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Economics of Modernization

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Minnesota dairy facilities are among the oldest in the United States. This contributes to the high cost of production compared to other regions. Modernization projects tend to improve output relative to the amount of labor and equipment without investing beyond what the farm's equity capital base can support. Historically, dairies producing more than 600,000 pounds of milk per full-time worker per year were considered efficient and productive. Modern dairies set productivity goals of more than a million pounds of milk per full-time worker per year.

Maybe it's time to think about modernizing your dairy facility. There are three main ways to do so: 1) add more tie stalls and continue to milk in the existing barn, 2) build a large, all-new parlor-freestall facility, or 3) turn an existing building into a parlor. This article will show you some of the economic considerations involved in deciding if and how to modernize.

Case Studies

To compare the economics of various modernization options, let's look at three Minnesota farms that recently modernized (Table 1). One farm installed a double-10 swing parlor in the old tie-stall barn, but cow numbers at the time of this comparison were lower than planned, thus explaining the lower pounds of milk per worker per year than the other two alternatives. The second installed a double-6 flat-barn step-up parlor, built a milk house, and bought a larger bulk tank, explaining some of its higher parlor cost compared to the other alternatives. The third installed a double-4 step-up parlor in the old tie-stall barn. All three built freestall barns to house the cows.

Now, let's look at a "typical" dairy farm and analyze how adding a retrofitted parlor would compare to expanding the tie-stall barn or building an all-new facility. Analysis is shown in Table 2.

Table 1. Description of three case study modernization alternatives.

Description	Parlor cost	Herd size	Milk/ cow (lb)	Workers (full-time equivalent)	Milking (hr/day)	Cows milked/hr	Cows/ worker	Milk/ worker (lb)
Swing parlor 2x10	$38,000	110	21,000	3.0	4	46	37	770,000
Step-up parlor 2x6	$100,000	200	23,500	3.5	7	48	57	1,342,857
Step-up parlor 2x4	$30,000	143	27,000	3.5	6	40	41	1,103,143

Assumes 85% of the cows are in milk, twice per day milking.

Table 2. Projected dairy enterprise budget under three expansion alternatives.

	Present tie-stall barn	Expand tie-stall barn	Retrofit parlor	All new facility
Milking time desired (hr/day)	4	6	6	21
Milking center throughput (cows/hr)	25	25	45	100
Herd size that can be accommodated by the milking center	58	88	158	823
Milking center investment required	---	$30,000	$50,000	$900,000
Total investment required for facility and cows	---	$78,000	$368,000	$2,947,000
Labor efficiency, cows/worker	30	30	50	60
Workers needed	2.0	3.0	3.2	13.8
Net annual farm income	$41,956	$40,235	$64,922	$252,999
Return on equity capital per year	$1,956	$235	$24,922	$212,999
Initial equity capital	$300,000	$300,000	$300,000	$1,500,000
Asset turnover ratio	55%	69%	77%	67%
Debt/asset ratio	0%	21%	62%	77%
Percentage return on equity capital (ROE)	0.7%	0.1%	8.3%	14.2%

The first column shows a typical tie-stall situation. Net farm income was based on a production level of 22,000 lb./cow/year, a $13.00/cwt. milk price, $6.50/cwt. for feed and other direct expenses, $1,500/year for repairs and maintenance, and $10,000 in overhead expenses on the existing dairy. If we assume the two operators could earn $40,000 elsewhere, the net farm income of $41,956 leaves only $1,956 as a return on their equity capital invested in the dairy. With a farm net worth of $300,000 and no debt, their return on equity (ROE) is only 0.7% -- less than they could make if their equity were earning money in the bank instead.

The second column shows the finances for an expanded tie-stall barn. Factoring in the cost of the remodeling and cows ($78,000), wages ($25,000), debt payments, and other expenses, the income nets out very close to where it was without the expansion.

The third column depicts a retrofit parlor. This alternative is projected to earn 8.3% ROE over and above the $40,000 labor and management opportunity cost. Overhead expenses might be higher than the $10,000 assumed here if the farm has significant existing debt before the expansion. Interest on term debt is an overhead expense. Higher overhead expenses would reduce the ROE and make an expansion more difficult to cash flow.

The final column shows a larger, all-new facility. An all-new facility would likely require a significantly larger initial capital base than the $300,000 net worth and zero debt we assumed for the other three scenarios. Even starting with a $1.5 million net worth, adding almost $3 million in debt for the all-new facility and cows and factoring in a facility resale value somewhat less than the construction cost brings the debt/asset ratio for the scenario up to 77%. Assuming three-times-per-day milking (21 hours/day), a production level of 24,000 lb./cow/year, and $6.35 for feed and other direct expenses, ROE is 14.2%. A

bigger ROE sounds better. But there's a down side. We increased ROE partly by increasing the debt/asset ratio. The higher debt payments could spell cash flow trouble if milk prices drop.

The Bottom Line

The trend in the dairy industry seems to be in the direction of herds of 500 to 1,000 cows or more. The increase in ROE and net farm income that expansion can offer can be quite attractive. However, a more gradual expansion can also offer attractive returns, and may be an appropriate choice if you don't have the equity to leverage a new facility, don't want to take on the risk involved with a loan of the size that all-new facilities would require, or don't care for the noneconomic implications (e.g., lifestyle changes) that a major expansion brings.

Editor's note: For a more detailed description of this analysis, including assumptions made for the various alternatives, contact the author at phone: 612/625-8150, email: wlazarus@umn.edu, or see Web site: http://www.apec.umn.edu/faculty/wlazarus.

Sidebars:

What's the Objective?

How do you measure success in modernizing? Two important measures are return on equity (net farm income minus a desired return for your labor) and net farm income, which reflects returns to all three of the main resources required to farm -- labor, management, and capital. Cash available for family living is also important. And don't forget to factor in nonfinancial goals, such as improving worker comfort, freeing up time for family activities, and the desirability (or undesirability) of being a people manager as well as (or instead of) a farm laborer.

Ford vs. Chevy

Swing parlor or step-up? Both have their proponents. Maybe it's a "Ford-vs.-Chevy" sort of personal preference. A step-up parlor with front exiting gates can speed milking because each cow can leave and be replaced without waiting for the rest of the group to finish. It is important for workers in a step-up parlor to be comfortable around cows, however. A nervous worker can make the cows reluctant to walk past. In a swing parlor, workers are separated from the cows, but cows must enter and leave together, so slow-milking cows can put a wrench in the works.