

The Cost of Producing Milk

Joe Conlin, PhD
Extension Animal Scientist
University of Minnesota
St Paul, MN

Let me introduce the dairy profit equation:

$$\text{Profit} = (\text{Price} - \text{Cost}) \times \text{Volume}$$

Simple, isn't it? Profit occurs when the price per 100 lbs is greater than the cost of producing it. The greater the difference and the greater the volume, the higher the profit. Profit turns to loss when costs are greater than price. Don't let the simplicity of the equation fool you. "There's nothing so deceptive as an apparent truth."

On the surface the equation suggests that the greatest profit occurs with the widest margin between price and cost. Not so; profit continues to increase as long as the cost of each added unit of input yields output of equal or greater value. Farms able to monitor and manage this principle have a powerful advantage.

Price

The price component of the equation is more than the milk price. It includes income from sale of animals and milk. Typically, cull cow income adds \$.70 to \$1.40 per cwt, and veal calf sales \$.30 to .60 per cwt. Culling rates, calf mortality, prices, and production level will affect these income values. Net milk price can vary by more than \$2.00 per cwt from farm to farm, the variants being milk quality, fat and protein content, and hauling discounts. The 1990 farm bill added the milk assessment of 5 cents per cwt in 1990, and 11.25 cents in 1991. These assessments will be refunded to farms not marketing more milk than the preceding year. The fertilizer value of manure is seldom credited to the dairy herd.

Cost

Tracking accurate estimates of production costs on our diversified upper midwest dairies is difficult. There are inherent problems in allocating several costs and assets among the various enterprises on the farm. For example; some machinery is used for several enterprises, or how much of the electric utility bills should be charged to the dairy.

Assigning prices to homegrown feeds can also be a

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problem -- some farms may charge the dairy the cost of producing the feed, the feed is marketed as milk. It is recommended that each enterprise or profit center be accounted for separately to enable an assessment of profitability of each. For example: studies have shown that the cost of raising crops, particularly grains, frequently exceeds the market value of the crop. Dairy farms typically have greater investment in field machinery per acre than cash crop farmers.

Determining the value of farm assets is another typical problem -- does one use original investment cost at the time of purchase plus improvements, the depreciated value, the market value, or the replacement value? Many upper midwest dairy facilities are substantially depreciated and have a low market value.

An additional problem is how costs are categorized and summarized. Availability of good farm account data from dairy farms is scarce. Two information sources are represented in Table 1, Wisconsin Dairy Farm Management Project, and Tables 2-7, the SE Minnesota Farm Management Association. The SE Minnesota project is in cooperation with the Minnesota Extension Service with which specialized farm management staff work closely.

Table 1 Wisconsin Dairy Farm Management Analysis Project 1989, shows the quartile breakdown of various financial performance parameters. These breakdowns illustrate the range and farm to farm variability for individual performance measures.

Table 2 describes the dairy farms represented in the 1990 SE Minnesota data set; the average, and high and low 20% profit farms.

Table 3 is a comparative dairy enterprise budget summary for the average, high and low 20% profit farms. Non-cash fixed costs and unpaid labor were assumed to be equal for the three herd groups (this information was not available) and those costs were input.

Tables 4-7 are simulated budget summaries based on the high and low 20% herd costs to illustrate the effects of improved management efficiencies and increased productivity. Only feed inputs were adjusted to support changes in production. A base milk price of \$10.50 per cwt was used

to simulate the 1991 situation.

Comparative budgets are shown for two production management regimes in Tables 4-7 described as follows:

	Mgmt regime A	Mgmt regime B
SCC	300,000	100,000
Age 1st calving	28 mo.	24 mo.
Cows culled, %	40%	35%
Lactation length	343	305
Dry days	60	62
Calf mortality	5%	0%

Table 4 shows low 20% profit herds average production of 16,280 lb per cow.

