Agricultural Marketing Report

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Extension

COMMUNITY DEVELOPMENT AND THE PROFITABILITY OF VALUE-ADDED MEAT PRODUCTION AND PROCESSING

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- *Success in Value-Added Meat Processing and Marketing Depends on the Details*

The cattle industry is economically and culturally important to many Colorado communities. In the face of marginal and volatile costs and returns, these cattleimportant communities have searched for ways to maintain their heritage and the important contribution that the beef industry provides. One of the most commonly mentioned solutions to these economic problems is through value-adding by packing and processing meat within the community. There are many benefits and costs to this strategy that communities should consider such as the implications for employment and taxation. However, the first consideration has to be whether a packing plant is profitable. Understanding the potential profitability of a meatpacking operation involves analysis of price, quantity, quality and cost data.

Profit is total revenue less total costs, which are expressed in per head dollar units for easy comparison of production, processing, and marketing alternatives. The following examples use price data from research conducted at Oklahoma State University. The example works through average revenue available from 1990-94 based on data reported in weekly USDA publication

Livestock, Meat, and Wool Market News. Revenue will be discussed first, followed by examples of cost data. The cost data is based on research conducted at the USDA Economic Research Service in 1990 and independently verified through a survey of the processing industry conducted at Oklahoma State University. These revenue and cost figures indicate average industry profit. Within this framework, we can then examine changes in profit as processing costs change with varying plant sizes, or as outsourcing to other processing facilities is used, and as revenues change when different premiums are paid for beef quality. For example, an improved quality beef system could be from an "all-natural" product. Improvements in quality are anything for which distributors are willing to pay more.

Revenue

Total revenue consists of meat and by-product sales. Returns to meat sales depends heavily on the distribution of quality within the cattle sold. Thus, the availability of USDA Choice versus Select cattle, for example, is important within the region where cattle are purchased. By-product sales depend on the further processing available to the meatpacker and this is largely a function of the size of the processing facility. Large facilities do extensive further processing, but this is highly plant dependent and is ignored here.

Extension programs are available to all without discrimination.

Over a period of time, average revenue from beef sales depends on average carcass weight, Choice and Select carcass prices, and the percent of Choice versus Select carcasses in the sales mix:

$$\begin{array}{ll} \text{Total Meat} \\ \text{Revenue} \quad = \\ \text{per Head} \end{array} \begin{array}{l} (\text{Choice Beef Price} \times \text{Percent Choice} \\ + \text{Select Beef Price} \times \text{Percent Select}) \\ \times \text{Dressed Carcass Weight} \end{array}$$

The 1990-94 average prices, percentages and weights would result in the following:

$$\begin{array}{ll} \text{Total Meat} \\ \text{Revenue} \quad = \\ \text{per Head} \end{array} \begin{array}{l} (\$116/\text{cwt.} \times 0.56 \\ + 111/\text{cwt.} \times 0.44) \\ \underline{\times\ 7.58\ \text{cwt}} \\ \$862.60/\text{head} \end{array}$$

Total revenue also depends on by-product value. Average by-product value depends on the average by-product price per hundredweight and the volume of sales. By-product prices are reported per hundredweight of live animal:

$$\begin{array}{ll} \text{Total By-Product} \\ \text{Revenue per Head} = \end{array} \begin{array}{l} \text{Average By-Product Price} \\ \times \text{Animal Weight} \end{array}$$

The 1990-94 average prices and weights would result in the following:

$$\begin{array}{ll} \text{Total By-Product} \\ \text{Revenue per Head} = \end{array} \begin{array}{l} \$7.85/\text{cwt} \\ \underline{\times\ 11.8\ \text{cwt}} \\ \$92.63/\text{head} \end{array}$$

Thus, total revenue per head is:

Total Revenue per Head = $862.60 + $92.63 = $955.23

Live Animal Costs
The primary cost of a meat processing operation is the purchase of animal inputs. Over a period of time, like with meat sales, average animal costs depend on average animal weight, Choice and Select animal prices, the percent of Choice versus Select and the percent of steers and heifers in the purchase mix. Prices and weights were averaged across Choice and Select animals, and steers and heifers, in the publication used.

