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PIG FEEDING

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CORN FOR PIGS

L.G. Young¹

Corn is an excellent feed for swine. When adequately supplemented with protein, minerals and vitamins, corn can supply 100% of the grain in starter, grower and finisher diets for swine. Corn has the lowest content of protein (9%) of any of the common grains fed to swine and is similar to wheat in energy content (80% T.D.N.). When these two main factors are taken into consideration, the general recommendations for feeding corn are similar to those for feeding of other grains.

Due to the high energy content of corn, diets which contain corn as the only grain will result in less feed required per pound of gain as compared to most of the other common grains. If these diets are self-fed to finishing pigs, carcasses may be produced which are slightly fatter than carcasses from pigs fed oats or barley. Where carcass quality is a problem, it may be economical to limit-feed barrows between 150 and 200 pounds liveweight. It is doubtful if limit feeding of gilts would be economical.

Corn should be processed by grinding or rolling prior to feeding. Recent research indicates that high moisture corn when ground or rolled has approximately the same feed values as dry ground corn when expressed on an equivalent dry matter basis.

Some suggested diet formulas and feeding guides are shown on the reverse side.

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SUGGESTED DIET FORMULA FOR SWINE

Class of Pig	Suggested Formulae	Feed Requirements
Early-weaned and weanling pigs 15-50 lbs.	A. Soybean meal 280 Ground corn 685 Ground limestone 8 Calcium phosphate 12 Salt (iodized) 5 Vitamin premix 5 Trace mineral premix 5 <u>5</u> 1,000 B. Commercial starter	2 lbs. feed per pound of gain
Growing-finishing pigs 50-200 lbs.	A. Soybean meal 180 Ground corn 785 Ground limestone 8 Calcium phosphate 12 Salt (iodized) 5 Vitamin premix 5 Trace mineral premix 5 <u>5</u> 1,000 B. 35% protein supplement 230 Ground corn 770	2.5 - 3.5 lbs. feed per pound of gain
Dry sows, open or bred gilts, boars	A. Same as A or B for growing-finishing pigs B. If pasture or clover-alfalfa haylage is available C. If corn silage is available	Sows & gilts 4-5 lbs. per head per day Boars 5-7 lbs./head/day Sows and gilts 2 lbs. per head per day of growing-finishing diet plus pasture or full feed of haylage Sows and gilts 1 lb. per head per day of 35% protein supplement plus full feed of corn silage

SUGGESTED DIET FORMULA FOR SWINE

Class of Pig	Suggested Formulae	Feed Requirements
Lactating sows* and gilts	A. Same as A for growing- finishing pigs	full fed
	B. Same as B for growing- finishing pigs	full fed

*If constipation is a problem at time of farrowing, wheat bran may be added at the rate of 25% of the ration for a few days prior to and after farrowing.

SUGGESTED FORMULA FOR VITAMIN AND TRADE MINERAL PREMIXES

Vitamin Premix — each 5 lbs. to contain the following:

Vitamin A (dry stabilized)	1,500,000 IU
Vitamin D (dry stabilized)	150,000 IU
Vitamin E	2,500 IU
Riboflavin	2 gm
Pantothenic acid	4 gm
Niacin	9 gm
Choline	50 gm
Vitamin B ₁₂	9 milligrams

Trace Mineral Premix — each 5 lbs. to contain the following:

Manganous oxide (56% Mn)	.10 lb
Ferrous sulfate (20% Fe)	.35 lb
Copper sulfate (25% Cu)	.04 lb
Zinc oxide (80% Zn)	.12 lb

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PIG FEEDING

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CANADA DEPARTMENT OF AGRICULTURE

AND

UNIVERSITY OF SASKATCHEWAN

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INTRODUCTION

Much of the success in raising pigs depends on the feeding program. Feed costs make up about three quarters of the total cost of raising pigs even under good management. The quality of the rations largely determines the rate of growth in young pigs; general resistance to disease, infection and parasites; regularity of breeding; size and vigor of the litter; amount and quality of the milk; and lastly the quality of the carcass.

Pig feeding is becoming increasingly complex as new knowledge is obtained on nutritional requirements, as production methods change under economic pressures, and as new growth stimulants and other products are discovered. For new developments to be practical, they must be in line with the principles of nutrition. And every new product must be considered carefully on an economic basis; though failure to use the proper supplements to grains can be costly, because of production losses, use of expensive or ineffective ingredients also dissipates profits.

Ration formulas are suggested and feed requirements listed inside the back cover.



REQUIREMENTS

Under good conditions, pigs in the period after weaning need about 3 pounds of well-balanced feed per pound of liveweight gain. This high efficiency declines until they eat 4 or 5 pounds of feed for every pound of gain toward the end of the finishing period. This progressive decline in feed efficiency makes it important to use good rations in the growing period. At this stage, feed efficiency is high because muscle, not fat, has priority in development of the pig.

Feed requirements increase from 2 to 3 pounds per day for an 8-week-old weanling to about 8 pounds per day for a 200-pound pig. Mature, pregnant sows eat about 7 or 8 pounds per day, and more in cold weather. Lactating sows may eat more than 12 pounds daily.

