COOPERATIVE EXTENSION SERVICE
UNIVERSITY OF ALASKA FAIRBANKS

Alaska Livestock Series

Feeding Alaska Swine

LPM-00841

Swine have been raised successfully in Alaska since the Gold Rush days. Although winter temperatures are somewhat colder than in most hog-producing states, swine do well with moderate shelter, even in the Interior. Environmentally controlled buildings are recommended for maximum efficiency and production.

Feed represents about 75 percent of the cost of raising hogs. The percentage can be even higher when buying feeder pigs and finishing them to market weights. Hogs kept in a cold environment will gain more slowly and require more feed. Thus, it is important to give much attention to the feeding phase of swine production.

FEEDS AVAILABLE FOR ALASKA SWINE

Feeds fed in other states are available in Alaska — at a price. That price is both the problem and the key to the profitability of a swine enterprise. The price of feed is the key in any state, but especially so in Alaska because of the high cost of freight. Because of this cost, the traditional Midwestern corn-soybean meal diet is usually not as economical as feed produced in this state.

Non-Traditional Feeds

In all parts of the country, swine feeders are able to make good use of selected nontraditional feeds, including silage crops, garbage, dairy products, candy, sugar, raw vegetables and stale bakery products. All of these feeds have some nutritional value and are fed successfully.

Silage is high in fiber and low in energy. It should only be fed as a part of a maintenance diet for mature sows that will eat 10 to 14 pounds per day. Silage will usually need to be supplemented with protein, vitamins and minerals. Garbage is highly variable in its nutrient content and must be cooked to a rolling boil to avoid the spread of diseases and parasites. Dairy products can be very nutritious, but somewhat variable, depending on the product itself and its moisture content. Candy, sugar and bakery products are easily digested and high in energy, but low in almost every other nutrient. Raw vegetables can be high in energy, with some vitamins, and medium to low in protein. Some vegetables are high in fiber and are not easily digested. Cooking overcomes the problem of digestibility but increases the cost.

Alaska Grown Barley

Fortunately, Alaska swine producers have high-quality barley for energy and marine by-products for protein available to them. This includes covered barley (with the hull), hulless barley, oats, wheat, fishmeal and crabmeal. In addition, some animal and vegetable fats, meat and bone meal are produced in the state. Several varieties of turnips, kale and rape grow well in most areas of the state and can be valuable as a grazing crop or silage for mature sows not in the last trimester of pregnancy or lactation. No mineral or vitamin supplements are produced in the state, but they are available and reasonably priced from outside sources.

Swine feeding trials at the University of Alaska Fairbanks Agricultural and Forestry Experiment Station show that Alaska barley, both covered and hulless, produces daily gains comparable to corn, but is slightly less efficient. Alaska barley can vary widely in bushel test weight. Low test weight barley is usually high in fiber and hard for the pig to digest, so gains and efficiency are reduced. However, the higher test weight grain performs well if it is properly prepared, supplemented and fed.

Like many grains fed to hogs, barley is low in mineral calcium and low to marginal in lysine, threonine (at crude protein levels of less than 14 percent), methionine+cystine, isoleucine and tryptophan, all of which are essential amino acids. Crude protein values for Alaska covered barley run between 10 and 14 percent, while Alaska hulless barley runs between 11 and 15 percent. Both provide slightly less energy than corn. As with feed anywhere, barley should be included or excluded in the swine diet according to the cost of the nutrients it provides. Good quality rolled or ground Alaska barley has about 93 percent of the feed value of ground corn and requires less protein supplementation. Thus, if corn is priced at $150 per ton, good Alaska barley could be substituted at prices of $140 per ton and less, without increasing the cost of the diet.

Oats

Oats are higher in fat than either corn or barley, but they are also higher in fiber. They are excellent as a part of the sow's ration for the bulk and laxative effect they have. However, oats fed to finishing hogs at more than 30 percent of the grain portion of the ration produce slower, less efficient gains than corn or barley.

Wheat

While some wheat is raised in Alaska, it is not widely fed to hogs because of its price and unavailability. Wheat is high in energy, low to medium in protein and easily digested. It should be coarsely ground or pelleted and not fed as more than 75 percent of the total diet, because it tends to cause compaction in the digestive tract of the animal.

Alaska Marine By-Products

Most Alaska fishmeals contain about 63 percent crude protein and are highly digestible. They provide a good supply of the B vitamins, several minerals and a balance of the essential amino acids, especially those that may be lacking in barley. To avoid any chance of imparting a fishy flavor to the pork carcass, care must be taken not to feed fishmeal in excess of 4 percent of the diet.

