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EC71-210 University of Nebraska : Swine Ration Suggestions

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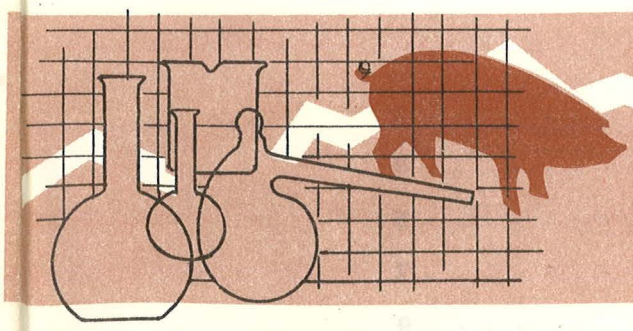
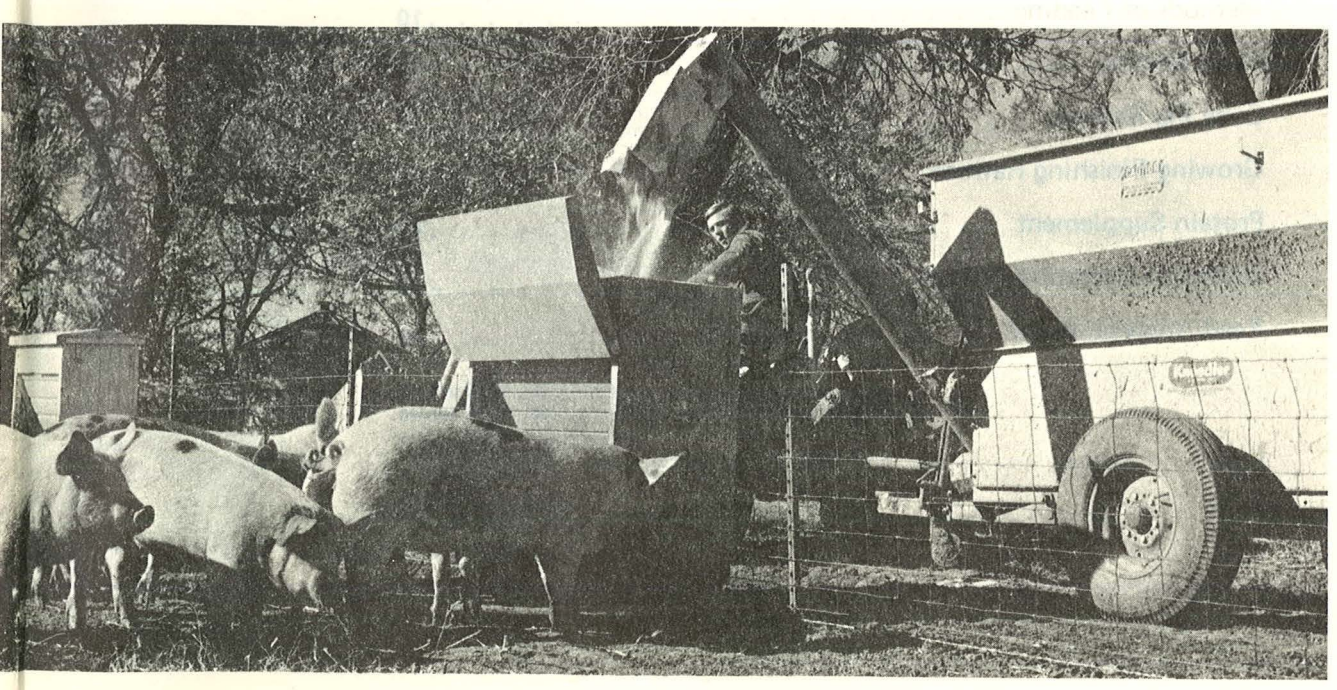


UNIVERSITY of NEBRASKA

swine ration suggestions



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UNIVERSITY OF NEBRASKA COLLEGE OF AGRICULTURE COOPERATING WITH THE
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E. F. FROLIK, DEAN; J. L. ADAMS, DIRECTOR

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University of Nebraska
Swine Ration Suggestions

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Feed represents 65 to 70 percent of the total costs of producing pork. Thus, the producer must be keenly aware of all aspects of swine feeding.

