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Dairy Enterprise – 100 Lactating Cows (Freestall)

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Production Level

Costs per unit and net returns in a dairy enterprise are highly dependent on the level of milk production. Production levels vary for a number of reasons such as livestock genetics, weather, input levels, and management. Budgeting at multiple production levels can help producers examine the financial risk of a livestock enterprise that is directly related to production risk. Table 1 shows milk production levels and income over feed costs from the Heart of America DHIA Summary of Holstein Herds for the last 5 years broken down by quartile of rolling herd average. The following estimated budget includes two production levels – 20,000 and 25,000. The 20,000 pounds reflects producers that are average; whereas, the 25,000 pounds is intended to reflect production levels of the top 25 percent of producers. The projected budget at the two production levels is presented on both a per-cow and a per-hundredweight (cwt) of milk production basis.

Capital Requirements

Capital invested in dairy facilities varies greatly depending on herd size and degree of mechanization. The capital needed to establish a new 100 lactating cow dairy operation with modern equipment using freestall housing is estimated to be $772,500 with another $230,100 for the cows. This budget is based on a total herd size of 118 cows, with 100 cows (85 percent of the herd) being milked at any one time. Thus, the total facility investment equates to $7,725 per lactating cow and $6,547 per total cow (lactating and dry) in the herd. Because investment in facilities can vary tremendously between operations, sensitivity analyses tables are included to show returns at various levels of facility investment versus milk price (Table 3) and facility investment versus milk production (Table 4).

Feed Costs

Dairy cows require high quality forage and grain. Concentrates and grain requirements increase as milk production increases. Feed efficiency, measured as pounds of milk production divided by pounds of dry matter feed consumed, is generally in the range of 1.4 to 1.6 with more productive dairies being on the high end of this range and lower producing dairies on the lower end. Efficiencies of this magnitude indicate that the value of increased production generally will offset the added feed cost associated with the higher production levels. Feed costs vary significantly over time due to the price of feed ingredients, but feed is consistently the most important factor in the cost of production. Feed costs are based on market prices, thus, for dairy operations that produce some, or all, of their grain and forage requirements this allocates the cost of producing the feed to the dairy enterprise. Because feed costs are so important, it is useful to examine how varying feed prices impact economic returns. Table 2 shows how the return on investment (Line G in the budget) is impacted by both feed and milk prices.

Returns

Producers receive income primarily from the sale of milk. Additional income is received from the Market Income Loss Contract (MILC) payment if national prices are below a target level, sale of calves and culled breeding stock, and the possible sale of manure (or value captured if used on producer owned land). In this budget, it is assumed that replacement heifers are purchased and thus all calves are sold. It is further assumed that slightly less than one-third (30 percent) of the cows are replaced each year due to culling and death loss. Cull income is assigned to 27 percent of the herd annually. The other 3 percent represents death loss and cows with no salvage value. Because milk sales make up the majority of income, returns are very sensitive to milk prices. Table 2 shows the return on investment (Line G in the budget) at varying feed and milk prices. Similarly, Table 3 shows the return on investment at varying milk prices and facility investment values.

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Table 1. *Heart of America DHIA Summary for Holstein Herds, 2003-07*

Year	Rolling herd average quartile: Bottom 25%	Lower middle 25%	Upper middle 25%	Top 25%
		Average Milk Production, lbs/cow/year		
2003	15,235	18,775	20,607	23,692
2004	15,239	18,781	20,703	23,952
2005	16,116	19,437	21,657	24,758
2006	16,083	19,276	21,434	24,796
2007	15,456	19,224	21,360	24,604
		Average Income Over Feed Cost, $/cow/year		
2003	$1,324	$1,781	$1,912	$2,373
2004	$1,359	$1,799	$1,936	$2,447
2005	$1,389	$1,734	$2,145	$2,434
2006	$981	$1,275	$1,611	$1,920
2007	$1,531	$2,159	$2,448	$2,893