Thus, the cost per animal is:

$$\begin{array}{ll} \text{Total} \\ \text{Animal Cost} = \\ \text{per Head} \end{array} \begin{array}{l} (\text{Choice Animal Price} \times \text{Percent Choice} \\ + \text{Select Animal Price} \times \text{Percent Select}) \\ \times \text{Animal Weight} \end{array}$$

$$\begin{array}{ll} \text{Total} \\ \text{Animal Cost} = \\ \text{per Head} \end{array} \begin{array}{l} (\$75/\text{cwt.} \times 0.56 \\ + \$75/\text{cwt.} \times 0.44) \\ \underline{\times\ 11.8\ \text{cwt}} \\ \$885.00/\text{head} \end{array}$$

Gross Margin
The gross margin is what meat processors use to cover processing costs beyond animal inputs. It is equal to total revenue less animal input cost:

$$\begin{array}{ll} \text{Gross Margin} \\ \text{per Head} \end{array} \begin{array}{l} \text{Total Revenue} \\ = \text{-Total Live Animal Cost} \end{array}$$

The gross margin for the period 1990-94 is:

$$\begin{array}{ll} \text{Gross Margin} \\ \text{per Head} \end{array} \begin{array}{l} \$955.23 - \$885.00 \\ = \$70.23/\text{head} \end{array}$$

Processing costs for individual plants and firms are not known in as much detail as the components of gross margin. Commodity beef processors purchase cattle and sell meat, and their actions in these markets are reasonably wellknown because the price and quantity are reported to the USDA, Agricultural Marketing Service (AMS) and Food Safety and Inspection Service (FSIS). The gross margin in 1990-1994 is representative of other years and is therefore useful for determining current profit potential for those communities considering packing plants.

The gross margin indicates how much money is left over for profit and to pay the fixed and variable costs of operating the facility. Engineering studies have been conducted by personnel at USDA Economic Research Service (ERS), and the results of this work has been confirmed by survey work at Oklahoma State University of packing facilities. Fixed costs are incurred irrespective of the volume of processing conducted at the facility. These costs are measured in total dollars. Variable costs are related to the volume of processing. These costs are measured in dollars per head. The proportion of fixed to variable costs are relatively high in the commodity meat processing system. This gives larger facilities a considerable advantage since total costs per head decrease as volume is increased in a

given facility. Total per unit costs can be reduced more by adding a second labor shift to a given facility. Further, across different facilities, total dollars per head costs are lower for larger facilities.

Facility costs are summarized in figure 1. Slaughter and fabrication costs for a 10-head-per-hour plant operating a single shift for 40 hours per week (20,000 head per year) is $130/head. This is the smallest plant considered in the ERS study. Slaughter and fabrication costs for a 120-head-per-hour plant operating a double shift for 40 hours per week (480,000 head per year) is $70/head. This is a medium-sized facility. The largest facility considered is a 300- head-per-hour plant operating a double shift for 50 hours per week. This is 1.5 million animals per year and cost $62/head. This is the common commercial plant that is currently being built or refitted within an older building.

Many of the rural communities are slaughtering fewer than 10 head per week as they try to build markets for specialized products such as natural beef. In recent interviews, producers using two plants on the western slope of Colorado stated that they are paying approximately $260-$300 per head for this volume. These costs are in-line with those from the ERS and Oklahoma State University studies. These communities are striving to increase production to a level that competes with commercial processors in order to keep the value-added industry within the community. The average profitability of the three commercial plants over the 1990-94 time period was:

$$\text{Total Profit per Head} = \begin{array}{l} \text{Total Revenue} \\ \text{- Total Animal Costs} \\ \text{- Total Facility Costs} \end{array}$$

This results in the following profits for the small, medium and large plants:

Small: Total Profit per Head = $955.23 - $885.00 - $130 = -$59.77/head.

Medium: Total Profit per Head = $955.23 - $885.00 - $70 = +$0.23/head.