This circular gives accurate information on swine feeding. Since rations and methods of feeding are changing rapidly, this circular will be revised periodically to provide the latest recommendations. In addition, it will be the object of this publication to give answers to some of the more frequently asked questions.

Protein

What is the relationship between amino acids and protein?

Protein is composed of small units called amino acids. There are 22 known amino acids, 8-10 of which are essential in swine diets for optimum growth, maintenance and reproduction. Cereal grains are low in total protein and deficient in 3 of the 10 essential amino acids—lysine, methionine and tryptophan. Soybean meal and commercial protein supplements both increase the level of protein and will correct amino acid deficiencies present in cereal grains.

Define amino acid balance and its relationship to protein quality.

A diet that is "balanced" with respect to amino acids would contain the proper level and ratio of the 10 essential amino acids required by the pig. Quality refers to the amino acid balance and level in relation to a pig's need at a particular stage of growth. The protein of corn and other cereal grains is of a poor quality while protein from soybean meal is of a high quality.

What is the recommended level of protein in the diet for all classes of swine?

To simplify the number of diets required for swine, the University of Nebraska recommends three basic diets containing 16, 14, and 12 percent protein. Other specialized diets will be indicated as required. The feeding program is given in Table 1.

How much protein supplement is needed with corn and milo to formulate rations with recommended levels of protein?

Table 2 lists the amount of corn and protein supplement per ton of feed with varying levels of protein in the supplement.

Can soybean meal be fed as the only source of supplemental protein for growing-finishing swine?

Research at universities in the midwest, including Nebraska, has shown that soybean meal is an excellent protein supplement for swine. It is equal to any other source of protein or combination of proteins for swine when properly fortified with vitamins and minerals. From an economic standpoint soybean meal by itself contains an adequate balance of amino acids to meet the needs of all classes of swine.

If soybean meal alone contains an adequate balance of amino acids (the building blocks of body protein), why do most commercial supplements contain a variety of protein sources?

There are three major reasons: (1) When a feed manufacturer registers his feed, he lists all feedstuffs that he may want to include in it. Then, depending on the price and limits of good nutrition,

Table 1. Feeding program for all classes of swine.

Diet	Source	Age or size of pig	Level of Protein %
Pre-starter	Commercial	Early weaned or orphan pigs	22
Starter	Commercial	2 wks. of age—30 lb. body weight	18-20
Starter-Grower or Grower	Commercial or farm mixed	30-60 lb. body weight	16
Growing-Finishing	Commercial or farm mixed	60-130 lb. or market weight	14
Growing-Finishing	Commercial or farm mixed	130 lb.—market weight	12
Gilts Retained for Breeding	Commercial or farm mixed	200 lb.—breeding[a]	14
Gestation	(Hand feed about 4 lb. per day) (Flush gilts by full feeding or hand feeding 6 to 8 lb. per day two weeks prior to breeding)		
	Hand feed gilts and sows 4 lb. per head per day. However, in extreme cold weather and/or for sows in poor condition a level of 5 to 6 lb. is suggested.		14
Farrowing			
	Reduce feed intake slightly 4 to 5 days before and after farrowing. Laxative rations, those containing 10—15% beet pulp or wheat bran, should be fed starting 10 days before farrowing and during the first week of lactation.		16
Lactation			
	Self-feed during lactation or hand-feed to appetite.		16

[a]For more information on Breeding Herd Management see E. C. 65-212.

he substitutes lower priced sources for higher priced protein sources; thus, the feed manufacturer is able to pass these economic advantages on to the consumer. (2) Since soybean is highly palatable to swine, the feed manufacturer usually adds less palatable ingredients, such as alfalfa meal or tankage, to help control supplement consumption for producers who feed supplement free choice with grain. (3) Habit! Animal proteins were once considered to be better than plant proteins.

At low levels of total protein (12% or lower) where little supplemental protein is used, is it advantageous to add the three amino acids (lysine, methionine and tryptophan) considered to be low in cereal grains?

Probably yes for lysine and methionine but not for tryptophan at present prices. There does not appear to be any economic advantage to adding these amino acids in diets containing levels of 14% protein or higher. In the future, high lysine corn may overcome the need to supplement for lysine and tryptophan.

