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CALCULATING FEED COSTS WITH ALTERNATIVE LYSINE DIETS FOR HIGH-LEAN GROWTH GILTS

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Summary

Data from two experiments were used to determine the feed cost per lb of lean gain for high-lean growth gilts fed various digestible lysine levels (.54 to 1.04%). The cost for producing 1 lb of lean increased as live weight increased from 75 to 160 lb (Exp 1) and from 160 to 300 lb (Exp 2). However, in Exp 1, the cost per lb of lean gain was minimized for gilts fed 1.04 and .94% digestible lysine (1.25 and 1.15% total lysine, respectively) from 75 to 90 lb and from 90 to 160 lb, respectively. These data are similar to the data for maximum rates of lean gain for grower gilts (75 to 160 lb), indicating that maximum gain is the most cost-effective gain during the grower period. During the finishing period (160 to 300 lb), maximal lean gain was attained for gilts fed .94% digestible lysine. However, cost of attaining this rate of lean gain was also the most expensive. The least feed cost per lb of lean gain was achieved when gilts were fed .84 and .54% digestible lysine (1.0 and .65% total lysine, respectively) from 160 to 180 lb and from 180 to 300 lb, respectively. In conclusion, these data indicate that feeding for maximum lean gain during the growing period (75 to 160 lb) results in least cost production. However, during the finishing period, economics will dictate the level of digestible lysine fed rather than maximum rate of lean gain.

(Key Words: Modeling, Requirements, Economics.)

Introduction

Many pork producers are already adopting phase-feeding programs that increase feed efficiency and improve profitability. Phase feeding refers to a series of diets that are the most profitable at different stages of growth. Key ingredients in feed efficiency are the levels of lysine and other essential amino acids present in the diet. Hogs with genetic capacity for increased lean growth have higher amino acid requirements than hogs with average genetic capacity for lean growth. Also, these requirements change as the pig matures. The percent protein in the diets declines as the pigs increase in weight, and lean efficiency decreases.

Successful implementation of phase-feeding programs is dependent upon the costs associated with them. When evaluating the optimal number of diets to use in a phase-feeding program, producers require information on feed costs, which account for over 60% of total production costs. The focus of this paper is the costs of feeding alternative lysine diets for high-lean growth gilts.

Procedures

Bioeconomic Model. The data from two experiments conducted at Kansas State University were used in this study and included 216 gilts (PIC Line 326 gilts). The objectives of the experiments were to determine dietary lysine requirements for optimal growth performance and measure carcass

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characteristics from 80 to 160 and 160 to 300 lb. Additional details of the experiment were presented in Friesen et al. (p. 134).

Both experiments were designed as a randomized complete blocks (three pigs/pen, six pens/treatment) with six dietary treatments varying from .54 to 1.04% digestible lysine (total dietary lysine ranged from .68 to 1.25% in increments of .1%) for the first experiment (initial weight was 76 lb). Digestible lysine ranged from .54 to .94% (.52 to 1.11% total lysine) for the second experiment (initial weight was 160 lb). Diets were formulated to assure that lysine was the first limiting amino acid. Dietary lysine was increased by adjusting the corn-soybean meal ratio. L-lysine-HCl addition was held constant at .05% of the complete diet.

Nonlinear live weight growth and protein (lean) accretion growths were developed according to previously published procedures. Live weight gain on a test was fit to a linear and quadratic function of days on test. Allometric equations ($Y=aX^b$) were used to develop coefficients for carcass lean where *Y* is carcass lean, *a* is an intercept term, *X* is live weight, and *b* is an exponential growth coefficient. These functions were used to establish the body component growth curves. Daily feed costs were determined using January 1994 average ingredient prices for each diet, which included corn, soybean meal, soy oil, lysine, methionine, monocal, limestone, salt, trace mineral, and vitamins. Once the cost of feeding the single diet over the entire weight range was determined (80 to 160 and 160 to 230 lb), diets were evaluated at 20-lb weight increments to determine recommendations for producers. The cost per lb of lean gain was determined by multiplying the lean efficiency (lb feed per lb lean gain) by the cost per lb of complete feed. The equation for fitting this feed cost per lb of lean gain is:

