Swine Nutrition

General Considerations

Factors Affecting Feeding Performance

Genetics
Feed efficiency in swine is about 35 percent inherited. Growth rate about 30 percent inherited. Selection for more efficient hogs can reduce costs by reducing the amount of feed required to grow a hog to market weight. An average feed conversion rate is 3.5 pounds for each pound of gain in growing-finishing hogs. About 550 to 750 pounds of feed are required to feed a hog from 40 pounds to 240 pounds live weight.

Environment
In addition to health, several environmental factors affect swine performance. These include; weather, environmental temperature, humidity, drafts, stress, management and nutrition. A good swine manager will prevent diseases by reducing stress while providing optimum environmental conditions.

A sound nutrition program will give good results only when all other conditions are optimum. Quantity and quality of feed are of critical importance. Feed must be palatable and readily accepted to produce the best results. Never feed moldy and stale feeds. Feeding recommendations in this publication are based on requirements determined by the National Research Council (NRC). Remember, these are guidelines and variations are sometimes necessary.

Nutrients
Carbohydrates and fats are main sources of energy. Swine are monogastric animals and compared to ruminants, generally require diets higher in energy and lower in fiber. For that reason, significant amounts of grains are often included in swine rations. Grains are good energy sources. Roughage is of lesser importance to swine, although roughages such as alfalfa, corn silage and pasture can be economically used, particularly with gestating sows.

In the past, swine rations were often balanced for energy by using TDN (total digestible nutrients). The caloric energy system is more accurate and is now used extensively. The basic unit of energy measure is
the calorie, the amount of heat required to raise 1 gram of water 1° centigrade. One kilocalorie (kcal) equals 1,000 calories and one megacalorie (Mcal) equals 1,000 kcal or 1,000,000 calories. The energy values of feedstuffs and requirements of swine are usually expressed in either kcal or Mcal. Metabolizable energy (ME) and net energy (NE) are the two most accurate energy measurements, with NE for maintenance and growth being slightly more accurate than ME.

Protein is essential for many functions, including reproduction and growth of lean muscle. Amino acids are the “building blocks” of protein, and 10 essential amino acids must be supplied in swine rations. Traditionally, swine rations have been balanced by calculating percent crude protein (CP); as long as good-quality protein supplements and grain were used, most rations furnished the requirements for amino acids. However, today’s pork producer is more concerned with amino acid balance.

Minerals – calcium, phosphorus and salt (sodium and chlorine) are the most important major minerals added to swine rations. Minor minerals, which require attention, are: iron, zinc, iodine, selenium, copper and manganese.

Vitamins are required in small amounts and are essential for normal body functions. Young grasses or legumes are good sources. When swine do not have access to good quality pasture, vitamin levels of the ration are of greater concern. Vitamins most often added to swine rations are A, D, E, K, B12, riboflavin, niacin, pantothenic acid and choline.

Water – A constant supply of clean fresh water is absolutely essential.

**Feeding the Breeding Herd**

**Flushing**
Flushing consists of feeding the sow more feed than is necessary for maintenance and ordinary functions for 2 or 3 weeks before breeding. This puts the sow in a positive energy state and usually increases the number of ovulated eggs, resulting in an increase in litter size. A level of 6 to 8 pounds per day of a properly-balanced gestation ration will usually suffice. Sows nursing large litters are fed at considerably higher levels, so the flushing amounts will need to be fed only from weaning to breeding. Sows normally show estrus within a week after weaning.

**Gestation**
Limit-feeding is important during gestation. The ration must be reduced *immediately* after breeding to a level of 4 or 5 pounds per day of a properly balanced gestation ration. If too much energy is fed at this time, embryonic mortality may result. Alternative feedstuffs may be used during gestation. Alfalfa hay and pasture can be used extensively, reducing feed costs. Other feedstuffs such as cooked potatoes, cooked beans, raw soybeans and bakery wastes also may be used, but care must be taken to balance the ration for all nutrients when substituting feedstuffs.
During gestation, sows being fed a ration based on grain and soybean meal require a daily average of about 0.48 pounds of CP and 5.76 Mcal of ME. For example, 4 pounds of an air-dried, grain-soybean meal ration, specifically balanced for amino acids, containing 12 percent CP and 1.44 Mcal ME per pound would meet the requirements. Feed should be increased during the last month of gestation to about 5 pounds per day and also during periods of cold weather stress.

If the specific amino acid levels aren’t known, the CP level of the ration should be increased to 14 or 15 percent with a variety of good quality feedstuffs used to formulate the ration. The increases for late gestation and for cold weather are general guidelines. The “eye of the master” is always important. Adjustments to daily amounts also should be made according to the condition of the sow. Sows too fat at farrowing time may have smaller litters or may have farrowing problems. Sows too thin at farrowing time may give less milk during lactation and may not return to estrus on schedule. Levels of minerals and vitamins in the ration also should be checked. The gestation ration should contain at least 0.75 percent calcium and 0.60 percent phosphorus, and the salt content (sodium chloride) should be 0.40 percent. The gestating sow should be receiving at least 7200 international units (IU) of vitamin A or beta carotene and 360 IU of vitamin D per day.

