

## ECONOMIES OF SIZE FOR FARROW-TO-FINISH HOG PRODUCTION IN KANSAS

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### Summary

Economies of size measure the impact on average cost of production of increasing the size of operation. Data from 91 farrow-to-finish operations enrolled in the Kansas Farm Management Associations in 1992 were used to empirically estimate economies of size. Results indicate that average total cost and operation size are significantly correlated, and that average total cost declines as operations become larger. Results also indicate a substantial variability in costs of production between producers. In fact, costs of production between producers of a given size vary more than costs of production between operations of different sizes.

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

### Introduction

Economies of size measure the relationship between the size of operations and the average cost of production. Economies-of-size measures are useful in answering questions such as:

What is the most profitable farm size?

Do larger farms have a lower break-even price?

Will the number of farms continue to decline?

If average total costs decline rapidly as the size of the farm increases, we would expect

the industry to become more consolidated. Conversely, if average total costs are similar for farms of different sizes, the incentive would not be as strong for the industry to consolidate.

The number of operations with hogs declined by 63% from 1980 to 1992. This trend implies that it was economical for hog producers to become larger over this 13-year period. Economies-of-size measures can be used to determine whether it would be advantageous for farms to become larger. The purposes of this study were to examine economies of size for farrow-to-finish production in Kansas and to analyze differences in cost of production between producers.

### Procedures

Enterprise data from 91 farrow-to-finish producers enrolled in the Kansas Farm Management Associations in 1992 were used in this study. Enterprise data included the size of the operation in litters, cwt produced, gross income, costs of production, and pigs weaned per litter.

A cost function was estimated by regressing size variables on average total cost per cwt. 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-

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third profit groups. Return above total cost was used to separate the 91 producers into profit groups.

## Results and Discussion

Figure 1 presents the fitted average total cost function for the 91 farrow-to-finish operations. The scatter points in Figure 1 represent average total cost per cwt for individual farms. Size was significantly correlated with average total cost per cwt. Average total cost per cwt does not reach a minimum for the size range depicted in Figure 1. The fitted cost curve reaches a minimum at 830 litters. However, because only a few farms in the sample had more than 650 litters, it is not possible to draw inferences with respect to average total costs for this size category.

Using the fitted average total cost curve in Figure 1, we can compare break-even prices between farms of various sizes. Average total cost for a farm with 200 litters is about 4% lower than average total cost for a farm with 100 litters. Average total costs for farms with 400 and 600 litters are about 10% and 13% lower than average total cost for a farm with 100 litters. Cost advantages on a per cwt basis for larger farms include lower operator labor costs, lower depreciation and interest on buildings and equipment, and lower feed costs.

As indicated by the scatter points in Figure 1, a tremendous amount of variability exists in total costs between operations. In fact, differences in cost of production between farms of the same size are much wider than differences in costs of production between large and small firms.

Table 1 presents financial and production factors for the average farm compared to those in the bottom and top one-third in terms of return over total cost. The average size of the farms in the top one-third profit group is about 80 litters larger than the average size of the farms in the bottom one-third group. However, the top one-third profit group contains farms of all

sizes. Variable costs includes hired labor, repairs, interest paid, feed, veterinarian expenses, utilities, fuel, and miscellaneous cash costs. Fixed costs include operator labor, depreciation and interest on buildings and equipment, and real estate taxes.

Sale price for producers in the top one-third profit group was \$0.95 per cwt higher than sale price for producers in the bottom one-third profit group. Producers in the top one-third group either do a better job of marketing their hogs or have higher quality hogs.

The gross margin ratio is a measure of economic efficiency. Gross margin is calculated by dividing variable cost per cwt by gross income per cwt. A lower ratio indicates that a firm is more efficient. The gross margin ratio for producers in the top one-third profit group is significantly lower than that for producers in the bottom one-third profit group.