Cost per lb of lean gain = lean efficiency × cost per lb complete diet

Results

The cost, based on January 1994 prices of each diet, is reported in Table 1. As the amount of dietary lysine in the diet increased, a higher feed cost was incurred. Figure 1 presents the feed costs assuming a constant level of digestible lysine in each diet for 80 to 160 and 160 to 230 lb weight ranges. The lowest total feed costs were found using the .54% diet ($11.97), whereas the highest feed costs were found with the 1.04% diet ($18.18). The biggest increase in cost was between the .94% and 1.04% diet, with an associated cost increase of $4.18 per hog. Similar results were found for the 160 to 230 lb weight range. The .54% diet had the lowest feed costs ($17.44), whereas the .94% diet had the highest costs ($22.70).

Table 1. Feed Costs for Six Different Diets Based On Alternative Lysine Levels

Percent digestible lysine	Diet cost per lb
.54	.0664
.64	.0682
.74	.0704
.84	.0728
.94	.0752
1.04	.0776

Table 2 presents the ratios for average daily gain, average daily feed intake, feed efficiency, average daily lean gain, and lean efficiency for 80 to 160 lb and 160 to 230 lb for each diet. The .84% diet had the most improved lean efficiency (4.89) from 80 to 160 lb while the .74% had best lean efficiency from 160 to 230 lb (8.38). Lean efficiency was highest for the .64% diet for both weight ranges (6.09 and 9.19, respectively). The differences in lean efficiency were not significant from 160 to 230 lb. This suggests that producers should focus on promoting

profitable lean growth from 80 to 160 lb. From 80 to 160 lb, pigs fed a .94% diet grew the fastest (46 days), whereas pigs fed a .54% diet grew the slowest (55 days). However, from 160 to 230 lb, the number of days was approximately the same (38).

The costs per lb of lean gain associated with each diet in the grower period are given in Figure 1. From 80 to 110 or 120 lb, a 1.04% digestible lysine diet had the lowest cost per lb of lean gain. Then the .94% digestible lysine diet had lowest costs from 110 or 120 lb until 160. A similar analysis of the 160 to 230 lb weight range revealed that the .54% digestible lysine diet had the lowest costs per lb of lean gain. These digestible lysine levels also resulted in maximum lean gain for the respective weight periods. The cost per lb of lean gain increased as liveweight increased from 160 to 300 lb. However, the feed cost per lb of lean gain was minimized for gilts fed .84 and .54% digestible lysine from 160 to 180 lb and from 180 to 300 lb, respectively.

Discussion

These analyses indicate that feeding for maximal carcass lean gain from 75 to 180 lb also results in the most economical production for high-lean growth gilts. From 180 to 230 lb or greater, economics has to be the underlying consideration. The cost of production increases by $.08 to .32 per lb of lean gain when feeding for maximal lean gain instead of cost-effective lean gain from 180 to 300 lb. These economic analyses reflect the changes in the efficiency of lysine use for lean tissue accretion. This suggests the importance of phase feeding throughout the growing and early finishing periods for cost-effective lean gain.

Specific recommendations for the hogs in this study would be to feed three different dietary lysine diets at different weight ranges in order to achieve increased feed efficiency and a faster marketing time. For the 80 to 100 or 120 lb weight range, a 1.04% digestible lysine diet is recommended. From 100 or 120 lb to 160 lb, a .94% diet is suggested, whereas from 160 to 230 lb, the .84% diet is preferred. Using these recommendations results in a 9-day savings in marketing time to offset this increased feed cost.

