Winter 2000

Technical Efficiency of Beef Cattle Producers in Louisiana (Research Report#103)

Anna Rakipova
Louisiana State University and Agricultural and Mechanical College

Jeffrey Gillespie
Louisiana State University and Agricultural and Mechanical College

LSU AgCenter Research & Extension
Research REPORT
Number 103 - Winter 2000

Technical Efficiency of Beef Cattle Producers in Louisiana

Anna Rakipova and Jeffrey Gillespie[1]

Louisiana beef cattle producers use a wide range of production practices. Because climate, landscape, and soil type vary across the state, cattle are raised under different environmental conditions. Producers generally react to specific local conditions by attempting to choose production practices that maximize profits. Personal preference over inputs also contributes to the variation in production practices. For example, some producers prefer to use one breed of cattle over another. One of the negative implications of varied practices is that some are likely to lead to efficient operations, while others do not. What types of production practices and farmer characteristics are generally associated with more efficient operations?

Data and Methods

The objective of this study was to examine the technical efficiency of beef cattle producers from across Louisiana and to determine the types of producers and practices that are associated with technically efficient farms. Sixty-two producers were surveyed in Fall, 1998, at Louisiana Cooperative Extension Service parish offices. On average, five producers were interviewed at each parish office. Surveys collected detailed information on input usage, outputs, and producer characteristics. Producers were selected by county agents to represent the cross-section of beef cattle producers in Louisiana. The twelve largest cattle-producing parishes in Louisiana were surveyed.

Technical efficiency refers to the capacity of producing the maximum level of output for a given quantity of inputs and technology. In this study, data envelopment analysis (DEA) was used to measure the technical efficiency of each of the 56 cattle farms. Using DEA, the technical efficiency of a farm is equal to the ratio of its total weighted output to its total weighted input, where the weights are decision variables in a linear programming DEA model (Sexton 1986). Using DEA, technical efficiency of each farmer is calculated relative to the technical efficiency of all the other farmers in the sample. Two outputs (number of weaned calves produced and number of stockers produced) and six inputs (number of cows, number of acres of land in the cattle operation, number of breeding bulls, total labor hours, amount of hay fed to cattle, and the total cost of operating tractors) were used in the model. These inputs included in the model represent the highest cost inputs in the operations. Using DEA analysis and solving a linear program for each producer results in a technical efficiency coefficient for each producer (Rakipova 1999). Technical efficiency coefficients may range from 0 to 1, where 0 represents no output from the operation and 1 represents the most technically efficient operation.

Table 1. Technical Efficiency of Beef Cattle Operations in Louisiana, 1997.

Technical Efficiency Range	Number of Producers
0.30 - 0.39	1
0.40 - 0.49	2
0.50 - 0.59	0
0.60 - 0.69	1
0.70 - 0.79	2
0.80 - 0.89	9
0.90 - 0.99	15
1.00	26
Total	56

Results

Calculated technical efficiency coefficients for producers are reported in Table 1. The producer with the lowest technical efficiency fell in the range 0.30-0.39. This producer had a calving rate of only 31 percent, resulting in very low technical efficiency. On the other end of the spectrum, 26 producers had technical efficiency coefficients of 1. For each of these 26 producers, a technical coefficient of 1 implies that no other producer using the same set of inputs and producing the same outputs was more technically efficient. Overall, the range of technical efficiency was relatively wide considering that the cattle industry is an established industry.

What types of producers are the most technically efficient? A 20 variable tobit analysis was conducted to answer this question. The variables used in the analysis included breeding, pasture, socioeconomic, and other production practices that varied across

[1]*Former graduate research assistant and assistant professor, respectively, Department of Agricultural Economics and Agribusiness, Louisiana State University Agricultural Center, Baton Rouge, LA 70803.*

farmers (Rakipova 1999). Statistically significant variables in the tobit analysis provide strong evidence that the variables are correlated with technical efficiency.

Results indicate that surveyed producers using more mixed-bred brahman cows had higher technical efficiency coefficients than producers who did not (Table 2). Producers using full-bred Bos taurus bulls had higher technical efficiency coefficients than those who did not. These findings are consistent with studies conducted by animal scientists. Older cattle producers were more technically efficient than younger ones. This is as expected, given that older cattle producers tend to have more experience with cattle. In some other agricultural enterprises with rapidly changing technology, the opposite has been found.