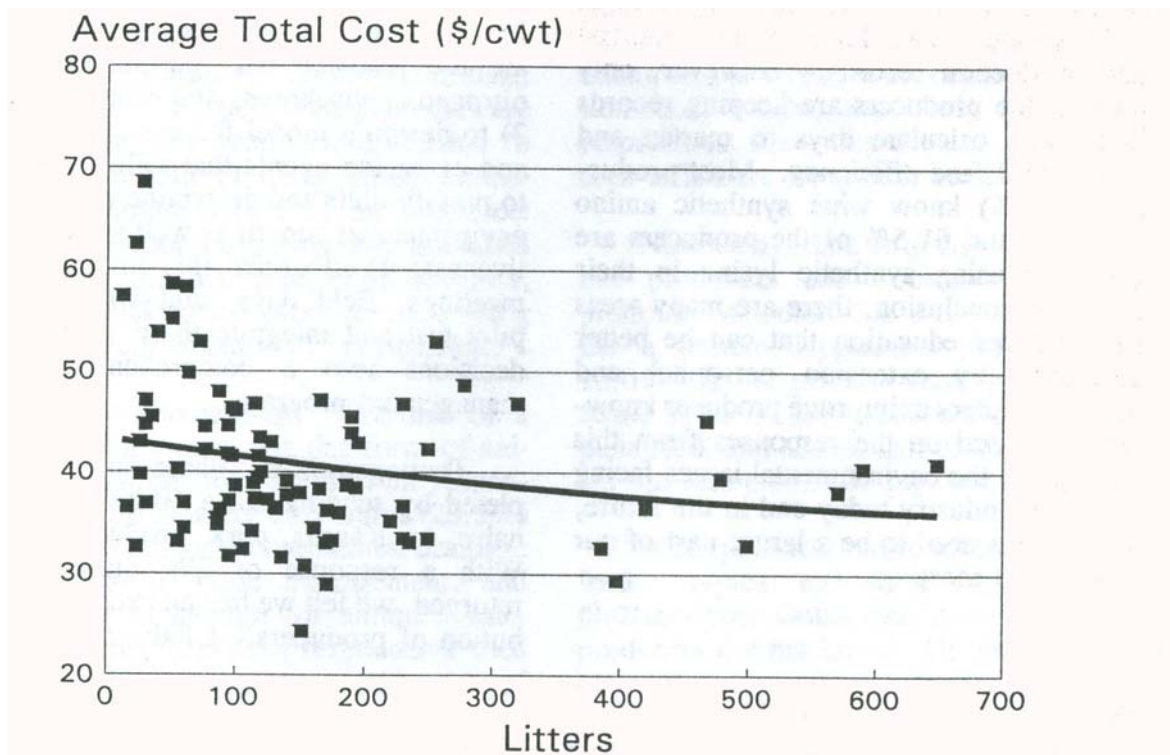
Costs of production on a per cwt basis are significantly lower for producers in the top one-third profit group. A large proportion (50%) of the difference in cost of production between profit groups can be attributed to differences in feed costs. We do not have feed conversion data on these farms. However, other studies have indicated that farms in the top one-third group have lower feed conversions and are more efficient in terms of purchasing feed ingredients. Another 26% of the difference in costs of production can be attributed to fixed costs. The remaining 24% of the difference in costs of production results from differences in variable costs other than feed.

Cwt produced and pigs weaned per litter are substantially higher for farms in the top one-third profit group. Gross income per cwt and higher productivity help explain the large difference in gross income per litter between producers in the top and bottom one-third profit groups.

**Table 1. Selected Financial and Production Factors for Farrow-to-Finish Hog Producers in Kansas**

Item	Bottom One-third (30 farms)	Average (91 farms)	Top One-third (30 farms)
<b>Financial Factors (\$ per cwt)</b>			
Gross income	40.35	41.35	42.44
Sale price	41.37	41.78	42.32
Feed cost	29.81	26.00	22.83
Variable cost	39.90	34.18	29.51
Total cost	48.64	40.80	34.62
Gross margin	0.99	0.83	0.70
<b>Financial Factors (\$ per litter)</b>			
Gross income	712.62	784.23	870.90
Feed cost	520.79	487.17	465.89
Variable cost	697.66	640.30	603.75
Total cost	851.92	763.51	709.27
Return above variable cost	14.97	143.93	267.16
Return above total cost	-139.31	20.72	161.63
<b>Production Factors</b>			
Number of litters	172	222	254
Number of pigs sold	1336	1717	2034
Sale weight (lb)	238	239	240
Cwt produced per litter	17.21	19.01	20.59
Pigs weaned per litter	7.12	7.45	7.82

Source: Kansas Farm Management Associations (1992).



**Figure 1. Total Cost per cwt for Farrow-to-Finish Hog Production in Kansas, 1992**