Volume 1

MANAGING Feed Costs

PRAIRIE SWINE CENTRE

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In-barn management to reduce feed costs

When feed prices are high, producers and nutritionists may look at adjusting feed formulations and feed processing options to save money (see other factsheets in this series). However, there are things producers can do in the barn that can also help decrease overall feed costs. The finishing period accounts for approximately 80% of total feed cost. If you are looking to re-evaluate your feeding program, you should start here.

There are multiple factors affecting feed usage and feed efficiency in a barn, including **feeder settings**, **water access** and **health status** of the herd. **Market hog weight** also plays an important role in overall feed costs.

HERD HEALTH

Herd health can have a significant impact on feed costs in a grow-finish pig barn. A facility with high herd health is less likely to suffer from various diseases and infections. Vaccinations, biosecurity measures, and proper sanitation practices can help prevent diseases from spreading within the herd and reduce the need for disease treatment and medication. This reduces both the cost of medication and the loss of productivity that may be associated with diseases. Sick pigs tend to have reduced appetite and eat less, resulting in slower growth rates and increased time required to reach market weight. Disease conditions can lead to digestive issues including reduced nutrient absorption, resulting in poor feed efficiency. Healthy pigs, on the other hand, have good feed intake, leading to faster growth and shorter periods in the barn. Healthy pigs generally have improved feed efficiency, resulting in reduced feed costs per unit of weight gain. Herds with good health also often experience lower mortality and fewer pigs culled due to illness or poor growth. This means we dedicate fewer resources to pigs that do not reach market weight or die prematurely.

Early detection of sick, injured, or unthrifty pigs is important. Segregate fallback pigs and sick pigs for treatment, special care and further monitoring. Follow your veterinarian's advice for individual pig treatment and care, including medication use, and when and how to euthanize animals. Also, consult with your veterinarian to develop a comprehensive herd health program.

Overall, maintaining herd health is vital for efficient feed utilization, minimizing disease-related costs, and optimizing productivity in a grow-finish pig barn, which all affect feed costs.

FEEDERS

Feed wastage should always be minimized, but especially when prices are high. Every gram of feed wasted is a gram of feed paid for without getting anything in return, while essentially dumping money and feed into the pits. Several aspects of feeder design play a role in controlling feed waste. First, the type of feeder can have a direct impact on the amount of feed wasted. Wet-dry feeders improve feed intake and weight gain, and some research has shown they can also help improve feed efficiency likely due to less feed wastage. Therefore, wet-dry feeders are preferred in grow-finish barns. If switching to new feeders is not in the cards, there are other things you can do with your existing feeders to reduce feed waste.

An important factor affecting feed wastage is proper feeder adjustment and relative pan coverage. Pan coverage refers to the percentage of the feed pan's flat portion covered by feed. Each speck, dusting or mound of feed counts in the pan coverage percentage.

Optimal pan coverage ensures adequate feed access while minimizing waste, at the same time reducing plugging of feeders, leading to out-of-feed events. Feeder settings (size of the feeder opening) depend on the feed form (pelleted or mash) and particle size, with the feeder adjusted in such a way to achieve optimal pan coverage.

Figure 1. Approximately 50% pan coverage

Figure 2. Approximately 35% pan coverage

The recommended pan coverage for pigs weighing between 30 and 70 kg (66 and 154 lb) is 40 - 50% (see Figure 1) and for pigs weighing more than 70 kg (154 lb) it's 30 - 35% (Figure 2).

Look for signs to show if pan coverage is adequate. If feed is present on the floor around the feeder, tighten or narrow the feeder opening. On the other hand, if pigs appear to work too hard for feed, or the amount of fighting observed at the feeder is high, clean the feeder, and adjust the feeder opening wider.

Pan coverage has an opposite impact on weight gain and feed efficiency; increasing pan coverage increases weight gain but reduces feed efficiency. In times of high feed prices and low hog prices, it makes financial sense to reduce pan coverage to the lower end of the recommendations increasing feed efficiency, even if it reduces weight gain a bit.

However, if you see sustained aggression near the feeder, the pigs may not get enough feed and you should adjust the feeder accordingly. Reducing feed cost is important but not at the cost of animal welfare. Check feeders daily and adjust when required to maintain optimal pan coverage.

Another aspect of feeders to keep in mind is the number of pigs per feeder space. For dry feeders, it is recommended to have eight pigs per feeder space, and for wet-dry feeders the recommendation is 12-13 pigs per feeder space. Having more feeder spaces than necessary allows pigs to spend more time at the feeder and to play with the feed, which causes more feed waste.

WATER

Providing adequate water access to pigs in grow-finish barns is crucial for maintaining proper hydration, encouraging feed intake, helping in digestion and nutrient utilization, and promoting optimal body temperature regulation. All these factors together contribute to improved feed efficiency, as water intake is 2-3 times greater than feed intake. Enough drinkers should be provided to ensure all pigs have access to water without overcrowding, providing at least one drinker for every 10 pigs. An extra water source also provides additional benefit, regardless of the type of feeder used.

