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PROFITABILITY OF FEEDING DAIRY STEERS TO FEEDER AND SLAUGHTER WEIGHT
ON NORTHEAST DAIRY FARMS

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INTRODUCTION

On most Northeastern dairy farms bull calves are considered a superfluous output and are sent to auction markets as soon as possible after they are born. The excess supply situation in the United States dairy industry combined with other obstacles to dairy herd expansion has resulted in dairy producers seeking expansion options other than increased dairy herd size. Several alternatives for expanding the dairy farm business that utilize bull calves as a resource are possible. Dairy beef systems that are most complementary to the ongoing dairy business should be particularly attractive.

The objective of this paper is to investigate the profitability of alternative dairy beef production and feeding systems in which Holstein bull calves are raised in a system compatible with the dairy operations. For the first nine months or up to 540 pounds, the optimal growth rates of steers and heifers are similar and thus they can be housed and fed together (Fox and Nowak). After reaching nine months of age, heifer calves raised for dairy replacements should grow more slowly than dairy steers. At this time, the steers can be sold as feeders or fed to slaughter weight. In this analysis, the rations contained in Fox and Nowak for alternative forage compositions are considered. All feeding systems contain large quantities of forage to be complementary with the crop producing capabilities of most Northeastern dairy farms.

Limited research is available investigating the economic potential of beef and dairy beef in the Northeast. Earlier studies of dairy beef (Hallman, Wentworth and Howland) found raising dairy beef to be economically feasible in New York. In more recent studies, Christensen and Stinson found limited potential profits from a beef cow herd in Massachusetts, and Knoblauch et al. 1979 found dairy beef production more profitable than other beef enterprises in the Northeast.

This paper extends these analyses in three ways. First, recent research results improving the knowledge of the growth response of dairy beef to high forage diets (Fox and Nowak) are incorporated into the analysis. Second, current price relationships are incorporated, and third, the production and feeding systems considered are more complementary to dairy farm businesses.

Potential profitability of raising farm produced dairy steers is investigated by analysis of two representative dairy farms. Using linear programming, the resources from these represent-

ative farms, cost and return information from enterprise budgets and feed requirements from Fox and Nowak are utilized to obtain profit maximizing enterprise combinations. Results from LP runs with alternative dairy beef systems and the subsequent calculation of net cash farm income and return to labor and management are used to assess potential profitability.

REPRESENTATIVE FARMS AND DATA SOURCES

One representative farm has a small dairy herd of 40 cows with restricted crop acres; the second has a larger herd size of 80 cows with a large crop acreage base (Table 1). The two farms represent conditions near the ends of the range of crop acres per cow typically found in the Northeast. A farm with a large dairy herd size is not included because it is unlikely businesses with large herds would be interested in dairy beef. Milk production and crop yields represent average to above average soil resources and management; limitations and yields are consistent with New York and Northeast farm conditions (Smith, Knoblauch). Corn acreage limitation on the small farm is crucial to the optimal solution and thus two maximum corn acreages are considered.

Product prices and input costs are representative of 1980 with minor adjustments in product prices to reflect anticipated relative prices over the next ten to fifteen years (Table 2). Since these prices are used as real prices, real interest rates are also used. Principal data sources for production and investment costs are Knoblauch, et al. 1980; Knoblauch and Milligan; Woodell, and Adams. More detailed source references are included in Milligan, Nowak and Knoblauch.

RESEARCH PROCEDURE

The analysis of the potential for raising dairy beef feeders with the dairy heifers and then selling the feeders or raising them to slaughter weight is accomplished by comparing the enterprise organization, feeding systems and profitability of three alternative dairy beef systems with the dairy operation for each of the representative farms. The three beef production systems are (1) feeder weight dairy steers in which the steers are sold as feeders, (2) feeder and slaughter weight dairy steers in which the steers can be sold as feeders or fed to slaughter weight if profitable and (3) slaughter weight dairy steers in which a feeder market is not available and the bobcalves must be sold or raised to slaughter weight.

Three production activities are included in the LP for all livestock enterprises; each activity represents a balanced ration of alternative forage compositions (Fox and Nowak and Milligan, et al.). The alternative activities facilitate the profit-maximizing use of the crop-producing

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Table 1: Production Characteristics of Representative Northeastern U.S. Dairy Farms

	Production Characteristics	
	Small Dairy	Large Dairy
Dairy Herd Size	40 cows	80 cows
Milk Sold Per Cow	13,000 lbs.	13,000 lbs.
Dairy Replacements	Raise on Farm	Raise on Farm
Calf Death Loss ^a	15 percent	15 percent
Calving Interval	13 months	13 months
Crop Acres	120	300
Maximum Corn Acres	30 and 60	220
Hay Crop	Mixed Mainly Grass	Mixed Mainly Legume
Crop Yields		
Hay ^b	2.5 tons/acre	—
Hay Crop Silage ^c	—	6.2 tons/acre
Corn Silage ^d	13 tons/acre	16 tons/acre
High Moisture Shelled Corn ^e	—	95 bushels/acre

^a Birth to freshening or sale.