Information Included in Budget – 100 Lactating Cow Dairy

1. **Milk sales:** based on the annual production per cow times base milk price of $17.57/cwt.
2. **Volume premium:** dairies that can ship milk in semi loads at a time often get a premium based on volume. No premium is used for a 100-cow dairy.
3. **Government payment (MILC):** the Market Income Loss Contract payment is based on 45 percent of the difference between $16.94 per cwt (adjusted for feed cost) and the monthly Boston Class I milk price on up to 2.985 million pounds of annual production per dairy operation.
4. **Calves sold:** based on a 95 percent calf crop and selling all calves (heifers and bulls) at birth.
5. **Cull cows sold:** assumes cull income is realized on 27 percent of the herd even though 30 percent of the herd is replaced annually. The 3 percent with no income represents cow death loss and cows with zero salvage value.
6. **Manure credit:** based on nitrogen (N) and phosphate (P_2O_5) excreted per cow that would be available the following year for crop production valued at $0.85/lb of N and $1.09/lb of P_2O_5 less an application cost of $0.008/gallon.
7. **Feed:** includes total feed for the dairy cow on an annual basis. Feed costs are based on a feed efficiency (lbs of milk divided by lbs of dry matter feed) of 1.44 and 1.55 for the 20,000 and 25,000 production levels, respectively.
8. **Labor:** based on 1.67 full-time persons at an average of $38,000 (salary + benefits) per person divided by the number of cows in the herd.
9. **Veterinary, drugs, and supplies:** costs for prevention and treatment of disease, and general supplies.
10. **Somatotropin:** costs for rbST based on annual doses per cow of 0.0 (not used) and 14.4 (75% of labeled rate) for the 20,000 and 25,000 production levels, respectively.
11. **Utilities and water:** telephone, electricity, fuel, and water costs allocated to the dairy enterprise.
12. **Fuel, oil, and auto expense:** share of the farm car and trucks plus gasoline, diesel, and oil for scraping and hauling manure and for hauling feed to the dairy herd.
13. **Milk hauling and promotion costs:** milk-hauling costs at $0.75/cwt. and promotion costs at $0.25/cwt.
14. **Building and equipment repairs:** annual building and equipment repairs allocated to dairy enterprise calculated as 2.5 percent of the total investment.
15. **Breeding/genetic charge:**

a. **Capital replacement:** price of a heifer replacement ($1,950) times the replacement rate (30%).
b. **Semen, A.I. services, and supplies:** includes semen, artificial insemination services, and supplies.
c. **Interest:** interest is charged on the value of the breeding herd, which is based on the cost of replacement heifers entering the herd.
d. **Insurance:** averages approximately 1 percent of the value of the breeding herd.

16. **Professional fees (legal accounting, etc.):** business costs allocated to the dairy enterprise.
17. **Miscellaneous:** miscellaneous costs (subscriptions, education, etc.) allocated to the dairy enterprise.
18. **Depreciation on buildings and equipment:** depreciation is based on the total original cost less the salvage value of buildings and equipment on a per cow basis divided by the estimated life. The budget value is based on a total investment of buildings and improvements of $5,100 per cow and an investment of $1,050 per cow for equipment. The useful life is assumed to be 25 years for buildings and improvements and 15 years for equipment. A salvage value of 10 percent is assumed on buildings and improvements and equipment.
19. **Interest on land, buildings, and equipment:** interest is charged on the land investment at a rate of 5 percent and one-half the average investment [(initial cost + salvage value) ÷ 2] for buildings and improvements and equipment at a rate of 8.0 percent.
20. **Insurance and taxes on buildings and equipment:** insurance on buildings and equipment is based on the original cost times 0.25 percent, taxes are based on 1.5 percent of the original cost for buildings and improvements and 0.35 percent for land.
21. **Interest on operating costs:** calculated on one-half of operating costs at a rate of 8.0 percent.