Bowl drinkers have lower levels of water wastage than nipple drinkers do; however, well-managed nipple drinkers can effectively reduce water wastage. The ideal settings for nipple drinkers in grow-finish pig barns may vary depending on various factors such as pig size, environmental conditions, and water quality. However, there are some general guidelines:

- Height: Set the height of nipple drinkers mounted at 90° at roughly shoulder height of the smallest pigs in the pen, and set drinkers mounted at 45° to 5 cm (2 inches) above the back of the smallest pig in the pen, ensuring easy access. Mounting nipple drinkers lower than required will increase water wastage.
- Flow rate: Adjust flow rate to ensure an adequate water supply without excessive wastage. Adjust flow rate based on pig weight. A good flow rate for grow-finish pigs is 0.5 to 1 liter per minute.
- Water pressure: Regulate the water pressure to provide an appropriate flow rate for the drinkers without causing excessive water spillage or leakage. Typically, a water pressure of 20-30 psi (pounds per square inch) is suitable for drinkers in pig barns.
- Cleaning and maintenance: Regular cleaning and maintenance of drinkers are essential to prevent water contamination and blockages. Proper checks and adjustments ensure the drinkers are functioning correctly and providing a sufficient and clean water supply.

Refer to the manufacturer's recommendations for information on drinker capacity and set-up. It is also recommended to consult with a veterinarian or manufacturer to ensure the best settings and practices specific to your farm's conditions and requirements.

MARKET HOG WEIGHT

What is the best weight to ship hogs to market? You might think the optimal market hog weight is the one that achieves the highest index and premiums from the packing plant. It is true that your income will be the highest in this scenario. However, you need to consider the costs associated with this market weight.

Increasing market weight results in the hogs staying in the barn longer. Of course, this means they eat more feed, increasing feed costs. On top of that, feed efficiency decreases as hogs grow bigger, so it costs more to add a kg of weight at 125 kg vs. at 90 kg. In other words, there are diminishing returns. Hitting that optimal weight on your grading grid may cost more than you get back!

The best way to calculate your optimal market hog weight is to use income over feed cost (IOFC). This takes into account both sides of the equation. In order to calculate IOFC you will need information on finisher diet cost, market hog price, carcass information including weight, fat, lean, and premiums, and feed efficiency for different weight classes. We will go into more detail on how to calculate IOFC in another factsheet (Measuring = Knowing). Calculating IOFC is an important part of your marketing strategy, targeting weight classes that have the highest IOFC (Figure 2). When feed prices increase, revenue and market hog weight decrease. On the other hand, when hog prices increase, revenue and market hog weight increase. The more volatility and fluctuations we see in hog and grain prices the more important IOFC becomes as your optimal market weight will change more frequently. You should calculate your optimal market weight monthly or at least every quarter.

	Weight Class					
	5	6	7	8	9	10
Min Live Wt.	120.3	126.6	132.9	139.2	145.6	151.9
Max Live Wt.	126.6	132.9	139.2	145.6	151.9	158.2
	Hog Value					
Hog Price $210 ckg	$241.59	$258.54	$270.48	$281.73	$287.99	$285.25
Feed Cost (mt)	Margin Over Feed Cost					
$300	$126.02	$136.73	$142.17	$147.22	$147.11	$138.09
$350	$110.54	$120.21	$124.56	$128.59	$127.41	$117.34
$400	$95.05	$103.69	$106.96	$109.95	$107.71	$96.59
$450	$79.57	$87.16	$89.35	$91.31	$88.01	$75.84
$500	$64.09	$70.64	$71.74	$72.67	$68.31	$55.09

Figure 2. Income over feed cost (IOFC) at different market hog weights

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Reducing feed costs through diet processing

Over the past two year pork producers have seen record feed prices but have been fortunate to have a bit of reprieve over the past couple of months. While this is good news for the bottom line, strategies to reduce feed cost and find efficiencies in your feeding program should not change as feed prices moderate. While making changes to in-barn management and feed formulation are important steps in reducing cost of production (see other factsheets in this series), additional things can be done through feed processing to get the most out of your feed.

REDUCE PARTICLE SIZE TO INCREASE FEED EFFICIENCY

Grinding is an important part of feed processing. Grinding damages the seed coat, hulls, and other structures so that dietary enzymes in the pig's gut can access nutrients inside the grain. Grinding reduces particle size and results in better digestibility and subsequently feed efficiency. Grinding can be done with a hammer mill (Figure 1), a roller mill, or a disc mill.

As a general rule of thumb, smaller particle size results in better digestibility and feed efficiency. For example, feed efficiency improves by 1.2% for every 100 microns reduction in particle size, in corn-soybean meal diets.

On the other hand, grinding uses energy and impacts how quickly you can process grain. If ground too fine, it can cause bridging and other flow issues in the barn's feeding system. In extreme cases, very fine particles can also cause gastric ulcers in pigs, one reason why particle size average should not be lower than 500 µm, with the ideal average particle size being 650-750 µm. Grinding will create a distribution of fine and course material, but the average particle size should be approximately 700 µm. The quantity of finer particles (<400 µm) and the coarsest fractions (>1600 µm) should be as low as possible, and the recommended standard deviation of particle size is below 2.7.

