Performance and Economics of a Perennial Cow Dairy Farm

C.A. Rotz and D.L. Zartman

Introduction

Economic and political forces are prompting change in the dairy industry. New ideas are being explored to improve the efficiency and profitability of dairy farms while reducing potential adverse effects on the environment. One possibility is the use of perennial dairy cows. A perennial cow is defined as one that remains at a relatively high milk production level for three to five years without cycling through a dry period and calving. The potential exists to develop the genetics of this type of animal to create a full herd on this management plan. The use of BST or other techniques may further increase the production level and longevity of such a herd. There is a need to determine how such a management change would effect the profitability and environmental impact of a typical dairy farm. A comprehensive evaluation of the whole farm is needed. The objective of this work was to use DAFOSYM to compare the performance, nutrient management and economics of dairy farms using traditional and perennial lactation cycles.

Materials and Methods

DAFOSYM is a simulation model that integrates the many biological and mechanical processes on a dairy farm. Crop production, feed use, and the return of manure nutrients back to the land are simulated over many years of weather. Simulated performance is used to predict the costs, income, and net returns or profit for typical dairy farms. DAFOSYM was first used to simulate a typical farm of today. Cows were bred for calving each year and replacement heifers were raised on the farm. In the next variation of this farm, calves were sold and replacement heifers were purchased as they came into production. The need for heifer housing was eliminated, less feed was required and less manure was produced.

To model the perennial herd, the number of animals in each production group was modified. The number of first lactation animals in early and mid lactation remained the same. All other animals were placed in a late lactation group that maintained an average production level of 51 lb of milk per day. There were thus no non-lactating cows on the farm. Breeding costs were eliminated further reducing annual livestock expenses. The replacement rate was also reduced from 35% to 25%. Therefore, animals remained in production for about four years.

Results and Discussion

The 25-year average performance and economic results for our representative farm are listed in Table 1. Compared to a conventional 100-cow dairy farm, use of 100 perennial cows with purchased replacements greatly under utilized the feed production potential of the farmland and reduced the profit potential of the farm. Use of 140 perennial cows with purchased replacements adequately utilized the feed production and manure recycling potential of the farmland and increased the profit potential by $20,000 per year. Feed use, nutrient recycling, and profit potential were similar between farms that used either perennial cows or cows that followed a standard lactation cycle where all replacement animals were purchased from off farm sources.

Conclusion

The concept of using a perennial cow dairy herd appears to be a feasible option for efficient dairy production. Further development of the concept for practical application is justified.

Table 1. Effect of purchased replacement heifers and a perennial cow herd on annual feed production, feed use, nutrient balance, costs, and net return of a dairy farm in south central Michigan.

Production or cost parameter	Units	Standard farm*	Purchased heifers† 100 cows	Purchased heifers† 135 cows	Perennial herd‡ 100 cows	Perennial herd‡ 140 cows
Alfalfa silage production	ton DM	334	334	334	334	334
Alfalfa hay production	ton DM	119	119	119	119	119
Corn silage production	ton DM	172	172	172	172	172
Grain production	ton DM	196	196	196	196	196
Alfalfa purchased (sold)	ton DM	(22)	(229)	(136)	(265)	(183)
Corn grain purchased (sold)	ton DM	154	140	263	162	310
Protein mix purchased	ton DM	32	35	30	41	50
Average milk production	lb/cow	20,000	20,000	20,000	18,974	18,974
Manure produced	ton	6,178	4,180	5,682	3,842	5,417
Nitrogen exported in milk and meat	lb	12,359	12,359	15,227	10,601	14,844
Nitrogen from fertilizer	lb	5,500	16,500	8,250	16,000	8,000
Nitrogen from manure and legumes	lb	81,430	78,020	80,366	77,011	70,874
Nitrogen removed in crops	lb	50,705	50,780	50,813	50,767	50,718
Nitrogen lost to atmosphere	lb	15,289	9,192	12,239	8,628	11,881
Nitrogen lost to ground water	lb	5,597	4,932	5,526	4,852	5,454
Residue and unused soil nitrogen	lb	9,839	13,114	11,788	12,767	10,819
Phosphorous shortage (buildup)	lb	363	1,222	(55)	1,013	(575)
Potassium shortage (buildup)	lb	6,171	16,815	12,405	18,205	11,760
Field and feeding machinery cost	$	43,207	41,802	42,945	41,467	42,703
Fuel and electric cost	$	5,253	4,422	5,101	4,219	4,958
Feed and machinery storage cost	$	21,511	20,562	21,155	20,522	20,839
Labor cost	$	40,724	38,749	50,274	38,273	51,342
Seed, fertilizer, and chemical cost	$	11,486	14,734	12,505	14,757	12,571
Purchased feed and bedding cost	$	36,552	31,464	54,814	35,822	64,501
Animal and milking facilities cost	$	36,896	31,088	31,088	31,088	31,088
Livestock expenses	$	23,800	62,800	84,780	47,300	66,220
Milk hauling and marketing fees	$	17,643	17,643	23,817	16,739	23,435
Property tax	$	4,466	4,261	4,261	4,261	4,261
Total production cost	$	241,539	267,524	330,741	254,449	321,919
Milk, feed, and animal sale income	$	308,553	322,510	417,623	307,327	409,770
Net return to management	$	67,014	54,986	86,882	52,878	87,851

*100 mature cows and 85 replacement heifers on 225 acres of cropland simulated over 25 years of East Lansing, Michigan weather.

†Same as standard farm except that replacement heifers were purchased, heifer housing was eliminated and livestock expenses were reduced by $30/cow/year.

‡Perennial cows were used and all replacements were purchased. Perennial cows had a peak milk production a few weeks after calving and then drop to a consistent level for the remainder of their productive life.