If the price of tankage or meat and bone scraps is the same as soybean on a protein basis, can tankage and/or meat scraps be fed as the only source of protein?

Research at the University of Nebraska indicates that high levels of meat and bone scraps in the diet reduce growth rate for finishing swine. Our recommendation is that tankage and/or meat and bone scraps should not exceed 5 percent of the diet or 25 percent of the protein supplement. A potential problem with some sources of animal protein is the possible presence of disease organisms such as salmonella.

Table 2. Corn and protein supplement per ton of feed with varying levels of protein.

Percent protein in supplement	*Percent protein ration*		
	16%	*14%*	*12%*
26 Corn or Milo[a]	1163 lb.	1375 lb.	1628 lb.
Supplement	837	625	372
Lb. of grain/lb. sup.	1.4	2.2	4.4
28 Corn or Milo[a]	1250	1458	1666
Supplement	750	542	334
Lb. of grain/lb. sup.	1.7	2.7	5.0
30 Corn or Milo[a]	1321	1509	1698
Supplement	679	491	302
Lb. of grain/lb. sup.	2.0	3.1	5.6
32 Corn or Milo[a]	1379	1552	1724
Supplement	621	448	276
Lb. of grain/lb. sup.	2.2	3.5	6.2
34 Corn or Milo[a]	1429	1587	1746
Supplement	571	413	254
Lb. of grain/lb. sup.	2.5	3.8	6.9
36 Corn or Milo[a]	1471	1618	1765
Supplement	529	382	235
Lb. of grain/lb. sup.	2.8	4.2	7.5
38 Corn or Milo[a]	1507	1644	1781
Supplement	493	356	219
Lb. of grain/lb. sup.	3.1	4.6	8.1
40 Corn or Milo[a]	1538	1667	1795
Supplement	462	333	205
Lb. of grain/lb. sup.	3.3	5.0	8.8
42 Corn or Milo[a]	1566	1687	1807
Supplement	434	313	193
Lb. of grain/lb. sup.	3.6	5.4	9.4
44 Corn or Milo[a]	1591	1705	1818
Supplement	409	295	182
Lb. of grain/lb. sup.	3.9	5.8	10.0

[a]Where protein content of milo is 9% or greater (see page 10 for explanation)

Is there a difference in uniformity of product between protein sources?

Animal proteins vary more in composition and quality than do plant proteins. Tankage and meat and bone scraps are by-products of the meat packing industry. Thus, the composition of these two products depends upon the classes of animals slaughtered. Methods of processing also influence the quality of animal proteins. Plant proteins, on the other hand, are more uniform because they are made from only one product. Too, methods of processing plant proteins have been standardized and the same kind of product can be produced year in and year out. However, improper processing can, and sometimes does occur in the production of plant proteins. Such instances are exceptions rather than the rule.

Minerals

What minerals and what level of each should be included in rations for swine?

See Table 3 for minerals and levels of each to include in swine rations.

Table 3. Minerals and levels to include in swine rations.

Mineral	Pig Weight				
	10-30 Lb.	*30-50 Lb.*	*50-125 Lb.*	*Market weight*	*Breeding stock (hand feeding)*
Calcium %	.70	.65	.65	.65	.90
Phosphorus %	.60	.50	.50	.50	.80
Salt % (Chlorine and Sodium)	.50	.50	.50	.50	.50
Zinc, gm./ton	90	90	90	90	90
Iodine, gm./ton	.20	.20	.20	.20	.20
Iron, gm./ton	90	90	90	90	90
Copper, gm./ton	9	9	9	9	9
Manganese, gm./ton	25	25	25	25	25

What are the sources of minerals for swine?

Mineral	*Source*
Calcium	Ground limestone
Calcium and phosphorus	Dicalcium phosphate, steamed bone meal
Phosphorus	Monosodium and disodium phosphate
Sodium and Chlorine	Salt
Iodine	Iodized salt, trace mineralized salt, and trace mineral mixes
Iron (baby pigs)	Iron injections, clean soil, pills or paste containing iron
Iron (growing and mature pigs)	Iron sulfate, trace mineral mixes, trace mineralized salt
Zinc	Zinc carbonate, zinc sulfate, trace mineral mixes, trace mineralized salt
Cobalt, potassium, Magnesium, sulfur	Usually adequate in natural feedstuffs
Copper	Copper sulfate, Copper oxide
Manganese	Manganese oxide, Manganese sulfate

How should the minerals be fed—as a part of a complete ration, part of a protein supplement or self-fed free choice?