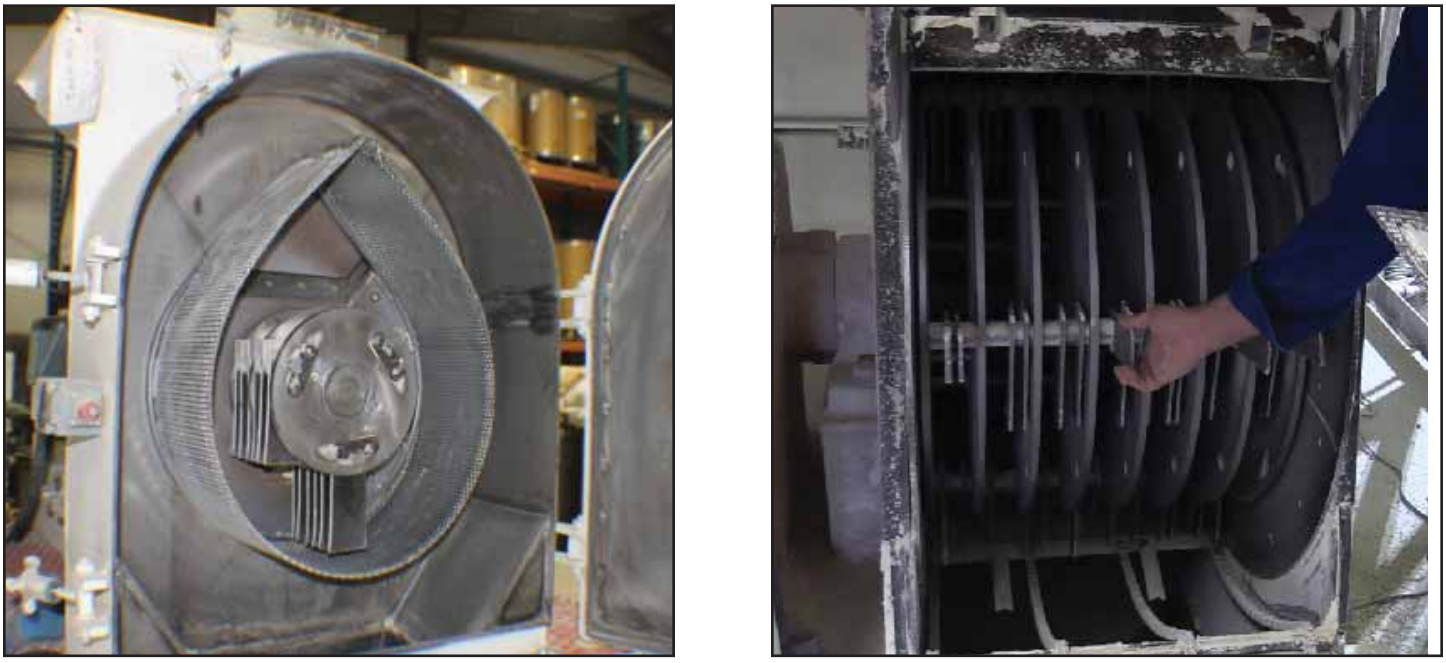

Figure 1. Small hammer mill (left) and commercial size hammer mill (right)

The cost of grinding depends on the type of mill (roller mills use less energy than hammer mills), type of ingredient (wheat is faster and thus cheaper than barley), and particle size (the smaller the more expensive) but will generally be below $1/mt. The condition of the mill also affects the cost of grinding. Items such as screens and hammers wear out over time (Figure 2,3, and 4). For hammer mills, change the direction of the rotor rotation frequently to ensure even wear on both sides of the hammers and screen holes. Change the direction of the hammermill rotor at least every 2 weeks. It is important to maintain the mill on a routine basis for a number of reasons. As parts wear, the machine becomes less efficient, resulting in higher energy needs and a decrease in grinding efficiency. Replace hammers and screens when the cost of lost production due to decreased efficiency is greater than the cost of the replacement parts.