PROTEIN—Adequate protein must be provided in the diet to sustain normal rates of growth or levels of milk production. Not only must the level be higher than that usually found in farm grains but the quality of the protein must be good. The quality depends on the type or makeup of the protein, that is, the particular assortment of amino acids in it. Pigs are simple-stomached animals and cannot synthesize amino acids as well as cows or sheep. The more closely the amino acid content of

the feed resembles that in the muscle or meat of the pig, the higher the quality of the protein. Hence, most proteins of animal origin are superior to those of plant origin. However, the amino acid requirements are so well known now that it is possible to formulate good mixed-protein supplements without extensive use of milk or packinghouse by-products if these feedstuffs are not readily available at competitive prices.

Growing pigs need from about 22 percent protein in the diet during the suckling stage and to about 16 percent by the time they weigh 100 pounds. They need about 14 percent when they approach 200 pounds. They need higher levels if the protein quality is low, that is, if one or more amino acids are deficient in the diet.

Pregnant females and young breeding boars need about 15 percent protein.

ENERGY—The energy, or total digestible nutrients (TDN), fraction of the ration is the largest part and includes starch and fat. Pigs require a high TDN content in their ration because they cannot digest fibrous feeds. They cannot gain rapidly if they are fed grain rations containing less than about 70 percent TDN.

Be sure that the ration contains the right level of energy, or TDN, for the age or size of pig. For example, for pigs under 100-125 pounds liveweight, high-energy rations, mainly barley, wheat and heavy oats, give best performance. In the finishing period, however, to avoid overfattening, it is best to reduce energy consumption by using feeds of lower energy value or limiting daily feed intake. For other rations, see the suggested formulas inside the back cover.

Most of the food energy obtained by pigs comes from starches. Occasionally fats are added to increase energy content, especially in commercial rations for young pigs. When special precautions are taken to ensure stability and quality, and when fats compete economically with grains as energy sources, this practice is acceptable. Incorporating some extra fat into a ration reduces dustiness and improves pelleting. Obviously fat as a ration ingredient is of most interest to the feed manufacturer, who has the necessary equipment for handling it.

MINERALS—Mineral supplements are needed for most rations. Mineral deficiencies are common causes of crippling, lameness, failure in lactation and slow growth.

Calcium—Much calcium is used in bone formation and it is an important constituent of milk. It is almost always too low in farm grains, and sometimes the quality of the drinking water aggravates the deficiency. If the water is hard or alkaline, it may be worthwhile to increase the calcium supplement slightly.

Ground limestone is the most common source of calcium.

Phosphorus—This mineral is very important in feed utilization and muscle development and is also used in bone and milk formation. Grain rations do not contain enough phosphorus. However, a good protein supplement containing meat meal, tankage, etc., corrects the deficiency.

The ratio of calcium to phosphorus should be about 1:1.

Iodine—Pregnant sows need iodine so that they do not give birth to weak or dead, hairless pigs. Iodized salt may give

adequate protection if it is fresh, but it may lose much of the iodine in storage. It is less risky to give each sow a tablespoonful of potassium iodide solution daily. To make this solution, dissolve 1 ounce of potassium iodide in 1 gallon of soft water.

Iron—Iron, along with a trace of copper, is used in formation of red blood cells. Lack of these minerals is a special problem with very young pigs. As milk contains very little iron, pigs begin to show anemic symptoms within a few days after birth. You must therefore begin supplying extra iron on the second or third day of life.

Iron compounds are available for injection and for giving by mouth. Many operators prefer the injectable compounds though they cost more than those given by mouth. One injection is usually enough for pigs that are weaned early or that begin eating solid feed at three or four weeks of age; otherwise, more iron may be needed.

If you give the iron by mouth you must give it weekly from the second or third day after birth to the third or fourth week, depending on how much is in the ration. It is best to give 1/8 to 1/4 teaspoonful of ferrous (iron) sulphate or reduced iron per pig. These iron supplements usually contain enough copper as an impurity to meet the needs for this element. Giving a feeding oil containing vitamins A and D with the iron reduces the danger of the pigs inhaling the powder, and supplies valuable vitamins as well. Though the above method of giving iron to pigs is the cheapest, there are several satisfactory commercial preparations available.

Zinc—Zinc is one of the essential minerals in animal nutrition but is usually



Figure 1—Parakeratosis is indicated by thickened skin, scaliness and a dirty appearance. It is caused by zinc deficiency, often aggravated by faulty calcium supplementation of the ration.

present in adequate amounts in typical pig rations. Recently, however, a skin condition called parakeratosis (Figure 1), somewhat resembling mange, has been found to be prevented and cured by adding zinc sulphate to the ration at about 1/3 ounce per 100 pounds. Zinc is now included in most commercial protein-mineral-vitamin supplements.

Others—Though there are 14 minerals known to be essential, the above are the only ones that usually need to be added to pig rations. As a rule, it is wasteful to use more complex mineral mixtures.

VITAMIN A—Vitamin A (or carotene) is needed for normal growth, bone development, and reproduction. This vitamin is almost entirely lacking in the cereal grains commonly grown in Canada. It occurs in green materials such as pasture grass and alfalfa meal as well as in feeding fish oils and many commercial supplements. To meet the requirement, provide 600-700 international units per pound of ration for pigs in the weight range from weaning to 200 pounds. During gestation a sow

needs more, about 10,000 I.U. per day or 1,500 I.U. per pound of feed (air-dry).

Since vitamin A is rather unstable unless it is protected from oxidation, use only dry, stabilized forms of the vitamin in feeds that are to be stored for more than two weeks.

