

SECTION 5: FEED QUALITY

Providing a high-quality feed to pigs involves many aspects along the production chain. It starts with ingredients that are of high nutrient value and free of contaminants. Processing, delivery and storage of the diets can also affect the quality and final composition of the feeds. Understanding the factors that affect feed quality and implementing a quality-assurance program will help ensure that the best possible nutrition is delivered to the pigs.

Test weight:

Corn weighing between 40 and 55 lbs/bushel will produce the same weight gain in finishing pigs as corn with a 56-lb/bushel test weight when compared on an equal moisture basis. A reduction in feed efficiency can be expected when test weight is reduced more than 10%. When test weight drops below 40 lbs./bushel, growth rate and feed efficiency may decrease by 5–10%.

Light test-weight grains have a lower bulk density than normal grains, which makes it important to add grains to the diet according to weight, not volume. Lightweight grains also contain more fiber and less oil, so they tend to be dustier during the grinding process. They may also cause bridging problems in bulk bins. It will take more bin space to hold the same weight of lightweight corn, so additional bin space may need to be added to accommodate that.

Mycotoxins:

Environmental conditions that place stress on grains may also cause those grains to be susceptible to mold growth. However, it's important to remember that it's not the mold itself that causes performance problems; rather, it's the mycotoxins the molds produce that cause the negative effects. The mycotoxins that are of primary concern in swine diets include aflatoxin, zearalenone, vomitoxin or deoxynivalenol (DON) and fumonisins.

Mycotoxin	Negative effects	Level of concern
Aflatoxin	Immune system suppression Reduced growth performance	200 ppb in finishing diets 100 ppb for growing pigs
Zearalenone	Red, swollen vulvas in prepubertal gilts Reduced reproduction performance	1 ppm for grower diets/3 ppm for finishers 500 ppb for replacement gilts
Vomitoxin	Feed refusal; decreased ADG	1 ppm
Fumonisin	Respiratory problems	5 ppm

Mycotoxins can have an additive effect. The levels of individual mycotoxins may be not be high enough to cause concerns; however, the combination of multiple mycotoxins, even at low levels, can have a significant effect. Drying the grain and adding mold inhibitors to mycotoxin-contaminated grains will decrease any further mold growth but will have no effect on the mycotoxins already present.

Particle size and grind

Grinding grains for swine diets improves feed utilization. By reducing the particle size, the surface area of the grain particle is increased, which allows for greater interaction with digestive enzymes. Swine feed efficiency is generally improved by 1% for each 100-micron reduction in particle size, from 1,000 microns down to 400 microns. As micron size decreases, the cost of grinding increases and mill throughput decreases. Taking into account improvements in feed efficiency, processing costs, incidence of gastric ulcers and the potential for feed bridging, the

recommended particle size for meal diets is between 650–750 microns.



The photo above illustrates corn ground to various particle sizes.

Hammermill vs. roller mill

The most popular grain processing options are the hammermill and the roller mill. Hammermills are effective at grinding an array of feedstuffs and are capable of producing a wide range of particle sizes. In comparison to roller mills, hammermills are noisier and generate more dust and heat during the grinding process while also consuming more energy.

Roller mills generate less noise and dust and provide a more uniform particle size/grind, which may improve digestibility and feed flowability. However, roller mills require more oversight to maintain a gap with that will produce the targeted particle size. This gap changes as rollers wear and grain qualities change. Hammermills require less oversight, by comparison. However, most swine farms prefer roller mills, given the more uniform particle size and improved flowability, which potentially reduces the incidence of feed bridging in bins and feeders and, subsequently, out-of-feed events. Many swine farms that utilize roller mills are decreasing ground corn to 500–600 microns. The improvement in feed efficiency needs to offset any increased incidence of feed bridging.

