Kansas Agricultural Experiment Station Research Reports

Volume 0
Issue 2 *Dairy Research (1984-2014)*

Article 7

1997

Explaining differences in efficiency among dairy operations

P. T. Berends

Michael R. Langemeier

Allen M. Featherstone

Follow this and additional works at: https://newprairiepress.org/kaesrr

 Part of the Dairy Science Commons

Recommended Citation

Berends, P. T.; Langemeier, Michael R.; and Featherstone, Allen M. (1997) "Explaining differences in efficiency among dairy operations," *Kansas Agricultural Experiment Station Research Reports*: Vol. 0: Iss. 2. https://doi.org/10.4148/2378-5977.2932

This report is brought to you for free and open access by New Prairie Press. It has been accepted for inclusion in Kansas Agricultural Experiment Station Research Reports by an authorized administrator of New Prairie Press. Copyright 1997 the Author(s). Contents of this publication may be freely reproduced for educational purposes. All other rights reserved. Brand names appearing in this publication are for product identification purposes only. No endorsement is intended, nor is criticism implied of similar products not mentioned. K-State Research and Extension is an equal opportunity provider and employer.

K-STATE Research and Extension

EXPLAINING DIFFERENCES IN EFFICIENCY AMONG DAIRY OPERATIONS

P. T. Berends [1], M. R. Langemeier [2], and A. M. Featherstone [2]

Summary

To remain competitive, dairy operations need to continue to improve production efficiency and manage costs. Kansas Farm Management Association data from 1991 to 1995 were used to measure technical, economic, and overall efficiencies for 50 dairy operations in Kansas. On average, the farms showed .87 technical, .71 economic, and .67 overall efficiency. The latter was related negatively to labor, capital, feed, and fuel and utility expenses per cow. Veterinarian expenses were related positively to overall efficiency. Overall efficiency was the most sensitive to changes in feed expenses per cow, emphasizing the importance of controlling this cost. Results also indicated that a larger proportion of overall inefficiency was due to cost control problems than to an inefficient herd size.

(Key Words: Efficiency, Profitability.)

Introduction

The U.S. dairy industry has gone through some dramatic changes during the last 5 to 10 yr. Two forces are driving structural change. The first force relates to technologies or innovations. Innovations or increases in the understanding of the biological process have made specialization more feasible. In addition to increasing production efficiency, specialization often has led to a reduction in production costs. The second force relates to economies of size. Advances in technology and management practices have increased the maximum size of operation that can be managed effectively.

To remain competitive, dairy operations need to continue to improve production efficiency and manage costs. One of the key ways to accomplish these objectives is the adoption of new technologies. However, before new technologies can be adopted, information pertaining to the current level of efficiency and cost of production is needed. High-cost producers need to examine their strategic position before expanding or implementing new technologies. The objective of this study was to examine the efficiency of a sample of dairy operations in Kansas.

Procedures

Kansas Farm Management Association data for 50 dairy operations from 1991 to 1995 were used in this study. The efficiency analysis required data on output, inputs, and costs of production. Output was measured as total pounds of milk produced. Input cost categories included labor, capital, dairy, feed, fuel and utilities, veterinarian expenses, and miscellaneous. Labor costs included hired labor and a charge for unpaid operator labor. Capital costs included interest, repairs, depreciation, and machinery hired. The opportunity charges associated with owning facilities were included in capital costs. Dairy expenses included marketing and transportation costs. Input costs were converted to real 1995 dollars.

[1]University of Wisconsin, Platteville.

[2]Department of Agricultural Economics.

Table 1 presents the mean and standard deviations of gross income, costs, profit, and selected farm characteristics. On average, the farms lost about $139 per cow during the 5-yr period. Feed costs comprised about 50% of the total cost per cow. Labor and capital costs accounted for 15 and 17% of total cost per cow, respectively. Average herd size was about 96 cows, and the average amount of milk produced per cow was about 18,100 lb.

Technical efficiency measures the extent to which a farm uses the best available technologies. Economic efficiency measures the extent to which a farm minimizes cost for a given level of output. A farm can be economically inefficient because of technical inefficiency or allocative inefficiency (resulting from a failure to use inputs in a cost efficient manner). Overall efficiency represents the minimum cost of producing a given level of output using constant returns to scale technology. Overall inefficiency can be due to economic inefficiency or not producing at the most efficient size. A series of mathematical programs was used to measure technical, economic, and overall efficiencies. Regression coefficients were used along with the means of the variables to compute elasticities. The elasticity measures provided information on the sensitivity of efficiency to each input cost. Efficiency estimates were used as the dependent variables in the regressions. Independent variables included the seven cost categories.