Table 5 shows cost profile of low profit herds with feed inputs adjusted to produce at the high profit herd

TABLE 1. Wisconsin Dairy Farm Management Analysis Project, 1989 36 Wisconsin Dairy Farms

	1st Quartile	2nd Quartile	3rd Quartile	4th Quartile	Mean
Size of Business					
Average number of cows	40.1	57.6	77.6	99.6	68.7
Average number of heifers	33.0	51.6	78.1	111.2	72.1
Milk sold, receipts	\$128,253	\$165,172	\$234,135	\$324,227	\$212,947
Worker equivalent	1.73	2.38	2.92	4.42	2.96
Total tillable acres	125	218	321	481	298
Rates of Production					
Milk sold per cow, pounds	16,210	18,298	19,386	21,894	18,947
Hay DM per acre, tons	2.3	3.4	3.7	4.4	3.5
Corn silage per acre, tons	9.0	14.2	16.2	22.1	15.6
Labor Efficiency					
Cows per worker	17.0	21.9	28.1	37.8	26.2
Milk sold per worker, pounds	320,062	400,046	533,871	721,561	493,885
Cost Control					
Grain & concentrate purchased as percent of milk sales	13.0%	18.3%	23.9%	31.5%	21.7%
All purchased feed as % of milk sales	20.7%	27.8%	34.0%	44.5%	31.7%
Dairy feed & crop expense per cwt. milk	\$2.83	\$3.79	\$4.56	\$5.87	\$4.26
Labor & machinery costs per cow	\$422	\$742	\$888	\$1,321	\$843
Oper. cost of producing cwt. milk	\$6.31	\$7.65	\$8.43	\$10.31	\$8.18
Milk receipts per cwt. milk	\$12.84	\$13.42	\$13.63	\$13.97	\$13.47
Capital Efficiency					
Farm capital per cow (avg. for year)	\$4,829	\$6,869	\$9,005	\$11,997	\$8,175
Machinery & Equip. per cow	\$735	\$1,294	\$1,680	\$2,561	\$1,568
Real estate per cow	\$1,139	\$2,895	\$4,365	\$6,230	\$3,657
Livestock investment per cow	\$970	\$1,128	\$1,286	\$1,600	\$1,246
Capital turnover, years	1.34	2.09	2.49	3.51	2.36
Profitability					
Net farm income w/o apprec.	\$18,336	\$41,464	\$49,297	\$88,360	\$49,365
Net farm income w/apprec.	\$27,503	\$45,564	\$66,245	\$104,706	\$61,004
Labor & management income per operator/manager	\$-2,739	\$14,561	\$33,705	\$56,955	\$25,621
Rate return on:					
equity capital w/apprec.	1.5%	8.8%	17.2%	46.9%	18.6%
all capital w/apprec.	3.4%	8.9%	12.9%	20.3%	11.4%
all capital w/o apprec.	1.2%	6.3%	10.7%	18.1%	9.1%
Financial Summary, End Year					
Farm net worth	\$127,256	\$269,223	\$433,866	\$810,457	\$410,081
Change in net worth w/apprec.	\$6,067	\$19,270	\$41,504	\$83,557	\$37,599
Debt to asset ratio	0.01	0.22	0.43	0.62	0.32
Farm debt per cow	\$435	\$1,443	\$2,788	\$5,376	\$3,012

level (18,574 lb per cow).

Table 6 shows high 20% profit herds to compare with Table 5 to illustrate differences in economic management efficiencies.

Table 7 shows high profit herd cost profile projected to produce an additional 4000 lb milk per cow (22,574 lb per cow) to illustrate impact of productivity on cost.

Observations

1. Profit performance is highly variable from farm to farm relative to all performance measures (Table 1).
2. High profit farms had larger herd sizes, higher production per cow, used a higher percent of barn capacity, culled more cows, had a lower feed cost, received a higher milk price, and had better control of practically all production cost categories (Tables 2 and 3).
3. Fine tuning production management efficiencies, comparison of management regimes A and B substantially improved profitability in all situations.
4. The benefit of tighter control of economic efficiencies (compare Tables 5 and 6) improved profitability by more than \$2.50/cwt independent of productivity.

References

Smith, Terry. 1991. Wisconsin Dairy Farm Management Analysis Project. 1989. Univ. of Wisconsin, Madison, WI. Freemna, Mervin. 1991. SE Minnesota Farm Management Association Analysis. Minnesota Ext. Service, Rochester, MN. Takula, James. 1991. 1990 Annual Report - Northeast and East Central Minnesota. Report No. 35. Staples Technical College, Staples, MN.

