

Factors Associated with Variations in Earnings
Comparison of Selected Measures and Costs by Quartile of Earnings
155 Dairy Farms, New York State, 2019

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The 2019 year was a rebound in earnings from 2018 for farms that participate in the Dairy Farm Business Summary and Analysis Program. The average rate of return on capital without appreciation increased from 1.1 percent in 2018 to 5.6 percent in 2019.¹ While the average increased, variation continued to be wide in earnings. With 155 farms completed for 2019, the data was sorted by quartile of earnings, as measured by rate of return on all capital without appreciation. The following tables contain selected measures and costs associated with the four quartiles of farms and can be used to see differences across the farms. The lowest quartile of farms averaged -1.1 percent rate of return on all capital without appreciation, with the second quartile averaging 3.1 percent, the third quartile earning 5.5 percent, and the highest quartile of farms earning 8.8 percent.

Table 1 highlights selected measures of size, efficiency, costs, and profitability for the four groups. Confirming a trend that has been ongoing for some time, as earnings increased, so did herd size, with the lowest quartile of farms averaging the smallest herd size, and the highest quartile of farms by earnings averaging the largest herd size. While there is a trend towards larger farms averaging higher earnings, a range of herd sizes is represented in each quartile of farms. In **Table 3**, the quintile range of herd sizes for the lowest earning group of farms was from 57 to 1,035 cows and the quintile range in herd size for the highest earning farms was 556 to 3,408. The quintile range of farms is the average of farms by 20 percent increments for that measure.

Increase in herd sizes are correlated with increased worker equivalents and total tillable acres. However, with increased herd sizes, efficiency is increased, with milk sold per worker equivalent going from an average of 1,013,639 pounds for the lowest quartile of farms to 1,493,981 pounds for the highest quartile of farms. With this increase in efficiency, the highest quartile of farms achieved the lowest cost per cwt for hired labor, averaging 26 cents per cwt less than the next closest quartile. While working more acres in total, the acres worked per cow fell from 2.28 acres per cow for the lowest quartile of farms to 1.62 for the highest quartile of farms. This utilization of less acres per cow helped lead to a lower total capital investment for the highest quartile of farms, averaging \$10,963 per cow, \$2,205 less than the lowest quartile of farms.

The highest quartile of farms average the highest milk sold per cow, averaging 27,092. This was 1,031 pounds higher than the third highest quartile of farms and 1,931 pounds higher than the

¹ Progress of the Dairy Farm Report, E.B 2020-5, Karszes, J, Hill, L, Knoblauch, W, Cornell Dairy Farm Business Summary and Analysis Program, Charles H. Dyson School of Applied Economics and Management, College of Agriculture and Life Sciences, Cornell University, Ithaca, NY, June 2020

lowest group. While the average milk sold per cow does increase for the higher profit farms, as is reported in **Table 3**, there is a large range in milk sold per cow, with farms in the higher earnings quartile ranging from 24,948 pounds sold per cow to 28,916 sold per cow. Along with averaging the highest milk production, the highest quartile of farms by earnings had the lowest cull rate, averaging 33 percent for the year.

The average net milk price received also increased, moving from the lowest quartile of farms to the highest quartile of farms, from \$18.04 to \$18.33, or a difference of \$0.29 per cwt. Part of this difference is explained by the highest quartile of farms averaging the highest percent protein.

Total costs to operate the farm decreased, moving from the lowest quartile of farms to the highest quartile of farms, with the average falling from \$19.66 per cwt to \$16.62 per cwt, a difference of \$3.04 per cwt (**Table 2**). While part of this difference is explained by the higher milk sold per cow, this is also a result of lower total expenses per cow, with the highest quartile of farms averaging the lowest operating cost to run the farm on a per cow basis. With expenses divided into 31 different expense categories, differences can be highlighted across the four groups. The highest quartile of farms had the lowest average cost per cow on 19 of the 31 expense categories. Machinery repair, fuel, fertilizer, seed, spray and chemicals, and rent expenses all averaged the lowest of the four groups and can potentially be a result of less acres per cow and higher asset utilization. However, of the five expense categories that the highest quartile of farms were the highest per cow, custom boarding and purchased forages may be partially a result of less available acres.

With the highest milk production per cow and the highest milk price, the highest quartile of farms averaged the highest milk sales per cow. They also averaged the highest in dairy cattle revenue and crop revenue, even with the least acres per cow. Crop revenue per cow is comprised of crop sales plus change in inventory of grown feeds plus crop insurance proceeds. The combined impact of all the revenue sources resulted in the highest quartile of farms averaging \$275 dollars more revenue per cow than the next quartile and \$516 higher than the lowest quartile of farms.

