Dairy Enterprise – 2,400 Lactating Cows (Drylot)

Department of Agricultural Economics — *www.agmanager.info*

K-STATE Research and Extension

Kansas State University Agricultural Experiment Station and Cooperative Extension Service

Kevin C. Dhuyvetter
Agricultural Economist
Farm Management

Micheal Brouk
Animal Scientist, Dairy

Joseph P. Harner, III
Agricultural Engineer
Grain and Livestock Systems

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 per cow milk production levels for Kansas as well as the top 25 percent, middle 50 percent, and bottom 25 percent of the states in the United States for the most recent 5 years. This indicates how much production might vary regionally, but it can vary considerably within a state for reasons already mentioned. The following estimated budget includes two production levels — 20,000 and 23,500. The 20,000 pounds reflects producers that are average; whereas, the 23,500 pounds is intended to reflect production levels of the top 20 to 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 2,400 lactating cow dairy operation with modern equipment and facilities is estimated to be $11,617,480 with another $3,709,920 for the cows. This budget is based on a total herd size of 2,832 cows, with 2,400 cows (85 percent of the herd) being milked at any one time. Thus, the total land, facility, and equipment investment equates to $4,841 per lactating cow and $4,102 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 may be received from government programs depending on milk and feed prices, 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 over one-third (34 percent) of the cows are replaced each year due to culling and death loss. Cull income is assigned to 26.5 percent of the herd annually. The other 6 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.

Table 1. *Average Milk Production per Cow, 2009–2013 (Source: USDA NASS)*

	2009	2010	2011	2012	2013	Average
Kansas	21,085	20,975	21,016	21,683	21,881	21,328
Top 25% [1]	22,112	22,675	22,815	23,189	23,143	22,787
Middle 50% [2]	18,885	19,246	19,482	19,909	20,239	19,552
Bottom 25% [3]	15,384	15,273	15,157	15,627	15,165	15,321

[1]*Average of the top 25% of the continental states (12-state average)*
[2]*Average of the middle 25% of the continental states (24-state average)*
[3]*Average of the bottom 25% of the continental states (12-state average)*

Information Included in Budget – 2,400 Lactating Cow Dairy

1. **Milk sales:** based on the annual production per cow times base milk price of $20.27/cwt.
2. **Volume premium:** dairies that can ship milk in semi loads at a time often get a premium based on volume. A premium of $1.00 per cwt. is included for a 2,400-cow dairy.
3. **Government payment:** producers could possibly receive price support through the Market Income Loss Contract Program or the new Dairy Producer Margin Protection Program, but no payments are anticipated at current projected prices and feed costs.
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 26.5 percent of the herd even though 34 percent of the herd is replaced annually. The 6 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 $0.55/lb of N and $0.52/lb of P_2O_5 less an application cost of $0.01/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 1.41 and 1.52 for the 20,000 and 23,500 production levels, respectively.
8. **Labor:** based on 22 full-time persons at an average of $41,520 (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 23,500 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 $0.95/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 ($1,310) times the replacement rate (34%).
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 $3,520 per cow and an investment of $495 per cow for equipment. The useful life is assumed to be 15 years for buildings and improvements and 7 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 6.5 percent.
20. **Insurance and taxes on land, 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-twelfth of operating costs at a rate of 6.5 percent.

E. **Breakeven milk price to cover total costs:** represents the price needed for milk per cwt. to cover total costs of production. Assumes government 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.

COST-RETURN PROJECTION — 2,400 LACTATING COW DRYLOT DAIRY (REPLACEMENTS PURCHASED[1])

