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## Economies of size for Kansas beef cow production

### Abstract

Economies of size measure the impact of increasing the size of operation on average cost of production. Economies of size exist if average total cost decreases as size increases. Enterprise data from producers enrolled in the Kansas Farm Management Associations in 1992 were used to empirically estimate economies of size for beef cow enterprises. Results indicate that economies of size exist for beef cow enterprises. Average total cost per head declined as the number of beef cows increased. Substantial variability in costs of production between producers also were documented. Costs of production between producers of a given size varied considerably more than changes in cost of production attributed to size alone. Smaller than average beef cow enterprises can compete in the 1990's, if they are cost competitive. In addition to size, feed costs, fixed costs, production efficiency, and sale prices of calves were important factors affecting the profitability of beef cow enterprises.

### Keywords

Cattlemen's Day, 1994; Kansas Agricultural Experiment Station contribution; no. 94-373-S; Report of progress (Kansas State University. Agricultural Experiment Station and Cooperative Extension Service); 704; Beef; Economies of size; Cost of production; Profitability; Cow/calf

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## **ECONOMIES OF SIZE FOR KANSAS BEEF COW PRODUCTION**

*M. R. Langemeier and T. C. Schroeder*<sup>1</sup>

### **Summary**

Economies of size measure the impact of increasing the size of operation on average cost of production. Economies of size exist if average total cost decreases as size increases. Enterprise data from producers enrolled in the Kansas Farm Management Associations in 1992 were used to empirically estimate economies of size for beef cow enterprises. Results indicate that economies of size exist for beef cow enterprises. Average total cost per head declined as the number of beef cows increased.

Substantial variability in costs of production between producers also were documented. Costs of production between producers of a given size varied considerably more than changes in cost of production attributed to size alone. Smaller than average beef cow enterprises can compete in the 1990's, if they are cost competitive. In addition to size, feed costs, fixed costs, production efficiency, and sale prices of calves were important factors affecting the profitability of beef cow enterprises.

(Key Words: Economies of Size, Cost of Production, Profitability, Cow/Calf.)

### **Introduction**

Economies of size measure the relationship between the size of operation (number of cows) and the average cost of production or break-even price. If average total costs decline rapidly as firm size

increases, the industry may become more consolidated as firms increase size to reduce average costs. Conversely, if average total costs are similar for firms of different sizes, incentive for consolidation may be less.

Economies of size measures can be used to determine whether it would be advantageous for farms to become larger. Economies of size can result from quantity discounts for inputs, from an increase in efficiency as size increases, or from adoption of capital-intensive technology. Additionally, as a producer increases the size of an enterprise, fixed costs such as unpaid operator labor, depreciation, and interest are spread over more units and fixed costs per unit decline. This research was conducted to examine economies of size for beef cow operations in Kansas using data from the Kansas Farm Management Associations. Additionally, differences in cost of production among producers were evaluated to determine which factors had the greatest impact on profitability.

### **Experimental Procedures**

Enterprise data from 171 beef cow producers enrolled in the Kansas Farm Management Associations in 1992 were used in this study. Enterprise data included the size of the operation, gross income, costs of production, profitability, and productivity. The average farm in the sample had 101 beef cows, with a range of 12 to 465.

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Productivity was measured as hundred lb (cwt) produced per cow, which included calf and breeding livestock sales as well as inventory changes. Production costs and profits were expressed on both per cwt produced and per head bases.

Variable cost categories included hired labor, repairs, interest paid, feed, veterinary expenses, utilities, fuel, and miscellaneous cash expenses. Feed costs included raised and purchased feed and pasture expenses. All feed costs were measured using economic costs of production. Thus, owned pasture land was charged an opportunity cost equal to the rented value of the pasture. Raised feed was priced according to prevailing market prices. Fixed cost categories included unpaid operator labor, depreciation and interest on buildings and equipment, and real estate taxes.