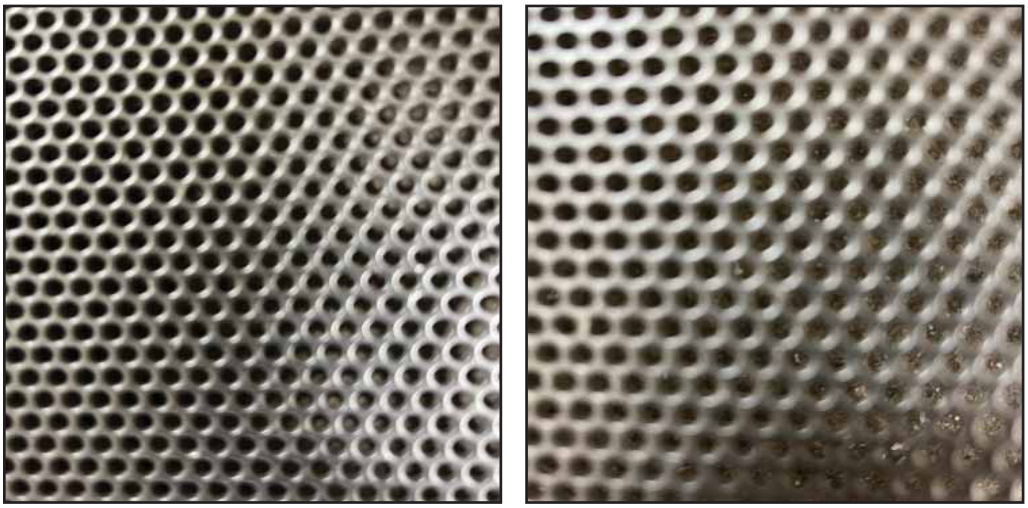

Figure 2. Left: hammer mill screen in good condition. Right: worn hammer mill screen (photo credit: Danilo Sotto, Western Ag Supply).

Figure 3. Damaged hammer mill screen (photo credit: Charles Stark, Kansas State University)

Figure 4. New hammers (top) and worn hammers (bottom) of a hammer mill (photo credit: Danilo Sotto, Western Ag Supply)

MEASURE PARTICLE SIZE REGULARLY

Your grinder directly affects particle size through the condition of the screen and hammers of the (hammer) mill. This is another reason why regular maintenance is very important. Ingredients themselves also affect particle size; for example, soft wheat grinds easier and produces finer particles than ingredients with a high fibre content. For this reason, measure particle size after changes to feed formulation.

It is a good idea to measure particle size regularly. Particle size cannot be measured on pelleted feed, for this reason make sure you take a sample of the mash feed before pelleting. You have two options: send samples to a laboratory for particle size analysis, or measure particle size in house, which requires a specific set of sieves. You can buy a full setup with 10 to 14 sieves and a rotary shaker. However, even with only three sieves and shaking those by hand with the aid of a few balls and carnucles will do the trick. You will need a small scale as well. Kansas State University provides information about this procedure and a spreadsheet to calculate the particle size for you at https://www.asi.k-state.edu/extension/swine/particle-size-information.html.

Figure 5. Barley ground through a hammer mill

Figure 6. Rotary tap shaker with full sieve setup (left), and three-sieve hand shaking setup (right)

USE PELLETED INSTEAD OF MASH DIETS

Diets can be fed as mash or pellets. Pelleting increases the cost and time needed to process diets. Despite this, pelleting offers several advantages that could provide a good return on investment.

The main benefit of feeding a pelleted vs. a mash diet is an improvement in nutrient digestibility thanks to steam and heat treatment of the ingredients. On top of that, a smaller particle size incorporated in pelleted diets improves feed efficiency, although ulcers would be a concern with this approach.

Another benefit of pelleting is that it improves flowability in the feed system. Thanks to the better flowability there is less chance of out-of-feed events. Out-of-feed events are costly. Every time an out-of-feed event occurs, it adds a full day to the time to slaughter and it can lead to health issues such as ulcers. The cost of out-of-feed events is estimated to be around $2.50 per pig per event. The use of smaller particle size is also possible thanks to the reduction of flowability issues. Moreover, pelleting allows for higher inclusion levels of ingredients that cause flowability issues when fed as a mash.

Another benefit of pelleted diets is that there is less separation of ingredients during feed handling and pigs are also not able to sort diet ingredients to the same extent as mash diets, so pigs get a more homogeneous diet with pellets. Pigs also seem to waste less feed when they are on pelleted diets vs. mash. Lastly, feeder adjustment is more predictable with pelleted vs. mash feed and results in less plugging of feeders. Partially plugged feeders decreases pan coverage and results in lower feed efficiency. See the factsheet 'In-barn management to reduce feed costs' for more information on feeder adjustment.

All these benefits result in better feed efficiency and growth performance of 3 to 8 % when feeding pellets vs. mash. With the increased cost of feed ingredients, the economics of pelleting are becoming much more favorable. Even a modest improvement in feed efficiency of 2-3% would pay for the cost of pelleting given current ingredient prices. For example, an improvement of 3% in feed efficiency means that feed can cost 3% more to maintain overall feed cost. At a feed cost of $400/tonne, if pelleting improves feed efficiency by 3%, it will pay for itself at $12 or under per tonne. If feed cost increases to $460/tonne, pelleting is profitable at $13.80 or under per tonne. Pelleting will generally cost under $10 per tonne for mills pelleting high volumes of feed but can be higher for smaller mills that process smaller batches. If you are interested in switching to pelleted feed, talk to your feed mill to see if they are equipped with a pellet mill and how much they charge per tonne.

