Economics in Swine Nutrition

The nutritional program for swine has a major influence on profitability as feed cost accounts for up to 75% of swine production cost. The economics involving a nutritional program for swine include feed cost, feed cost per unit of gain, and income over feed cost. Some economic concepts and examples of use of economics in swine nutrition are discussed in this fact sheet.

Economics of a nutritional program

Determining the economic value of a nutritional program is a different process for each production system. There are three potential methods for determining the economics of a nutritional program: feed cost, feed cost per unit of gain, and income over feed cost.

Feed cost

Feed cost only takes into consideration the cost of the diets for comparison between one nutritional program versus another. This method is the simplest and has its greatest and best application when there is no expected change in pig performance associated with nutritional program. However, because changes in ingredients or nutrient levels often change pig performance, it should rarely be used as the main evaluation of economic competitiveness of a feeding program.

Feed cost per unit of gain

Feed cost per pound of gain is calculated by multiplying feed efficiency by the feed cost per pound. The best application of this method is for comparison between nutritional programs when there is an expected change in feed efficiency without a change in growth rate.

Feed cost per pound of gain, $/lb gain =

Feed efficiency × Feed cost, $/lb

Income over feed cost

Income over feed cost (IOFC) is a margin of profit calculated by subtracting feed cost from the revenue, usually on a per pig basis. Revenue per pig is often estimated by multiplying hot carcass weight by hot carcass weight price, or by multiplying total weight gain by live weight price. Feed cost per pig is estimated by multiplying total feed intake by feed cost. Facility cost can be also added to feed cost to estimate the income over feed and facility cost (IOFFC). Typically, facility cost in the United States is around $0.10 to 0.12 per pig per day.

IOFC and IOFFC are accurate methods to determine the economic value of a nutritional program. The best application is for systems that run on a fixed-time basis and for comparison between nutritional programs when there is an expected or possible change in both feed efficiency and growth rate.

Income over feed cost, $/pig =

Revenue, $/pig - Feed cost, $/pig

Income over feed and facility cost, $/pig =

Revenue, $/pig – (Feed cost + Facility cost, $/pig)

Examples of use of economics

The use of economics in swine nutrition is exemplified by the economics of using fats or oils and by the economics of using distillers dried grains with solubles.

Economics of using fats or oils

Energy is the most expensive component of the diet. The use of fat in the diet increases dietary energy and has direct impact on growth rate, feed efficiency, and carcass criteria. The use of fat should be based on an economic analysis to determine the most economical dietary energy level considering the value of incremental changes in energy on production indicators and the market price.

A production tool has been developed to aid in determining the optimum dietary energy level in the grow-finish phase (Net Energy Model). Also, using the appropriate method to evaluate the economics of using fat is essential to determine the most cost-effective diet.

The example in **Table 1** illustrates the use of feed cost, feed cost per pound of gain and income over feed cost, to determine the economics of added dietary fat. The example is a comparison between two nutritional programs with or without 5% added fat in grow-finish diets. The assumption is that diets with added fat are approximately 20% more expensive but result in 10% improvement in feed efficiency and 5% increase in average daily gain in a system running on a fixed-time basis.

In this example, considering feed cost or feed cost per pound of gain, the nutritional program without added fat to grow-finish diets would be more economical. However, taking into account the extra weight gain and improvement in feed efficiency with added fat, there is a $0.76 per pig advantage in income over feed cost with a nutritional program with added fat to grow-finish diets. This would be the interpretation in a system that runs on a fixed-time basis. However, if the system runs on a fixed-weight basis and could take longer to achieve a heavier carcass weight, then feed cost per pig would also be an adequate indicator of the economic value of the nutritional program.