For the lowest quartile of farms, the operating costs to produce milk averaged \$17.59 per cwt, with the highest quartile of farms averaging \$14.53 per cwt. Incorporating depreciation expenses and values for family contributions of labor, management, and equity resulted in a total cost of producing milk of \$22.52 per cwt for the lowest quartile of farms, and \$17.96 per cwt for the highest quartile of farms as determined by the rate of return on all capital without appreciation.

Analyzing how your business compares to industry benchmarks can be useful to identify areas to consider making management changes. If you are interested in participating in the Dairy Farm Business Summary and Analysis Program, please reach out to the Cornell Cooperative Extension farm business management extension educator in your county.

TABLE 1

DAIRY FARM BUSINESS SUMMARY SELECTED FACTORS				
Sorted by Return on All Capital without Appreciation, 155 New York Dairy Farms, Preliminary 2019 ¹				
SELECTED FACTORS	Average of Lowest Quartile	Average of 2nd Quartile	Average of 3rd Quartile	Average of Top Quartile
<i>Size of Business</i>				
Average number of cows	360	840	1,167	1,608
Average number of heifers	291	704	947	1,280
Milk sold, pounds	9,061,086	21,389,364	30,412,919	43,554,517
Worker equivalent	8.9	17.8	23.4	29.2
Total tillable acres	822	1,712	2,142	2,504
<i>Rates of Production</i>				
Milk sold per cow, pounds	25,161	25,470	26,061	27,092
Hay DM per acre, tons	2.94	3.11	3.36	3.22
Corn silage per acre, tons	17.63	18.85	18.18	18.95
Cull rate, percent	37%	35%	35%	33%
<i>Labor Efficiency</i>				
Cows per worker	40.3	47.2	49.8	55.1
Milk sold per worker, pounds	1,013,639	1,201,031	1,297,111	1,493,981
<i>Cost Control and Milk Price</i>				
Grain & concentrate per cwt. milk	\$5.98	\$5.84	\$5.44	\$5.69
Net milk income over purchased grain & conc. per cow	\$2,654	\$3,094	\$3,278	\$3,416
Dairy feed & crop expense per cwt. milk	\$7.56	\$7.16	\$6.78	\$7.01
Labor and machinery costs per cow	\$2,137	\$1,798	\$1,763	\$1,593
Hired labor costs per cwt. milk	\$2.99	\$3.14	\$3.14	\$2.73
Hired labor costs per worker equivalent	\$42,660	\$45,423	\$46,459	\$45,051
Operating cost of producing milk per cwt.	\$17.59	\$16.13	\$15.60	\$14.53
Purchased input cost of producing milk per cwt.	\$19.58	\$17.83	\$17.09	\$16.01
Total cost of producing milk per cwt.	\$22.52	\$20.18	\$19.20	\$17.96
Net milk price	\$18.04	\$18.19	\$18.27	\$18.33
<i>Capital Efficiency (average for year)</i>				
Farm capital per cow	\$13,168	\$11,733	\$11,426	\$10,963
Machinery and equipment per cow	\$2,709	\$1,894	\$1,613	\$1,563
Asset turnover ratio	0.43	0.49	0.52	0.56
<i>Profitability</i>				
Net farm income without appreciation	-\$27,654	\$317,833	\$704,771	\$1,521,133
Net farm income without appreciation per cow	-\$77	\$378	\$604	\$946
Net farm income with appreciation	\$97,439	\$561,905	\$1,094,158	\$1,908,969
Net farm income with appreciation per cow	\$271	\$669	\$938	\$1,187
Labor & management income per operator/manager	-\$91,328	\$3,979	\$106,684	\$380,641
Rate return on equity capital with appreciation	-0.9%	5.9%	10.3%	13.7%
Rate return on equity capital without appreciation	-5.3%	2.0%	5.7%	10.6%
Rate return on all capital with appreciation	1.5%	5.6%	8.4%	11.0%
Rate return on all capital without appreciation	-1.1%	3.1%	5.5%	8.8%
<i>Financial Summary (based on market value, excluding deferred taxes)</i>				
Farm net worth, end year	\$2,859,694	\$6,321,262	\$8,975,633	\$12,815,622
Debt to asset ratio	0.4	0.37	0.35	0.3
Farm debt per cow	\$5,324	\$4,295	\$3,983	\$3,273
Debt coverage ratio*	0.64	1.23	1.64	2.51
*Farm participating both years				
¹ Groups determined by Rate of Return to All Capital w/o Appreciation				