The gross margin ratio, indicating the amount of variable costs incurred per dollar of revenue generated, was used as a measure of economic efficiency. The gross margin ratio was calculated by dividing variable cost per cwt by gross income per cwt. A lower ratio indicates that a firm is more efficient.

A cost function was estimated by regressing average total cost per cwt on size variables. If economies of size exist, the size variables in this regression would be significantly different from zero.

This study also used data from the Kansas Farm Management Associations to separate producers into top and bottom one-third profit groups. Return above total cost was used to separate the 171 producers into profit groups.

## Results and Discussion

Figure 1 presents the average total cost curve (represented by the solid line) for 171 beef cow operations in the Kansas Farm Management Associations in 1992. Each triangle in Figure 1 represents the average total cost per cwt for a specific farm. Average total cost was significantly

correlated with the size of the operation ( $P < .05$ ). However, as evident from the variability in costs presented in Figure 1, size was not the only factor influencing cost. The average total cost curve did not reach a minimum over the range of the data.

Using the average total cost curve in Figure 1, farms with 25 and 50 beef cows had break-even prices that were 12% and 4% above that of a farm with 100 beef cows. Farms with 200 and 300 beef cows had average total costs 4% and 6% below those of a farm with 100 beef cows.

Variable costs were not significantly different across farm size. Thus, the cost advantages of large farms were related to unpaid operator labor costs and depreciation and interest on fixed assets.

As indicated by Figure 1, tremendous variability occurred in average total costs among operations. Differences in costs of production for farms of the same size were much wider than differences in costs of production between large and small farms.

Table 1 presents financial and production factors for the average farm, compared to those in the bottom and top one-third. Farms in the top one-third averaged about 30 cows more than farms in the bottom one-third profitability group. However, farms of all sizes occurred in both groups.

Gross income for producers in the top one-third profit group was about \$6.80 per cwt higher than gross income for producers in the bottom one-third profit group. Sale price and sale weight were similar for the two profit groups. Cwt produced per cow, on the other hand, was relatively higher for producers in the top one-third profit group, which resulted from a larger calf crop. The gross margin ratio was significantly lower for producers in the top one-third group than for those in the bottom one-third profit group.

Costs of production were significantly lower for producers in the top one-third profit group. Their total costs of production

were about \$147 per cow lower than those for producers in the bottom one-third. A large proportion (46%) of the difference in cost of production between profit groups was attributable to fixed costs. Another 37% of the difference was attributable to feed costs. Feed costs per head were about \$55 lower for the producers in the top one-third group. The remaining 17% of the difference in costs was attributable to variable costs other than feed.

Using the above information, we identified five critical factors affecting the profitability of the beef cow enterprise:

- (1) size of the herd,
  - (2) feed costs,
  - (3) fixed costs,
  - (4) pounds of beef produced per cow,
- and
- (5) sale price of calves.

For any size of operation, it is imperative to control production costs. Even with higher than average performance, high-cost producers are at a competitive disadvantage.

**Table 1. Selected Financial and Production Factors for Beef Cow Producers in Kansas**

	Bottom One-Third (57 Farms)	Average (171 Farms)	Top One-Third (57 Farms)
<u>Financial Factors (\$/Cwt.)</u>			
Gross income	73.85	77.52	80.66
Sale price of calves	86.18	86.29	85.58
Feed cost	50.18	43.66	36.10
Variable cost	72.49	62.97	52.27
Total cost	107.40	89.97	72.54
Gross margin ratio <sup>1</sup>	.99	.82	.65
<u>Financial Factors (\$/Cow)</u>			
Gross income	409.50	447.45	497.02
Feed cost	277.85	249.48	223.66
Variable cost	400.42	359.37	321.28
Total cost	592.66	512.39	445.73
Return above variable cost	9.08	88.08	175.74
Return above total cost	-183.16	-64.94	51.29
<u>Production Factors</u>			
Number of cows	87	101	118
Sale weight of calves, lb	568	564	575
Cwt. produced per cow	5.63	5.85	6.25

<sup>1</sup>Variable costs ÷ revenue generated.