Alaska crabmeal contains about 35 percent crude protein and less energy and lysine than fishmeal. It is higher in calcium and fiber and, as a result, is not as digestible. Crabmeal should be limited to not more than 6 percent of the diet as a 50-50 blend with soybean meal so as to avoid a reduction in feed efficiency. Research has shown no fish flavor resulting from feeding crabmeal at levels up to 20 percent of the diet. Both fish and crabmeal must be stabilized with an antioxidant to prevent rancidity.

Tankage, Animal and Vegetable Fats

While only small amounts of Alaska-produced tankage is available, it is high in protein, B vitamins, calcium and phosphorus, and medium in energy. Animal fats are good sources of energy and essential fatty acids but none of the other nutrients. They are fairly consistent in quality and are produced in small amounts in the state. Vegetable fats, in the form of recycled cooking oils, are more available. These can vary widely in their energy content and quality.

NUTRIENT REQUIREMENTS OF SWINE

Unlike ruminant animals, swine have only one compartment to their stomach, and thus are unable to efficiently digest fibrous feeds. Their nutrient requirements change as they mature and go through the various stages of growth and production. Some of the changes can be accommodated by simply increasing or decreasing the amount of feed each day. Other changes require the formulation of the diet to be adjusted.

Tables 1 and 2 show the nutrient requirements of various classes of swine using information published in *Nutrient Requirements of Swine*. Note that baby pigs require high concentrations of nutrition, and their needs lessen as they approach maturity. Sows and boars have low nutrition demands when they are simply maintaining themselves; however, as sows get into the last one-third of pregnancy and lactation, their nutrient requirements rise.

FEED PROCESSING, HANDLING AND STORAGE

Determining swine requirements and formulating rations is just half the battle. The best formulations can be of little value if they are not prepared, handled and stored correctly.

Processing

Since swine do not chew their food thoroughly and are not able to digest fibrous seed coats, it is important that the grain portion of the ration be broken down by grinding, rolling or cooking. This reduces fiber size and allows better digestion of the feed. Grinding grain tends to make it dusty, which in turn lowers its palatability and can cause respiratory problems for swine. Oils and animal fats can be added to the ration to solve this problem. These also increase the energy of the diet and provide needed fatty acids. Fats and oils improve the palatability of swine rations in amounts up to 10 percent of the diet. When they are included in amounts above 10 percent, palatability drops sharply. All fats and oils are subject to rancidity and thus must be stabilized with an antioxidant.

When extra energy is not needed, a dusty swine ration can be mixed with water. This usually improves palatability and increases consumption. Indeed, several types of slurry feeders for swine have been introduced in the market over the past 10 years. Feeders and researchers report slight increases in feed consumption, efficiency and daily gain in hogs fed in this manner.

Pelleted feed offers the advantages of being nearly free of dust, uniformly mixed, easy to handle and feed, and highly palatable. Unfortunately, pelleting is very energy intensive and is therefore expensive. It is widely used for creep and starter rations for baby pigs.

Handling and Storage

In Alaska, grain is often high in moisture when it comes out of the field. To prevent it from molding, grain must either be dried or stored in special high structures. Both alternatives are expensive. However, the damage that can result from feeding moldy feed to hogs can be disastrous. Feeds containing more than 13 percent moisture can become moldy in a matter of hours at temperatures above 30°F. These molds produce toxins that can cause low conception rates, abortions, slow growth, digestive upsets, hemorrhage and more. It is imperative that rations containing grain from high moisture storage be fed within 12 hours of the time they are processed and mixed.

Feed becomes contaminated when birds and rodents have access to it. This can result in dramatic losses of feed, degradation of remaining feed and and increased chance of spreading disease.

Store feed in areas or containers not accessible to such pests. In addition, feeds should not be stored directly on concrete floors because such floors tend to draw moisture.

Other sources of feed contamination include seed that has been treated with pesticides and pesticides themselves stored close to feed or mixing areas. **Never** feed grain that has been treated with any type of pesticide to animals, unless the label specifically approves such use. Store pesticides and other contaminates in a separate area from feed and mixing equipment, preferably under lock. Always **read and follow label instructions** when handling any pesticide or medication.

Table 1 Nutrient Requirements of Growing-Finishing Swine Fed Free Choice: Percent of Amount per Pound of Diet[ab]