Many instances have been reported in Nebraska where swine have overeaten or undereaten minerals that have been fed free choice. If we wish to make sure that pigs meet their daily requirement for minerals, but do not exceed these, minerals should be fed in a completely mixed ration.

What occurs if high levels of minerals are fed?

If the level of calcium in the ration exceeds 0.8 percent in growing-finishing rations, there may be a decrease in pig gains and feed conversion. Most commercial protein supplements are balanced in minerals to meet the pig's needs when supplement is combined with grain according to the manufacturer's recommendations. Minerals should not be added haphazardly. If problems develop

such as bone abnormalities, rations should be carefully analyzed before changes or additions in the mineral content are made. **Warning!** Adding minerals without reason may cause more harm than good.

Why the change in the recommended level of phosphorus in corn-soy rations?

Recent research from the Nebraska Station and elsewhere indicates that 0.50 percent phosphorus in a corn-soy diet is adequate for growing-finishing swine if the calcium level is no more than 0.65 percent. This is a 1.3:1 ratio between calcium and phosphorus. If the calcium level exceeds 0.65 percent of the diet, phosphorus should be increased accordingly, preferably to maintain the 1.3:1 ratio.

If a complete mineral supplement is used for preparing the ration, the calcium-phosphorus ratio in the supplement should not exceed 1.8:1. Such a ratio should give a 1:1 ratio between calcium and phosphorus in a complete corn-soybean ration.

Are mineral supplements available which will allow you to add phosphorus to the ration without adding calcium too?

There are several commercial compounds that contain phosphorus but no calcium. Two compounds generally recommended are monosodium phosphate (about 25 percent phosphorus) and disodium phosphate (about 21 percent phosphorus). The so-called "tri-poly phosphate" and ammonium phosphate appear to be acceptable sources of phosphorus for swine.

What is parakeratosis and what relation has it to zinc?

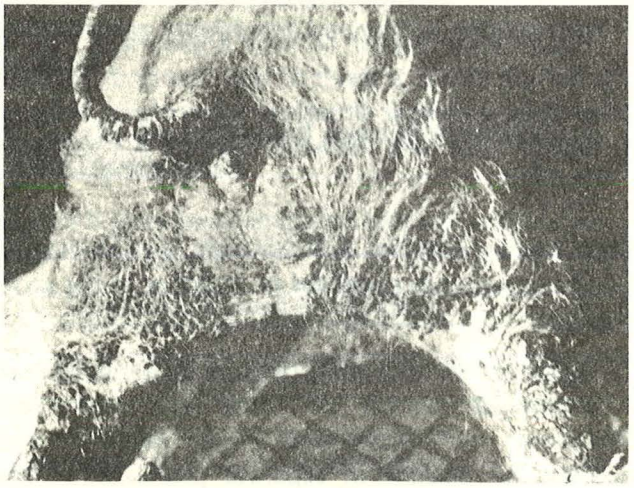
A low level of zinc in the diet will cause a nutritional disease known as parakeratosis. Also, the combination of a high level of calcium (over 0.8 percent) and an inadequate level of zinc may cause parakeratosis. The condition can be identified by the mangy-like appearance of the animal. The skin becomes dry and scaly, particularly on the hind legs, tail, and under region of body. The condition can be prevented by keeping the level of calcium below 0.8 percent and by adding 90 grams of zinc per ton of complete ration.

Is iron carbonate an available source of iron for pigs?

