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ECONOMICS COMMENTATOR

South Dakota State University

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ECONOMIC IMPACTS OF ALTERNATIVE SIZED DAIRIES IN SOUTH DAKOTA

by

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South Dakota dairy production has had continual declines in the number of dairy farms, and until recently, declining number of dairy cows and volume of milk production. Dairy farms with less than 100 cows are rapidly declining while the number of larger dairy farms is increasing. The trend toward larger dairy operations presents difficult questions for state and local policy makers and the general public regarding environmental, social, and economic consequences. In this *Commentator*, we provide some background information on dairy industry trends and report results from a recent study that compares and contrasts economic impacts of two alternative size dairies (150-milk cows and 1000-milk cows) with potential to expand in the state.

Past and Prospective Trends

South Dakota's dairy industry has followed national (U.S.) trends to 2004 in terms of declining number of dairy cows, declining number of dairy farms, increased herd size, and increased milk production per cow. For example, from 1978 to 2004, the number of dairy cows in South Dakota declined 51 percent from 162,000 to 80,000 cows, while the number of dairy operations declined 86 percent from 7400 farms to 1000 farms. Average dairy herd size in South Dakota in 2004 was 80 cows per farm compared to only 22 cows per farm in 1978. In 2004, dairies of 100 head or more were 21 percent of dairy farms in South Dakota and accounted for 70 percent of annual production. Milk production per cow in South Dakota increased 77 percent from 9,500 lbs. per cow in 1978 to 16,840 lbs. per cow in 2004 (NASS).

Despite an 18 percent decline in U.S. dairy cow numbers during the same time period, U.S. milk production steadily increased as milk production per cow increased. Total U.S. milk production increased 45 percent from 115 billion pounds in 1975 to 168 billion pounds in 2000. However, total milk production in South Dakota declined despite comparable gains in production per cow. Total production in South Dakota for 2004 was 1.35 billion pounds, down from a 27 year high of 1.77 billion pounds in 1983 (NASS), but up from a low of 1.29 billion pounds in 2002. The general trend of declining milk production in South Dakota has raised major concerns for dairy processors located in the state.

Examination of recent trends, 1998 – 2004, in South Dakota milk production by herd size (less than 50 head, 50 – 99 head, and 100 head or more) confirmed the rapid changes and consolidation of dairy production units. Total milk production of small (less than 100 head) dairies declined from 693 million pounds in 1998 to 404 million pounds in 2004, despite substantial increases in milk production per cow. Total milk production of larger dairies (100 cows or more) increased from 693 million pounds in 1998 to 943 million pounds in 2004. Most of this increase came from new investment in larger dairies and from some expansion of existing dairies.

Using annual trend data from 1998 – 2004, Gerlach estimated continued rapid decline (>10 percent per year) of smaller dairies and some increase in the number of larger (100-head plus) dairies by 2010. Statewide, milk production is projected to increase by 9 percent or 123 million pounds from 2004 to 2010, with declining milk production from smaller dairies (-174 million pounds) offset by increased production (+297 million pounds) from the larger dairies. The share of milk produced from these larger dairies

increased from 50 percent in 1998 to 70 percent in 2004 and is forecasted at 84 percent of South Dakota's projected milk production in 2010.

Economic Impacts of Medium and Large Sized Dairies

Input-Output analysis using the IMPLAN Pro modeling software was used to estimate the overall economic impact of a medium (150-head) and a large (1000-head) dairy. The IMPLAN model uses a set of purchase coefficients, which makes up the industry's production function, to describe the amounts of purchases an industry makes from other industries. For each industry, IMPLAN uses regional purchase coefficients (RPC's) to measure the percentage of inputs purchased locally.

Default production functions and RPCs are included in the IMPLAN software. In this study, the default IMPLAN dairy industry data was replaced with production functions and RPCs representative of the following specific operation sizes and types:

1. A 150-head dairy that raises its own grain and forages, raises its own replacement heifers, and has owner/operator and family supplied labor in addition to one hired employee. The dairy produces 19,000 pounds of milk per cow per year.
2. A 1000-head dairy that purchases all inputs, contracts off-site growers to supply replacement heifers, and hires all labor. The dairy produces 22,000 pounds of milk per cow per year.

The modifications to the default production functions and RPCs were derived from dairy producer panels and from average costs and returns for similar dairy operations in the Minnesota Farm Business Management database, more commonly known as FINBIN.