Liveweight (lb)		2–11[b]	11–22	22–44	44–77	77–132	132–220
Expected Daily Gain (g)		.44	.66	1.1	1.32	1.54	1.76
Expected Efficiency (feed /gain)		1.25	1.67	2.00	2.50	2.86	3.75
Metabolizable energy[c]	kcal	3600	3600	3600	3600	3600	3600
Crude Protein[d]	%	26.0	23.7	20.9	18.0	15.5	13.2
Indispensable amino acids most often deficient in grain diets							
Lysine	%	1.34	1.19	1.01	0.83	0.66	0.52
Isoleucine	%	0.73	0.65	0.55	0.45	0.37	0.29
Methionine	%	0.76	0.68	0.58	0.47	0.39	0.31
Threonine	%	0.84	0.74	0.63	0.52	0.43	0.34
Tryptophan[e]	%	0.24	0.22	0.18	0.15	0.12	0.10
Valine	%	0.91	0.81	0.69	0.56	0.45	0.35
Mineral elements							
Calcium	%	0.90	0.80	0.70	0.60	0.50	0.45
Phosporus[f]	%	0.70	0.65	0.60	0.50	0.45	0.40
Vitamins							
Vitamin A	IU	4840	4840	3850	2860	2860	2860
Vitamin D	IU	484	484	440	440	330	330
Vitamin E	IU	35.2	35.2	24.2	24.2	24.2	24.2

Other minerals and vitamins
Can be economically supplied by including a swine mineral pre-mix from a reputable manufacturer following the manufacturer's instructions.

[a] Adapted from *Nutrient Requirements of Swine*, 1998; www.nap.edu/catalog.php?record_id=6016

[b] Requirements reflect the estimated levels of each nutrient needed for optimal performance when a fortified grain-soybean meal diet is fed, except that a substantial level of milk products should be included in the diet of the 1–5 kg pig. Concentrations are based upon amounts per unit of air-dry diet (i.e., 90% dry matter).

[c] These are not absolute requirements but are suggested energy levels derived from diets containing corn and soybean meal (44% crude protein). When lower energy grains are fed, these energy levels will not be met; consequently, feed efficiency would be lowered.

[d] Approximate protein levels required to meet the need for indispensable amino acids when a fortified grain-soybean meal diet is fed to pigs weighing more than 5 kg.

[e] It is assumed that usable tryptophan content of corn does not exceed 0.05%.

[f] At least 30% of the phosphorus requirement should be provided by inorganic and/or animal product sources.

Table 2 Nutrient Requirements of Breeding Swine: Percent per Pound of Diet[ab]

		Young and Adult Boars	Bred Gilts and Sows	Lactating Gilts and Sows
Metabolizable energy[c]	Kcal	3265	3265	3265
Crude Protein[c]	%	13	13	13
Indispensable Amino Acids most often deficient in grain diets				
Lysine	%	0.60	0.49	0.79
Isoleucine	%	0.35	0.28	0.44
Methionine	%	0.42	0.33	0.39
Threonine	%	0.50	0.38	0.49
Tryptophan[d]	%	0.12	0.10	0.14
Valine	%	0.40	0.34	0.77
Mineral Elements				
Calcium	%	0.75	0.75	0.75
Phosporus[e]	%	0.60	0.60	0.60
Vitamins				
Vitamin A	IU	8800	8800	4400
Vitamin D	IU	440	440	440
Vitamin E	IU	44	44	44

Other Minerals and Vitamins
Can be economically supplied by including a swine mineral pre-mix from a reputable manufacturer following the manufacturer's instructions.

[a] Adapted from *Nutrient Requirements of Swine*, 1998; www.nap.edu/catalog.php?record_id=6016

[b] Requirements reflect the estimated levels of each nutrient needed for optimal performance when a fortified grain-soybean meal diet is fed. Concentrations are based upon amounts per unit of air-dry diet (i.e., 90% dry matter).

[c] Approximate protein levels required to meet the need for indispensable amino acids when a fortified grain-soybean meal diet is fed. The true digestibilities of the amino acids were assumed to be 90%.

[d] It is assumed that usable tryptophan content of corn does not exceed 0.05%.

[e] At least 30% of the phosphorus requirement should be provided by inorganic and/or animal product sources.

Alaska Swine Diets

Table 3 lists diets recommended by the University of Alaska as a result of their research. When properly prepared, handled and fed, they provide all of the nutrients required by swine, and produce fast, efficient gains.

Table 3 SWINE DIETS MADE UP PRIMARILY OF ALASKA FEEDSTUFFS [1]

Ingredient	8–25 lb	25–45 lb	45–125 lb	125–230 lb	Boars and Maintenance Sows	Bred Gilts Lactating Sows
Dry Matter	ad lib[2]	ad lib	ad lib	ad lib	5–7 lbs	ad lib
Covered Barley	—	61.43	82.45	91.65	90.50	89.40
Hulless Barley	— (can be substituted for or mixed with covered barley 1:1)					
Corn	43.70	—[3]	—[3]	—[3]	—[3]	—[3]
Soybean Meal	28.85	3.27	9.90	1.10	1.10	3.10
Dried Whey	20.00	20.00	—	—	—	—
Fishmeal	(10.00)[4]	10.00	—	—	—	(3.00)[4]
Crabmeal	—	—	6.00	6.00	6.00	6.00
Corn Oil	3.00	1.80	—	—	—	—
Limestone	0.85	0.85	—	—	—	—
DiCalcium Phosphate	1.90	1.00	0.75	0.50	0.75	0.75
TM Salt	0.40	0.40	0.50	0.50	0.50	0.50
Vitamin Pre-mix	1.25	1.25	0.5	0.25	0.25	0.25
L-Lysine HCL	0.05	—	—	—	—	—

[1] All values shown as a percentage of diet as fed.