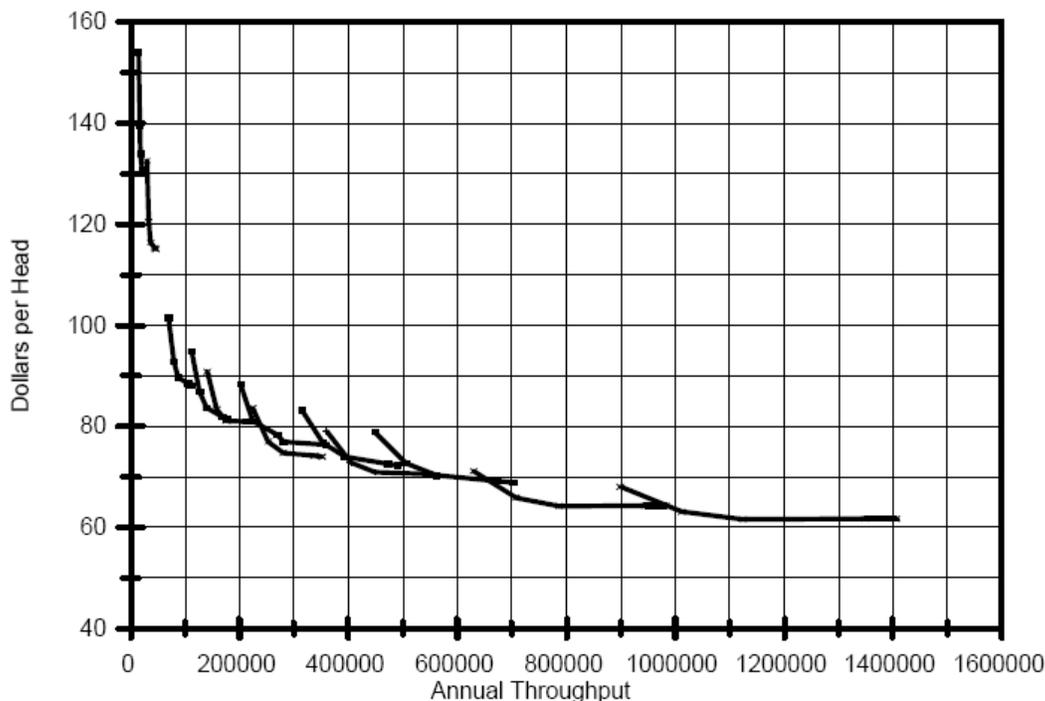Large: Total Profit per Head = $955.23 - $885.00 - $62 = +$8.23/head.

Figure 1: Slaughter and Fabrication Costs for Different Sized Beef Processing Facilities.

These are the average profitability for a five-year time period. The actual Oklahoma State University publication which reported gross margins noted that the average was slightly above $72/head. Gross margins were calculated with a more elaborate formula that recognized different prices for carcasses of different weights and the proportion of carcasses in the categories. Nonetheless, gross margins in the commodity meat processing system are small relative to processing costs and these profit per head numbers are small.

The information revealed in these calculations speak clearly to the changing structure of the meat processing industry of the past 25 years. In the commodity beef system, the break-even plant size slaughters and fabricates approximately one-half million animals per year. This is a one-thousand fold increase over 10 head per week. Further, there is little reason to refurbish plants of this size once the useful plant-life has been exhausted. Capital could be better invested elsewhere. Census of manufacturers data suggests that 15-25% of the small to medium sized plants exit the industry *each year*. Almost all new capital that has been attracted into the commodity beef industry in the past 15 years has been used to construct plants with annual capacities of 1.5 million head or greater.

Value-Added Systems? Or, Let's Jiggle a few Things
Gross margins for commodity beef are small relative to costs for animal growers as well as processors. Because of this, many producers have considered investing in value-added marketing systems themselves. Value-added marketing systems provide service in addition to that obtained in the commodity system. The additional service results in additional costs, and hopefully additional revenue. There are two important considerations for back-of-the-envelope analysis of value-added systems. The first is assessing the impact of value-added on processing costs and the second is assessing the impact on processing revenues.

