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Feedstuffs for Pigs

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Balanced pig diets contain two main components -- energy and amino acids. Many feedstuffs are appropriate for use in pig diets. However, corn-soybean meal diets are the most common. Corn is an excellent source of energy for pigs, and most other energy feedstuffs are priced relative to corn. The amino acids of soybean meal complement corn's amino acids resulting in a diet that matches the nutritional needs of the pig well. Table 1 presents suggested maximum levels of different feedstuffs in pig diets.

Energy Feeds

Corn is the major energy feed fed to pigs. Other energy feeds are priced relative to corn and often are more variable in their quality. Potential benefits of homegrown alternative energy grains include adding another crop to the crop rotation, providing a source of bedding other than cornstalks, and possibly greater net yields than corn.

$$Net\ Yield = \frac{Total\ Useful\ Outputs}{Total\ Inputs}$$

Small grains such as oats, barley, wheat, and triticale are the most common alternative energy grains. These crops are harvested earlier than corn, allowing manure to be spread on fields before corn harvest. In Iowa, these crops tend to yield less than corn both in terms of bushels per acre and pig available calories per bushel, and usually are limited in their use.

Processing coproducts such as vegetable oils, dried distillers grains with solubles, corn gluten feed, and corn gluten meal can replace some corn in pig diets. If allowed, animal fat is another excellent source of energy for the pig. Economics generally determine the use of these feedstuffs for pigs. Table 1 presents suggested inclusion levels for a number of energy feeds.

Protein Feeds

Protein feeds are used to supply amino acids in pig diets. Soybean meal is by far the most common feedstuff used to supply pigs with essential amino acids. Alternatives such as whole soybeans, field peas, alfalfa meal, canola meal, linseed meal, sunflower meal, whey, fish meal, plasma protein, and meat and bone meal exist. However, most niche markets prohibit the use of feeds from fish or animal tissue.

Field peas, alfalfa meal, canola meal, linseed meal, and sunflower meal are not common in pig diets in the Midwest, and the characteristics of these feedstuffs are not as well known as soybean meal. Whole soybeans must be cooked or extruded to make the amino acids available to the pig. Whey protein is commonly used in young pig diets but economics limit its use in other diets. Table 1 details suggested levels of several protein feeds.

Dried distillers grains with solubles and corn gluten feed have large amounts of crude protein; however, the availability of the amino acids present in those feeds may be limited. Corn gluten meal has improved amino acid availability, but typically is not economical to feed to pigs. The protein in corn is low in lysine, a critical amino acid for pig muscle growth. Corn-based protein feeds need to be supplemented with a source of lysine.

Crystalline forms of some amino acids are available for feeding to pigs. Check with

your market before using crystalline amino acids in pig diets to insure compliance with niche market guidelines. Generally, crystalline amino acids are more expensive than soybean meal, but allow more precise diet formulation. Crystalline amino acids usually are more digestible than other forms of amino acids and can be used to precisely match amino acid content of the diet with needs of the pig, thereby reducing the crude protein content of the diet. As discussed in leaflet 310 of this handbook, dietary amino acids in excess of need are not used by the pig but rather are excreted in the urine.

Feedstuffs and Pork Quality

Maintaining pork quality is critical, and feedstuffs influence meat quality. Fat quality is a major component of pork quality. Fat quality is defined in terms of physical and nutritive characteristics. Major issues relating to fat quality include soft fat, off-flavors, and impact of the composition of pork fat on human health.

Soft fat is a major concern to meat processors because it can cause problems in meat processing. These problems result in lower processing yields and reduced value which impact pork producers. Soft fat becomes rancid with off-flavors more quickly than normal fat. Additionally, extremely soft fat may be oily, a characteristic that is considered very undesirable by most consumers. Vegetable oils and coproducts with high levels of vegetable oil reduce the firmness of pork fat. At dietary inclusion levels of less than 10% oil, pork quality generally is not impacted. Pigs fed corn-soybean meal diets have good fat quality, although there is evidence that including barley in the diet may lead to an even higher quality fat in terms of firmness and color.

Fish oils and meals are very susceptible to rancidity and the development of off-flavors. Feeding fish oils or fish meals may result in fishy taints in the meat. Although usually prohibited by niche markets, if allowed fish oils and meals should be used at low levels and with caution. Table 1 values for fish meal and fish oil have resulted in satisfactory performance and fat quality.

