not always in the sample farms' favor. Corn production per acre on the average sample farm was exceeded by that on the average N.Y. census dairy farm in 1974 and by the average U.S. census dairy farm in 1982. Average hay yields for the sample group were greater each year than the N.Y. census group but did not differ significantly from the U.S. group.

Dissimilarities between the sample farms and the DFBS group are not as substantial as those just discussed between the sample group and the two census groups. The sample farms are somewhat larger by most measures, with interest expense being one important exception. In 1974, the only statistically significant difference between the sample and DFBS farms was the value of machinery and equipment. However, in 1978, value of land and buildings, value of machinery and equipment, total crop land, number of cows, hired labor expense, value of dairy products sold (all farms), and corn grain yield all showed significant differences. In 1982, all of these variables except corn grain yield were again significantly different. In addition, interest expense, which had been very similar for the DFBS and sample farms in 1974 and 1978, was significantly different in 1982 with the average DFBS farm paying over one-fourth more in interest than the average sample farm.

It is important to remain cognizant of the differing nature of the groups being compared. The sample farms are a compositionally static group of the same 112 farms for all the years being compared. The DFBS and both census groups are, in contrast, more dynamic groups which differ in size and composition for each of the comparison years.

The larger size of the sample farms in comparison to the DFBS farms has apparently not been an advantage in terms of production rates. For the three years presented in Table 10, the differences between the sample and DFBS farms in terms of milk sales per cow never exceed \$26. Dry hay yields for the two groups were virtually identical each year. As noted above, corn grain yields differed significantly only in 1978.

A final area for comparison of the sample and DFBS farms is profitability. Figures 2 and 3 show graphically the movement of labor and management income per operator and rate of return to equity capital, respectively, for the 10 year period. Values used in deriving these figures were adjusted to constant 1983 dollars. Labor and management income per operator for the sample farms was significantly higher than that for the DFBS farms in five of the ten years. These five years were all relatively high income years, suggesting that the managers of the sample farms were more successful in availing themselves of favorable economic conditions. During less favorable periods there was little difference in incomes between the two groups.

Figures 2 and 3 demonstrate an important attribute of the sample period itself. Both labor and management income per operator and rate of return to equity capital start the period at relatively high levels, decrease until 1977, peak in 1979, and then fall off again toward the end of the period. Thus, the decade represents one complete cycle of farm profitability. Rises and falls such as this one have occurred regularly in the past and are likely to recur in the future. Therefore, the sample period 1974-1983 seems a reasonable one from which to draw conclusions about dairy farm management strategies and to make inferences about future strategies.<sup>5</sup>

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<sup>5</sup>See Kauffman (1985) for an analysis of the management strategies of the 112 sample farms.