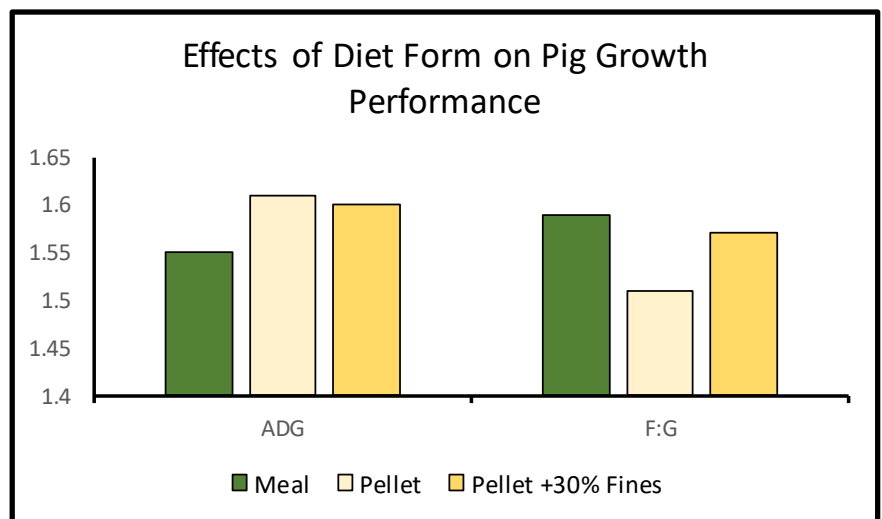
Pelleting

Pelleting diets is an effective way of improving feed efficiency in all phases of swine production. In addition to enhancing performance, pelleting decreases diet segregation and reduces dustiness and issues with feed bridging. Multiple studies conducted by Hubbard Feeds have consistently shown a 5% improvement in ADG and a 6% improvement in feed efficiency when healthy nursery pigs were fed pelleted vs. meal diets. To maintain the feed efficiency benefits of feeding pelleted diets, pellet fines must be minimized. Since having zero fines in swine diets is not realistic, Hubbard conducted a study looking at the performance of pigs fed pelleted diets compared to pigs fed pellets that contained fines to determine at which level fines would be detrimental to performance.

Results of that trial are shown to the right and indicate that performance benefits associated with pelleting diets were lost when pigs were fed pelleted diets with over 30% fines. These findings indicate that some fines can be in the pellets and not affect performance.

Good Manufacturing Practices (GMP)

Quality ingredients and manufacturing processes are the key components of any nutrition program. The FDA has established guidelines and standards for Good Manufacturing Practices (GMP) for animal feeds that must be followed by all feed mills. Good manufacturing practices are the backbone of a good quality control program. They are designed to ensure proper usage of feed additives and prevent feed contamination. Providing a residue-free supply of pork for human consumption is extremely important. The Food Safety Modernization Act (FSMA) will provide more direction on manufacturing and producing safe feed for animals intended for human consumption.



Sampling ingredients and finished feeds is an integral part of any quality assurance program. Working with a reputable supplier of ingredients can help ensure that quality expectations are met. Yearly maintenance tasks, such as a mixer uniformity tests, can help uncover potential problems before they occur. Keeping retainer samples of manufactured feeds is a good practice so, if questions arise, the feed sample can be sent off for analysis.

Ingredient storage and shelf life

To prolong ingredient shelf life and quality, follow these guidelines:

1. Keep ingredients at a cool temperature or avoid excessive heat.
2. Keep ingredients dry to prevent mold and bacteria growth.
3. Prevent rodents and insects from entering the feed.
4. Use antioxidants to preserve fats and oils in ingredients and feed.
5. Rotate stock and pay attention to expiration dates.

Feed delivery

Delivery of finished feeds is an important part of GMP. Sequencing the unloading process to make sure non-medicated feeds are unloaded first can prevent drug residues. Flushing between medicated feeds can also help prevent residue concerns. Proper identification of bulk bins can reduce the chance of unloading feed into the wrong bin and potentially creating drug withdrawal concerns for pigs near market weight.

Feed Quality FAQs

Q: I want to take samples of my feed. What's the best way to do that?

A: In order to get the most accurate feed analysis, it is important to take multiple samples of a single batch of feed to ensure that you are getting the most representative sample. Taking samples of feed as it's being discharged from the auger to the bulk bin is one of the most convenient ways to obtain samples. Another option would be to take probes from each feeder. Regardless of sample location, subsamples should be combined together to create one large sample. A small, representative sample can then be taken and stored for later analysis or sent to a lab.

Q: Where can I find more information on GMP and FSMA?

A: More information on FSMA can be found on the Food and Drug Administration website at <http://www.fda.gov/fsma>. The American Feed Industry Association (AFIA) also has a number of resources for feed manufacturers on their website, www.afia.org.