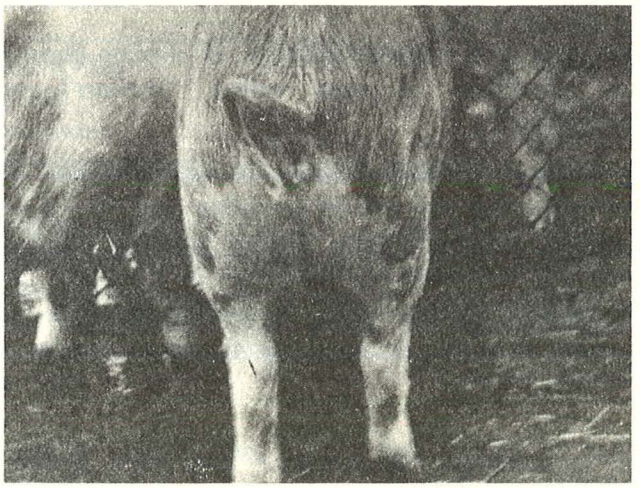
Recent research indicates that iron from iron carbonate is poorly utilized by pigs. Iron sulfate is an excellent source.

Vitamin Requirements

The recommended total levels of vitamins in swine rations from all sources are given in Table 4.



This gilt developed parakeratosis on a ration high in calcium and inadequate in zinc.



Same gilt four weeks later with same calcium level but added zinc (90 gm. per ton).

Table 4. Recommended total levels of vitamins in swine rations.

Vitamin	Pig Weight			
	10-30 lb.	*30-50lb.*	*50 lb. to market*	*Breeding stock*[c]
	Amount per ton of complete feed			
Vitamin A (million IU)[a]	4	3	3	5 [b]
Vitamin D (million IU)[a]	.72	.40	.40	.40[b]
Riboflavin (gm.)	8	6	6	6 [b]
Niacin (gm.)	32	32	32	40 [b]
Pantothenic acid (gm.)	20	16	16	24 [b]
Choline (gm.)	900	700	700	900 [b]
Vitamin K[d] (gm.)	2	2	2	2 [b]
Vitamin B_{12} (mg.)	40	20	10	30 [b]

[a]IU or USP Units.

[b]See diets on page 12 for levels to be added to corn-soybean meal rations.

[c]Feeding rate for Breeding Stock is four pounds complete feed per head per day.

[d]Menadione sodium bisulfite (MSB) or equivalent.

How much carotene should be considered in corn and milo when determining the amount of supplemental vitamin A to add in the ration?

Vitamin A and carotene are easily destroyed by heat and light. This results in varying levels of carotene between samples of corn. Thus, in ration formulation, we consider no carotene in corn or milo.

Are there any differences in stabilized vitamin A between commercial feeds?

Generally not. Most commercial companies fortify their feed with a stabilized form of Vitamin A. The stabilized form of Vitamin A can be used by the pig over an extended period of time.

Will high level supplementation of choline correct the condition in pigs called "shakers" or "spraddler"?

Choline supplementation is recommended at 200 gram level per ton of complete feed. This level supports maximum gain. Higher levels of choline have not corrected the condition of "shakers" or "spraddlers" in field tests. Recent evidence would indicate that this condition may be caused by a subclinical virus.

What is biotin and should swine diets contain supplemental levels?

It does not appear that biotin is deficient in the type of natural ingredient swine rations used in the corn belt.

What value does live cell yeast have as a source of vitamins or as a source of other feed ingredients for swine?

Live yeast is a good source of protein and the B vitamins. There are no "magic" factors in live yeast which will make pigs grow faster than those fed a balanced diet. From a practical standpoint, the relative cost of B vitamins from live yeast must be competitive with B vitamins from a commercial protein supplement or a vitamin premix before being considered.

How about the use of electrolytes?

Electrolytes appear to have a beneficial role in pigs dehydrated as a result of diarrhea or dysentery. Other than a disease situation, electrolytes have no particular value over elements present in a balanced swine diet.

When buying vitamins and minerals, should they be bought in separate premixes or together in the same mix?

Some vitamins in the presence of minerals over a prolonged period of time are destroyed. Therefore, we recommend that vitamins and minerals be bought in separate premixes. If the vitamins and minerals are purchased in one premix they should be used within 30 days of purchase.

What is the approximate cost of adding premixes to corn-soybean rations and where can they be obtained?

The cost of a premix containing only vitamins will vary up to $4.00 per ton of complete feed. All vitamin premixes should be stored in a cool, dry, place. Addresses of companies selling premixes in Nebraska are available at the County Extension office or the Animal Science Department. Here is a table of commonly used conversion factors:

1 pound = 454 grams
1 ounce = 28.4 grams
1 gram = 1,000 milligrams
1 milligram = 1,000 micrograms
1 microgram per gram = 1 part per million
.6 microgram of B caratene = 1 IU of Vitamin A

To convert milligrams per gram to milligrams per pound, multiply by 454.