Using different digestible lysine diets for these pigs makes sense, because they have the genetic capacity for increased growth. However, for your operation, feeding different diets may not be economically feasible because of facility constraints or your feeding system. These results are derived from pigs grown in a controlled experiment under ideal conditions. Consequently, growing hogs in commercial conditions might change the feed costs depending upon your management, feeding system, and crowding. Many different feed programs are available that can be customized for your grower or finishing unit and the pigs' genetics. Analyzing differences in feed costs with respect to alternative lysine levels is one way to improve the bottom line.

Table 2. The Influence of Dietary Lysine on Selected Growth Performance Variables

	Digestible lysine, %					
Variable and live weight range	.54	.64	.74	.84	.94	1.04
Average daily gain, lb						
80 to 160 lb	1.51	1.65	1.63	1.82	1.87	1.82
160 to 230 lb	1.93	1.95	1.97	2.03	2.05	
Average daily feed intake, lb						
80 to 160 lb	4.31	4.23	3.79	4.03	4.14	4.03
160 to 230 lb	6.24	6.45	6.43	6.67	6.49	
Feed efficiency, lb						
80 to 160 lb	2.88	2.56	2.32	2.20	2.16	2.23
160 to 230 lb	3.25	3.32	3.28	3.29	3.17	
Lysine intake, g/day						
80 to 160 lb	14.86	15.35	16.86	19.39	22.18	24.02
160 to 230 lb	18.97	23.13	26.55	31.18	33.87	
Average daily lean gain, lb						
80 to 160 lb	.73	.84	.94	1.02	1.01	.95
160 to 230 lb	.76	.70	.81	.75	.74	
Lean efficiency						
80 to 160 lb	7.16	6.61	5.26	4.89	5.44	5.47
160 to 230 lb	8.83	9.19	8.38	8.54	8.77	
Days to market						
80 to 160 lb	54.8	51.3	51.3	47.8	45.5	46.7
160 to 230 lb	37.3	37.3	38.5	37.3	37.3	