TABLE 2. SE Minnesota Farm Business Management Association dairy farms - 1990

	Herd profit group		
	Average	Low 20%	High 20%
No. farms	35	7	7
Milk sold	16795	16280	18754
Cows per farm	63	46	76
% barn capacity used	100	88	114
% culled	37	34	46
Milk/lb conc. feed	2.06	1.68	2.28
Feed cost/cwt milk	5.28	6.32	4.65
Avg. price per cwt milk	13.81	13.59	13.89

TABLE 3. SE Minnesota Farm Business Management Association dairy farms - 1990.

	Cost of production profiles					
	All farms		Low 20%		High 20%	
	\$/cow	\$/cwt	\$/cow	\$/cwt	\$/cow	\$/cwt
Feed costs:						
Grains	278	1.66	381	2.34	294	1.57
Prot./vit./min.	254	1.49	300	1.84	187	1.00
Forage	361	2.13	345	2.12	385	2.05
Total feed cost	893	5.30	1026	6.32	866	4.65
Other variable costs:						
Breeding	34	.20	38	.23	29	.15
Marketing	57	.34	73	.45	64	.34
Veterinary	68	.41	88	.54	57	.30
Supplies	111	.66	159	.97	102	.54
Fuel & oil	16	.10	24	.15	11	.06
Utilities	58	.35	62	.38	49	.26
Repairs	100	.60	155	.95	75	.40
Bedding	2	.01	0	0	2	.01
Interest	49	.29	35	.21	18	.10
Lease payments	27	.16	20	.12	9	.05
Hired machinery work	5	.03	0	0	1	.01
Hired labor	76	.45	72	.44	63	.34
Misc. expense	12	.07	16	.10	8	.04
Total other var. costs	615	3.66	741	4.55	488	2.60
Total variable costs	1508	8.96	1767	10.87	1354	7.25
Fixed cash costs:						
Real estate taxes	7	.04	9	.06	6	.03
Insurance	14	.08	16	.10	11	.06
Total fixed cash costs	21	.13	26	.16	17	.09
Total cash costs	1529	9.10	1936	11.02	1379	7.35
Fixed non-cash costs:						
Depreciation	118	.70	141	.87	134	.71
*Opportunity costs	250	1.49	250	1.53	250	1.33
*Unpaid labor	243	1.45	246	1.51	253	1.35
Economic costs	2140	12.74	2573	15.80	2016	10.85

*These cost components were estimated based on asset values \$4,678 and 6% interest, 60 total hours labor per cow and \$5.00/hour labor charges.

TABLE 4. Low Profit Herds Dairy Enterprise Budget Summary* Low 20% Herds - SE MN Farm Management Association, 1990

	Management Regime A			Management Regime B		
	Per cow	Herd	Per cwt	Herd	Per cwt	Diff.
Dairy Herd Income						
Milk sold	16280	748880	-----	lb 808843	-----	59963
Milk income	1709	78632	10.30	\$ 86546	10.70	7914
Calf sales	125	5753	0.77	\$ 6600	0.82	848
Sale cull cows	239	11000	1.47	\$ 8800	1.09	-2200
TOTAL INCOME	2074	95385	12.74	\$ 101946	12.60	6561
Variable Costs Feed						
Hay	456	20966	2.80	\$ 19161	2.37	-1805
Corn silage	81	3719	0.50	\$ 3393	0.42	-325
Corn equivalent	210	9656	1.29	\$ 10365	1.28	709
Purchased	60	2778	0.37	\$ 4149	0.51	1371
Mineral/vit/additive	164	7544	1.01	\$ 7544	0.93	0
Milk/replacer	50	600	0.08	\$ 600	0.07	0
TOTAL FEED COST	1021	45263	6.04	\$ 45213	5.59	-50
Other Variable Costs						
Milk hauling	73	3370	0.45	\$ 3640	0.45	270
Cattle hauling	10	460	0.06	\$ 460	0.06	0
Breeding	38	1748	0.23	\$ 1748	0.22	0
Power & fuel	86	3956	0.53	\$ 3956	0.49	0
Repairs	175	8050	1.07	\$ 8050	1.00	0
Bedding	40	1840	0.25	\$ 1840	0.23	0
Supplies	175	8050	1.07	\$ 8050	1.00	0
Vet & health	88	4048	0.54	\$ 4048	0.50	0
Hired labor	77	3542	0.47	\$ 3542	0.44	0
Livestock insurance	10	460	0.06	\$ 460	0.06	0
TOTAL OTHER VAR.	772	35524	4.74	\$ 35794	4.43	270
TOTAL VAR. COST	1793	80787	10.79	\$ 81007	10.02	220
Cash Fixed Costs						
Bldg. interest	0	0	0.00	\$ 0	0.00	0
Equip. interest	48	2208	0.29	\$ 2208	0.27	0
Livestock interest	0	0	0.00	\$ 0	0.00	0
Feed & operating loans	0	0	0.00	\$ 0	0.00	0
Taxes & insurance	9	414	0.06	\$ 414	0.05	0
TOTAL CASH FIXED	57	2622	0.35	\$ 2622	0.32	0
Non-Cash (NC) Fixed Costs						
Deprec. bldg.	110	5060	0.68	\$ 5060	0.63	0
Deprec. equip.	150	6900	0.92	\$ 6900	0.85	0
Opportunity cost	250	11478	1.53	\$ 11478	1.42	0
TOTAL NC FIXED COST	510	23438	3.13	\$ 23438	2.90	0
TOTAL FIXED COST	567	26060	3.48	\$ 26060	3.22	0
Unpaid labor	246	11316	1.50	\$ 11316	1.40	0
TOTAL CASH COST	1850	83409	11.14	\$ 83629	10.34	220
Return/cash cost	223	11976	1.60	\$ 18317	2.26	6341
Family living	543	25000	3.34	\$ 25000	3.09	0
TOTAL ECON. COST	2606	119876	16.01	\$ 118383	14.63	-1493
Return/econ. cost	-532	-24488	-3.27	\$ -16437	-2.03	8051