To convert micrograms per gram or per pound to milligrams per gram or per pound, divide by 1,000.

To convert milligrams per pound to micrograms per gram or parts per million, divide by .454 or multiply by 2.2.

Feed Additives

What antibiotics should be fed and at what levels?

The response to specific antibiotics varies considerably due to disease level, kind, level of antibiotics, season of year, and other environmental factors. As a result, rotation of antibiotics and use of mixtures seems to be more effective than antibiotics used singly and/or continually. Rotation may be yearly or with changes in protein levels.

Antibiotics should not be used to replace good management.

What are the recommended levels of antibiotics per ton of complete feed?

Table 5 gives recommended levels of antibiotics.

Table 5. Recommended levels of antibiotics.

Ration	*Grams Per Ton*
Starter	100–250 gm.
Grower (16%)	50–250 gm.
Growing-Finish (14%)	20–50 gm.
Growing-Finish (12%)	0 or 20 gm.

How about feeding antibiotics to the breeding herd?

Several experiments have been conducted where high levels of antibiotics were fed before breeding and after breeding to determine effect on conception rate and litter size. Results have been variable. However, in instances of poor litter size and low conception rate there has been a positive response to antibiotics. The minimum suggested level is 200 grams per ton of complete feed or about ½ gram per sow per day.

When should arsenicals be used in the ration?

Besides their growth-promoting effect, arsenicals may also help where scours is a problem. Arsenicals can be added in the form of arsanilic acid, 90 grams per ton of complete feed, or 3-nitro-4-hydroxy phenylarsonic acid (3-nitro) at 22.7 grams per ton of complete feed.

Should copper sulfate be considered as a feed additive for swine?

Copper sulfate gives a growth response similar to antibiotics when fed at levels of 125-225 grams per ton. However, the margin of safety is very narrow and mixing error in the wrong direction could result in copper toxicity and death loss. Extreme care and accuracy should be taken when mixing and feeding copper sulfate.

What are the withdrawal periods for feed additives?

Feed tags are required by law to state any

Table 6. Withdrawal time additives in hog feeds.

Feed Additive	*Time*
Arsanilic Acid	5 days
ASP 250	7 days
Aureomycin (Chlortetracycline)	none
Bacitracin (Zinc)	none
Dichlorvos (Atgard)	none
Iodinated Casein	none
Neomycin Sulfate	none
Roxarsone (3 Nitro)	5 days
NF 180 or Furox (Furazolidone)	none
Piperazine	none
Penicillin	none
Terramycin (Oxytetracycline)	none
Tylan (Tylosin)	none
Tylan and Sulfa (Tylosin & Sulfamethazine)	5 days

withdrawal required when feed additives are contained in the feed. Withdrawals must be followed in order to insure carcasses free from residuals. Some common withdrawal periods are listed in Table 6.

Feed Grains

What are the feeding values of grains other than corn when fed to swine?

Feeding values of grains other than corn when fed to swine are given in Table 7.

Table 7. Feeding values of grains other than corn.

Grain	*Feeding Value As Compared to Corn*
Corn	100 percent
Milo	97 percent
Wheat	100 percent
Barley	90 percent
Rye	85 percent
Oats	80 percent
Millet	93 percent

Although some feed grains may produce the same gains as corn, the amount of feed required to produce a unit of gain may be greater, as in the case of milo (5 percent more).

What limits the use of oats in swine finishing rations?

The high fiber content of oats (12 percent) reduces the energy content of rations and consequently results in reduced growth rate and feed efficiency of growing-finishing pigs when oats exceed 20 percent of the diet. Young pigs (up to 100-125 lb.) should be fed high energy rations to produce maximum lean pork efficiently. Oats is an excellent feed grain for brood sows.

What rule should you follow when replacing corn with milo in a corn-soybean meal ration?

A good procedure is to substitute milo for corn pound for pound if the protein content of the milo is greater than 9 percent. If the protein content of milo falls below 9 percent, recalculate your rations on a protein basis. It is usually profitable to have your milo analyzed for protein content.