VITAMIN D—This vitamin is needed mainly in bone development and in utilization of the minerals calcium and phosphorus. Sunshine produces the vitamin from chemicals in the skin but animals fed indoors must receive the vitamin in the diet (Figure 2).

Feeds should contain about 100 I.U. of vitamin D per pound when pigs of any age or class are fed indoors. A common source is feeding fish oil, which provides both vitamins A and D. Dry synthetic mixtures containing both vitamins A and D in the correct proportions are available from many feed retailers.

B VITAMINS—These include thiamin, riboflavin, niacin, pantothenic acid, pyridoxine, vitamin B₁₂ and others. They have many roles in digestion and utilization of feed, and deficiencies

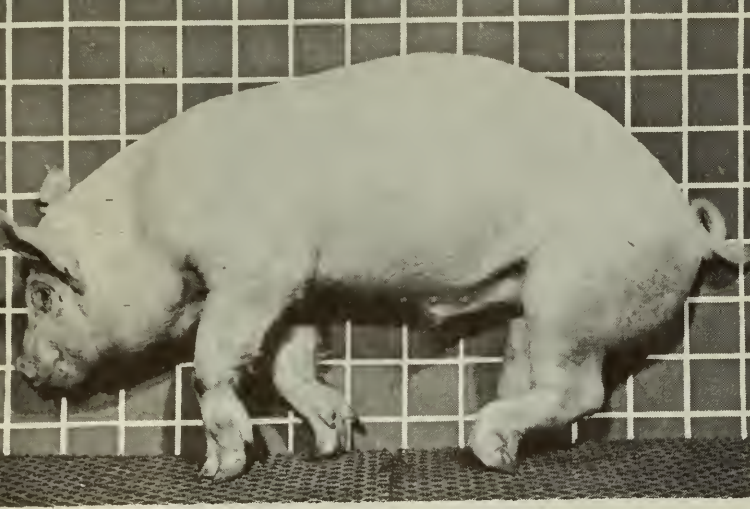


Figure 2—Pigs kept indoors require a vitamin D supplement in the ration. Without it, they grow poorly, go lame or develop rickets.

cause poor growth and a variety of other outward symptoms.

Good-quality grain and the recommended types of mixed supplements usually provide all the necessary B vitamins. If the quality of the feed is doubtful, add 2-5 percent of brewers' yeast, wheat germ meal or dehydrated alfalfa meal. Various special vitamin mixtures are available but these are best prepared by the feed manufacturer or mixed according to advice of feed specialists.



In most areas of Canada, grain is the basic feed for pigs. Barley is the main feed but appreciable quantities of oats, wheat, rye, screenings, damaged grain, etc., are used. The characteristics of the various feeds of most concern to the feeder are as follows.

All the cereal grains are low in protein, calcium, and vitamins A and D. As hulls have very little food value, bushel weight is a very important criterion of quality.

BARLEY—Barley is a very palatable and nutritious grain for pigs and can be fed successfully to pigs after weaning if it is used in balanced rations. Good barley contains about 70 percent TDN,

but as quality declines or as the proportion of hulls increases the energy content declines.

Good barley (48-55 pounds per bushel) is suitable as the only grain in growing rations but is too high in energy for good carcass development in finishing rations. It is also much too high in energy for self-fed pregnant sows.

OATS—Oats vary extremely in quality. Hulless oats and light-hull varieties like Rodney are very palatable and high in energy and are excellent pig feeds. Average oats contain about 65 percent TDN.

Heavy oats (40 pounds or more per bushel) can be used where moderately

high energy rations are called for, and light oats in finishing rations and dry-sow rations; very light oats can be mixed with heavy barley or wheat to make a desirable mixture.

WHEAT—Wheat contains more energy than oats or barley, about 80 percent TDN, and is a very concentrated, or “hot,” feed. It is nutritious and palatable and can be used to advantage either as the main grain in a ration or in mixtures. It is a good feed during the early phases of the feeding period but should be fed less heavily during the finishing period, lest the pigs become too fat.

Wheat usually contains about 13 to 15 percent protein. This level of protein is higher than that in oats or barley. Lightweight wheat often contains even more protein, whereas oats and barley of low bushel weight have lower protein contents.

RYE—Rye resembles wheat in being high in energy and low in fiber, but it is not as palatable to livestock. If you use it, mix it with other grains, preferably at less than a third of the mixture. Be sure that the ergot content is low, since more than one ergot body per 1,000 kernels of grain is toxic to pigs.

SCREENINGS, WILD OATS, WILD BUCK-WHEAT, ETC.—The feeding values of feeds like these correspond to their cereal grain contents. Much lightweight fibrous matter such as chaff and hulls reduces the feeding value. “Black” weed seeds likewise have very little feeding value, and some are slightly toxic. Since frozen flax may contain prussic acid and cause illness or death, it should be fed in small amounts or cooked or

stored for a season to eliminate the hazard.

DAMAGED GRAIN—Drought, rust, frost, fire, heating and other factors often make grain unsalable, and feeding it to livestock offers a chance to recover some of the losses. All of these types of damage reduce the feeding value somewhat through loss of some of the nutrients in the grain and through lower palatability because of the off-flavors and off-odors present. Such grain does not appear to be toxic. It is best, however, not to feed damaged grain to pregnant or nursing sows.

MILL BY-PRODUCTS—These include bran, shorts and middlings. Bran is low in energy but rich in protein, minerals and B vitamins. It is also laxative and therefore useful in sow rations near farrowing time. Shorts and middlings are popular ingredients of feeds for young pigs. They contain about 17 percent protein and are slightly richer in energy than oats.

