

SWINE UPDATE

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Animal Sciences & Industry

Ways to View Economics of Your Nutrition Program

What is the best way to express dietary economics?

The swine industry has evolved to place a greater emphasis on business principles and increased understanding of various economic facets of swine production. The National Pork Producer's Council's leadership in adopting standardized financial measurements is an example of this evolution.

Methods to express the economic return of the nutrition program for the swine business have also evolved. In the past, simplistic measures such as diet cost per ton were commonly evaluated. Today measures that assign a quality value to the feed input, such as cost per pound of gain are common. The evolution is continuing with many production systems now basing nutritional decisions on margin over feed cost, instead of cost per pound of gain.

The next step in this process is to incorporate risk analysis into the dietary economics discussion. In this update, we will discuss the importance of moving to these more complex measures to determine the economic value of nutrition decisions. In the April 2000 *Swine Update* we demonstrated that different lysine levels will be optimal in grower diets depending on whether cost per pound of gain or margin over feed cost is your response criteria. Here we will share results of a recent study on increasing added dietary fat to discuss how the method of valuing dietary economics changes decisions on diet formulation.

What is the optimal level of added fat in each grow-finish diet?

Briefly, in this experiment we used 480 pigs in a commercial research facility to determine the influence of fat additions to the grow-finish diet on pig performance and carcass composition. For details about the study and actual data results, please see the 1998 KSU Swine Industry Day Report, page 181. The four dietary treatments

were based on increasing added dietary fat (0, 2, 4, or 6 percent).

The change in growth response from one phase to the next as influenced by increasing added fat is listed as a percentage improvement over the control diet in Table 1. The influence of added fat on Average Daily Gain (ADG) was greater (1.5 percent for every 1 percent fat) and more consistent during phase 1 than during subsequent phases. Overall, addition of each 1 percent fat resulted in approximately a 1 percent increase in ADG.

The negative influence of added fat on ADFI became greater as the trial progressed with approximately a 1 percent reduction in ADFI for every 1 percent added fat. The most consistent response to dietary fat was the improvement in F/G. Every 1 percent addition of fat resulted in approximately 2 percent improvement in F/G. Not only was the F/G response to added fat consistent among the three phases, within each phase, increasing added fat from none to 2, 4, or 6 percent resulted in a 4, 8, and 12 percent improvement in F/G.

Table 1. Influence of Each 1% Increase in Added Dietary Fat on Percentage Response in Pig Performance

Item	ADG	ADFI	F/G
Average daily gain			
Phase 1 (80 to 130 lb)	1.5%	-0.8%	-2.0%
Phase 2 (130 to 210 lb)	.8%	-1.1%	-1.6%
Phase 3 (210 to 265 lb)	.6%	-1.3%	-1.9%
Overall	.83%	-1.1%	-1.8%

We conducted an initial economic analysis for the production system using the ingredient costs at the time of the study. Using this economic scenario, adding fat to the diet did not consistently reduce feed cost per pound of gain. Economic calculations must also include the impact of the improvement in ADG. The value of the extra gain



will depend on the availability of grow-finish space. For systems that have excess space or can easily contract additional space, the advantage in ADG is only worth the reduced number of days in the facility. For example, adding 6 percent fat to the diet during phase 1 and 2 reduces the number of days needed for pigs to grow from 80 to 210 pounds from 78 to 73 days. If the space is only worth \$.10/day, the extra gain is only worth \$.50 per pig. The gain may actually not be worth anything if you do not have another pig available to fill the space. But for systems with limited space (i.e., systems with difficulty reaching the desired market weight), the advantage in ADG is worth the extra pounds of pork sold at market after subtracting the extra feed cost (margin over feed cost).

Under this scenario, adding 6 percent fat to the diet during phase 1 and 2 increases the weight per pig by 8.6 pounds (130 vs. 138.6 pound gain) in the same number of days. If market price were \$40/cwt, the extra weight would be worth an additional \$3.44. After subtracting the feed cost of the extra 8.6 pounds (approximately \$1.40), the net benefit of adding fat would be \$2.04/pig. Thus, the economics of whether fat should be added to the grow-finish diet depend on the design of the production system as well as the prices of market hogs, corn, soybean meal, and fat.