[2] "Ad libitum" (fed free choice).

[3] Corn can be substituted for barley 1:1 provided the soybean meal is increased by 4.6% in the diet.

[4] Must be herring meal quality or better. Can be substituted for 17.4% of the soybean meal if corn is increased to 51.1% of the starter diet, and can be substituted for soybean meal 1:1 without further alteration of the gestating-lactation diets.

FEEDING SWINE

Hand-Feeding

Feed can be offered to swine in many ways. It can be hand-fed directly on clean ground or floors, which reduces the cost of feeding equipment. However, this can result in feed wastage, contamination and increased chance of internal parasitism in the hogs.

The next cheapest method of hand-feeding is in a trough, constructed from wood, metal or concrete. Any type of swine equipment should be as strong as possible because hogs are very destructive.

Self-Feeding

The vast majority of hogs are self-fed from some type of mechanical feeder. There are many variations in size and design of feeders, and most are very good. Many commercially built self-feeders are durable and fairly economical. They keep feed dry and safe from birds and rodents and offer the convenience of flow adjustment of feed to cut down waste. A good self-feeder requires a minimum of maintenance and has an expected life span of 5 to 10 years, depending on construction, location and use. Though these feeders will hold enough feed for several days, they should be checked daily for feed that has bridged or is not flowing for some reason. Either wet or dry feed can be fed through properly designed self-feeding units.

Table 4 shows the recommended space allowances for swine fed in various ways.

Table 4

SPACE REQUIREMENTS FOR FEEDING SWINE

(All spaces expressed in inches/animal)

	PIGS (lb)				MATURE SWINE
	8-25	25-45	45-125	125-230	Over 230 lb
Troughs	6	10	14	18	22
Self-feeder	2	2	3	3	3

Self-feeders should be adjusted to allow the feed to flow freely without accumulating in the compartments, causing wastage. Any time the consistency of the ration is changed, the feeder may need to be adjusted. The lighter and bulkier the ration, the slower it flows. There is always a danger of the feed bridging inside the feeder. This problem is compounded by moisture and a ration containing lots of bulk. Some feeders have mechanical devices to prevent bridging. These increase both the cost and maintenance of the equipment. Checking the feeder daily, breaking up the bridge by poking something through it or hitting the side of the feeder with a rubber mallet, is usually sufficient to keep feed moving.

Feeding Schedules

Swine fed by a self-feeder have feed available 24 hours a day. Care should be taken not to let the feeder be empty for more than a few hours. Self-fed hogs that have fasted tend to overeat when feed is once again available. Hand-fed growing and finishing pigs should receive feed at least twice a day, as should sows in the last trimester of pregnancy and during lactation. Feeding more often than twice a day usually results in higher feed consumption and faster daily gains. Some of this increased production is offset by the increased labor demands of this feeding schedule. Sows and boars on a maintenance ration can get along fine when fed once a day. Some breeders feed once every two or even three days. This practice reduces labor, but it increases the stress on the animals and requires a higher level of management.

WATER

Perhaps the most important nutrient for swine is water. Young growing pigs and pregnant or lactating sows need lots of fresh, clean water daily for maximum production and good health. As with feed, water can be provided in various ways, including natural streams, ponds, troughs and self-waterers. All of these are satisfactory as long as the water is present 24 hours a day, is clean, is protected from unnecessary contamination and is in liquid form. For hogs that do not have access to natural water sources, self-waterers are the most efficient of the alternatives. They are more expensive to install, but the extra cost is more than recovered in labor saved, the increase in feed efficiency and possible

daily gain. Many types of self-waterers are available, and they vary in cost and complexity. Care should be taken to purchase those that will have low rates of failure and maintenance. The use of rubber tubs for hand-watering hogs in the winter facilitates the removal of ice.

SUMMARY

Swine are extremely adaptable and can be successfully raised in most areas of Alaska. Maximum production requires significant capital and managerial skills; however, many hogs are raised profitably with a minimum of facilities and expense. Alaska-produced feedstuffs, supplemented with vitamins and minerals, are available, and swine rations can be formulated that are cost competitive with those used in other states. Additional printed materials, feed analysis and ration balancing services are available through University of Alaska Fairbanks Cooperative Extension Service.

REFERENCES

Nutrient Requirements of Swine, 10th revised edition. 1998. Subcommittee On Swine Nutrition, Committee On Animal Nutrition, and the National Research Council. Washington, DC: National Academies Press.

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