MILK AND MILK BY-PRODUCTS—Skim milk and buttermilk are excellent supplements to grains for pigs. They contain protein of good quality, vitamins and minerals. If you rely on skim or buttermilk as the entire supplementary protein, give growing pigs about 1½ to 2 pints for every pound of grain they eat; in other words, most of their drink must be milk.

Whey is also a good pig feed but is most important as a source of minerals and vitamins since it contains very little protein (12 percent on a dry basis).

TANKAGE, MEAT MEAL, MEAT SCRAPS—These packinghouse by-products are of

special value because of their animal origin. Mixed protein supplements should contain at least a third of animal protein to ensure proper amino acid contents in the rations. These products are rich in protein (45-60 percent) and contain considerable calcium and phosphorus. They are usually good sources of B vitamins, but vary in this regard according to the quality of the original material, the temperature and period of cooking during processing and other factors.

FISHMEALS—Fishmeals are richer in protein than packinghouse by-products and the protein is excellent in quality. The protein contents range from 60 to 70 percent. Fishmeal is worth somewhat more than meat meal, per unit of protein, because its lysine content is higher and the protein is more readily digestible.

OIL MEALS—These include the oil meals from flax (linseed), soybeans, rape and sunflower. They contain from 32 to 45 percent protein and are useful with protein supplements of animal origin. Rapeseed oil meal is less palatable than the others and, because it contains a substance that may retard growth, it should not be used for more than 25 percent of the protein supplement in growing and finishing rations and should not be used at all in gestation, lactation, early-weaning or starter rations. The oil meals contain slightly more calcium and phosphorus than grains and, when used at the rates recommended, contribute appreciable amounts of B vitamins.

ALFALFA MEAL—High-quality alfalfa is an excellent source of vitamin A, vitamin D (if the alfalfa is sun-cured),

B vitamins and certain other nutrients. Alfalfa hay placed in racks is relished by sows. The alfalfa, however, must be of high quality.

The best product for mixing into feeds is artificially dehydrated alfalfa meal. It is highly desirable to include 5 percent of this in the rations of sows and 2-5 percent for other pigs. Most good commercial supplements contain alfalfa meal or some high-quality dehydrated forage material.

PASTURE—Lush, vigorously growing, green pasture also is an excellent source of supplementary feed, and can provide much of the feed for mature boars and dry sows. However, especially in some areas of the Prairie Provinces, the quality of the pasture may not be high enough throughout the grazing season. Yet it is worthwhile to ensure that breeding stock have access to good pasture in season.

ROOT CROPS, POTATOES—These feeds are satisfactory as part of the ration. They are high in water content but low in minerals and protein. Potatoes are utilized best if cooked. To maintain usual rates of gain, preferably limit these succulent feeds to a few pounds daily per animal, not more than 5 percent of body weight.

BONE MEAL, BONE FLOUR—These are excellent sources of supplementary calcium and phosphorus. Bone meal is usually granular but bone flour is fine and sometimes dusty, and somewhat unpleasant to handle. They are of about equal value nutritionally and contain about 24 percent calcium and 12 percent phosphorus.

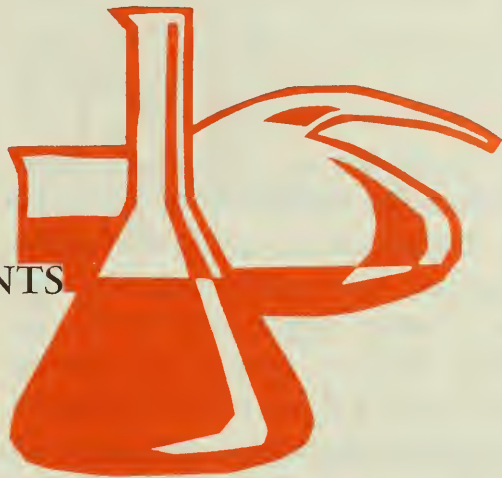
DICALCIUM PHOSPHATE AND DEFLUORINATED ROCK PHOSPHATES—These products are obtained from deposits in

the earth and can be used as substitutes for bone meal. Those that contain excessive fluorine must be defluorinated before they can be sold. They are somewhat less palatable than bone meal. Dicalcium phosphate contains about 26 percent calcium and 18 percent phosphorus, and rock phosphate about 34 percent calcium and 14 percent phosphorus.

GROUND LIMESTONE—This is a very useful supplement in certain pig rations but it supplies only calcium. It contains 38 percent calcium.

SALT—Salt is required by pigs and is available in plain, iodized and cobalt-iodized forms. Iodized salt is recommended (*see* page 4 for giving iodine to pregnant sows).

SPECIAL SUPPLEMENTS



COMMERCIAL PROTEIN SUPPLEMENTS—When used with farm grains, these supplements usually provide all the protein, minerals, vitamins and antibiotics needed. The Feeding Stuffs Act requires at least 35 percent protein in protein supplements sold for pig feeds. The quality and nutritional value of the supplements vary according to the ingredients used, such as alfalfa meal and brewers' yeast, and also to the amounts and quality. However, when skim milk, buttermilk or home-made mixtures are not used, this type of supplement is recommended for general use.

To be sure that the supplement is of high quality, buy from reputable manufacturers or dealers. Supplements containing antibiotics should include at least 3 to 4 grams of antibiotic in each 100 pounds of supplement.