Source: Kansas Farm Management Associations.

# Average Total Cost (\$/cwt)

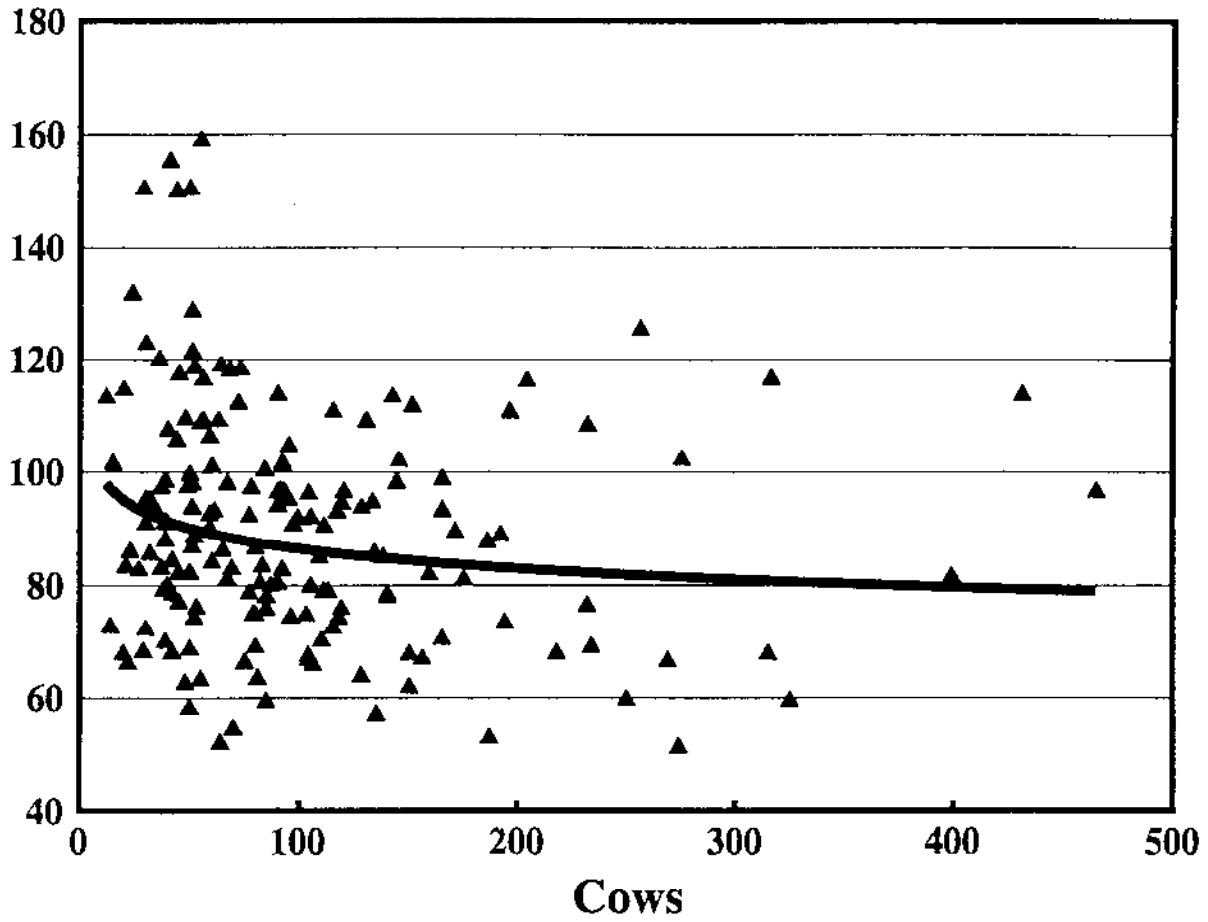


Figure 1. Average Total Cost per Cwt for Beef Cow Operations in Kansas, 1992