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Diet Formulation When Feed Costs are High

When feed costs are high, focusing on diet formulation is one way that you can help keep the costs in check. Feed formulation programs should change from targeting maximal performance to instead targeting 'optimal' performance, with optimal meaning the performance level at which the net income of the farm is maximized. Some of the options to reduce feed costs include reducing the net energy (NE) level, using alternative ingredients, formulating diets based on standardized ileal digestible (SID) amino acid (AA) to net energy ratio, reducing safety margins and re-evaluating your phase feeding program.

DIETARY ENERGY LEVEL

Energy is by far the most expensive component of feed cost. It is no surprise reducing the energy level in the feed reduces the price of the feed, through the use of alternative ingredients including peas, faba beans, wheat or corn DDGS, wheat millrun, and even oats. Diets should be formulated on net energy level, rather than digestible energy (DE) or metabolizable energy (ME) levels, as net energy provides the closest estimate of the dietary energy available to the pig for maintenance and growth. Using the NE system in feed formulation is especially important when feeding alternative ingredients. Many of these ingredients are high in fibre, which increases the heat increment - this is the energy lost due to heat production. Formulating diets based on DE or ME levels will overestimate the energy available to the pigs from high fibre ingredients.

Standard grow-finish pig diets have a NE level of around 3.5 to 4.5 Mcal/kg. This can be reduced to 2.2 or even 2.1 Mcal/kg without major effects on growth rate, as long as pigs are able to increase their feed intake to make up for the lower dietary energy level. Income over feed cost, a parameter to measure a farm's financial success, can increase by a whopping $2-$10 per hog when feeding low NE diets.

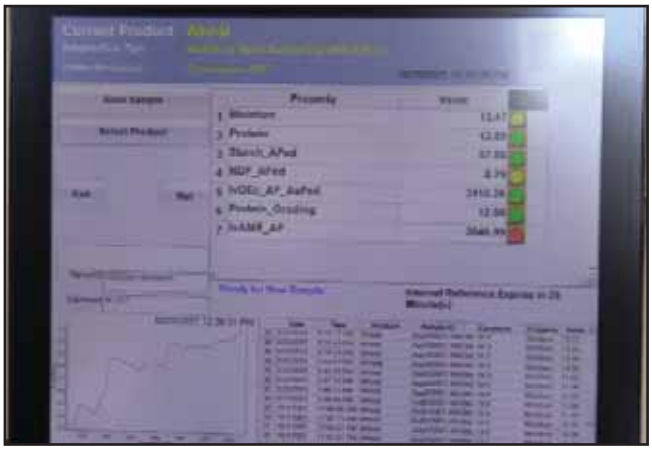
It is hard to identify in advance which herds will be able to increase their feed intake and which herds won't. Many factors can affect daily feed intake: crowding, lack of feeder access, high temperatures in the barn, inadequate access to water, poorly balanced diets and certain genotypes are all associated with low feed intake. However, one of the biggest factors is herd health. Healthy pigs have bigger appetites than sick ones and can adapt to lower energy diets more effectively than herds wrestling with a variety of health problems; be cautious decreasing energy levels during a health challenge. Evaluating the use of very low dietary energy levels in the summer is important, as heat stress causes pigs to eat less.

FORMULATE DIETS BASED ON SID AA : NE RATIO

As mentioned before, it is important to formulate diets using the NE level of ingredients rather than DE or ME level. Another important aspect of formulating diets is to use the standardized ileal digestible amino acid content, rather than the total amino acid content of an ingredient. Using the SID AA level helps diets better meet the nutritional needs of the pig. The ratio between SID AA content and NE level should stay the same. In other words, if the NE level of the feed is decreased, the SID AA content should also be decreased, so that the SID AA : NE ratio stays the same. The reason for this is that pigs eat more when feed is low in NE, and if the SID AA content stayed the same in the diet, then the pigs would receive more AA than they need, so you would be paying for amino acids that the pigs don't use. The ideal SID AA : NE ratio changes as pigs grow bigger and can also be influenced by sex and genetics. It is best to discuss with a nutritionist what the SID AA : NE ratio should be for the different growth phases on your farm and how to estimate the SID AA content and NE level of ingredients.

RE-EVALUATE (REDUCE) SAFETY MARGINS

Nutritionists build in safety margins in dietary nutrient levels to account for variation in ingredient nutrient composition, feed mixing, and pig requirements. At high feed prices, safety margins are very costly and may not provide much in return. That's why it is important in times of high feed prices to reduce safety margins to save money. Measuring nutrient composition of incoming ingredients decreases the need for large safety margins. The introduction of the near-infrared (NIR) technology has made it possible to measure ingredient nutrient composition accurately and quickly at the feed mill. The cost of NIR machines have come down, making it a good investment to reduce safety margins of diets.