*Budget simulated based on farm account data for 20% low profit herds.

TABLE 5. Low Profit Costs/High Profit Productivity Dairy Enterprise Budget Summary*

	Management Regime A			Management Regime B		
	Per cow	Herd	Per cwt	Herd	Per cwt	Diff.
Dairy Herd Income						
Milk sold	18754	862684	-----	lb 927530	-----	64846
Milk income	1969	90582	10.30	\$ 99246	10.70	8664
Calf sales	125	5753	0.67	\$ 6600	0.71	848
Sale cull cows	239	11000	1.28	\$ 8800	0.95	-2200
TOTAL INCOME	2333	107334	12.44	\$ 114646	12.36	7311
Variable Costs Feed						
Hay	455	20919	2.42	\$ 18413	1.99	-2507
Corn silage	81	3713	0.43	\$ 3275	0.35	-438
Corn equivalent	216	9934	1.15	\$ 11345	1.22	1411
Purchased	70	3222	0.37	\$ 5063	0.55	1842
Mineral/vit/additive	164	7544	0.87	\$ 7544	0.81	0
Milk/replacer	50	600	0.07	\$ 600	0.06	0
TOTAL FEED COST	1035	45931	5.32	\$ 46240	4.99	308
Other Variable Costs						
Milk hauling	84	3882	0.45	\$ 4174	0.45	292
Cattle hauling	10	460	0.05	\$ 460	0.05	0
Breeding	38	1748	0.20	\$ 1748	0.19	0
Power & fuel	86	3956	0.46	\$ 3956	0.43	0
Repairs	175	8050	0.93	\$ 8050	0.87	0
Bedding	40	1840	0.21	\$ 1840	0.20	0
Supplies	175	8050	0.93	\$ 8050	0.87	0
Vet & health	88	4048	0.47	\$ 4048	0.44	0
Hired labor	77	3542	0.41	\$ 3542	0.38	0
Livestock insurance	10	460	0.05	\$ 460	0.05	0
TOTAL OTHER VAR.	783	36036	4.18	\$ 36328	3.92	292
TOTAL VAR. COST	1819	81967	9.50	\$ 82568	8.90	600
Cash Fixed Costs						
Bldg. interest	0	0	0.00	\$ 0	0.00	0
Equip. interest	48	2208	0.26	\$ 2208	0.24	0
Livestock interest	0	0	0.00	\$ 0	0.00	0
Feed & operating loans	0	0	0.00	\$ 0	0.00	0
Taxes & insurance	9	414	0.05	\$ 414	0.04	0
TOTAL CASH FIXED	57	2622	0.30	\$ 2622	0.28	0
Non-Cash (NC) Fixed Costs						
Deprec. bldg.	110	5060	0.59	\$ 5060	0.55	0
Deprec. equip.	150	6900	0.80	\$ 6900	0.74	0
Opportunity cost	250	11478	1.33	\$ 11478	1.24	0
TOTAL NC FIXED COST	510	23438	2.72	\$ 23438	2.53	0
TOTAL FIXED COST	567	26060	3.02	\$ 26060	2.81	0
Unpaid labor	246	11316	1.31	\$ 11316	1.22	0
TOTAL CASH COST	1876	84589	9.81	\$ 85190	9.18	600
Return/cash cost	457	22745	2.64	\$ 29456	3.18	6711
Family living	543	25000	2.90	\$ 25000	2.70	0
TOTAL ECON. COST	2632	122271	14.17	\$ 119944	12.93	-2327
Return/econ. cost	-196	-14937	-2.98	\$ -5298	-0.57	9639