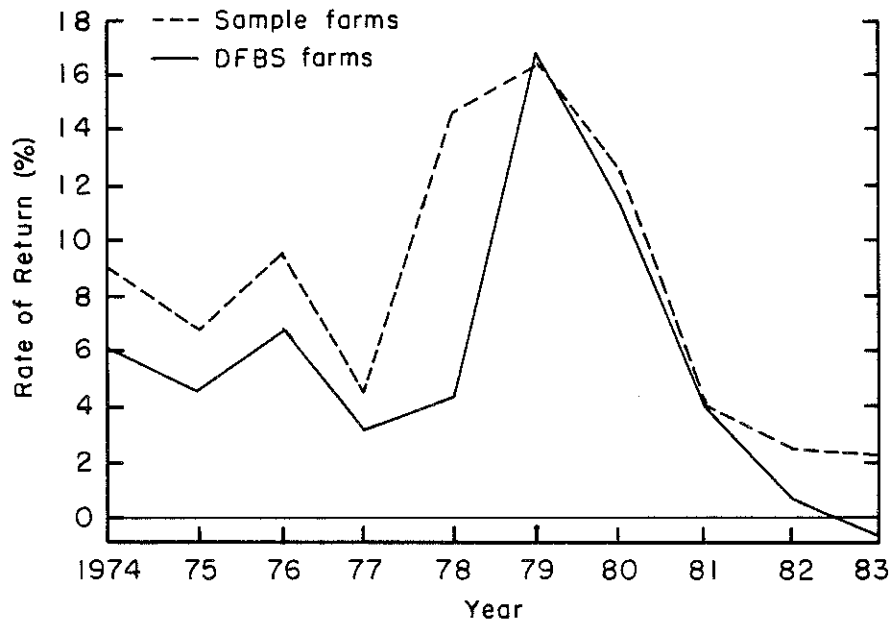


Figure 2. Rate of Return to Equity Capital on Sample and DFBS Farms, 1974-1983

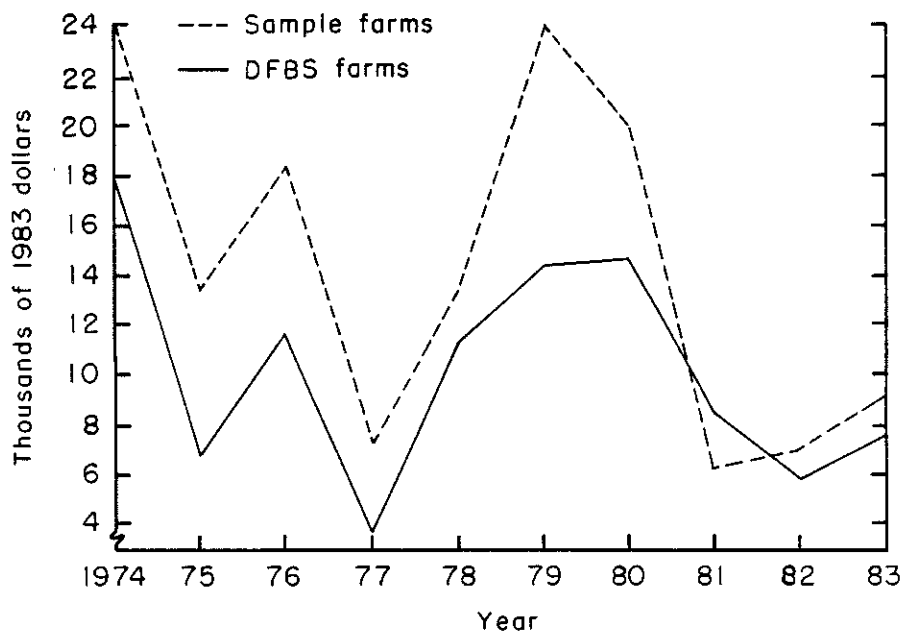


Figure 3. Labor and Management Income per Operator on Sample and DFBS Farms, 1974-1983

## Conclusions

It was demonstrated that average farm size - as measured by several variables - increased steadily between 1974 and 1983. In contrast, farmers' average capital investment rose in real terms until 1980 and then fell through the end of the sample period. Farm profitability fluctuated widely during the decade, peaking a year before asset values.

Significant gains in farm efficiency were evidenced only in increased milk production per cow. Crop yields showed very little improvement during the period. Similarly, the data indicate that there were no measurable gains in labor or capital efficiency.

Total farm debt and interest expense on the average farm increased substantially between 1976 and 1983. Several cost control measures - including machinery and labor costs - trended upward through the middle years of the period and then fell off towards the end. This movement might be viewed as a relaxing of restraints on spending by managers during the more profitable years followed by more strictly controlled spending in the latter, less profitable years.

It was demonstrated that the 112 sample farms are somewhat different from the census dairy farms to which they were compared, especially in terms of size, and only modestly different from the other DFBS farms.

The larger size of the sample farms in comparison to the DFBS farms was apparently not an advantage in terms of production rates. Both milk production and crop yields for the two groups were very similar. In terms of profitability, the 112 sample farms had higher incomes during years of favorable economic conditions while there was little difference in incomes in less favorable years.