RE-EVALUATE YOUR PHASE FEEDING PROGRAM

Energy and nutrient requirements change as pigs grow. In an ideal world, we would be feeding exactly what the animal needs for growth and maintenance. However, unless you have precision feeding equipment available, it is not possible to change diets every day or even every week. Instead, you can divide the nursery and grow-finish stages into several feeding phases and in each phase, you can feed a diet with different energy level and different AA/protein, vitamin, and mineral composition to allow diets to be formulated closer to the pigs' needs. The more phases, the closer feed can be to the pig's nutrient requirements. However, bin space and freight costs play a role in the ideal number of phases to feed. Typically, divide the nursery stage into two or three phases, and in the grow-finish stage, three to five phases is ideal. In Figure 1, you can see how a feeding program using two phases is either underfeeding or overfeeding lysine more distinctly than a feeding program using five phases. Underfeeding nutrients leads to suboptimal growth, while overfeeding nutrients causes costly nutrients to be wasted. It is, therefore, important to look at the phase feeding program in your barn to reduce the overall diet cost per pig and to reduce nutrient excretion.

Feeding phases are often set based on body weight. Not every barn can easily weigh pigs, so how do you know when it's time to switch to the next phase? This is where feed budgets come into play. Feed budgets are a practical way of implementing phase feeding without the need for estimating pig weights in the barn. Feed budgets take into consideration cumulative feed consumption estimates over the entire weight range in the grow-finisher. For each feeding phase, calculate individual feed intake based on estimated feed conversion ratios, and multiply this by the number of pigs in the barn or room. Deliver the total calculated amount of feed to the barn/room, switching to the next phase when all the feed has been consumed. It is a good idea to monitor the growth rate of the pigs in the grow-finish barn evaluating if the feed provided is supporting the desired growth targets. If feed conversion is different than expected - for example due to a health challenge (reduced feed efficiency) or genetic improvements of the pigs (improved feed efficiency) - then the switch to the next phase will not happen at the expected body weight and the current phase diets will not be optimal for the nutrient requirements of the pigs, ultimately leading to increases in total feed costs.

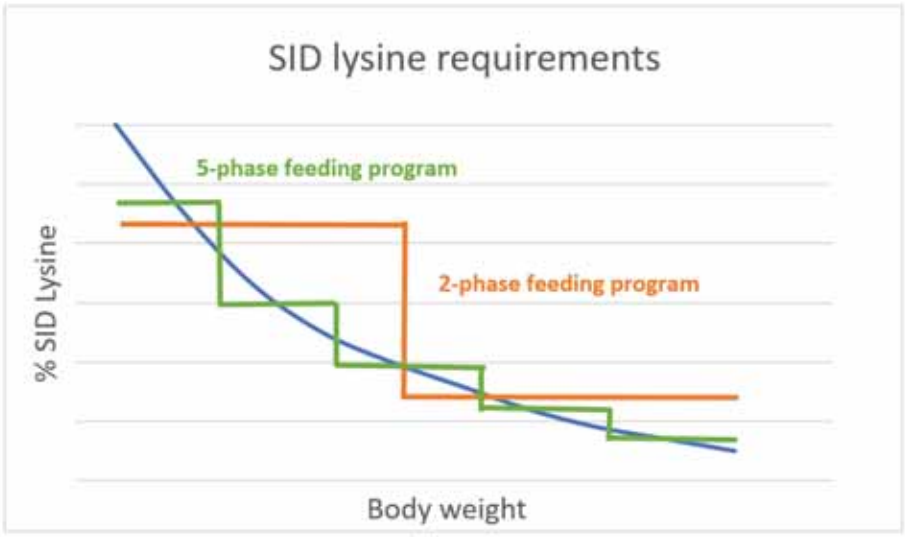


Figure 1. Example of how a 2-phase and 5-phase program would match the SID Lysine requirements of a grow-finish pig.

ALTERNATIVE INGREDIENTS

Standard pig diets contain corn or wheat as the main energy source and soybean meal as the main protein source. A variety of locally grown alternatives could decrease the feed cost. Some alternative protein sources include canola meal and canola or soy expeller cake. Expeller cake has more oil left compared to meal, so it decreases the need to add fat/oil to the diet. Corn and wheat DDGS, as well as wheat millrun are some alternative energy sources, while field peas, faba beans, and lentils are a good source of both energy and protein.

It is important to analyze the quality and nutrient composition of alternative ingredients before incorporating them into your diets. Some of these alternative ingredients contain antinutritional factors and for that reason, there are recommendations for maximum inclusion levels in the diet. Please talk to a nutritionist if you're not sure how much of an alternative ingredient you can add to the diet, in addition to introducing new ingredients gradually to allow pigs to adapt to the changes in their diet.

Most alternative ingredients are higher in fibre than the standard corn-soybean meal diets, potentially resulting in reduced growth rates. This may sound undesirable, but in a high feed cost environment, especially when combined with low hog prices, it is better to reduce costs than to increase revenue. If you measure feed intake and growth rates in your barn, you can calculate the feed cost per pig, feed cost per kg of BW gain, and the feed cost per pig place. These parameters should be your guide to decide whether it makes financial sense to add alternative ingredients into your diets.

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Measuring Success When Feed Costs are High

It is often said that measuring is knowing and that if you cannot measure it, you cannot manage it. This is largely true for hog operations as well. In times of high hog prices and low cost of production there seems to be little need to measure and improve things. After all, measuring takes time, something we all have very little of. Unfortunately, the pork industry has not been in such a lucky position over the past two years, instead has been battling with very high feed costs and other costs. When every penny counts, it becomes worthwhile to spend the time to measure certain barn parameters. This factsheet focuses on which parameters are good to measure on farm and translate to good measures of success.