E. **Breakeven milk price to cover total costs:** represents the price needed for milk per cwt. to cover total costs of production. Assumes MILC payment, calf and cull income, manure credit, and all costs remain constant.
F. **ASSET TURNOVER:** (gross returns per cow divided by total assets) asset turnover is the percentage of total investment recovered by total returns. Inverting this measure allows different enterprises to be compared on the basis of capital required to generate a dollar of gross income.
G. **NET RETURN ON ASSETS:** [(returns over total costs + interest on breeding herd + interest on operating costs + interest on land, buildings, and equipment) ÷ assets] net return on assets is the percentage return on investment capital (both borrowed and equity). This measure enables comparisons to be made between enterprises as well as other investment alternatives.

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COST-RETURN PROJECTION — 100 LACTATING COW FREESTALL DAIRY (REPLACEMENTS PURCHASED[1])

	Production Level (lbs milk sold) 20,000 Per cow	20,000 Per cwt	25,000 Per cow	25,000 Per cwt	Your Farm
RETURNS PER COW:					
1. Milk sales @ $17.57/cwt	$ 3,514.75	$ 17.57	$ 4,393.44	$ 17.57	
2. Volume premium					
3. Government payment (MILC)					
4. Calves sold: 95% × $246/head	233.70	1.17	233.70	0.93	
5. Cull cows sold: 1,350 lbs × 27% × $57.90/cwt	211.05	1.06	211.05	0.84	
6. Manure credit	120.66	0.60	126.40	0.51	
A. GROSS RETURNS	$ 4,080.16	$ 20.40	$ 4,964.59	$ 19.86	
COSTS PER COW:					
7. Feed	$ 1,774.25	$ 8.87	$ 2,033.77	$ 8.14	
8. Labor	536.72	2.68	536.72	2.15	
9. Veterinary, drugs, and supplies	130.00	0.65	140.00	0.56	
10. Somatotropin (rbST)			82.93	0.33	
11. Utilities and water	77.01	0.39	79.83	0.32	
12. Fuel, oil, and auto expense	75.00	0.38	75.00	0.30	
13. Milk hauling and promotion cost	200.00	1.00	250.00	1.00	
14. Building and equipment repairs	153.75	0.77	153.75	0.62	
15. Breeding/genetic charge:					
a. Capital replacement: 30% × $1,950/head	585.00	2.93	585.00	2.34	
b. Semen, A.I. services, and supplies	42.00	0.21	52.50	0.21	
c. Interest	156.00	0.78	156.00	0.62	
d. Insurance	19.50	0.10	19.50	0.08	
16. Professional fees (legal, accounting, etc.)	20.34	0.10	20.34	0.08	
17. Miscellaneous	25.42	0.13	30.42	0.12	
18. Depreciation on buildings and equipment	246.61	1.23	246.61	0.99	
19. Interest on land, buildings, and equipment	290.43	1.45	290.43	1.16	
20. Insurance & taxes on land, buildings, & equipment	93.26	0.47	93.26	0.37	
B. SUB TOTAL	$ 4,425.29	$ 22.13	$ 4,846.05	$ 19.38	
21. Interest on ½ operating costs @ 8.0%	117.89	0.59	132.72	0.53	
C. TOTAL COSTS PER COW	$ 4,543.18	$ 22.72	$ 4,978.78	$ 19.92	
D. RETURNS OVER TOTAL COST (A-C)	$ -463.02	$ -2.32	$ -14.19	$ -0.06	
E. BREAKEVEN MILK PRICE, $/cwt		$ 19.89		$ 17.63	
22. Lactating cow feed cost, $/head/day	5.16		5.99		
23. Dry cow feed cost, $/head/day	2.18		2.18		
F. ASSET TURNOVER (A ÷ Assets)[2]		48.0%		58.4%	
G. NET RETURN ON ASSETS [(D + 15c + 19 + 21) ÷ Assets][2]		1.19%		6.65%	