^b 88 percent dry matter

^c 47 percent dry matter

^d 33 percent dry matter.

^e Dry corn equivalent (89 percent dry matter).

Table 2: Product Prices and Input Costs, 1980

PRICES		COSTS	
<u>Dairy and Beef</u>	<u>Dollars</u>	<u>Feeds</u>	<u>Dollars</u>
Feeders (lb.)	0.75	Hay	60.00
Fat Steer (lb.)	0.65	Corn Grain (bu.)	3.50
Bobcalves (head)	60.00	Soybean Meal (T)	300.00
Milk (cwt.)	12.70	Rumensin (lb.)	34.00
Cull Cows (cwt.)	45.00	Dical (cwt.)	25.00
Bred Heifers (head)	1050.00	Limestone (cwt.)	5.00
		Trace Mineral Salt (cwt.)	7.50
<u>Crops Sold</u>		<u>Labor</u>	
Corn Grain (bu.)	3.30	Hired (hr.)	4.60
Hay (T)	50.00	<u>Fertilizer</u>	
		Nitorgen (lb.)	.30
		Phosphorus (lb.)	.28
		Potassium (lb.)	.17
		<u>Capital (real interest rate)</u>	
		Short Term	4%
		Long term	3%

resources. Two of the alternatives for all live-stock are roughage compositions of all hay crop and equal parts dry matter from hay crop and corn silage. The third contains a large although varying proportion of corn silage. The high corn silage ration is twenty-five and forty-two per cent of the roughage dry matter from hay crop for the dairy cows and dairy heifers, respectively. This feeding system is all corn silage for the dairy steers except for the dairy feeders where twelve percent of the roughage dry matter is from hay crop because the steers eat some hay when they are housed with the heifers. For the slaughter weight steer, three alternative rations are formulated for 540 to 850 pounds and 850 to 1250 pounds.

The linear programming objective function maximizes return over variable cost using feed requirements from Fox and Nowak, prices from Table 2 and enterprise information from Table 3. Investment costs are calculated as if the equipment complement had been purchased equally over the last nine years and buildings had been purchased equally over the last fifteen years. Cash (property taxes and insurance) and non-cash fixed expenses (depreciation, interest on investment

and value of family labor) were then calculated (Milligan, Nowak and Knoblauch) to determine net cash farm income and return to operator labor and management.

RESULTS FROM SMALL DAIRY

The dairy farm with 30 corn acres and only the milking herd is self-sufficient in roughage with no sales or purchase (Table 4). Raising bobcalves to feeder weight with the heifers adds about \$1100 to the return to operator labor and management; however, it is not profitable to keep the animals to slaughter weight. If no feeder market is available, raising bobcalves with heifers and then fattening for slaughter is marginally profitable, but definitely inferior to selling feeders.

The roughage compositions of the rations are intriguing. When feeders are raised, the limited supply of corn silage is most profitable used almost exclusively for the dairy cows; however, when dairy steers are fed, the corn silage is more valuable for the 850 to 1250 pound steers.

Although the shadow prices are not affected greatly, the changes are revealing. When feeders

Table 3: Cash Receipts and Variable Expenses Excluding Labor and Feed for Crop and Livestock Enterprises

Enterprise	Cash Receipt	Variable Expenses Excluding Labor and Feed ^a	
		Small Dairy	Large Dairy
		-----Dollars-----	
Dairy Cow	1802.40	375.39	342.50
Dairy Heifer ^b	—	189.90	184.85
Dairy Beef Feeder ^c	405.00	109.68	125.98
Slaughter Weight Dairy Steer ^d	812.50	218.75	249.90
Hay ^e	—	75.50	—
Hay Crop Silage ^e	—	—	106.69
Corn Silage ^e	—	132.75	130.90
Corn Grain ^e	—	—	130.03

^a Variable expenses for livestock enterprises vary slightly by ration forage composition. Values presented are for half of the forage dry matter from the hay crop and half from corn silage. Enterprise information for all livestock enterprises are in Milligan, Nowak and Knoblauch.