Table 1. Summary Statistics for a Sample of Kansas Dairy Farms, 1991-1995

Variables	Unit	Mean	Standard Deviation
Gross revenue per cow	$	2,677	506
Labor expense per cow	$	409	167
Capital expense per cow	$	476	155
Dairy expense per cow	$	274	111
Feed expense per cow	$	1,412	296
Fuel and utility expense per cow	$	105	44
Veterinary expense per cow	$	72	48
Miscellaneous expense per cow	$	69	73
Profit per cow	$	-139	436
Age of operator	yr	50	12
Milk produced per cow	lb	18,062	3,090
Herd size	no.	96	68
Total acres operated	no.	979	696
Acres in forage production	%	28	17
Farms classified as cash crop farms	%	25	44
Farms classified as mixed farms	%	4	20
Hired labor expense/total labor expense	%	48	38
Debt to asset ratio	%	31	26
Farms operated by sole proprietor	%	56	50

Source: Kansas Farm Management Associations.

Results and Discussion

Table 2 reports distributional information for technical, economic, and overall efficiencies. Technical efficiency ranged from .57 to 1. About 28% of the farms were technically efficient or were producing milk at a high level. Average technical efficiency for the sample of dairy operations was .87, indicating that the output of these farms could potentially be increased by 11%, if each farm were operating on the production frontier.

Economic efficiency ranged from .45 to 1 and averaged .71. If all of the farms had been operating on the average cost frontier, the same level of output could have been produced with 29% less cost. Only 6.8% of the farms had an economic efficiency index that was greater than .90. In contrast, 45.6% of the farms had a technical efficiency index that was greater than .90. Thus, producing on the cost frontier was more difficult for these farms than producing on the production frontier.

Overall efficiency ranged from .44 to 1 and averaged .67. If all of the farms had been operating at minimum cost, the same level of output could have been produced with 33% less cost. Significant cost savings occurred up to a size of about 500,000 lb. The average cost curve was relatively flat once this output level was reached. In addition, more variation in production costs existed in operations of similar size than for efficient operations of different sizes. Thus, dairy operators should focus on controlling costs rather than changing operation size.

Elasticities are reported in Table 3. An asterisk indicates that the variable was significant ($P<.05$) in the corresponding regression. Labor, capital, feed, and fuel and utilities were significant and related negatively to overall efficiency, indicating the importance of controlling these cost items. Reducing labor and feed costs by 10% would increase overall efficiency by 1.1 and 2.3%, respectively. Conversely, increases in veterinary expenses lead to an increase in overall efficiency. Possible improvements in herd health and milk production per cow resulting from increases in veterinary expenses may explain this result.

Table 2. Efficiency Measures for a Sample of Kansas Dairy Farms (1991-1995)

Variable	Technical Efficiency	Economic Efficiency	Overall Efficiency
Summary statistics (index)			
Mean	.87	.71	.67
Standard deviation	.12	.12	.10
Minimum	.57	.45	.44
Maximum	1.00	1.00	1.00
Distribution of farms (%)			
		))))))))) %)))))))))	
0 to .50	0.0	2.0	4.0
.50 to .60	2.4	16.0	21.6
.60 to .70	6.4	32.0	39.2
.70 to .80	21.6	27.2	25.2
.80 to .90	24.0	16.0	7.2
.90 to 1.00	17.6	4.4	2.4
1.00	28.0	2.4	.4

Table 3. Input Use Elasticities for a Sample of Kansas Dairy Farms (1991-1995)

Variable	Technical Efficiency	Economic Efficiency	Overall Efficiency
Labor expense per cow	-.0586*	-.0918*	-.1134*
Capital expense per cow	-.0069	-.0838*	-.0880*
Dairy expense per cow	-.0965*	-.0682*	-.0191
Feed expense per cow	-.0493	-.2023*	-.2267*
Fuel and utility expense per cow	-.0157	-.0016	-.0403*
Veterinary expense per cow	-.0068	.0541*	.0650*
Miscellaneous expense per cow	-.0087	-.0109	-.0144

*Indicates that the regression coefficient used to compute the elasticity was significant ($P < .05$).