To further examine the value of fat for an individual production system, we will consider a series of six grow-finish diets, phase fed from 60 to 265 pounds (Tables 2 and 3). In Table 2, the average prices from a 5-year price series from 1994 through 1998 were used to determine the economics of adding fat to each individual phase. Because fat price can vary considerably depending on the method of purchase and handling, we also present a similar analysis in Table 3 with an extra \$.02/lb added to the fat price. This \$.02 handling charge allows us to evaluate

the sensitivity of the economic scenario to a small change in fat price. Using the prices for the last 5 years (Table 2), feed cost per pig decreases slightly in the first three diets (60 to 164 pounds) as fat is added to the diet. From 164 to 265 pounds, feed cost per pig increases slightly, such that for the overall period, there was no difference in feed cost for pigs fed corn-soybean meal based diets with or without 6 percent added fat. But because of the extra weight gain, adding fat to the diet increased return over feed cost for every dietary phase.

The return ranged from an extra \$1.23 when adding fat to the diet for pigs weighing 60 to 99 lb to \$.02 for pigs weighing 218 to 265 pounds. This is because the response in ADG was greatest in the early phases compared to the later phases. The other cost that must be considered is the potential negative effect on carcass premiums. Recent research from Kansas State University suggests that if a decrease in carcass premium is discernable when fat is added to the diet, it is only because of the fat added during the last dietary phase from approximately 210 pounds to market.

The data in Table 3 demonstrates the impact of a small change in fat price on the economic scenario. By adding \$.02/lb to the price of fat, adding fat to the diet will no longer reduce feed cost during any phase. Feed cost per pig is increased by \$.05 to \$.22/phase or \$.63 per pig if added for every grow-finish phase. So if space were not limited, adding fat to the diet would increase production cost. However, because of the increased weight gain with added fat; it is still economical at the higher price in systems that are limited in space. In this scenario, adding fat to the diet would increase margin over feed cost for every diet from 60 to 218 pounds. The only phase that would realize a net loss by adding fat to the diet is the last phase from 218 to 265 pounds. The improvement in daily gain

Table 2. Example of economic decision on adding fat to the grow-finish diet by phase of production ^a.

Weight		Feed Budget, lb/pig		Feed cost, \$/pig			Feed cost, \$/lb of gain		Extra gain from fat		Value of fat
Initial	Final	With fat	No fat	With fat	No fat	Diff.	With fat	No fat	lb/pig	\$/pig	\$/pig
60	99	76	86	\$6.30	\$6.34	\$.04	\$0.161	\$0.163	3.99	\$1.19	\$1.23
99	133	76	86	\$6.05	\$6.07	\$.02	\$0.178	\$0.179	2.73	\$0.77	\$0.79
133	164	76	86	\$5.69	\$5.70	\$.01	\$0.184	\$0.184	1.89	\$0.51	\$0.52
164	192	76	86	\$5.45	\$5.44	(\$0.01)	\$0.195	\$0.194	1.21	\$0.32	\$0.31
192	218	76	86	\$5.27	\$5.25	(\$0.02)	\$0.203	\$0.202	0.70	\$0.18	\$0.16
218	265	150	170	<u>\$10.11</u>	<u>\$10.07</u>	<u>(\$0.04)</u>	<u>\$0.215</u>	<u>\$0.214</u>	<u>0.24</u>	<u>\$0.06</u>	<u>\$0.02</u>
				\$38.87	\$38.87	\$0.00	\$0.190	\$0.190	10.80	\$3.03	\$303.00

^a Average 5-year prices from southern Minnesota were \$2.51/bu corn, \$207/ton SBM, \$.158/lb fat, and \$.46/lb market hog price.

Table 3. Example of economic decision on adding fat to the grow-finish diet by phase of production with \$.02 handling charge on fat^a.