It should be unnecessary to add anything but a good commercial supplement to cereal grain for pigs over 35-40 pounds in weight.

COMMERCIAL MINERAL SUPPLEMENTS—These must, by law, contain 22.5 to 30.0 percent calcium and 20-25 percent salt. They also usually contain phosphorus, iron and iodine and may contain copper, manganese, zinc and cobalt. Other minerals are neither permitted to be added nor considered necessary in the supplements. The essential ingredients are iodized salt, ground limestone, bone meal or dicalcium phosphate, and possibly ferrous (iron) sulphate. More complex or more expensive mixtures are usually not needed.

As mineral supplements do not supply protein, vitamins or other

factors considered necessary as additives to grain, other supplements are also essential.

ANTIBIOTIC FEED SUPPLEMENTS—It is now common practice to include antibiotics such as a tetracycline compound (Aureomycin or Terramycin), penicillin, streptomycin, Bacitracin, oleandomycin or mixtures of these in pig feeds. The tetracycline compounds usually give better responses than the others. Their use has resulted in fewer 'runt' pigs, less scours or diarrhea, faster growth rates and higher feed efficiency.

The antibiotics are available in dilute concentrations, usually from 2.5 to 50 grams of antibiotic in each pound of the supplement. This supplement is added to the protein supplement or to the complete feed to obtain the desired concentration. Rations for early-weaned pigs usually contain 30 to 100 grams of antibiotic per ton of feed—the higher levels being used in herds having a history of severe scours. Growing rations should contain about 10 grams per ton but it is doubtful if it is worthwhile to add antibiotics to finishing rations.

Antibiotics are not recommended for mature, dry or breeding stock, which seldom have digestive disturbances.

Antibiotics, singly and in combination with sulfa or other drugs, are also available in high concentrations to control severe outbreaks of scours. They are especially useful for very young pigs that do not eat solid feed and when quick action is needed to save affected animals. Some preparations are available in soluble form for adding to the drinking water.

VITAMIN SUPPLEMENTS—Vitamin deficiencies are unlikely to occur if a

protein-mineral-vitamin supplement is used as recommended. When more vitamins are needed, they are best incorporated into the overall supplement since they are not the only nutrients lacking in farm grains (*see* ration formulas inside the back cover).

Pigs raised outdoors on good green pastures obtain enough vitamin A (as carotene from forage) and enough vitamin D (from sunshine). Pigs raised indoors need these vitamins added to their feed as dry, synthetic preparations or feeding oils as described previously.

OTHER MATERIALS—Products other than the above, such as complex vitamin mixtures, tonics and stimulants, are available, but standard supplementary feeds usually supply the basic nutritional needs of the pig. Also, unnecessarily expensive materials may reduce profits greatly. When difficulties arise in spite of apparently good feeding practices, consult a veterinarian or a specialist on swine problems.



PREPARING FEED

If you prepare the feed on the farm, it pays to grind cereal grains such as wheat, oats or barley. The nutrients inside the kernel are not well digested unless the hull has been broken.

Grind oats fine, especially for young pigs as their intestines may be irritated by coarse oat hulls. Grind other grains coarse, or roll them just enough to expose the insides of the kernels to the digestive juices. Avoid dusty feeds.

Soaking or cooking of cereal grains does not improve feeding value and, without special mechanization, requires considerably more labor and expense than dry feeds do.



Feeding recommendations for pigs always include use of some type of supplement unless plenty of skim milk or buttermilk is available. Hence the question of cost arises. A general-purpose protein-mineral-vitamin supplement costs two or three times as much as feed grain, but the saving in feed per pound of gain or the improvement in reproduction performance usually far more than offsets the cost. Also, pigs suffering from malnutrition are more susceptible to diseases, infections and parasites.

GESTATION RATIONS FOR SOWS AND GILTS—Many of the difficulties in raising pigs are due to faulty feeding of the pregnant female. For you to make a profit, the litters must be large and vigorous because a sow eats about $1\frac{1}{2}$ tons of supplemented grain per year (less with good pasture (Figure 3) in summer) and the cost of this feed

must be charged against the returns from her litters.

Pregnant females need a ration containing 14-16 percent protein (the higher level for gilts), 0.6 percent calcium, 0.4 percent phosphorus, 0.5 percent salt and 1,500 I.U. of vitamin A and 100 I.U. of vitamin D per pound of feed. Use of 7-12 percent of a good protein-mineral-vitamin supplement containing 35 percent protein usually gives excellent results along with farm grains. Sows in good flesh that are being self-fed (Figure 4) should be given rations containing little heavy barley or wheat and correspondingly more oats, bran or alfalfa meal to prevent excessive fattening. You may restrict the amount of feed to 5-7 pounds per day if it is well balanced and has not been diluted by low-energy ingredients, without interfering with reproductive performance.



Figure 3—Pasture is an excellent source of supplementary feed and can provide most of the feed for mature boars and dry sows.

For a home-made supplement for sows, a satisfactory formula is given under “Growing pigs” in the ration formulas inside the back cover.