**Lactation**

The sow’s nutrient requirements are highest during lactation. A higher percentage of CP in the ration is recommended. Feed should be gradually increased from the second day after farrowing to a full feed at about 7 to 10 days after farrowing. Sows nursing litters of 8 or more pigs should be allowed all they will eat unless they are over-conditioned. A sow nursing 10 or more pigs may require 14 pounds of air-dry feed per day; with litters of this size it’s usually best to feed as much as the sow will eat. A heavily milking sow can require 1.58 pounds of CP and 17.6 Mcal ME per day. Requirements would be met by feeding 12.25 pounds of a grain-soybean meal lactation ration containing 13 percent CP, specifically balanced for amino acids, and 1.44 Mcal ME per pound.

If the specific amino acid levels aren’t known, free choice feeding of a ration containing 15 to 16 percent CP, formulated from a variety of good quality feedstuffs, is usually satisfactory. A good swine manager will make adjustments to the amounts of feed fed per sow. For example, if a sow is raising a small litter or is too fat, the daily amount of feed during lactation should be reduced accordingly. Lactation rations should contain at least 0.75 percent calcium and 0.50 percent phosphorus, and the sodium chloride content should be 0.50 percent. Heavily-milking sows should receive at least 11,000 IU of vitamin A or beta carotene and 1100 IU of vitamin D per day.

**Feeding Replacement Gilts**

Replacement gilts may be fed as much as they will eat of growing-finishing rations until they weigh about 200 pounds. They must not be allowed to get too fat. At 200 pounds, replacement gilts should be separated from the finishing hogs and fed about 5 pounds per day of a gestation ration until they
completed 2 estrous cycles. They may then be flushed until they are bred 3 weeks later on the third heat period. Immediately after breeding, the ration should be reduced to gestation levels for sows as discussed earlier. Gilts should be bred by the time they are 7 to 8 months old.

**Feeding Boars**

*Young boars* weighing up to 200 pounds should be fed a ration containing about 2 percent higher CP and higher levels of calcium and phosphorus than normal finishing rations. At about 200 pounds the boars may be switched to a sow’s gestation feed in amounts which help them grow but not become over-conditioned. Usually 7 or 8 pounds of feed per day is sufficient. *Mature boars* may be fed a sow’s gestation feed at about 6 pounds per day. It’s important to maintain the boar in a healthy condition and not allow him to get too fat or too thin. The amount of feed per day should be varied according to environmental conditions. For example, extra feed should be given to the boar during breeding periods of cold weather.

**Feeding Pigs**

**Before Weaning**

*Iron* – Pigs which don’t have access to clean soil should be given supplemental iron, either orally or by injection, at 2 to 3 days of age or according to the instructions for the products.

*Creep feeding* is an economical practice. Beginning at about 7 to 10 days of age, nursing pigs should have access to a properly-balanced, complete pre-starter or starter ration. Excellent pre-starter and/or starter rations are available commercially, and it’s often more practical to purchase a pre-starter feed than to formulate one. Pre-starter and starter rations range from 18 to 22 percent CP or higher and are properly balanced for amino acids, minerals and vitamins. Pigs gain very efficiently during the nursing period, and the purchase of a top-quality creep feed is a wise investment.

**Growing-Finishing**

The growing-finishing period extends from weaning to marketing at about 220 pounds. Pigs should have access to a properly-balanced ration on a free choice basis. The protein requirement, as a percentage of ration, decreases as the body weight increases. If rations based on grain and soybean meal are balanced for amino acids and fed free choice, the following NRC recommendations for protein, energy, calcium and phosphorus for growing-finishing pigs should be adequate.

Rations other than the traditional grain-soybean meal-based ration can be used, particularly during the finishing phase (more than 100 pounds live weight). When specific information about amino acid composition is not available, a general rule of thumb is use a variety of good quality feedstuffs and increase the CP by 1 to 2 percent. The energy levels of the ration also should be calculated because many alternative feedstuffs have lower ME values. The salt content of growing-finishing rations should be 0.23 percent.
**Self-Feeding vs. Hand-Feeding**

Self-feeding is the most efficient method of feeding swine in that the animals may feed at will from a unit containing large amounts of feed. Normally, they won’t over-eat. It’s important, however, to make sure pigs aren’t wasting feed and the feed doesn’t “bridge” in the feeder and not deliver. Be sure self-feeders are weather proof and the feed does not get wet or moldy.

Hand-feeding, although more labor intensive, provides better control of feed intake per pig, especially for gestating and lactating sows where ration monitoring is very important.

A combination of self-feeding and hand-feeding may be practiced on the farm as needed at various stages of development or condition.

**Feedstuffs and Processing Feeds**

Corn is the standard grain and soybean meal is the most commonly-used protein supplement in swine rations. However, New England pork producers can reduce feed costs by using alternative feedstuffs. Care must be taken to be certain the ration is nutritionally balanced, and a knowledge of the limitations and proper use of substitution feedstuffs is necessary.

Various methods of processing are used to improve the palatability and consumption of feedstuffs. Pelleting improves feed conversion and is very popular for starter rations. Grinding and mixing ingredients is often beneficial for growing-finishing swine and the breeding herd. The addition of fat to the rations of swine of a certain age or at a certain stage of production often improves performance. For further information, read UNH Cooperative Extension’s publication *Alternative Feedstuffs for Swine.*
References

- National Research Council, 1979; *Nutrient Requirements of Swine*, No. 2; National Acad. Sci., Washington, DC.

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