If economics favor the feeding of wheat to swine, what proportion of wheat to corn will provide best feed conversion and gain?

Wheat is an excellent feed grain for swine. It can replace part or all of the corn pound for pound in a swine diet without affecting performance. Since wheat tends to flour, it should be coarsely ground. If ground too fine the palatability may decrease, thus a reduction in feed conversion. Growth rate apparently is not affected by fine grind.

Methods of Feeding

The main methods of feeding swine are (1) grain and supplement free choice (2) complete rations either full-fed or limited-fed and (3) liquid feeding.

The authors prefer the use of complete rations because the producer can be sure of better control of protein, mineral and vitamin intake. Complete feeds reduce mineral and vitamin problems. Over-consumption of protein supplement is eliminated. Each pig gets a balanced ration with every pound of feed. Although complete feeds are preferred, grain and protein supplement, self-fed free choice is still an economical practice particularly if mixing and grinding equipment are not readily available.

Will it pay to mix and formulate rations on the farm?

One method of mixing a complete ration is by mixing ground corn with a commercial protein supplement in proportions suggested by the manufacturer or as suggested on page 12 . The mixing can be done either commercially or with a mixer-grinder. *A self-unloading wagon does a poor job of mixing corn and supplement.*

A second method of mixing rations is to use the feeding program suggested in this circular. This requires the producer to buy all ingredients indicated in the rations on pages 12, 13 and to do a thorough job of mixing.

Many factors are involved in the success of home mixing. Some of these include the efficiency of grinding, mixing, size of operation, quality of feed, availability of ration ingredients and labor. There will not be much cost saving in mixing your own rations unless (1) you can buy 44 percent soybean meal for at least $20 a ton less than a good 40 percent supplement and unless (2) you can buy minerals, vitamins, and antibiotics to fortify a ton of complete ration for $4.00 to $6.00.

In addition, feed manufacturers today offer a

service program for swine producers that can be invaluable to a swine enterprise.

Should feed be limited to growing-finishing hogs, and if so, at what weight should you start?

The question must be answered on an individual farm basis. There are two possible reasons for limiting feed for finishing hogs. These are (1) the amount of feed required to produce a pound of gain may be reduced by 5 to 15 percent, and (2) the backfat thickness can be reduced 0.1 inch at 200 pounds. The economic advantages here will depend upon the extra investment required in automatic feeding systems and housing. Also, limited feeding will increase the time required for pigs to reach market weights. Thus, reduced feed costs may be offset by increased investment and a longer feeding time.

If limited feeding is planned, pigs should weigh about 125 pounds before feed intake is reduced. Feed intake may be reduced by feeding 70 to 80 percent of full feed or feeding a constant amount of 5 pounds per pig daily to market weight. Limit feeding is not widely practiced in the U. S. for G-F swine.

What are the advantages and disadvantages of liquid feeding for growing-finishing swine?

Research conducted at universities throughout the country shows little or no difference in feed efficiency between dry and liquid feeding of market hogs. In these tests feed wastage was controlled in the dry feeding system. It is possible under farm conditions when feed wastage is a problem that liquid feeding may reduce this wastage and as a result improve efficiency. However, it may be less costly to correct the wastage problem than to buy new equipment. Possible advantages of liquid feeding may be increased feed consumption in pigs after weaning and no investment in pen waterers. Possible disadvantages are the extra cost of liquid feeders and the requirement of semi-controlled environment during the winter. Also for optimum growth rate and feed conversion strict management is necessary to maintain the proper water/feed ratio. The so-called increased contentment of pigs on liquid feeding has not been generally observed.

What influence does fineness of grind have on pig performance?

Varying results have been reported due to (1) age of the pig, (2) method of processing, (3) type of grain and (4) amount of feed wastage. Generally, the young pig (20 to 50 lb.) will convert feed grain more efficiently when feed is ground fine (¼" screen) whereas little value is received with older pigs (75 lb. to market weight) with fine grinding. However, fine grinding tends to increase feed wastage and increase the incidence of gastric ulcers. From a practical standpoint it appears that a medium grind (3/8" to 1/2" screen) will give the best total results. Milo and millet should be cracked.