	Production Level (lbs milk sold) 20,000 Per cow	20,000 Per cwt	23,500 Per cow	23,500 Per cwt	Your Farm
RETURNS PER COW:					
1. Milk sales @$20.27/cwt	$ 4,054.00	$ 20.27	$ 4,763.45	$ 20.27	
2. Volume premium	200.00	1.00	235.00	1.00	
3. Government payment (MILC)					
4. Calves sold: 95% × $180/head	170.81	0.85	170.81	0.73	
5. Cull cows sold: 1,350 lbs × 28% × $81.41/cwt	307.09	1.54	307.09	1.31	
6. Manure credit	5.27	0.03	3.27	0.01	
A. GROSS RETURNS	$ 4,737.16	$ 23.69	$ 5,479.62	$ 23.32	
COSTS PER COW:					
7. Feed	$ 2,336.87	$ 11.68	$ 2,573.62	$ 10.95	
8. Labor	322.52	1.61	322.52	1.37	
9. Veterinary, drugs, and supplies	135.00	0.68	150.00	0.64	
10. Somatotropin (rbST)			93.74	0.40	
11. Utilities and water	122.74	0.61	125.73	0.54	
12. Fuel, oil, and auto expense	82.61	0.41	82.61	0.35	
13. Milk hauling and promotion cost	240.00	1.20	282.00	1.20	
14. Building and equipment repairs	100.38	0.50	100.38	0.43	
15. Breeding/genetic charge:					
a. Capital replacement: 34% × $1,310/head	445.40	2.23	445.40	1.90	
b. Semen, A.I. services, and supplies	42.00	0.21	56.00	0.24	
c. Interest	85.15	0.43	85.15	0.36	
d. Insurance	13.10	0.07	13.10	0.06	
16. Professional fees (legal, accounting, etc.)	13.98	0.07	13.98	0.06	
17. Miscellaneous	18.54	0.09	23.54	0.10	
18. Depreciation on buildings and equipment	214.97	1.07	214.97	0.91	
19. Interest on land, buildings, and equipment	149.51	0.75	149.51	0.64	
20. Insurance & taxes on land, buildings, & equipment	63.14	0.32	63.14	0.27	
B. SUB TOTAL	$ 4,385.91	$ 21.93	$ 4,795.39	$ 20.41	
21. Interest on ½ operating costs @ 6.5%	17.61	0.09	19.60	0.08	
C. TOTAL COSTS PER COW	$ 4,403.52	$ 22.02	$ 4,814.99	$ 20.49	
D. RETURNS OVER TOTAL COST (A-C)	$ 333.65	$ 1.67	$ 664.63	$ 2.83	
E. BREAK-EVEN MILK PRICE, $/cwt		$ 18.60		$ 17.44	
22. Lactating cow feed cost, $/head/day	6.73		7.48		
23. Dry cow feed cost, $/head/day	3.16		3.16		
F. ASSET TURNOVER (A ÷ Assets)[2]	87.5%		101.2%		
G. NET RETURN ON ASSETS [(D + 15c + 19 + 21) ÷ Assets][2]	10.83%		16.98%		

[1] *For cost of raising replacement heifers see MF399.*
[2] *Assets equal total value of breeding herd and land, buildings and equipment.*

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**	$14.22	$14.72	$15.22	$15.72	$16.22
	Production level (lbs milk sold/cow/year) = 20,000				
$18.27	6.20%	4.82%	3.44%	2.05%	0.67%
$19.27	9.90%	8.51%	7.13%	5.75%	4.37%
$20.27	13.59%	12.21%	10.83%	9.44%	8.06%
$21.27	17.29%	15.90%	14.52%	13.14%	11.76%
$22.27	20.98%	19.60%	18.22%	16.83%	15.45%
	Production level (lbs milk sold/cow/year) = 23,500				
$18.27	11.35%	9.82%	8.29%	6.77%	5.24%
$19.27	15.69%	14.16%	12.64%	11.11%	9.58%
$20.27	20.03%	18.50%	16.98%	15.45%	13.93%
$21.27	24.37%	22.85%	21.32%	19.79%	18.27%
$22.27	28.71%	27.19%	25.66%	24.14%	22.61%

** Dry cow feed price equals 69.2% 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**	$4,238	$4,488	$4,738	$4,988	$5,238
	Production level (lbs milk sold/cow/year) = 20,000				
$18.27	4.53%	3.96%	3.44%	2.95%	2.50%
$19.27	8.54%	7.80%	7.13%	6.51%	5.93%
$20.27	12.55%	11.65%	10.83%	10.06%	9.36%
$21.27	16.55%	15.50%	14.52%	13.62%	12.78%
$22.27	20.56%	19.34%	18.22%	17.18%	16.21%
	Production level (lbs milk sold/cow/year) = 23,500				
$18.27	9.80%	9.02%	8.29%	7.63%	7.01%
$19.27	14.51%	13.53%	12.64%	11.81%	11.03%
$20.27	19.22%	18.05%	16.98%	15.98%	15.06%
$21.27	23.93%	22.57%	21.32%	20.16%	19.09%
$22.27	28.64%	27.09%	25.66%	24.34%	23.11%

** 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	$4,238	$4,488	$4,738	$4,988	$5,238
	Production level (lbs milk sold/cow/year) = 20,000**				
18,000	7.21%	6.53%	5.91%	5.33%	4.80%
19,000	9.88%	9.09%	8.37%	7.70%	7.08%
20,000	12.55%	11.65%	10.83%	10.06%	9.36%
21,000	15.21%	14.21%	13.28%	12.43%	11.64%
22,000	17.88%	16.77%	15.74%	14.79%	13.92%
	Production level (lbs milk sold/cow/year) = 23,500**				
21,500	13.89%	12.94%	12.06%	11.25%	10.50%
22,500	16.55%	15.49%	14.52%	13.62%	12.78%
23,500	19.22%	18.05%	16.98%	15.98%	15.06%
24,500	21.89%	20.61%	19.44%	18.35%	17.34%
25,500	24.55%	23.17%	21.89%	20.72%	19.62%

** 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.

Publications from Kansas State University are available at: *www.ksre.ksu.edu*.

Kansas State University Agricultural Experiment Station and Cooperative Extension Services

MF2540 April 2014

K-State Research and Extension is an equal opportunity provider and employer. Issued in furtherance of Cooperative Extension Work, Acts of May 8 and June 30, 1914, as amended. Kansas State University, County Extension Councils, Extension Districts, and United States Department of Agriculture Cooperating, John D. Floros, Director.