[1] *For cost of raising replacement heifers see MF-399.*

[2] *Assets equal total value of breeding herd and land, buildings and equipment.*

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Table 2. *Sensitivity of Return on Investment (Line G) to Milk Price and Feed Price*

Gross	Lactating cow feed price, $/cwt of DM*				
Milk price**	$10.18	$10.93	$11.68	$12.43	$13.18
	Production level (lbs milk sold/cow/year) = 20,000				
$15.57	-0.89%	-2.20%	-3.52%	-4.83%	-6.14%
$16.57	1.46%	0.15%	-1.16%	-2.47%	-3.79%
$17.57	3.82%	2.50%	1.19%	-0.12%	-1.43%
$18.57	6.17%	4.86%	3.55%	2.23%	0.92%
$19.57	8.52%	7.21%	5.90%	4.59%	3.28%
	Production level (lbs milk sold/cow/year) = 25,000				
$15.57	3.78%	2.27%	0.76%	-0.74%	-2.25%
$16.57	6.72%	5.22%	3.71%	2.20%	0.69%
$17.57	9.67%	8.16%	6.65%	5.14%	3.63%
$18.57	12.61%	11.10%	9.59%	8.08%	6.58%
$19.57	15.55%	14.04%	12.53%	11.03%	9.52%

** Dry cow dry matter feed price equals 62.3% of lactating cow feed price.*
*** Gross milk price includes hauling and promotion costs*

Table 3. *Sensitivity of Return on Investment (Line G) to Milk Price and Facility Investment*

Gross	Total investment in facilities and equipment, $/lactating cow*				
Milk price**	$5,257	$6,257	$7,257	$8,257	$9,257
	Production level (lbs milk sold/cow/year) = 20,000				
$15.57	-2.40%	-3.02%	-3.52%	-3.92%	-4.26%
$16.57	0.54%	-0.40%	-1.16%	-1.78%	-2.30%
$17.57	3.48%	2.21%	1.19%	0.36%	-0.34%
$18.57	6.42%	4.83%	3.55%	2.50%	1.63%
$19.57	9.36%	7.44%	5.90%	4.64%	3.59%
	Production level (lbs milk sold/cow/year) = 25,000				
$15.57	2.95%	1.74%	0.76%	-0.03%	-0.69%
$16.57	6.63%	5.00%	3.71%	2.64%	1.76%
$17.57	10.30%	8.27%	6.65%	5.32%	4.21%
$18.57	13.98%	11.54%	9.59%	8.00%	6.67%
$19.57	17.65%	14.81%	12.53%	10.67%	9.12%

** Investment per cow in herd equals investment per lactating cow times 84.7%.*
*** Gross milk price includes hauling and promotion costs*

Table 4. *Sensitivity of Return on Investment (Line G) to Production and Facility Investment*

Milk	Total investment in facilities and equipment, $/lactating cow*				
production	$5,257	$6,257	$7,257	$8,257	$9,257
	Production level (lbs milk sold/cow/year) = 20,000**				
18,000	0.14%	-0.77%	-1.49%	-2.08%	-2.57%
19,000	1.81%	0.72%	-0.15%	-0.86%	-1.45%
20,000	3.48%	2.21%	1.19%	0.36%	-0.34%
21,000	5.16%	3.70%	2.53%	1.58%	0.78%
22,000	6.83%	5.19%	3.87%	2.79%	1.90%
	Production level (lbs milk sold/cow/year) = 25,000**				
23,000	6.95%	5.30%	3.97%	2.88%	1.98%
24,000	8.63%	6.78%	5.31%	4.10%	3.10%
25,000	10.30%	8.27%	6.65%	5.32%	4.21%
26,000	11.97%	9.76%	7.99%	6.54%	5.33%
27,000	13.65%	11.25%	9.33%	7.76%	6.45%

** Investment per cow in herd equals investment per lactating cow times 84.7%.*
*** Costs vary by production level due to varying feed and hauling and promotion costs.*

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