LACTATION RATIONS—Give sows more water or skim milk than usual for a few days before farrowing, and dilute the gestation ration with about $1/4$ to $1/3$

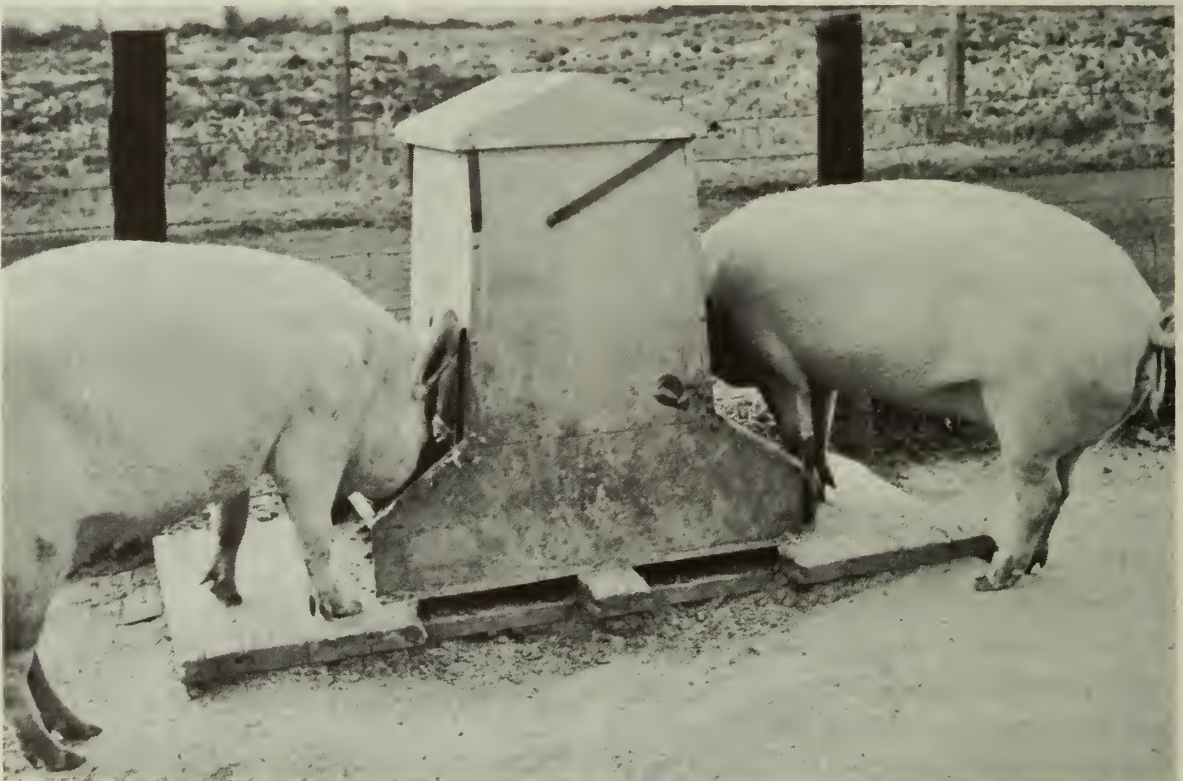


Figure 4—Sows may be self-fed, but the TDN content of the ration should be low enough to prevent excessive fattening.

The following suggestions will aid in designing sow rations:

Oats	20%	} Or any mixture of grain weighing about 45 pounds per bushel: for example, equal parts of oats and feed wheat.
Barley	60%	
Alfalfa meal	10%	} If you do not use alfalfa meal, increase the protein supplement to 12 percent.
Commercial protein supplement	10%	

bran. These practices reduce constipation and udder congestion. You may withdraw bran gradually during 3 or 4 days after farrowing; otherwise the gestation ration is suitable throughout lactation.

The main difference in nutritional requirements is an increase in total feed. Even if feed intakes are doubled it is usually impossible to prevent weight losses in heavy milking sows, but it is necessary to avoid deficiencies of protein, minerals and vitamins. These may adversely affect the yield or quality of the milk or the health of the sow.

CREEP RATIONS FOR SUCKLING PIGS—

Until about 8 weeks of age, suckling pigs require a ration containing at least 17 or 18 percent protein and one that is otherwise highly nutritious and palatable. Ingredients that are specially relished are oat groats (hulled oats or sifted oat chop), coarsely ground wheat, soybean oilmeal and sugar.

Commercial starter rations are popular for creep feeding; they come in pellets or crumbles practically free of dust and well liked by the pigs.

If you mix creep rations, preferably use the following: 20 pounds of commercial protein-mineral-vitamin supplement, 10 pounds of cane sugar and

70 pounds of ground oat groats, ground wheat and possibly some wheat shorts. To the mixture add one gram of broad-spectrum antibiotic, for example, 1/10 pound of an antibiotic feed supplement containing 10 grams of antibiotic per pound.

GROWER RATIONS (for pigs from 40 to 110 pounds)—These rations should contain 15 or 16 percent protein and a rather heavy grain mixture. The grain may be straight barley or almost any mixture of farm grains that weighs 45-50 pounds per bushel. Rapid growth is desirable at this stage. From 12 to 15 percent of a protein-mineral-vitamin supplement should be included in the ration. It is advisable to include antibiotics.

If parakeratosis, a mange-like condition, has been a problem in the herd, include 1/3 ounce of zinc sulphate in each 100 pounds of feed. Most commercial supplements, however, contain added zinc, in which case it is not necessary to add more.

FINISHER RATIONS (for pigs from 110 to 200 pounds)—During this phase of development the pigs tend to deposit fat. Overfinish is the main reason for failure of 200-pound pigs to obtain top

grades when marketed. Therefore, you may improve carcass quality appreciably by restricting the rate of gain during the finishing period.