The average sample farm in the study represents the size toward which many currently smaller farms will be moving. Further, there is evidence to suggest that the majority of dairy farms in the Northeastern United States will not soon be moving beyond the size of the larger sample farms. The sample farms, then, can be considered harbingers of the future and, as such, they could prove to be a valuable source of information for other farmers.



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# APPENDIX A

## Average Annual Farm Receipts for the 112 Sample Dairy Farms, 1974-1983\*

Item	1974	1975	1976	1977	1978
Dairy cattle sales	\$11,104	\$9,147	\$11,092	\$10,389	\$15,683
Milk sales	154,808	151,901	173,122	166,811	171,823
Other livestock sales	2,539	1,889	2,361	2,690	3,937
Crop sales	5,454	5,845	4,828	3,214	4,507
Custom machine work	268	252	402	346	515
Gas tax refund	271	283	243	260	271
Government payments	436	502	603	838	1,782
Miscellaneous	1,395	1,672	2,004	2,148	1,828
Total Cash Receipts	176,275	171,490	194,655	186,696	200,346
Increase livestock	4,587	1,425	1,205	1,241	2,456
Increase feed & supplies	12,137	4,418	2,319	-401	5,270
Total Farm Receipts Excluding Apprec.	192,999	177,333	198,179	187,535	208,072
Appreciation:					
Livestock	-7,580	2,636	4,927	2,531	29,983
Machinery	4,367	4,838	5,612	6,268	6,691
Real estate	13,111	9,068	10,650	8,392	11,739
Total Farm Receipts	202,896	193,876	219,368	204,726	256,485

\*All values are adjusted by the PCE deflator (1983=100).

APPENDIX A  
(continued)

Average Annual Farm Receipts for the  
112 Sample Dairy Farms, 1974-1983\*

Item	- - - - - 1979	- - - - - 1980	- - - - - 1981	- - - - - 1982	- - - - - 1983
Dairy cattle sales	\$18,709	\$15,652	\$14,394	\$13,117	\$12,426
Milk sales	192,226	194,319	193,543	186,495	195,269
Other livestock sales	5,530	3,735	3,518	3,071	3,810
Crop sales	5,736	7,796	7,686	7,831	8,766
Custom machine work	389	471	568	421	944
Gas tax refund	225	191	350	181	128
Government payments	672	686	761	846	1,383
Miscellaneous	2,173	2,527	2,640	2,633	2,671
Total Cash Receipts	225,660	225,377	223,460	214,595	225,397
Increase livestock	4,334	1,862	1,096	7,157	2,183
Increase feed & supplies	8,414	9,090	291	-731	2,341
Total Farm Receipts Excluding Apprec.	238,407	236,329	224,847	221,021	229,921
Appreciation:					
Livestock	28,297	14,728	-431	-5,208	-9,948
Machinery	7,794	5,268	5,697	4,142	5,216
Real estate	16,168	8,520	6,247	5,741	5,741
Total Farm Receipts	288,217	272,494	238,633	226,203	230,930

\*All values are adjusted by the PCE deflator (1983=100).