There is a close relationship between the composition of dietary and body fat in the pig. Thus it is relatively easy to manipulate pork fat composition by changing the type of the fat fed to the pig. High levels of saturated fat have been associated with cardiovascular disease in humans. There is interest in increasing the intake of "healthier" fats by humans through manipulation of the diets fed to pigs. Omega-3 fatty acids have been associated with a beneficial effect on cardiovascular diseases. Feeds high in omega-3 fatty acids such as flax, linseed meal, or linseed oil may increase the amount of omega-3 fatty acids in pork fat. Research suggests that feeding flax at levels below 15% improves omega-3 fatty acid content of pork fat without negatively impacting pork fat quality.

Forages

Forage and pasture historically have been vital components of pig production. While less commonly used today, there remain benefits to including forages in pig diets. Forages can replace some grain and protein supplements in pig diets. It is important to remember that the digestibility of the amino acids and energy in forages tends to be less than the digestibility of feeds such as corn and soybean meal. Forage fiber may reduce diarrhea problems in young pigs. Sows fed high amounts of forage can access self-feeders without becoming excessively fat. This simplifies feed management for the gestating sow herd and may improve sow welfare.

Because of their high fiber content, and limited availability of energy and amino

acids, forages should not be fed at high levels to lactating sows and young pigs. Gestating sows are the best type of pig to feed forages. Growing pigs can perform acceptably on pasture if supplemented with concentrated feeds. If forages are fed, gradually increase the amount of forage fed to pigs over 40 pounds in weight. Pigs will utilize more nutrients from forages following a two-month adaptation period. Digestibility of forages also increases with maturity of the pig.

Human Food Waste

Although pigs fed a corn-soybean meal diet perform well, pigs are omnivores and can use a wide range of feedstuffs. They may perform valuable functions as recyclers of nutrients found in food that is no longer fit for human consumption. Pigs will use the nutrients found in dried bakery wastes and rejected fruits and vegetables. Processed foods such as candy, popcorn, potato chips, cereal, and pasta that failed to meet specifications or have passed a manufacturer's expiration date also can be fed to pigs. Table scraps and other food wastes from restaurants, schools, and other institutions can be used by pigs. However, raw garbage should not be fed to pigs. If table scraps and food wastes contain animal products they may not be acceptable in some niche markets. Check both marketing guidelines and state regulations governing feeding human food wastes to pigs to insure compliance.

Additional Resources

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Table 1. Feedstuff inclusion level for satisfactory growth and performance[1].

	Percentage of diet			
	Sows		Growing Pigs	
Feedstuff	Gestation	Lactation	≤ 40 lbs	≥ 40 lbs
Alfalfa meal, dehydrated	0-50	0-10	0	0-5
Alfalfa hay	0-60	0	0	0-15
Barley	0-90	0-85	0-25	0-95
Corn	0-90	0-85	0-25	0-95
Corn, dried distillers grains w/ solubles	0-40	0-20	0-10	0-30
Corn, gluten feed	0-90	0	0	0
Corn, gluten meal	0-5	0-5	0	0-5
Corn, silage	0-60	0	0	0-15
Field peas	0-15	0-15	0-15	0-30
Grass hay	0-15	0	0	0-5
Grass–legume hay	0-30	0	0	0-10
Legume, haylage	0-60	0	0	0-15
Oats	0-90	0-15	0-15	0-40
Skim milk, dried	0	0	0-20	0
Sorghum	0-90	0-85	0-45	0-95
Soybean meal	0-10	0-25	0-45	0-40
Soybeans, full-fat cooked	0-15	0-30	0-60	0-50
Soybean oil	0-8	0-8	0-8	0-8
Sunflower meal	0-10	0	0	0-10
Triticale	0-90	0-40	0-25	0-40
Wheat	0-90	0-85	0-45	0-90
Whey, dried	0-5	0-5	0-30	0-5

Feedstuffs that are commonly prohibited by niche market requirements

	Percentage of diet			
	Sows		Growing Pigs	
Feedstuff	Gestation	Lactation	≤ 40 lbs	≥ 40 lbs
Animal fat	0-10	0-10	0-10	0-10
Blood meal	0-5	0-5	0-5	0-5
Fish meal	0-10	0-10	0-10	0-5
Fish oil	0-5	0-5	0-5	0-3
Meat and bone meal	0-10	0-5	0-5	0-5
Poultry by-product meal	0-5	0-5	0	0-5

[1] Based on Life Cycle Swine Nutrition, 1996 and Nontraditional feed sources for use in swine production, 1990.