MEASURING = KNOWING

What is the best way to measure success in the barn? Should we base it on maximum growth performance and barn throughput, or focus on reducing input costs? As feed is the largest component in cost of production, reducing feed cost would have the biggest impact on the bottom line. Does that mean we should focus on a least-cost diet formulation to keep costs down? When it comes to diet formulation, you should look at both the cost of the diet and the resulting growth performance. Several factors will affect both the price and feed efficiency of diets, including the use of alternative high fibre ingredients and the dietary energy level. Changing to a cheaper diet only makes sense if the savings in the diet cost are greater than the loss in growth performance. A good way to measure this is by calculating the feed cost per hog and per kg BW gain, as follows:

- Feed cost ($/hog) = feed intake (kg/pig) x feed cost ($/kg)
- Feed cost ($/kg BW gain) = feed intake (kg/pig) / growth rate (kg/pig) x feed cost ($/kg)

These equations will help you to decide which diet formulation will generate the best return, as long as you know the expected diet effects on feed efficiency. Least-cost diet formulation may not result in best feed cost per kg BW gain, due to changes in animal performance.

These equations take into account feed cost and growth performance, but they fail to take into account revenue or operating costs. A better measure of success is to look at the income over feed cost or the income over feed and operating costs, for which you need to know the carcass revenue across weight classess. Carcass revenue is dependent on the dressed weight, lean yield and backfat measurements of the carcass. Use your grading certificates (lean yield, index, premiums) from your packer to calculate carcass revenue as follows:

- Carcass revenue ($/hog) = (price ($/ckg) x index/100 x dressed weight (kg)) + premiums ($)

To calculate income over feed cost and income over feed and operating cost, use the following equations:

- Income-over-feed-cost ($/hog) = carcass revenue ($/hog) – feed cost ($/hog)
- Income-over-feed-cost ($/hog) = carcass revenue ($/hog) – feed cost ($/hog) – operating cost ($/hog)

Diet formulation can affect lean, backfat, and yield and subsequently carcass revenue, therefore income over feed cost provides a more accurate picture of the economic value of your nutrition program. It is therefore best to calculate the income over feed cost for different diet formulations.

GETTING THE FEED CONVERSION RATIO

Having a good handle on feed conversion (feed intake divided by growth rate) is essential in determining the economic value of your feeding program. The better data you have regarding feed intake and growth performance, the more accurate calculations of economic value are. Most producers can calculate feed intake (per phase) by dividing the total amount of feed delivered to the room or barn by the total number of pigs per room or farm. If you work with a nutritionist, feed conversion ratios are available on your feed budgets, and available for different weight ranges in the grow-finisher. The problem with this approach is that feed conversion in your barn might be different than expected - for example due to a health challenge (reduced feed efficiency) or genetic improvements of the pigs (improved feed efficiency), resulting in feed cost per kg BW gain and income over feed cost not being accurate.

As mentioned in the factsheet 'Diet formulation in a high feed cost environment', it is important to audit your feed budgets, so switching to the next diet will happen at the expected body weight. For this reason, weigh pigs at the start and end of each phase, so you know the actual weight of your pigs instead of relying on assumed weight ranges. This will allow for more accurate calculations of economic value. The equation for feed conversion is then as follows, depending on what information you have:

- Feed conversion kg/kg) = Feed intake per pen (kg) / (pen end weight (kg) – pen start weight (kg))
- Feed conversion kg/kg) = (feed delivered to the barn (kg) / number of pigs) / (average end weight per pig (kg) – average start weight per pig (kg))

MEASURING BODY WEIGHT

The best way to measure body weight is by using a scale, individually or for groups of pigs. While scales are not cheap, their benefits provide significant return on investment, by allowing you to accurately determine when to change to the next phase diet, and by ensuring all pigs going to market are within the target grid. If your barn does not have a scale available, a much cheaper and still somewhat reliable option to estimate body weight is by using a heart girth weigh tape. The heart girth is measured by wrapping a tape measure around the pig, just behind the forelegs and shoulders. The measure in inches can then be used in an equation from Kansas State University to get pig weight in pounds (lb): 10.1709 x Heart girth – 205.7492. Table 3 shows the heart girth measurement in inches and body weight in both pounds (lb) and kilograms (kg) for market pigs when using the equation.

