Sponsors

University of Minnesota
College of Veterinary Medicine

College of Agricultural, Food and Environmental Sciences

Extension Service

Swine Center

Editors
W. Christopher Scruton
Stephen Claas

Layout
David Brown

Cover Design
Ruth Cronje, and Jan Swanson;
based on the original design by Dr. Robert Dunlop

Feeding programs to increase margin and maximize throughput

Steve S. Dritz, Mike D. Tokach, Robert D. Goodband, and Jim L. Nelssen

Kansas State University

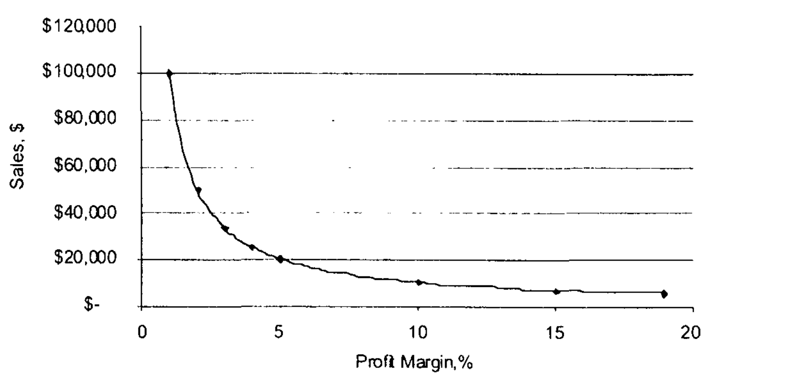
It is widely recognized that 50–65% of the total cost of swine production is contributed by feed in a farrow-to-finish swine operation. Therefore, relatively small changes in feeding programs can lead to large increases in returns. Feeding program costs and influence on revenues vary widely among swine operations—there is usually a complex interplay of factors that influence a feeding program's impact on returns. Although we recognize that diet formulation and nutrient requirements have significant effects on the economics of feeding programs, this paper will focus on the economic influence of feeding program components other than these two factors. We commonly encounter over-formulating for nutrients, which can have a huge impact on feeding program returns and highlight the importance of this major opportunity area for many production systems. The objective of this paper is to examine examples of components of feeding programs in order to provide a sense of the magnitude of the influence changes can have on returns.

A feeding program affects both the expense and revenue sub-branches of the net margin branch of the return to equity productivity tree (see Morrison et al. in these proceedings for a diagram of the ROE tree). In general, larger gains in return for altering feeding programs can be obtained by decreasing costs rather than increasing revenue. We believe the words of Bogle (1999) are just as applicable to the swine industry as the financial industry: "Cost matters!" Lowering cost or increasing margin without lowering productivity is critically important at a time when profit margins are low. This concept is illustrated in **Figure 1**, a figure adapted from McEllhiney (1994) to illustrate the sales value of a $1,000 cost reduction. Note that at profit margins below 5% the amount of sales or throughput needed to increase profit by the same amount as a $1,000 decrease in cost rises dramatically as profit margin decreases.

We also recognize that the effects of changes in feeding programs are much easier to quantify on the cost sidethan the revenue side. For example, it is relatively easy to determine the impact of feeding added dietary fat on feed cost per pound of gain. However, the effect on revenue is more difficult to categorize due the variable influence of added fat on ADG and carcass value depending on environment, genetics, or other factors, and the wide variation in the value of ADG among production systems.

