

# Determinants of Financial Performance of Commercial Dairy Farms

Hisham S. El-Osta and James D. Johnson

## Introduction

The Federal dairy policy under the 1996 farm bill calls for replacing government purchases of dairy products in the year 2000 with a recourse loan program. The farm bill, which repeals the provision for a minimum support level for milk also rescinds provisions for assessments and for increasing and decreasing support levels based on the estimated level of government purchases. These changes, in effect, will eliminate the role the government has played for many decades in supporting milk prices. The likelihood of increased volatility in milk prices resulting from a market-oriented dairy policy will adversely affect the financial position of many dairy farms, and may even force some to exit the industry. Particularly vulnerable are the marginal operations with low production efficiency, and those that are highly leveraged. To minimize the potential of this adverse effect, the Federal Government is stepping up use of the Dairy Export Incentive Program while many State governments are allowing for the establishment of multi-state dairy compacts designed to establish a minimum milk price.

The financial position of dairy farms hinges on many factors in addition to the price of milk, a factor no dairy producer can control. Large dairy operations that are utilizing the latest in technological innovation with high rates of production, and small and mid-sized dairies that are well managed and with low levels of indebtedness are likely to continue to operate profitably, even when dairy farming becomes increasingly dependent on the free market. Other factors that influence profitability in dairy production are cost of inputs and efficient conversion of labor, feed, and capital resources into milk (Conlin), all of which tend to fall under the control of the individual producer.

To the extent that many dairy operations will have to adjust to the new economic environment set forth by

the new farm bill if they are to survive, the focus of this report is to provide information that might prove useful to dairy farmers and policymakers alike during the course of the adjustment. Specifically, the report will first provide insight to the regional differences that characterize the dairy industry in terms of size, labor availability, balance sheet, and farm profitability. In pursuing this objective, the report will highlight the regional differences by providing a pictorial representation of the means of these variates, by producing tabulations that show how dairy farms are distributed across the ranges of some of these variates, by plotting corresponding Lorenz curves, and by presenting estimates of Gini coefficients, which are helpful in describing concentration magnitudes. In providing measurements of the degree of concentration in the resource base and financial position of dairy farms, the study in effect will be providing insight regarding the extent of heterogeneity that might exist among farms in terms of their income-generating capabilities, thus remedying the lack of work in this area. In doing so, the report will have contributed to the literature by extending the public knowledge base about the dairy industry.

This public knowledge base will be enhanced even more as the report attempts to achieve its main objective, which is to assess factors hypothesized to affect the profitability of commercial dairy farms.<sup>1</sup> This objective is achieved by using weighted multiple linear regression where measures of profitability are regressed against  $k$  independent variables that describe

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<sup>1</sup>ERS generally defines a commercial farm as any farming operation with total annual sales of \$50,000 or more (Hoppe and others, 1996). In the context of this report, a commercial dairy farm is defined as any farming operation with annual milk sales of \$50,000 or more. The dairy enterprise in a commercial dairy farm defined in this manner is characterized as being dominant since data from the 1993 Farm Costs and Returns Survey show that nearly 80 percent of all farm sales tend to be generated from the sale of milk. Also note that excluded from the analysis are commercial dairy farms organized as nonfamily corporations or cooperatives.

the characteristics of the farm, the enterprise, and the operator. Once the functional relationships between profitability measures and the  $k$  independent variables are estimated, hypotheses tests concerning estimated parameters are utilized to isolate the variables deemed important to the profitability of the dairy farm. Having fitted these regressions and having obtained the prediction equations based on the estimated parameters, these prediction equations allow for the imputation of farms' potential or expected financial performance in the absence of any statistical noise.

Two subsidiary issues are also investigated: (1) The question of how much variation in profitability is explained by the  $k$  independent variables, and (2) how much variation in States' financial performance is explained by the level of concentration of capital in farming and in the resource base, namely, debt capital, farm assets, farm equity, and cow inventory and its proxy milk sales. These issues will be investigated using the concepts of the coefficients of separate determination, and the coefficient of determination, respectively.

The third and final objective is to determine, based on expected financial performance, which management practices are employed by the top 20 percent of commercial dairy operations. Such determination is carried using a statistical test commonly known as the  $F$ -test of independence.

The report, which builds on the work by Haden and Johnson (1989), and Kauffman and Tauer (1986), among others uses standard econometric methods to identify important factors in financial performance of dairy farm businesses. However, unlike in Haden and Johnson and in Kauffman and Tauer, where data from individual milk-producing States were used (Tennessee and New York, respectively), the report uses representative and probability-based data collected by the Economic Research Service (ERS) from multiple milk-producing States.

## **Data Source and Delineation of Milk-Producing Areas**

The report draws on data from the Dairy Cost of Production version (COP) of the 1993 Farm Costs and Returns Survey (FCRS). The FCRS, which has a complex stratified, multiframe design, is a national

annual survey of farms conducted by ERS and the National Agricultural Statistics Service (NASS). Because of survey costs, ERS and NASS collect detailed surveys on a specific commodity only once every 4 years. The FCRS fully integrates information about the production practices and inputs used in the farm's dominant dairy enterprise with structural information about the farm's financial position, organization, and performance and demographic attributes of the operator.

ERS uses four general approaches to estimate commodity production costs: direct and indirect costing, valuing of input quantities, and allocation of whole-farm costs (Short and McBride, 1996). Direct costing involves summarizing survey responses to questions about the total amount paid for selected inputs and is especially suited for estimating variable cost components. Indirect costing involves the combination of survey information and engineering formulas and is used in estimating machinery, building, and equipment replacement costs; fuel, lubrication, and electricity costs; and repair costs. Valuing quantities of inputs requires survey data of the physical quantities of inputs used in production (e.g., quantities of homegrown feed, hours of unpaid labor, etc.). Allocating whole-farm expenses occurs for inputs that are not specifically associated with production of a certain commodity such as general farm overhead, interest, property taxes, and insurance. For dairy farmers, expenses incurred by the farm business for these items are allocated to the milk enterprise based on the share of total value of farm production attributed to milk sales.

Figure 1 highlights the 1993 FCRS sample coverage of milk production. Figures 2 and 3 show the ranking of sampled milk-producing States based on changes in milk production (1977-93) and in number of milk cows (1978-92). By comparing the ranking of each sampled milk-producing area in both figures, evidence emerges that, with the exception of Pennsylvania, the traditional milk-producing States of the Northeast and Lake States are becoming stagnant in increases in milk output and number of milking cows.

Fallert and Blayney (1990) and Perez (1994) point to factors that may have contributed to shifts in milk production from traditional milk-producing States to those of the Southeast, Southern Plains, Pacific, and, to some extent, Mountain States, namely: (1) rapid