## APPENDIX B

Average Annual Farm Expenses for the  
112 Sample Dairy Farms, 1974-1983\*

Item	1974	1975	1976	1977	1978
Hired Labor	\$12,691	\$12,924	\$15,147	\$15,852	\$17,431
Feed					
Dairy grain & conc.	41,929	36,763	42,030	43,225	42,287
Hay & other feed	1,393	1,969	2,032	2,443	3,249
Machinery					
Mach. hire, lease	1,489	1,046	1,191	1,405	1,819
Machinery repairs	7,369	8,019	8,932	8,879	9,754
Auto expense (farm)	623	659	609	519	477
Gas & oil	4,852	5,007	5,583	5,507	5,656
Livestock					
Purchased livestock	6,249	3,787	4,736	4,488	5,882
Breeding fees	1,815	1,947	1,949	2,010	2,155
Veterinary & medicine	2,286	2,437	2,562	2,880	3,057
Milk marketing	2,161	3,636	3,433	4,197	4,969
Other livestock exp.	4,576	4,998	5,449	5,184	5,696
Crops					
Fertilizer & lime	9,987	10,317	9,853	8,791	10,366
Seeds & plants	2,673	3,280	3,099	3,028	3,525
Spray & other crop exp.	2,669	2,868	3,020	2,842	2,927
Real Estate					
Land, bldg, fence repair	2,755	2,762	3,189	2,659	3,265
Taxes	3,718	4,045	4,363	5,113	4,782
Insurance	2,337	2,394	2,686	2,927	2,891
Rent/lease	2,576	2,650	3,589	2,851	3,163
Other					
Telephone (farm)	541	523	582	587	608
Electricity (farm)	2,196	2,463	2,555	2,829	2,951
Interest paid	9,430	10,019	9,747	10,708	11,132
Miscellaneous	1,723	1,838	2,101	1,973	2,380
Total Cash Expenses	128,038	126,351	138,437	140,897	150,422
Machinery depreciation	14,167	14,166	15,593	16,411	17,474
Building depreciation	5,512	5,119	5,220	5,142	5,669
Unpaid labor	1,758	1,427	1,389	1,587	1,390
Interest @4% on equity capital	13,338	13,466	14,485	14,329	15,842
TOTAL FARM EXPENSES	162,813	160,529	175,124	178,366	190,797

\*All values are adjusted by the PCE deflator (1983=100).

APPENDIX B  
(continued)

Average Annual Farm Expenses for the  
112 Sample Dairy Farms, 1974-1983\*

Item	1979	1980	1981	1982	1983
Hired Labor	\$20,050	\$19,928	\$20,567	\$20,615	\$20,791
Feed					
Dairy grain & conc.	48,533	47,316	46,159	43,222	46,264
Hay & other feed	2,218	1,472	1,199	1,742	2,602
Machinery					
Mach. hire, lease	1,636	1,996	1,969	1,815	1,549
Machinery repairs	9,926	10,241	10,808	10,304	9,888
Auto expense (farm)	470	479	462	482	665
Gas & oil	6,737	8,610	9,413	8,468	7,827
Livestock					
Purchased livestock	6,236	3,982	5,096	6,117	3,026
Breeding fees	2,376	2,388	2,493	2,531	2,628
Veterinary & medicine	3,501	3,478	3,903	3,617	3,659
Milk marketing	5,106	5,267	5,486	6,463	12,261
Other livestock exp.	6,408	6,172	5,925	6,559	7,127
Crops					
Fertilizer & lime	11,383	11,195	11,301	11,024	9,794
Seeds & plants	3,693	3,919	3,968	3,955	3,740
Spray & other crop exp.	3,525	3,379	4,577	3,023	3,676
Real Estate					
Land, bldg, fence repair	3,426	3,358	3,609	3,507	2,950
Taxes	4,829	4,875	5,575	5,242	5,310
Insurance	3,242	3,397	3,150	3,064	2,855
Rent/lease	3,086	3,414	3,694	3,365	3,608
Other					
Telephone (farm)	617	587	848	668	702
Electricity (farm)	3,067	3,155	3,764	4,081	4,232
Interest paid	11,535	14,083	16,346	15,992	17,243
Miscellaneous	2,293	2,852	2,965	2,933	2,412
Total Cash Expenses	163,893	165,543	173,277	168,789	174,809
Machinery depreciation	18,752	19,359	17,676	17,343	18,173
Building depreciation	6,017	6,592	6,770	7,445	7,614
Unpaid labor	1,420	1,352	1,223	1,220	1,071
Interest @4% on equity capital	18,024	18,267	17,799	16,502	16,058
TOTAL FARM EXPENSES	208,106	211,112	216,744	211,299	217,725

\*All values are adjusted by the PCE deflator (1983=100).