^b Birth to freshening at twenty-four months.

^c Birth to 540 pounds at nine months. The \$12.00 marketing costs included are not incurred if animals are fed to slaughter weight.

^d 540 pounds to 1250 pounds slaughter weight in 341 days.

^e Crop expenses are from Knoblauch and Milligan.

Table 4: Profitability and Optimal Enterprise Organization of Dairy Herd Only, Dairy Feeders and Slaughter Weight Dairy Steers for the Small Representative Dairy Farm With a Maximum of 30 Corn Acres

	Dairy Herd Only	Feeder and Slaughter Weight Steers	Slaughter Weight Steers
<u>Livestock Numbers</u>			
Heifer Calves Sold	0	0	0
Bred Heifers Sold	4.4	4.4	4.4
Bull Calves Sold	15.6	0	0
Feeders Sold	—	15.6	—
Slaughter Weight Steers Sold	—	0	15.6
<u>Ration Roughage Composition</u>			
Hay Crop, %—Cows	65	50	61
Hay Crop, %—Heifers	50	97	100
Hay Crop, %—Feeders	—	97	100
Hay Crop, %—Stockers	—	—	100
Hay Crop, %—Fat	—	—	0
<u>Feed</u>			
Buy Hay, tons	2.5	5	42
Dry Corn Purchased, bu.	1327	1625	2542
Soybean Meal Purchased, cwt.	290	354	327
Hay Sold, tons	0	0	0
<u>Crop Acres</u>			
Hay Crop	90	90	90
Corn Silage	30	30	30
<u>Return Over Variable Cost</u>	\$38,899	\$40,032	\$39,153
<u>Net Cash Farm Income</u>	\$32,802	\$33,935	\$33,018
<u>Fixed Costs (Non-cash)^a</u>			
Dairy Operation	\$24,275	\$24,275	\$24,275
Steer Facilities	—	0	102
<u>Return to Labor and Management</u>	\$ 8,527	\$ 9,660	\$ 8,641
<u>Shadow Prices</u>			
Dairy Cow	\$ 462	\$ 491	\$ 468
Land	64	64	64
Corn Limitation	144	143	144

^a Current facilities are large enough to raise feeders with the dairy heifers. See Milligan, Nowak and Knoblauch for investment costs.

are produced, the marginal value of another cow increases because the male calves are more valuable as feeders than as bobcalves and the marginal value of land increases because the crop acreage limitation is stretched even further.

Relaxation of the limitation on corn acreage increases returns from the dairy herd and from the addition of dairy steer enterprises (Table 5). As with the 30-acre corn limitation, the introduction of the feeder enterprise is the most profitable dairy steer alternative adding about \$1500 to operator labor and management income. The slaughter weight dairy steer enterprise provides an additional \$400 to operator labor and management income. With all marketing options available, a small number of feeders are sold rather than fed to slaughter weight, but the advantage over feeding all bobcalves to slaughter weight (no feeder market) is minute.

With the dairy herd only, excess hay is sold and all livestock are fed a high corn silage ration. When dairy beef feeders and steers are added, they are fed all or nearly all of their roughage as corn silage, and the dairy cows move toward equal parts of roughage dry matter from hay and corn silage.

The two analyses with the small dairy indicate that feeding the feeders with the heifers is an attractive expansion opportunity. The fattening of the feeders to slaughter weight is profitable only if adequate quantities of farm-produced roughage are available.

RESULTS FOR LARGE DAIRY

Since corn acreage is not a major limitation, only one analysis was conducted with the large dairy. The large dairy has a large cash grain enterprise (Table 6). The addition of dairy beef enterprises reduces this enterprise.

The addition of a feeder weight steer enterprise increases labor and management income almost \$3,000. Raising the feeders to slaughter weight is only profitable when feeders cannot be sold and then by less than \$100. These results are similar to the small dairy with 30 acres of

corn. The cash grain enterprise provides a large enhancement to the profits of the dairy herd. The reduction in profits from this enterprise by using acreage to produce feed for slaughter weight is as great or greater than the profits from the slaughter weight steers.

SUMMARY AND CONCLUSIONS

Under the economic conditions analyzed, feeding dairy steers with the heifers for sale as feeders is profitable; however, keeping the feeders to slaughter weight rather than selling as feeders is only profitable on the small dairy with 60 corn acres (Figure 1). These results suggest that the limited crop acres and profitable cash grain enterprises limit the potential profitability of dairy beef. It should also be noted that heifer calves, not required as replacements, were raised and sold as bred heifers; consequently, heifer raising enterprises may also be more profitable than dairy beef.