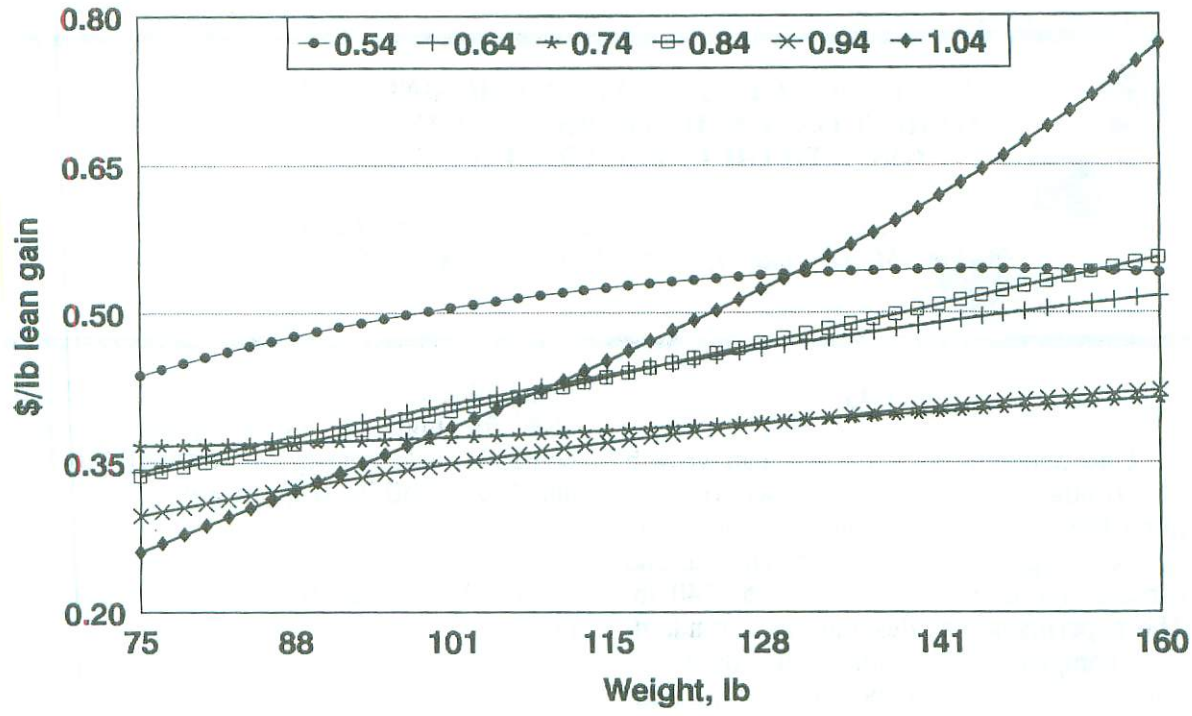

Figure 1. Feed Cost per Lb of Lean Gain for High-Lean Growth Gilts Fed .54 to 1.04% Digestible Lysine from 75 to 160 Lb

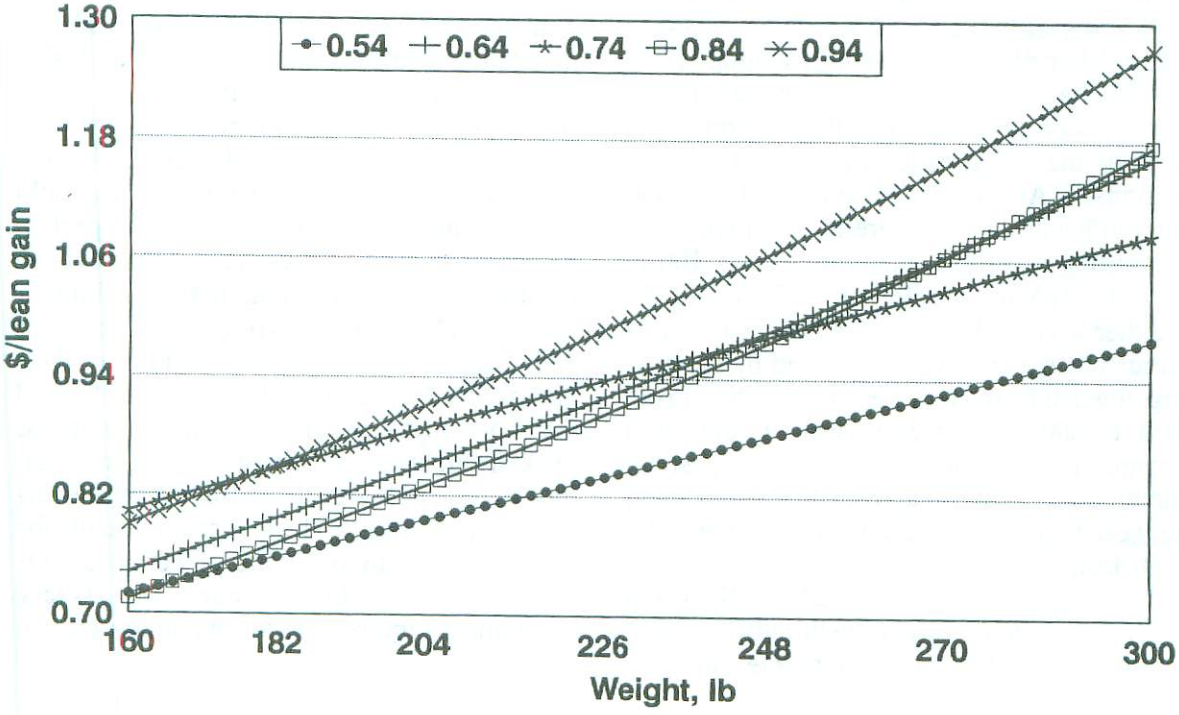

Figure 2. Feed Cost per Lb of Lean Gain for High-Lean Growth Gilts Fed .54 to .94% Digestible Lysine from 160 to 300 Lb