*Budget simulated based on farm account data for 20% low profit herds at high profit production level.

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**TABLE 6. High Profit Herds
Dairy Enterprise Budget Summary*
High 20% Herds - SE MN Farm Management
Association, 1990**

	--- Management Regime A ---			lb	--- Management Regime B ---		
	Per cow	Herd	Per cwt		Herd	Per cwt	Diff.
--- Dairy Herd Income ---							
Milk sold	18574	1411624	-----	1518126	-----	106502	
Milk income	1950	148221	10.30	\$ 162440	10.70	14219	
Calf sales	95	7200	0.51	\$ 8700	0.57	1500	
Sale cull cows	145	11000	0.78	\$ 14850	0.98	3850	
TOTAL INCOME	2190	166421	11.79	\$ 185990	12.25	19569	
--- Variable Costs Feed ---							
Hay	440	33459	2.37	\$ 30078	1.98	-3381	
Corn silage	94	7130	0.51	\$ 6388	0.42	-742	
Corn equivalent	156	11822	0.84	\$ 12470	0.82	647	
Purchased	28	2143	0.15	\$ 4509	0.30	2366	
Mineral/vit./additive	83	6288	0.45	\$ 6288	0.41	0	
Milk/replacer	50	1400	0.10	\$ 1400	0.09	0	
TOTAL FEED COST	851	62242	4.41	\$ 61133	4.03	-1109	
--- Other Variable Costs ---							
Milk hauling	63	4800	0.34	\$ 5162	0.34	362	
Cattle hauling	10	760	0.05	\$ 760	0.05	0	
Breeding	29	2204	0.16	\$ 2204	0.15	0	
Power & fuel	60	4560	0.32	\$ 4560	0.30	0	
Repairs	85	6460	0.46	\$ 6460	0.43	0	
Bedding	2	152	0.01	\$ 152	0.01	0	
Supplies	110	8360	0.59	\$ 8360	0.55	0	
Vet & health	57	4332	0.31	\$ 4332	0.29	0	
Hired labor	63	4788	0.34	\$ 4788	0.32	0	
Livestock insurance	10	760	0.05	\$ 760	0.05	0	
TOTAL OTHER VAR.	489	37176	2.63	\$ 37538	2.47	362	
TOTAL VAR. COST	1340	99418	7.04	\$ 98670	6.50	-747	
--- Cash Fixed Costs ---							
Bldg. interest	0	0	0.00	\$ 0	0.00	0	
Equip. interest	24	1824	0.13	\$ 1824	0.12	0	
Livestock interest	0	0	0.00	\$ 0	0.00	0	
Feed & operating loans	0	0	0.00	\$ 0	0.00	0	
Taxes & insurance	6	456	0.03	\$ 456	0.03	0	
TOTAL CASH FIXED	30	2280	0.16	\$ 2280	0.15	0	
--- Non-Cash (NC) Fixed Costs ---							
Deprec. bldg.	110	8360	0.59	\$ 8360	0.55	0	
Deprec. equip.	150	11400	0.81	\$ 11400	0.75	0	
Opportunity cost	269	20418	1.45	\$ 20418	1.34	0	
TOTAL NC FIXED	529	40178	2.85	\$ 40178	2.65	0	
TOTAL FIXED COST	559	42458	3.01	\$ 42458	2.80	0	
Unpaid labor	253	19228	1.33	\$ 19228	1.26	0	
TOTAL CASH COST	1370	101698	7.20	\$ 100950	6.65	-747	
Return/cash cost	820	64723	4.58	\$ 85039	5.60	20316	
Family living	329	25000	1.77	\$ 25000	1.65	0	
TOTAL ECON. COST	2152	163552	11.58	\$ 160356	10.56	3196	
Return/econ. cost	38	2843	0.20	\$ 25634	1.68	22791	

*Budget simulated based on farm account data for 20% high profit herds.