In most analyses, the dairy cows are fed a ration with equal parts hay and corn silage while mostly corn silage was included in dairy beef and heifer rations. These results are consistent with Knoblauch, et al.; Milligan; and Woodell. It is interesting that when corn silage is extremely limited, it is allocated to 850 to 1250 pound dairy steers and to the dairy cows.

This analysis needs to be expanded. Of particular importance is analysis of farm businesses purchasing additional feeders in order to have a feedlot large enough to capture feedlot economies of size. Unless feedlots of this type are available, the option of selling dairy beef at feeder weight is not available.

The results do indicate potential for raising dairy steers with the heifers. Whether the greatest profitability is with selling feeder weight steers or raising them to slaughter weight will depend upon the stage of the cattle cycle and short-term price relationships. Implementation of feeding feeder weight steers requires a marketing system that guarantees a market will be available.

Table 5: Profitability and Optimal Enterprise Organization of Dairy Herd Only, Dairy Feeders and Slaughter Weight Dairy Steers for the Small Representative Dairy Farm With a Maximum of 60 Corn Acres

	Dairy Herd Only	Feeder Weight Steers	Feeder and Slaughter Weight Steers	Slaughter Weight Steers
<u>Livestock Numbers</u>				
Heifer Calves Sold	0	0	0	0
Bred Heifers Sold	4.4	4.4	4.4	4.4
Bull Calves Sold	15.6	0	0	0
Feeders Sold	—	15.6	3.2	—
Slaughter Weight Steers Sold	—	—	12.4	15.6
<u>Ration Roughage Composition</u>				
Hay Crop, %—Cows	25	25	37	43
Hay Crop, %—Heifers	42	42	42	42
Hay Crop, %—Feeders	—	12	12	12
Hay Crop, %—Stockers	—	—	0	0
Hay Crop, %—Fat	—	—	0	0
<u>Feed</u>				
Buy Hay, tons	0	0	0	17
Dry Corn Purchased, bu.	88	88	383	497
Soybean Meal Purchased, cwt.	592	639	556	513
Hay Sold, tons	58	48	0	0
<u>Crop Acres</u>				
Hay Crop	67	64	60	60
Corn Silage	53	56	60	60
<u>Return Over Variable Cost</u>	\$40,652	\$42,184	\$42,714	\$42,667
<u>Net Cash Farm Income</u>	\$34,529	\$36,061	\$36,553	\$36,506
<u>Fixed Costs (Non-cash)^a</u>				
Dairy Operation	\$24,361	\$24,361	\$24,361	\$24,361
Steer Facilities	—	—	102	102
<u>Return to Labor and Management</u>	\$10,168	\$11,700	\$12,090	\$12,043
<u>Shadow Prices</u>				
Dairy Cow	\$ 667	\$ 705	\$ 597	\$ 543
Land	39	39	58	64
Corn Limitation	0	0	43	51

^a Current facilities are large enough to raise feeders with the dairy heifers. See Milligan, Nowak and Knoblauch for investment costs.