Weight		Feed Budget, lb/pig		Feed cost, \$/pig			Feed cost, \$/lb of gain		Extra gain from fat		Value of fat
Initial	Final	With fat	No fat	With fat	No fat	Diff.	With fat	No fat	lb/pig	\$/pig	\$/pig
60	99	76	86	\$6.39	\$6.34	(\$.05)	\$0.164	\$0.163	3.99	\$1.19	\$1.14
99	133	76	86	\$6.14	\$6.07	(\$.07)	\$0.181	\$0.179	2.73	\$0.77	\$0.70
133	164	76	86	\$5.79	\$5.70	(\$.09)	\$0.187	\$0.184	1.89	\$0.51	\$0.42
164	192	76	86	\$5.54	\$5.44	(\$.10)	\$0.198	\$0.194	1.21	\$0.32	\$0.22
192	218	76	86	\$5.36	\$5.25	(\$.11)	\$0.206	\$0.202	0.7	\$0.18	\$0.07
218	265	150	170	<u>\$10.29</u>	<u>\$10.07</u>	<u>(\$.22)</u>	<u>\$0.219</u>	<u>\$0.214</u>	<u>0.24</u>	<u>\$0.06</u>	<u>(\$0.16)</u>
				\$39.50	\$38.87	(\$.63)	\$0.193	\$0.190	10.8	\$3.03	\$2.40

^a Average 5-year prices from southern Minnesota were \$2.51/bu corn, \$207/ton SBM, \$.178/lb fat (\$.158/lb plus \$.02 handling charge), and \$.46/lb market hog price.

during this last phase is not great enough to overcome the increased feed cost.

Change in economic response over time.

Due to changes in the prices of ingredients and market hogs, the economic benefit to adding fat to the diet changes over time. The extra feed cost per pig for each dietary phase with the addition of 6 percent fat to the diet is shown in Figure 1. During the early 1990's adding 6 percent fat to the diet decreased feed cost per pig by \$.10 to \$.30 for each dietary phase. Beginning in the middle of 1994, adding fat to the diet has led to increases in feed cost per pig for a period in 1996 and the beginning of 1998. The extra margin over feed cost has more consistently favored the addition of added fat. The only dietary phase that does not show a consistent improvement in margin over feed cost with the addition of fat is the last phase from 218 to 265 pounds. Because of the greater influence of dietary energy on daily gain in the earlier phases, the increase in margin over feed cost due to dietary fat is much greater at lighter weights and decreases progressively as pigs become heavier.

Based on these results and analysis, if finishing space is limited, high levels of fat should be added to the diet for most of the finishing period. But if added fat results in decreased carcass value because of either genetics or other environmental or management factors, it should not be added during the last phases of growth. Lastly, when finishing space is not limiting, the value of added dietary fat is reduced.

Conclusion

Economic analysis of a dietary program should not focus on feed cost per pound of gain alone. More inclusive measurements of profitability need to be included. Margin over feed cost is a relatively easy value to calcu-

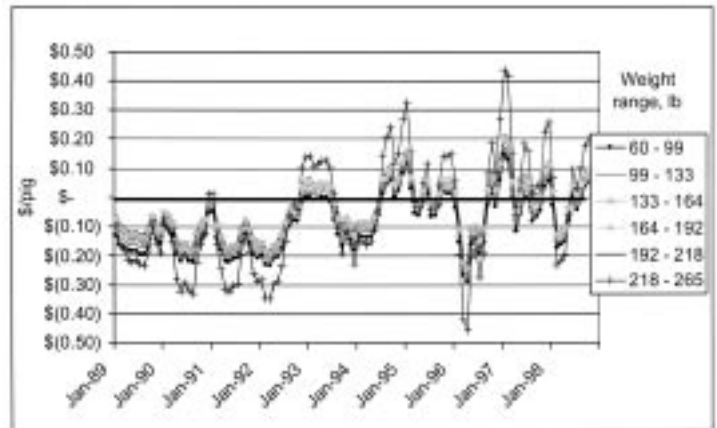


Figure 1. Extra feed cost per pig for each dietary phase with the addition of 6% fat to a corn-soybean meal based diet.

late and provides a more complete picture of the impact of a dietary change on profitability. We describe a case with dietary fat where an increase in diet cost and feed cost per pound of gain actually leads to increased profitability. But producers should avoid the trap of believing that diet cost is not important. Minimizing ingredient cost within any diet formulation continues to be very important. As shown in the examples in Tables 2 and 3, a slight increase in an individual ingredient price can decrease your formulation flexibility. Unless ADG is improved by the higher cost diet, diets that provide the lowest feed cost per pound of gain will continue to be the most profitable.

In conclusion, producers should focus on factors that would either decrease feed costs without affecting productivity or on factors that will increase revenue. But when trying to increase revenue by adding lysine, energy, growth promoting agents, or a carcass modifier to the diet, the increase in revenue must be greater than the increase in feed cost.

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