TABLE 1 CONTINUED

DAIRY FARM BUSINESS SUMMARY SELECTED FACTORS				
Sorted by Return on All Capital without Appreciation, 155 New York Dairy Farms, Preliminary 2019 ¹				
SELECTED FACTORS	Average of Lowest Quartile	Average of 2nd Quartile	Average of 3rd Quartile	Average of Top Quartile
<i>Income Generation</i>				
% Butterfat*	3.90%	3.96%	3.89%	3.90%
% Protein*	3.07%	3.10%	3.10%	3.12%
Lbs. of Butterfat and Protein per Cow*	1,761	1,795	1,823	1,902
Component Value per Cwt.*	\$18.19	\$18.42	\$18.29	\$18.35
Gross Milk Price	\$19.27	\$19.31	\$19.41	\$19.51
<i>Balance Sheet Analysis</i>				
Working Capital as % of Operating Expenses	13%	15%	20%	31%
Long Term Debt to Asset Ratio	0.39	0.28	0.32	0.28
Intermediate/Current Debt to Asset Ratio	0.42	0.46	0.37	0.31
Debt to Asset Ratio, Total	0.4	0.37	0.35	0.3
<i>Debt Analysis</i>				
Accounts payable as percent of total debt	7%	3%	4%	3%
Long-term debt as percent of total debt	44%	38%	46%	41%
Current & intermediate debt as percent of total debt	56%	62%	54%	59%
Cost of term debt(weighted average)	4.7%	4.4%	4.6%	4.1%
<i>Net Worth Change</i>				
Retained earnings	-\$92,299	\$144,132	\$404,071	\$1,051,770
Contributed capital	\$27,612	\$34,952	\$109,846	\$26,758
Valuation equity	\$96,141	\$183,419	\$229,955	\$257,254
<i>Cash Flow</i>				
Net provide by operating activities, per cow	\$194	\$422	\$520	\$690
Net provided by investing activities, per cow	-\$452	-\$474	-\$612	-\$606
Net provided by financing activates, per cow	\$293	\$33	\$119	-\$54
Net provided by reserves, per cow	-\$41	\$4	-\$26	-\$27
<i>Repayment Analysis**</i>				
Planned debt payments per Cow	\$807	\$663	\$572	\$489
Planned debt payments per Cwt.	\$3.19	\$2.60	\$2.19	\$1.80
Percent of total receipts	15%	12%	10%	9%
Percent of milk receipts	17%	14%	12%	10%
Cash flow coverage ratio	0.60	0.97	1.27	1.76
Debt coverage ratio	0.64	1.23	1.64	2.51
<i>Crop Program Analysis</i>				
Crop input costs per acre	\$121	\$131	\$148	\$138
Total tillable acres per cow	2.28	2.04	1.87	1.62
Total forages acres per cow	1.94	1.74	1.61	1.44
Harvested dry matter per cow	8.18	8.20	7.62	6.99
Percent tillable land owned	51%	51%	54%	52%
<i>Capital and Financial Efficiency</i>				
Farm capital per cow	\$13,168	\$11,733	\$11,426	\$10,963
Real estate per cow	\$6,113	\$5,832	\$5,627	\$4,882
Machinery and equipment per cow	\$2,709	\$1,894	\$1,613	\$1,563
Asset turnover	0.43	0.49	0.52	0.56
Operating expense ratio	0.87	0.81	0.79	0.74
Interest expense ratio	0.05	0.04	0.04	0.03
Depreciation expense ratio	0.09	0.08	0.07	0.07
*Average of farms reporting milk check detail		**Farm participating two years		
1 Groups determined by Rate of Return to All Capital w/o Appreciation				

TABLE 2**RECEIPTS & EXPENSES PER COW AND PER HUNDREDWEIGHT**Sorted by Return on All Capital without Appreciation, 155 New York Dairy Farms, Preliminary 2019¹