**TABLE 7. High Profit Herds + 4,000 lb Milk
Dairy Enterprise Budget Summary***

	--- Management Regime A ---			lb	--- Management Regime B ---		
	Per cow	Herd	Per cwt		Herd	Per cwt	Diff.
--- Dairy Herd Income ---							
Milk sold	22574	1715624	-----	1835168	-----	119544	
Milk income	2370	180141	10.30	\$ 196363	10.70	16222	
Calf sales	95	7200	0.42	\$ 8700	0.47	1500	
Sale cull cows	145	11000	0.64	\$ 14850	0.81	3850	
TOTAL INCOME	2610	198341	11.56	\$ 219913	11.98	21572	
--- Variable Costs Feed ---							
Hay	401	30454	1.78	\$ 27887	1.52	-2567	
Corn silage	86	6550	0.38	\$ 5962	0.32	-587	
Corn equivalent	247	18763	1.09	\$ 18997	1.04	234	
Purchased	100	7617	0.44	\$ 8828	0.48	1212	
Mineral/vit./additive	109	8264	0.48	\$ 8264	0.45	0	
Milk/replacer	50	1400	0.08	\$ 1400	0.08	0	
TOTAL FEED COST	993	73046	4.26	\$ 71338	3.89	-1708	
--- Other Variable Costs ---							
Milk hauling	77	5833	0.34	\$ 6240	0.34	406	
Cattle hauling	10	760	0.04	\$ 760	0.04	0	
Breeding	40	3006	0.18	\$ 3204	0.17	198	
Power & fuel	60	4560	0.27	\$ 4560	0.25	0	
Repairs	85	6460	0.38	\$ 6460	0.35	0	
Bedding	2	152	0.01	\$ 152	0.01	0	
Supplies	78	5894	0.34	\$ 6092	0.33	198	
Vet & health	82	6242	0.36	\$ 6560	0.36	318	
Hired labor	63	4788	0.28	\$ 4788	0.26	0	
Livestock insurance	10	760	0.04	\$ 760	0.04	0	
TOTAL OTHER VAR.	506	38455	2.24	\$ 39576	2.16	1121	
TOTAL VAR. COST	1499	111501	6.50	\$ 110915	6.04	-587	
--- Cash Fixed Costs ---							
Bldg. interest	0	0	0.00	\$ 0	0.00	0	
Equip. interest	24	1824	0.11	\$ 1824	0.10	0	
Livestock interest	0	0	0.00	\$ 0	0.00	0	
Feed & operating loans	0	0	0.00	\$ 0	0.00	0	
Taxes & insurance	6	456	0.03	\$ 456	0.02	0	
TOTAL CASH FIXED	30	2280	0.13	\$ 2280	0.12	0	
--- Non-Cash (NC) Fixed Costs ---							
Deprec. bldg.	110	8360	0.49	\$ 8360	0.46	0	
Deprec. equip.	150	11400	0.66	\$ 11400	0.62	0	
Opportunity cost	269	20418	1.19	\$ 20418	1.11	0	
TOTAL NC FIXED	529	40178	2.34	\$ 40178	2.19	0	
TOTAL FIXED COST	559	42458	2.47	\$ 42458	2.31	0	
Unpaid Labor	253	19228	1.12	\$ 19228	1.05	0	
TOTAL CASH COST	1529	113781	6.63	\$ 113195	6.17	-587	
Return/cash cost	1081	84559	4.93	\$ 106718	5.82	22159	
Family Living	329	25000	1.46	\$ 25000	1.36	0	
TOTAL ECON. COST	2311	175636	10.23	\$ 172601	9.41	-3035	
Return/econ. cost	298	22687	1.32	\$ 47312	2.57	24685	

*Costs simulated based on farm account data for high profit herds +4,000 lb of milk. Feed costs adjusted for production level.