With self-fed pigs, rely mainly on oats as the grain or in some way reduce the energy content, or weight per bushel, of the ration to about the equivalent of good-quality oats. The ration should contain 13 or 14 percent protein, which can be obtained by including 5-6 percent of a protein supplement. If the only available grain is heavy barley or wheat or if pigs are gaining more than about 1.75 pounds per day, there is risk of overfinish. Then you might consider diluting the ration with materials such as finely ground oat hulls, chaff, ground straw or hay, providing the cost of the diluting material is less than half the cost of the grain, pound for pound.

Various mechanical methods of restricting feed intake are now available. These include intermittent, automatic dispensing of dry and liquid feeds.

EARLY-WEANING RATIONS—There is increasing interest in weaning pigs at about 3 weeks of age, especially among producers who have suitable facilities. There are some commercial rations for this purpose and, because they contain

skim-milk powder, sugar, protein, and vitamin and antibiotic supplements, they are more expensive than most other feeds sold for pigs. Yet there is some evidence that early weaning offers several advantages, including saving more pigs, earlier marketing, earlier rebreeding of the sow and some saving in total feed costs.

If you wean pigs at about 15 pounds average weight, feed them a special prestarter or early-weaning ration, preferably a commercial one, until they weigh about 30 pounds. Then change gradually to a grower ration. Each pig needs about 10-15 pounds of prestarter.

MILK REPLACERS—A milk replacer is a convenient means for saving extra or orphan pigs but is too expensive and troublesome to handle otherwise. Baby pigs must receive a few feedings of colostrum, or “first milk,” to acquire enough disease antibodies to survive. When they reach about 15-20 pounds, it is best to transfer them to an early-weaning dry-meal formula and water, and from there on proceed as usual for early-weaned pigs.

Milk replacers cost over twice as much per pound of dry matter as do prestarters and these in turn are about twice as expensive as grower rations.

NUTRITIONAL DEFICIENCIES

Often, unthriftiness and sickness are caused by nutritional deficiencies and can be prevented by use of well-balanced feeds. However, not all sickness is caused by faulty feeding and it is best to consult a veterinarian when

a pig becomes sick. When this service is not available the following list of symptoms of nutritional deficiencies and their possible causes may aid in curing or preventing them.

Symptoms	Possible Causes
Slow growth	Grain too light in weight; too little feed; protein too low in quantity or quality; mineral or vitamin deficiency. Also, parasites or disease.
Poor appetite	Deficiency of protein, calcium, phosphorus, iron, or B vitamins.
Abnormal skin and hair conditions	Deficiency of amino acids (improper protein supplements), calcium (or imbalance), zinc, salt, or B vitamins. Also, mange.
Lameness, rickets, posterior paralysis	Deficiency of calcium, phosphorus, vitamin A, vitamin D, or certain B vitamins. Also, for lameness: imbalance of calcium and phosphorus, especially excess phosphorus.
Scours, diarrhea, enteritis	B-vitamin deficiencies; ration too fibrous (especially coarse oat hulls). High 'disease-level' in barn due to improper sanitation, poor ventilation, etc.
Poor breeding performance in sows	Overfatness or run-down condition; deficiency of calcium, iodine, vitamin A or B vitamins.
Birth of dead or weak pigs	Deficiency of vitamin A, iodine, protein, calcium or B vitamins in sow's ration during pregnancy.
Birth of hairless pigs	Iodine deficiency in the sow's ration during pregnancy.
Birth of blind, dead or mummified pigs	Vitamin A deficiency in sow's ration during pregnancy.
Anemia	Iron deficiency. Copper and certain B vitamins may also be involved but these are probably available in sufficient amount in the iron supplement and the milk from the sow.
Lactation failure (agalactia)	Probably mineral and protein deficiencies in the gestation rations. The exact cause is unknown but sows that are fed according to the recommendations in this publication and that are well cared for seldom fail to have milk.

Table 1—Growth and feed intakes typical of well-bred pigs fed as recommended in this publication, free of diseases and parasites and comfortably housed

Weight lb.	Days of age	Daily gain, lb.	Daily feed intake, lb.
30	44	0.7	1.8
40	57	1.0	2.5
50	65	1.2	3.0
60	73	1.2	3.4
70	82	1.3	3.7
80	88	1.6	4.6
90	94	1.7	5.5
100	100	1.7	5.7
120	112	1.7	6.0
140	124	1.8	7.1
160	135	1.8	7.3
180	146	1.8	7.5
200	157	1.8	7.8

RATION FORMULAS AND FEED REQUIREMENTS FOR PIGS

Alternatives are listed in the usual order of preference. Skim milk and buttermilk are assumed not to be available.¹ The requirements are estimates only and vary with local conditions.

Class of Pigs	Suggested Formulas	Feed Requirements
Suckling pigs (2 to 8 weeks old)	A. Commercial pig starter, meal, pellets, crumbles	10 lb. per pig (varies with litter size, milk production of sow, etc.)
	B. Wheat, ground.....400 lb. Oat groats, ground.....240 lb. Sugar.....100 lb. { Soybean meal.....170 lb. Fish meal..... 50 lb. Brewers' yeast..... 20 lb. Salt, iodized..... 5 lb. Ground limestone..... 5 lb. Bonemeal..... 10 lb. Zinc sulphate.....0.5 lb. Vitamin A.....900,000 I.U. Vitamin D.....130,000 I.U. Vitamin B ₁₂ 15 mg. Antibiotic (broad-spectrum; see below).....20-50 gm.	
	The bracketed part of the ration may be replaced by 30 percent of a commercial protein-mineral-vitamin supplement ("hog concentrate") or 30 percent of the "Growing pigs" supplement shown on next page.	