Item	Lowest Quartile		2nd Quartile		3rd Quartile		Top Quartile	
	Per Cow	Per Cwt.	Per Cow	Per Cwt.	Per Cow	Per Cwt.	Per Cow	Per Cwt.
Average number of cows	360		840		1,167		1,608	
Cwt. of milk sold		90,611		213,894		304,129		435,545
ACCRUAL OPERATING RECEIPTS								
Milk	\$4,848	\$19.27	\$4,919	\$19.31	\$5,059	\$19.41	\$5,285	\$19.51
Dairy cattle	\$242	\$0.96	\$271	\$1.07	\$297	\$1.14	\$310	\$1.15
Dairy calves	\$16	\$0.06	\$22	\$0.09	\$22	\$0.08	\$21	\$0.08
Other livestock	\$27	\$0.11	\$12	\$0.05	\$9	\$0.03	\$7	\$0.02
Crops	\$39	\$0.15	\$6	\$0.02	\$41	\$0.16	\$87	\$0.32
Miscellaneous receipts	<u>\$203</u>	<u>\$0.81</u>	<u>\$206</u>	<u>\$0.81</u>	<u>\$189</u>	<u>\$0.72</u>	<u>\$182</u>	<u>\$0.67</u>
Total Operating Receipts	\$5,375	\$21.36	\$5,436	\$21.34	\$5,616	\$21.55	\$5,891	\$21.74
ACCRUAL OPERATING EXPENSES								
Hired labor	\$753	\$2.99	\$799	\$3.14	\$819	\$3.14	\$739	\$2.73
Dairy grain & concentrate	\$1,504	\$5.98	\$1,487	\$5.84	\$1,418	\$5.44	\$1,541	\$5.69
Dairy roughage	\$76	\$0.30	\$61	\$0.24	\$74	\$0.28	\$137	\$0.50
Nondairy feed	\$2	\$0.01	\$0	\$0.00	\$0	\$0.00	\$0	\$0.00
Professional nutritional services	\$7	\$0.03	\$2	\$0.01	\$1	\$0.00	\$1	\$0.00
Machine hire, rent & lease	\$240	\$0.95	\$121	\$0.48	\$152	\$0.58	\$137	\$0.51
Machine repair & vehicle expense	\$257	\$1.02	\$247	\$0.97	\$260	\$1.00	\$225	\$0.83
Fuel, oil & grease	\$185	\$0.73	\$155	\$0.61	\$144	\$0.55	\$130	\$0.48
Replacement livestock	\$46	\$0.18	\$13	\$0.05	\$24	\$0.09	\$11	\$0.04
Breeding	\$44	\$0.17	\$60	\$0.24	\$47	\$0.18	\$41	\$0.15
Veterinary & medicine	\$148	\$0.59	\$160	\$0.63	\$164	\$0.63	\$140	\$0.52
Milk marketing	\$310	\$1.23	\$285	\$1.12	\$298	\$1.15	\$318	\$1.17
Bedding	\$95	\$0.38	\$116	\$0.46	\$98	\$0.37	\$75	\$0.28
Milking supplies	\$89	\$0.35	\$91	\$0.36	\$95	\$0.36	\$85	\$0.32
Cattle lease	\$18	\$0.07	\$0	\$0.00	\$6	\$0.02	\$2	\$0.01
Custom boarding	\$46	\$0.18	\$52	\$0.20	\$63	\$0.24	\$121	\$0.45
BST expense	\$0	\$0.00	\$0	\$0.00	\$0	\$0.00	\$0	\$0.00
Livestock professional fees	\$17	\$0.07	\$16	\$0.06	\$16	\$0.06	\$16	\$0.06
Other livestock expense	\$32	\$0.13	\$30	\$0.12	\$24	\$0.09	\$19	\$0.07
Fertilizer & lime	\$107	\$0.43	\$108	\$0.42	\$98	\$0.38	\$82	\$0.30
Seeds & plants	\$132	\$0.52	\$106	\$0.42	\$116	\$0.44	\$90	\$0.33
Spray & other crop expense	\$74	\$0.29	\$51	\$0.20	\$56	\$0.22	\$48	\$0.18
Crop professional fees	\$8	\$0.03	\$11	\$0.04	\$4	\$0.01	\$3	\$0.01
Land, building & fence repair	\$67	\$0.26	\$68	\$0.27	\$74	\$0.28	\$78	\$0.29
Taxes	\$78	\$0.31	\$70	\$0.27	\$67	\$0.26	\$53	\$0.19
Real estate rent & lease	\$93	\$0.37	\$94	\$0.37	\$91	\$0.35	\$67	\$0.25
Insurance	\$69	\$0.27	\$45	\$0.18	\$40	\$0.15	\$44	\$0.16
Utilities	\$110	\$0.44	\$82	\$0.32	\$87	\$0.34	\$79	\$0.29
Interest paid	\$272	\$1.08	\$218	\$0.86	\$204	\$0.78	\$171	\$0.63
Other professional fees	\$40	\$0.16	\$25	\$0.10	\$30	\$0.11	\$26	\$0.09
Miscellaneous	<u>\$31</u>	<u>\$0.12</u>	<u>\$27</u>	<u>\$0.11</u>	<u>\$30</u>	<u>\$0.12</u>	<u>\$25</u>	<u>\$0.09</u>
Total Operating Expenses	\$4,948	\$19.66	\$4,603	\$18.07	\$4,599	\$17.65	\$4,504	\$16.62
Expansion livestock	\$3	\$0.01	\$23	\$0.09	\$23	\$0.09	\$37	\$0.14
Extraordinary expenses	\$14	\$0.06	\$0	\$0.00	\$0	\$0.00	\$0	\$0.00
Machinery depreciation	\$285	\$1.13	\$238	\$0.93	\$211	\$0.81	\$215	\$0.79
Real estate depreciation	<u>\$202</u>	<u>\$0.80</u>	<u>\$194</u>	<u>\$0.76</u>	<u>\$179</u>	<u>\$0.69</u>	<u>\$188</u>	<u>\$0.69</u>
Total Expenses	\$5,452	\$21.67	\$5,057	\$19.86	\$5,012	\$19.23	\$4,945	\$18.25
Net Farm Income w/o Appreciation	-\$77	-\$0.31	\$378	\$1.49	\$604	\$2.32	\$946	\$3.49