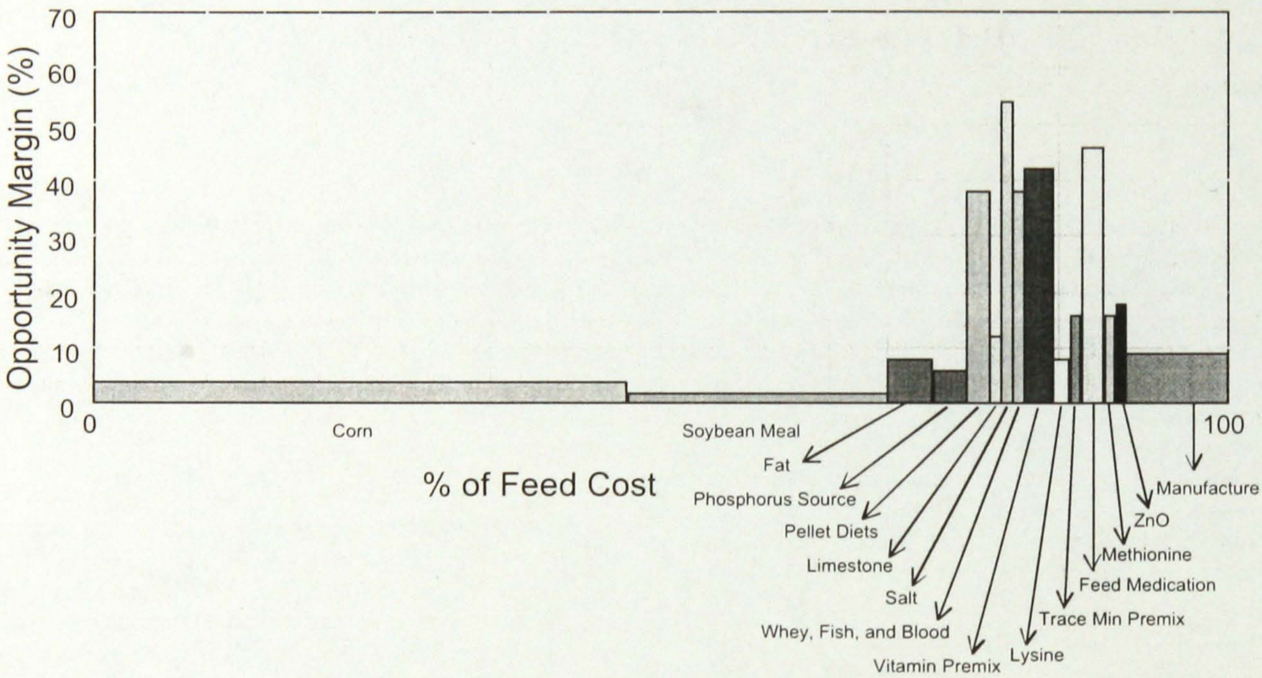
A depiction of the mental model we use to prioritize efforts in managing feeding programs to increase return is depicted in **Figure 2**. We developed a two-dimensional graph (Figure 2) based on the authors' experience. This graph consists of the percentage of feed cost contributed by various components of feed cost (depicted along the horizontal axis). The opportunity margin is depicted along the vertical axis. The opportunity margin is defined as the average percentage of each component cost that may be available for increasing net profit. The opportunity margin is derived from either reducing ingredient cost or changing usage of that ingredient to reduce feed cost or increase revenue. Therefore, the area of each box represents the opportunity for profit we commonly observe.

Figure 1. Amout of Sales at Vaious Profit Margins Needed to Generate the same Amount of Profit as a $1,000 Reduction in Cost



As expected, corn and soybean meal comprises the largest percent of feed cost. However, the opportunity from lowering corn or soybean meal price is usually a small percentage such as $0.10 per bushel of corn or $10 per ton of soybean meal. However, because of the large area of opportunity with corn, soybean meal, and fat, usage of these ingredients drives a large share of a nutritionist's focus on lysine and energy

Figure 2. Opportunity for various components of feeding programs to increase profit.



requirements in swine diet formulation. The next area that usually nets a large opportunity is feed manufacturing and delivery. The impact of feed manufacturing will be further detailed elsewhere (below). The next three opportunity areas are pellet diets (starter diets fed to pigs weighing less than 15 lb), vitamin premixes, and (to a lesser exten)t the specialty nursery ingredients of whey, fish meal, or blood meal. There is little centrally reported pricing for these ingredients, so fairly large differences in pricing exist in the marketplace. In addition, the composition and quality of these ingredients varies greatly leading to difficulties in making accurate price comparisons. Further, usage has an impact on the opportunity cost. For example, since pelleted diets are usually much more expensive than the average diet cost, small unneeded increases in usage lead to large increases in cost without improvements in net return. Feed medications are also in this category; however, pricing is usually fairly consistent and the opportunity lies in medication selection and amount used. Another ingredient that we found presents a fairly large opportunity is salt. Two factors are responsible. The first is the grade of salt fed. Sometimes the design of the feed mill cannot handle a feed grade salt and a free flowing food grade must be utilized. The second is that, since salt is such a low cost ingredient per lb, transportation costs have a significant effect on opportunity. The final area of opportunity is the phosphorus source. Most of the opportunity for this component results from efficient transportation or purchasing and quantity discounts.