Class of Pigs	Suggested Formulas	Feed Requirements
Early-weaned pigs (15 to 25 lb.)	A. Commercial early-weaning formula	18 lb. per pig
	B. Early-weaning or prestarter ration	
	Wheat, ground.....250 lb.	
	Oat groats, ground..... 50 lb.	
	Skim milk, dried.....150 lb.	
	Whey, dried.....100 lb.	
	Wheat germ meal..... 80 lb.	
	Fish meal.....100 lb.	
	Soybean meal.....100 lb.	
	Lard, stabilized..... 50 lb.	
	Cane sugar..... 80 lb.	
	Brewers' yeast..... 30 lb.	
	Salt, iodized..... 5 lb.	
	Ground limestone..... 5 lb.	
	Iron sulfate.....0.5 lb.	
	Copper sulfate.....2.3 gm.	
	Zinc sulfate.....300 gm.	
Vitamin A.....1,200,000 I.U.		
Vitamin D.....150,000 I.U.		
Vitamin B ₁₂20 mg.		
Antibiotic (broad-spectrum; see below).....25-100 gm.		
Weanling pigs (35 to 50 lb.)	A. Barley or wheat, ground.....500 lb.	30 lb. per pig
	Oats, low fiber, ground.....240 lb.	
	Commercial supplement, 35 percent protein.....260 lb.	
	B. Equal parts of Creep Ration or Pig Starter and regular Grower Ration	50 lb. per pig
Growing pigs (50 to 110 lb.)	A. Barley or wheat, ground.....700 lb.	180 lb. per pig
	Oats, ground fine.....150 lb.	
	Commercial protein-mineral- vitamin supplement.....150 lb.	
	B. Protein-mineral-vitamin supplement, 35% protein	180 lb. per pig
	Meat meal.....450 lb.	
	Soybean meal.....300 lb.	
	Bone meal or dicalcium phosphate 80 lb.	
	Ground limestone..... 80 lb.	
	Salt, iodized..... 40 lb.	
	Vitamin A, stabilized.....8,000,000 I.U.	
	Vitamin D.....1,800,000 I.U.	
	Zinc oxide.....100 gm.	
	Riboflavin..... 20 gm.	
	Pantothenic acid.....500 gm.	
	Methionine..... 30 lb.	
Vitamin B ₁₂ supplement (9 mg. per lb.)..... 5 lb.		
Antibiotic (see list under "Creep Ration").....160 gm.		
Finishing pigs (110 to 200 lb.)	Oats, ground.....800 lb.	360 lb. per pig
	Barley, ground.....120 lb.	
	Salt, iodized..... 5 lb.	
	Ground limestone..... 5 lb.	
	Commercial supplement, 35 percent protein..... 70 lb.	

Class of Pigs	Suggested Formulas	Feed Requirements
Dry sows, open gilts, boars	Green pasture in season: finisher ration in winter and to supplement pasture nutrients	Without pasture: Sow (500 lb.) 5-7 lb. per day Gilt (300 lb.) 5-6 lb. per day Boar (500 lb.) 7.5 lb. per day.
Bred sows and gilts	A. Oats, ground.....140 lb. Barley, ground.....650 lb. Alfalfa meal.....150 lb. Commercial supplement, 35 percent protein..... 60 lb. B. Finisher ration	Sow 5-7 lb. per day Gilt 5-6 lb. per day
Lactating sows and gilts	Oats.....130 lb. Barley.....600 lb. Wheat.....100 lb. Alfalfa meal..... 50 lb. Commercial supplement..... 80 lb. Bran..... 40 lb.	400-lb. sow 12.5 lb per day 350-lb. gilt 11.0 lb. per day

¹ Skim milk and buttermilk are excellent feeds for pigs. 1 to 1½ gal. will replace about 1 lb. of commercial protein supplement but lacks vitamins A and D.

SPECIAL PROBLEMS—MAJOR HAZARDS—COMMENTS

CREEP RATION

Diarrhea and enteritis problems are severe at this stage. The ration should contain 30 to 100 gm. of antibiotic per ton of feed. Use a tetracycline compound (Terramycin or Aureomycin), Bacitracin, oleandomycin or a mixture of penicillin and streptomycin. Palatability may be increased by including 10 percent sugar (replace 100 lb. wheat with 100 lb. sugar). Give injectable or oral iron compounds separately to prevent anemia.

STARTER RATION

The ration should contain 18-25 percent protein, 75-80 percent TDN plus ample vitamins, minerals and an antibiotic.

GROWER RATION

The grain may be almost any mixture of wheat, oats or barley of good quality; final mixture to weigh 45-50 lb. per bushel. Worm control advised here: piperazine, Hygromycin, etc. The antibiotic chosen (*see* "Creep Ration" above) should be included in supplement or ration to provide 10-20 gm. of antibiotic per ton of feed.

GESTATION RATION

Ration A is high in alfalfa meal and is a good winter ration if alfalfa is low in price and grain is heavy. Ration B is suitable for pasture use or winter use. Beware of deficiencies of iodine, vitamin A, protein and calcium. Make maximum use of green pasture.

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