The impact on processing costs of developing a value-added system are relatively straightforward. The system being considered on the western slope of Colorado, for example, involves construction and refitting of a meat processing facility. Discussions with participants indicates that they intend to internalize the processing profit center and maintain quality control of the processing of the meat products. An alternative is to purchase boxed beef on the commodity market. This is a common economic and business decision: make or buy? Another alternative is to sell cattle into the commodity system. In either case, this value-added system is competing with the existing commodity system. The value-added product and commodity beef are substitutes. Thus, a cost comparison between the value-added system and commodity system is relevant.

We will consider expanding packing from 10 head per week to 40 per week, to 100 head per week, and 100 head per day. These figures convert to the following head per hour and annual capacities:

40 head per week -- 1 head per hour -- 2000 head per year,
100 head per week -- 2.5 head per hour -- 5000 head per year,
100 head per day -- 12.5 head per hour -- 25000 head per year.

The 40 head per week figure comes from current production levels at one western slope plant; 100 head per week is a 150% expansion, or a ten-fold increase over the 10 head per week figure cited by some of the niche marketers in the region. The 100 head per day figure would be, approximately, the maximum possible if all of the feeder cattle in the region were dedicated to the value-added program. We perceive this to be an absolute top-end volume and capacity figure and is also unrealistic.

Average slaughter and fabrication costs for these three capacities, based on the examples shown above, are:

    40 head per week = $280 per head,
    100 head per week = $200 per head,
    100 head per day = $125 per head.

A facility using one of these three capacities is at a cost disadvantage of $210, $130, and $55 per head compared to the medium-sized commodity processing facility with processing costs of $70 per head.

In order to compete with existing commodity firms, the value-added firm will have to provide enough service to offset this cost disadvantage. In other words, the value-added firm will have to receive enough premium to offset this cost disadvantage. How large does this premium have to be for the value-added system to break-even? The medium-sized facility just brakes even over the period from 1990-1994. Thus, the value-added firm will have to increase the gross margin 210, $130, and $55 per head, depending on the size of the facility. These figures imply a 300%, 186%, or 79% increase in gross margin.

From a slightly different perspective, the value-added firm will have to increase the total revenue from meat sales by $210, $130, and $55 per head, depending on the size of the facility. These figures imply a 24%, 15%, or 6% increase in total revenue from meat, with constant returns from by-product. These premiums must be received on top of the commodity beef price. Caution is warranted since these premiums are the average for the entire carcass. Premiums would need to be even greater for the value-added system to be profitable if premiums cannot be obtained for the entire carcass.

Conclusion
Success in the commodity beef system depends largely on the ability of the firm to capture economies of size and to control costs. Large firms have a substantial cost advantage over small firms. Further, firms that have constant assess to volume flows of cattle also have a cost advantage. Gross margins in the meat processing industry are small. The results presented in this document are based on average prices and quantities for a five-year period from 1990 through 1994. The average gross margin for a meat processor for this time period was $72 per head. Even if producers could get premiums high enough to cover their higher processing costs, more money might be made by outsourcing meat processing and packing. For example, if someone could get the $130 per head needed to cover higher costs, they could make money as opposed to breaking even if they could find cheaper processing. Keeping the processing in the community might be worthwhile anyway, but it appears that it will come at a cost.

Profit margins are also small -- they are a small portion of the gross margin -- and they are highly variable. Producer groups often react negatively to news of record high profits or improvements in profitability in the processing industry. However, news sources which service producer groups often only communicate this side of the coin. Variable profits also imply record lows and decreases in profitability. An example com-

municates this issue best. Suppose a meat processor has a gross margin of $72 per head and processing costs of $66 per head. The processing costs of this firm are in between the medium-sized firm and the large firm used earlier, but this plant is actually the large plant that has been running at less than full capacity because of limited animal numbers. The profit margin for the firm is $6 per head. Next, suppose the firm is

able to reduce costs to $62 per head because more cattle are available. The profit margin increases to $10 per head. The processor was able to reduce costs by 6% and the profits increased by 67%. Small changes in costs have dramatic impacts on profitability. Likewise, suppose the firm experiences increased costs because of very limited cattle numbers. Costs increase 10% to $72.60 per head. The profit margin becomes a loss of $0.60 per head. Profits to the processor decreased over 100%. These are not unreasonable changes in costs and they result in firm profitability. Thus, we see the incentive for processing firms to maintain volumes and control costs.

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