Feed manufacturing costs

Listed in the table (**Table 1**, below) are on-farm feed manufacturing costs from a study of 17 Kansas swine farms conducted by the Grain Science and Agricultural Economics Departments at Kansas State (Herrman et al., 1997). First note the large range in costs of $11.85 per ton between the highest cost farm and lowest cost farm. This represents $4.38 difference per pig. Second, observe that the difference in feed manufacturing costs from 1 SD above to 1 SD below the average is $2.59 per pig. The impact of the differences in feed manufacturing costs is examined in the last two columns. The first column ("Avg. profit change impact") is based on the assumption of a farm with average feed manufacturing costs having the same profitability as the 10-year average profitability from the Iowa State swine records summary. Note that if it is assumed that the farm has the lowest feed manufacturing cost, profit will increase by 10.4%. Conversely, farms with the highest cost will have 17.6% lower profit than farms with average feed manufacturing costs. An

Table 1. Feed Manufacturing Costs from 17 Kansas Swine Farms

Category	$/ton	$/pig marketed	$/cwt live	Avg. profit change impact	Low profit change impact
Highest	$ 15.49	$ 5.73	$ 2.29	-17.6%	-55.0%
Plus 1 SD	$ 11.56	$ 4.28	$ 1.71	-8.3%	-25.9%
Average	$ 8.06	$ 2.98	$ 1.19	0.0%	0.0%
Minus 1 SD	$ 4.56	$ 1.69	$ 0.67	8.3%	25.9%
Lowest	$ 3.64	$ 1.35	$ 0.54	10.4%	32.7%

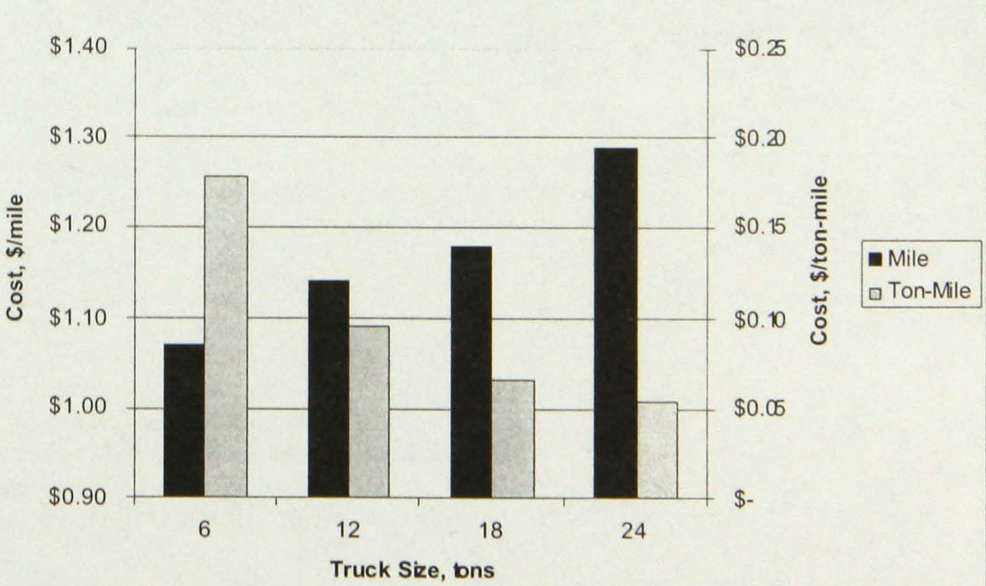
Feed manufacturing ($/ton) costs reported by Herrman et al., 1997. The $/pig marketed assumes that 740lb of feed is required to produce 1 market pig. The $/cwt assumes an average live market weight of 250 lb. The profit change scenarios were calculated using the average profit per pig for the 1985–96 10 year Iowa State University Swine records.

alternative scenario using a profit of $5 per pig for the category with average feed manufacturing cost is examined in the last column ("Low profit change impact"). Observe that, similar to the data from McEllhiney, as profit margins decrease the importance of lower manufacturing costs is magnified.

Delivery costs

The effect of truck size on delivery cost is depicted in **Figure 3**. This data is based on costs reported by Baumel (1997). The delivery cost per mile increases linearly as the truck size increases from 6 to 24 tons. However, the cost per ton-mile (cost per mile/truck size) decreases in a curvilinear fashion. Based on these data the cost per ton-mile is decreased by 43% when comparing a truck size of 12 to 24 tons. Although the advantage depends primarily on the distance feed must be transported, for a 15 mile delivery this translates into a $0.62 per ton and $0.23 per pig decrease in feed cost when using 24-ton versus a 12-ton truck. These figures also illustrate that savings in transportation costs are significant when utilizing grains and feed produced on-farm.