More highly educated cattle producers were more technically efficient than less educated producers. Education improves the ability to adopt suitable technology in a timely manner. Producers who worked more hours in an off-farm job were more technically efficient than those who worked fewer hours. While this result may seem surprising, it is consistent with the hypothesis that those farmers who have an off-farm job must compensate for the time they spend off-farm with better management and more efficient use of resources.

> Overall, the range of technical efficiency was relatively wide considering that the cattle industry is an established industry.

Farmers who were sold higher weight calves were, as expected, more technically efficient than others. Farmers who set aside hay fields and never grazed them were less technically efficient than other farmers. Perhaps this is because farmers who have a field that is used for only one purpose use more resources than those who do not. However, this should not be taken to suggest that farmers should not set aside a special field for hay. Further economic analysis would need to be conducted in order to draw such a conclusion. As expected, farms with higher percentages of permanent pasture that was improved were more technically efficient.

Producers who rented a higher percentage of their land devoted to cattle were more technically efficient. This result likely indicates the short-run incentive of the renter to utilize fewer resources to maintain inputs for long-run firm viability, such as land, fences, and buildings.

Table 2. Results of the Tobit Analysis: The Effect of Louisiana Cattle Producers' Characteristics and Management and Production Practices on Technical Efficiency.

Variable	Estimate	Standard Error
Constant	-0.8216*	0.4565
Farmer Uses Full Vaccination Program	0.0336	0.0600
Farmer Uses Full-Bred Bos taurus Bulls	0.1174**	0.0589
Presence of Stockers in the Operation	-0.0636	0.0748
Percentage of Cows that Are Registered	0.0012	0.0010
Percentage of Cows that Are Mixed-Bred Brahman	0.0028**	0.0010
Farmer Pregnancy Tests Cows	-0.0578	0.0582
Farmer's Age	0.0141**	0.0704
Farmer's Education in Years	0.0206**	0.0097
Hours per Week Farmer Works in an Off-Farm Job	0.0037**	0.0018
Farmer Rates Cattle Operation as Highly Important	0.0906	0.0672
Farmer Will Increase Operation Size <25 Percent Next Year	0.0424	0.0669
Farmer Will Increase Operation Size >25 Percent Next Year	-0.0469	0.0817
Farm Is Located In South Louisiana	0.0672	0.0978
Farmer Raises Crops for Sale	-0.0512	0.1237
Acres Devoted to the Cattle Operation	0.138E-4	0.539E-4
Acres Squared Devoted to the Cattle Operation	0.163E-9	0.274E-8
Percentage of Cattle Land that Is Rented	0.0014*	0.0008
Weaning Weight of Calves	0.0007*	0.0004
Farmer Has a Designated Hay Field	-0.1418**	0.0704
Percentage of Permanent Pasture that Is Improved	0.0017*	0.0009

** indicates significance at the 10 percent level. ** indicates significance at the 5 percent level.*

Implications

Technical efficiency varied widely among cattle producers in Louisiana, partially due to the wide variation in the number of breeds that are used, the range of farm size and structure, and the intensity of input use. This kind of variability in technical efficiency is often found in enterprises that range from small, part-time operations to very large, full-time operations and where the enterprises operate under highly varied environments. The wide variability also suggests that additional research needs to focus on the economic efficiency of beef cattle production in Louisiana, particularly from the perspective of increasing the efficiency of younger, full-time producers. ■

References

Rakipova, A.N. "Technical Efficiency of Beef Cattle Producers in Louisiana." Unpublished M.S. Thesis, Dept. of Agricultural Economics and Agribusiness, Louisiana State University, Baton Rouge, LA, December 1999.

Sexton, T.R. "The Methodology of Data Envelopment Analysis." In Silkman, R.H. (Ed.). Measuring Efficiency: An Assessment of Data Envelopment Analysis. New Directions for Program Evaluation, Jossey-Bass, No. 32. San Francisco: Winter 1986.