The total output, employment, and value-added multipliers that would be generated by the 150-head operation are compared with that of the 1000-head operation at regional (Brookings, Deuel, Hamlin, Kingsbury, Lake, and Moody counties), state, and national level (Tables 1 & 2). Multipliers describe an economy's response to a change in production. The output multiplier describes the total dollar change in total output from all industries given a change in final demand. For example, a total output multiplier of 1.72

suggests that for every dollar spent, \$0.72 of indirect and induced effects occur in related industries.

Table 1. Comparison of the 150 head dairy system at the regional, state, and national levels.

Multipliers	Regional	State	National
Total Output	1.30	1.43	2.68
Employment	2.70	3.70	8.63
Total Value Added	1.37	1.53	2.83

Source: Gerlach, 2005

Table 2. Comparison of the 1000 head dairy system at the regional, state, and national levels.

Multipliers	Regional	State	National
Total Output	1.60	1.79	3.20
Employment	2.84	3.44	7.37
Total Value Added	2.21	2.69	5.41

Source: Gerlach, 2005

The total output multiplier for the 150-cow unit ranges from 1.30 at the regional level, to 1.43 at the state level, to 2.68 at the national level. The employment multiplier for the 150-cow unit is 2.70 at the regional level, 3.70 at the state level, and 8.63 at the national level. The total value-added multiplier is 1.37 at the regional level, 1.53 at the state level, and 2.83 at the national level. The extent of economic leakages from the region and state is the main reason for much lower multipliers than those shown at the national level.

The 1000-head dairy system total output and total value added multipliers are higher relative to the 150-head dairy system when compared across regional, state, and national levels (Table 2). The employment multipliers are slightly higher for the 1000-cow dairy at the regional level and lower at the state-wide and national levels. The 150-head dairy farm generates lower output multipliers because it produces its own replacement heifers and grows its own feed grain and forages.

Assuming the milk production levels stated above are valued at \$13/cwt, the 150-head dairy would generate \$563,508 in total output, 2.7 jobs, and \$286,230 in value-added yearly. The 1000-head dairy would generate \$4,977,184 in total output, 39.7 jobs, and \$1,813,608 in total value-added.

If dairy industry trends continue, South Dakota milk production was conservatively projected to increase by 123 million pounds from 2004 to 2010. What economic benefits would South Dakota be foregoing if the dairy industry cannot expand in the herds of 100 cows or more to mitigate continued losses of smaller herds?

The expansion alone (123 million pounds of milk at \$13/cwt) would account for over \$20 million in net total output, over \$14 million in value-added, and an additional 114 jobs for the state when achieved via the 150-head dairy model. The 114 additional jobs do not include the additional proprietors needed for each dairy, which is estimated at 104. Under the 1000-head model, the expansion produced over \$34 million in total output, over \$13 million in value-added, and an additional 385 jobs. Proprietary additions in this case would be 13-14. If the entire expansion was processed in South Dakota as additional cheese production the projected growth in milk production would provide an additional \$48.2 million in total output, 251 additional jobs, and over \$11 million in value-added impacts for the state.

Conclusions

These results suggest that there are significant economic advantages to expanding the dairy industry. If the dairy industry cannot expand in the dairies sized at 100 cows or more, the trends suggest continued decline in dairy cow numbers and milk production. The estimated economic decline from loss of smaller herds is over \$34 million in total output and a \$14 million reduction in value-added. One can assume the results presented above as foregone costs in addition to the projected economic losses of dairies sized below 100 head if expansion was impeded.

Additionally, processing capacity is dependent on a certain level of local production. The cheese manufacturing multipliers suggest economic losses larger than that of dairy production if local production declines to a level that processors choose to exit the region.

These results show that existing dairy farms which can be profitably expanded together with new style large dairies can provide a boost to the dairy industry and generate new economic opportunities within the state.

For more detailed information, a full copy of this study is available electronically at the Economics Department website at: <http://econ.sdstate.edu/Research/Janssen-WAEA2006-Dairy.pdf> or contact the authors at Department of Economics, 605-688-4141. The full copy is titled: *Economic Impacts of Alternative Sized Dairy Farms in South Dakota* and is co-authored by Janssen, Taylor, Gerlach, and Garcia. The full study also will be included as part of the Proceedings of the 2006 Western Agricultural Economics Association (WAEA) Annual Meetings.

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- National Agricultural Statistics Service (NASS) data at <http://www.nass.usda.gov>.

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