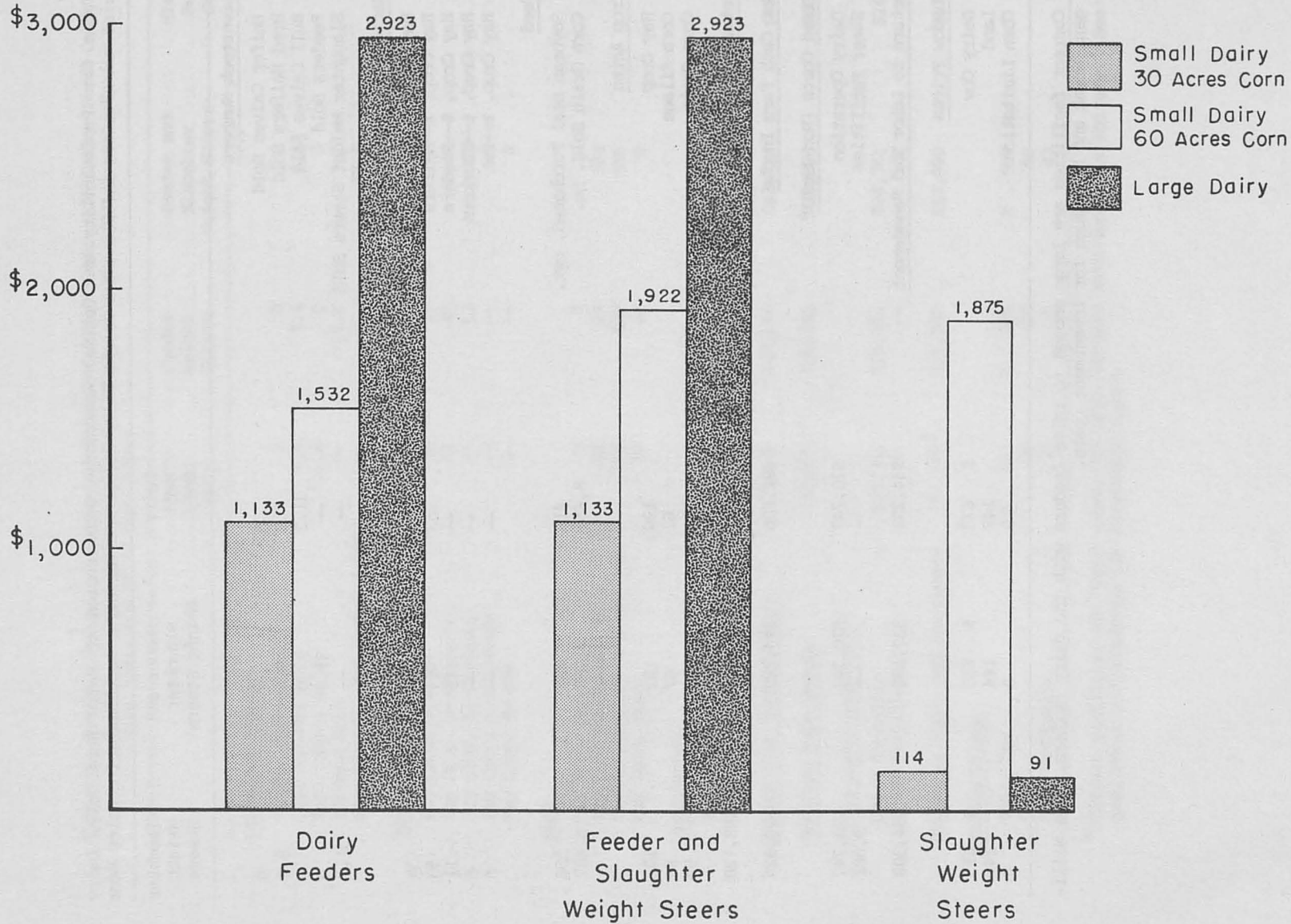
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Table 6: Profitability and Optimal Enterprise Organization of Dairy Herd Only, Dairy Feeders and Slaughter Weight Dairy Steers for the Large Representative Dairy Farm

	Dairy Herd Only	Feeder and Slaughter Weight Steers	Slaughter Weight Steers
<u>Livestock Numbers</u>			
Heifer Calves Sold	0	0	0
Bred Heifers Sold	8.8	8.8	8.8
Bull Calves Sold	31.2	0	0
Feeders Sold	--	31.2	0
Slaughter Weight Steers Sold	--	--	31.2
<u>Ration Roughage Composition</u>			
Hay Crop, %--Cows	50	50	50
Hay Crop, %--Heifers	53	53	53
Hay Crop, %--Feeders	--	11	11
Hay Crop, %--Stockers	--	--	0
Hay Crop, %--Fat	--	--	0
<u>Feed</u>			
Soybean Meal Purchased, cwt.	416	486	554
Corn Grain Sold, bu.	8,650	7,988	5,887
<u>Crop Acres</u>			
Hay Crop	120	122	122
Corn Silage	62	67	84
Corn Grain	118	111	94
<u>Return Over Variable Cost</u>	\$104,956	\$107,879	\$108,128
<u>Net Cash Farm Income</u>	\$91,806	\$94,729	\$94,020
<u>Fixed Costs (Non-cash)^a</u>			
Dairy Operation	\$70,747	\$70,747	\$70,747
Steer Facilities	--	--	3,081
<u>Return to Labor and Management</u>	\$34,209	\$37,132	\$34,300
<u>Shadow Prices</u>			
Dairy Cow	\$ 673	\$ 645	\$ 613
Land	149	144	143
Corn Limitation	0	0	0

^a Current facilities are large enough to raise feeders with the dairy heifers. See Milligan, Nowak and Knoblauch for investment costs.

FIGURE 1. INCREASE IN OPERATOR LABOR AND MANAGEMENT INCOME FROM DAIRY FEEDERS, DAIRY FEEDER AND SLAUGHTER WEIGHT STEERS AND SLAUGHTER WEIGHT STEERS PRODUCTION SYSTEMS.



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