¹ Groups determined by Rate of Return to All Capital w/o Appreciation

TABLE 3

SELECTED FARM BUSINESS CHARTS								
Sorted by Return on All Capital without Appreciation, 155 New York Dairy Farms, Preliminary 2019 ¹								
Each Column Sorted Independently								
Lowest Quartile								
Average Number of Cows	Pounds Milk Sold Per Cow	Pounds Milk Sold Per Worker	Hired Labor Cost per Worker Equiv.	Operating Cost to Produce Milk Per Cwt.	Total Cost of Milk Prod. Per Cwt.	Milk Receipts per Cwt.	Investment Per Cow	% Rate of Return on All Capital w/o Apprec.
57	15,898	385,169	1,892	14.54	21.28	18.37	9,150	-10.4
110	21,597	643,400	29,741	16.40	22.20	19.00	11,752	-4.2
202	24,017	905,947	36,713	17.42	23.86	19.39	13,560	-2.3
481	25,982	1,110,988	41,091	18.46	27.34	19.69	17,133	-0.5
1,035	27,666	1,379,904	49,747	21.53	35.03	21.23	24,490	0.8
2nd Quartile								
Average Number of Cows	Pounds Milk Sold Per Cow	Pounds Milk Sold Per Worker	Hired Labor Cost per Worker Equiv.	Operating Cost to Produce Milk Per Cwt.	Total Cost of Milk Prod. Per Cwt.	Milk Receipts per Cwt.	Investment Per Cow	% Rate of Return on All Capital w/o Apprec.
248	20,773	860,009	36,743	14.22	19.22	18.53	9,280	1.8
422	24,266	1,044,663	39,898	15.21	19.92	19.05	10,591	2.6
727	25,648	1,179,526	43,025	15.66	20.40	19.29	12,011	2.9
1,019	26,622	1,294,941	45,759	16.32	21.03	19.69	13,526	3.5
1,918	27,864	1,494,897	54,275	17.87	22.56	21.39	17,261	3.9
3rd Quartile								
Average Number of Cows	Pounds Milk Sold Per Cow	Pounds Milk Sold Per Worker	Hired Labor Cost per Worker Equiv.	Operating Cost to Produce Milk Per Cwt.	Total Cost of Milk Prod. Per Cwt.	Milk Receipts per Cwt.	Investment Per Cow	% Rate of Return on All Capital w/o Apprec.
352	20,707	952,102	31,761	13.44	18.23	18.55	7,341	4.5
768	25,425	1,143,471	40,533	14.80	18.85	19.04	10,368	4.9
1,078	26,569	1,282,403	43,108	15.50	19.18	19.41	11,738	5.4
1,411	27,543	1,389,431	45,907	16.11	19.75	19.70	12,936	6.0
2,377	28,530	1,542,387	53,407	17.79	20.94	21.17	14,859	6.4
Top Quartile								
Average Number of Cows	Pounds Milk Sold Per Cow	Pounds Milk Sold Per Worker	Hired Labor Cost per Worker Equiv.	Operating Cost to Produce Milk Per Cwt.	Total Cost of Milk Prod. Per Cwt.	Milk Receipts per Cwt.	Investment Per Cow	% Rate of Return on All Capital w/o Apprec.
556	24,948	1,130,071	39,150	12.19	16.71	18.67	7,120	6.9
1,012	26,118	1,318,906	41,742	13.81	17.64	19.09	9,599	7.5
1,411	27,289	1,492,867	44,984	14.66	18.07	19.44	10,775	8.2
1,916	28,096	1,621,003	47,385	15.31	18.55	19.87	12,120	9.0
3,408	28,916	1,959,645	53,182	16.82	19.50	20.72	16,488	13.2

¹ Groups determined by Rate of Return to All Capital w/o Appreciation