Table 1. An example on how to determine the economic value of added dietary fat in grow-finish diets

Assumptions:	
Diets without added fat	Diets with 5% added fat
- Feed cost: $160/ton or $0.08/lb	- Feed cost: $190/ton or $0.095/lb
- Initial BW: 50 lb	- Initial BW: 50 lb
- F/G: 2.8	- F/G: 2.5
- ADG: 1.80 lb	- ADG: 1.90 lb
- 130 days in the grow-finisher	- 130 days in the grow-finisher
- Final BW: 50 lb + (1.80 lb × 130 d) = 284 lb	- Final BW: 50 lb + (1.90 lb × 130 d) = 297 lb
- Yield: 75%	- Yield: 75%
- HCW: 284 lb × 0.75 = 213 lb	- HCW: 297 lb × 0.75 = 223 lb
- HCW price: $0.70/lb	- HCW price: $0.70/lb
Calculations:	
Feed cost = $160/ton or $0.08/lb	Feed cost = $190/ton or $0.095/lb
Feed cost per lb of gain = 2.8 × $0.08 = $0.224/lb gain	Feed cost per lb of gain = 2.5 × $0.095 = $0.237/lb gain
Income over feed cost = revenue – feed cost	Income over feed cost = revenue – feed cost
Revenue = HCW × HCW price = 213 lb × $0.70 = $149.10	Revenue = HCW × HCW price = 223 lb × $0.70 = $156.10
Feed cost = F/G × ADG × days in finisher × feed cost, $/lb = 2.8 × 1.80 lb × 130 d × $0.08 = $52.42	Feed cost = F/G × ADG × days in finisher × feed cost, $/lb = 2.5 × 1.90 lb × 130 d × $0.095 = $58.66
Income over feed cost = $149.10 – $52.42 = $96.68/pig	Income over feed cost = $156.10 – $58.66= $97.44/pig

Economics of using distillers dried grains with solubles

Corn distillers dried grains with soluble (DDGS) is an economical and widely available feed ingredient for use in swine diets. The economic value of DDGS depends on cost of corn and soybean meal, as DDGS replaces both ingredients in the diet. The favorable price of DDGS relative to corn and soybean meal is often an incentive to greater DDGS inclusion rates. However, dietary inclusion rates of DDGS in grow-finish diets have an impact on growth performance, carcass yield, and pork fat firmness, which affect the economic return of the nutritional program.

A production tool has been developed to aid in determining the economic DDGS levels for grow-finish diets. The KSU DDGS Calculator estimates the economic return from using dietary DDGS at varying levels by considering changes in feed cost and growth performance. However, the impact of DDGS levels on carcass yield or pork fat firmness is not accounted for.

The example in **Figure 1** illustrates the use of the KSU DDGS Calculator. The calculator suggests the DDGS inclusion rate in grow-finish diets to maximize savings per pig. Then, the user can choose the most appropriate DDGS level for the production system. In this example, using a maximum of 30% DDGS in a step-down program would result in savings of $2.67 per pig.

K-State DDGS Calculator (Variable DDGS Energy)

Calculator attempts to consider economic return per pig from change in diet cost, feed efficiency, and growth rate. It does not account for any economic impact on yield or iodine value.

Corn, $/bu	$ 3.25	$ 116.07	**112%** =DDGS to Corn price ratio		
SBM, $/ton	$ 290.00		Use fat to equalize energy	Yes	
Monocal, $/ton	$ 460.00		Include L-Trp in diets?	Yes	DDGS NE, % of corn
Limestone, $/ton	$ 50.00		Energy as % of corn or oil content	Oil, %	90.6%
Lysine HCl, $/lb	$ 0.70		DDGS oil content, %	8.0%	
DL-Met, $/lb	$ 1.20		Value of pig gain, $/lb	$ 0.70	
L-Threonine, $/lb	$ 0.90		Fat, $/lb	$ 0.20	
DDGS, $/ton	$ 130.00		L-Trp, $/lb	$ 3.90	

Start weight, lb	**50**	**75**	**125**	**170**	**210**	**246**	
End weight, lb	**75**	**125**	**170**	**210**	**246**	**280**	
DDGS maximum value	**F1**	**F2**	**F3**	**F4**	**F5**	**F6**	**Total**
DDGS % at max savings	**40**	**40**	**40**	**30**	**25**	**20**	
Max savings, $/pig	**$0.46**	**$1.01**	**$0.93**	**$0.77**	**$0.62**	**$0.49**	**$4.26**
DDGS levels chosen	**30%**	**30%**	**30%**	**20%**	**10%**	**0%**	
- Savings, $/pig	**$0.35**	**$0.77**	**$0.76**	**$0.52**	**$0.27**	**$0.00**	**$2.67**

Figure 1. An example on how to determine the economic DDGS level in grow-finish diets using the KSU DDGS Calculator.

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