Table 1. Pig weight estimates in pounds and kilograms based on heart girth measurement in inches (accuracy +/- 10 lb)

Heart girth in inches	Pig weight in lb	Pig weight in kg
38	180	81.6
39	193	87.5
40	206	93.4
41	219	99.4
42	234	106.1
43	249	112.9
44	264	119.7
45	280	127.0
46	297	134.7
47	314	142.4
48	332	150.6

CALCULATE OPTIMAL MARKET WEIGHT

As mentioned in the factsheet 'In-barn management to reduce feed costs' it is important to evaluate what your optimal market weight is monthly or at least every quarter. The best way to calculate your optimal market hog weight is to use income over feed cost. As you have already seen, the equation to calculate income over feed cost requires information on market hog price and carcass information including weight, fat, lean, and premiums to calculate the carcass revenue, as well as finisher diet cost and feed efficiency for different weight classes. Keep in mind that weights, bonuses, and feed conversion all change corresponding to your market weight. Carcass data is available through producer settlement summaries or available electronically through your packer, while feed conversion and diet cost is available in your feed budgets or can be provided to you by the nutritionist or feed company that you work with.

Once you have all the required information, the next step is to summarize the data. You can see a summary of 1066 hogs sent for slaughter in Table 2. At a quick glance, we can see that index and premiums vary significantly across all weight categories. We maximize index between 110 – 140 kgs (live weight). However, we maximize carcass revenue between 132 – 152 kgs with a $205/ckg hog price. For example, if we use the 110-115 kg carcass weight range as an example, we see: ($2.05/kg x (106.4/100) x 112.2 kg) + 17.52 = $262.32 per hog carcass revenue.

Table 2. Average carcass data, feed cost and income over feed cost (IOFC) by weight class.

	Weight class								
Min. Wt. (kg)	70	80	87.5	95	102.5	110	117.5	125	132.5
Max. Wt. (kg)	79.9	84.9	92.4	99.9	107.4	114.9	122.4	129.9	137.4
# of Hogs	1	8	39	143	390	274	158	42	11
Weight (kg)	78.0	82.9	90.8	97.5	104.9	112.2	119.8	127.4	133.6
Index	75.0	93.8	113.2	112.3	111.8	106.4	98.3	50.0	50.0
Fat (mm)	14.0	14.4	17.9	17.6	16.8	16.9	18.2	17.6	17.3
Lean (mm)	55.0	71.1	70.5	69.4	68.0	68.9	68.5	69.3	66.6
Yield (%)	62.4	63.1	61.4	61.6	61.8	61.8	61.2	61.5	61.5
Carcass value	**$119.93**	**$157.57**	**$210.20**	**$224.54**	**$240.54**	**$244.80**	**$241.51**	**$130.62**	**$137.00**
Premiums	$15.75	$15.00	$16.01	$15.96	$17.42	$17.52	$16.46	$16.28	$17.23
Est. Live Wt. (kg)	98.7	105.0	115.0	123.5	132.8	142.1	151.7	161.3	169.2
Feed Conversion (kg/kg)	2.75	2.90	3.05	3.19	3.34	3.49	3.64	3.78	3.93
Feed cost/hog	$112.00	$119.48	$132.19	$143.45	$156.37	$169.75	$184.28	$199.35	$212.19
IOFC	**$23.68**	**$53.10**	**$94.02**	**$97.05**	**$101.59**	**$92.57**	**$73.68**	**-$52.45**	**-$57.97**

**Hog price of $205/ckg, finisher diet cost $415/mt

For calculating feed cost, again looking at the same weight class, and assuming a finished feed price of $415/mt, each pig would consume $169.75 worth of feed. We calculate income over feed cost by subtracting feed cost from carcass revenue ($262.32 - $169.75) for a total of $92.57. When we consider feed cost, our optimal marketing weight range drops by approximately 12 kgs to 123-133 kgs. Your goal should be to market your pigs within the weight classes that have the highest income over feed cost. By focusing on a single outcome like index, premiums or gross value you could make a decision that will leave dollars on the grid.

Table 3 shows the change in income over feed cost at different feed prices. If we can market our pigs in a relatively tight window (12 dressed kgs), our ideal market weight remains constant, between 95 and 107 kgs. Overall, we can see a general trend that shows higher feed prices result in lower income over feed cost, and a decrease in you optimal marketing weight range. The same exercise can be done by changing market hog price at a fixed feed cost. Generally, we'll see that optimal market hog weight increases with increasing market hog prices.

Table 3. Income over feed cost calculations for different weight classes

					Weight class				
Min. Wt. (kg)	70	80	87.5	95	102.5	110	117.5	125	132.5
Max. Wt. (kg)	79.9	84.9	92.4	99.9	107.4	114.9	122.4	129.9	137.4
					Hog value				
Hog Price*	$135.68	$172.57	$226.21	$240.50	$257.97	$262.32	$257.96	$146.90	$154.22
Feed cost (mt)					**Income over feed cost**				
$390	$30.68	$60.55	$102.24	$105.95	$111.27	$103.05	$85.04	-$40.19	-$44.93
$415	$23.68	$53.10	$94.02	$97.05	$101.59	$92.57	$73.68	-$52.45	-$57.97
$440	$17.68	$46.65	$86.81	$89.16	$92.92	$83.09	$63.33	-$63.71	-$70.00
$465	$3.68	$32.20	$71.59	$73.26	$76.25	$65.61	$44.98	-$82.97	-$90.04

Hog value calculation based on hog price of $205/ckg

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