Figure 3. Influence of Feed Truck Size on Delivery Costs



Other common opportunity areas

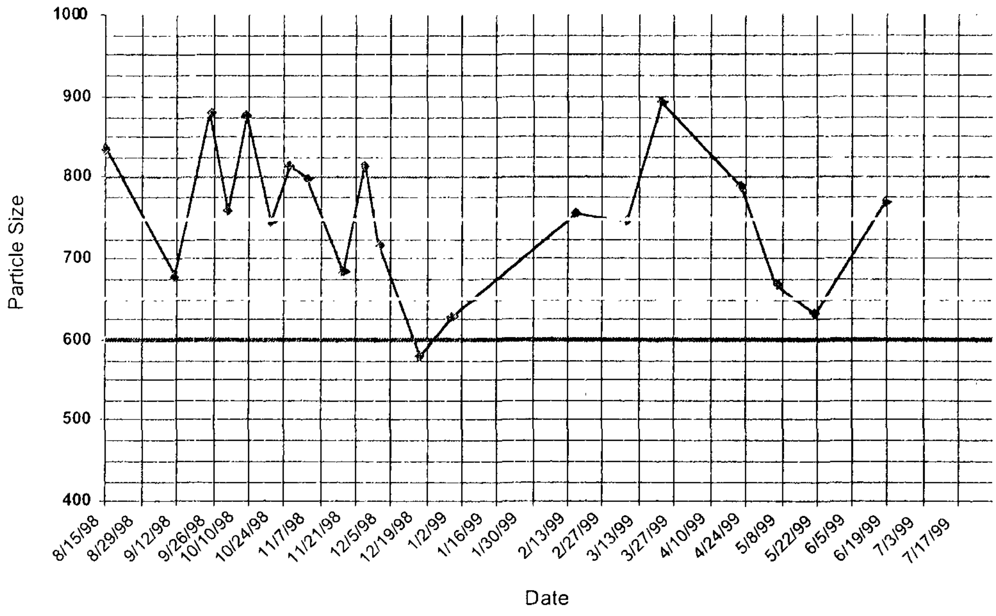
Feed efficiency

Improvements in feed efficiency from the reduction in feed wastage directly reduce cost per lb of gain and per pig. For example, feed cost is lowered by $0.95 per pig in the finisher and $0.40 per pig in the nursery by reducing feed efficiency by 0.1. These costs have been derived using relatively low grain and soybean meal prices of $1.80 per bushel and $140 per ton, respectively. We often observe improperly adjusted feeders on farms. Many times the improper adjustment is the result of difficulty that management has communicating what proper adjustment should look like to personnel adjusting the feeders. As a result, we have borrowed an idea from a producer by providing pictures of properly adjusted feeders. The pictures are placed in each barn and serve as constant motivational reminders for reducing feed wastage.

Particle size

The final opportunity area we will examine for improving net re-

Figure 4. Particle Size Monitoring



turn is grain particle size reduction. A summary of research from Kansas State indicates that for every 100 micron decrease in average particle size, feed efficiency improves by 1.2%. This results in approximately a $0.40 to $0.50 improvement in feed cost per pig. The research clearly indicates that reducing particle size improves energy utilization and feed efficiency. However, implementating the proper particle size is a problem in many feeding programs. We find that without continual monitoring that particle size is difficult to maintain in the optimum range of 600–800 microns. Listed in **Figure 4** are the particle size analysis results for 9 months from one production system. Based on these analyses, this production system has incurred approximately $50,000 in lost opportunity because of particle size in excess of 750 microns.

Conclusion

In conclusion, we recognize that the areas influenced by feeding program management are not independent of each other and that each area affects other areas. For example, the ingredient purchaser must interact and communicate to the nutritionist regarding what ingredients are available. The nutritionists must communicate the feeding value of the ingredient to the purchaser so the purchaser can base decisions about different ingredients on their nutritional value. In our opinion, the most economical feeding programs are much more than a set of diet formulations based on a set of nutrient levels.

References

Baumel CP. Feed mill costs: Implications for high cost mills. Feedstuffs June 30, 1997 p. 10–11.

Bogle J. 1999. Common Sense on Mutual Funds. John Wiley and Sons, Inc. New York, 1999.

Herrman TJ, Harner JP, Baker S, and Langemeier MR. Time and cost analysis of on-farm portable feed manufacturing. Appl Eng Ag, 1997, 13:421–425.

McEllhiney, R. Manufacturing Cost Control. In: ed. R. McEllhiney, Feed Manufacturing Technology IV. American Feed Industry Association, 1994, Arlington VA, p.236.