Rations for Various Classes of Swine

Baby pig ration

The complexity of good starter rations plus the small amount consumed are the primary factors responsible for recommending commercial pig starter rations. If you wish to mix your creep feed, the rations in Tables 8, 9, and 10 are suggested. The 22 percent protein pre-starter is needed primarily by orphan or early weaned pigs. When used, feed 5 to 10 pounds per pig depending upon age and weight. Use the higher level for younger and lighter pigs. Creep feed a 20 or 18 percent starter ration and feed until all pigs weight 30 pounds.

Producers who have used this starter ration prefer the 18 percent for pigs nursing good milking sows; the 20 percent ration is preferred for pigs on poor milking sows, or to follow the pre-starter on early weaned pigs. The 16 percent starter-grower ration may be more acceptable to the pig when changing from a complex starter to a simple corn-soy ration. Also, it can be used for slow growing pigs which are beyond the starter stage.

Some possible substitutions when using these rations are:

1. Milo, wheat or millet can be substituted for corn pound for pound. If milo contains less than 9 percent protein, substitute on a protein basis.
2. Forty nine percent soybean meal can be substituted for 44 percent soybean meal by substituting 88 pounds of 49 percent soybean meal and 12 pounds of corn or milo for each 100 pounds of 44 percent soybean meal.
3. Dehydrated alfalfa meal is included as a nutrient safety factor in these rations. Therefore, if excellent mixing is available, dehydrated alfalfa can be replaced by corn per pound provided adequate vitamin and mineral supplement is available.

Table 8. Rations for various classes of swine.

Ingredients	*Percent Protein*[a]				
	22 Pre-Starter	*20 Starter*	*18 Starter*	*18 Simple Starter*	*16 Starter-Grower*
Sugar (beet or cane)	15.00	10.00	10.00	10.00	– – –
Ground yellow corn	19.35	17.75	27.85	24.68	65.75
Ground oats	5.00	10.00	10.00	10.00	– – –
Ground wheat	5.00	10.00	10.00	10.00	– – –
44% soybean meal	4.00	12.50	12.00	24.82	15.00
Dried skimmilk	40.00	20.00	15.00	– – –	5.00
Dried whey	– – –	10.00	5.00	10.00	5.00
Dried fish solubles	5.00	2.50	2.50	2.50	2.50
Dried brewer's yeast	1.00	1.00	1.00	1.00	– – –
Lard or fat (stabilized)	2.50	2.50	2.50	2.50	2.50
Trace minerals (10% zinc, swine)	0.15	0.15	0.15	0.15	0.10
Dicalcium phosphate	0.10	0.70	1.00	1.25	0.90
Monosodium phosphate	0.40	– – –	– – –	– – –	– – –
Ground limestone	– – –	0.40	0.50	0.60	0.75
Salt (iodized)	0.50	0.50	0.50	0.50	0.50
Vitamin-antibiotic mix	2.00[b]	2.00[c]	2.00[c]	2.00[c]	2.00[d]
	100.00	100.00	100.00	100.00	100.00

[a]All rations are calculated to contain 0.7% calcium and 0.6% phosphorus.

[b]Added at the following rate per pound of ration: Vit. A, 2000 I.U.; Vit. D_2, 180 I.U.; Vit. B_{12}, 20 mcg.; riboflavin, 1.0 mg.; calcium pantothenate, 3.0 mg.; choline chloride, 80.0 mg.; thiamine, 2.0 mg.; niacin, 6.0 mg.; pyridoxine, 2.0 mg.; Vit. E, 1.0 mg.; MSB, 1.0 mg.; and antibiotics, 50–125 mg.

[c]Added at the following rate per pound of ration: Vit. A, 2000 I.U.; Vit. D_2, 180 I.U.; Vit. B_{12}, 20 mcg.; riboflavin, 1.5 mg.; niacin 10.0 mg.; calcium pantothenate, 2.0 mg.; choline chloride, 100.0 mg. and antibiotics, 50–125 mg; MSB, 1.0 mg.

[d]Added at the following rate per pound of ration; Vit. A, 1500 I.U.; Vit. D_2, 180 I.U.; Vit. B_{12}, 7.5 mcg.; riboflavin 1.5 mg.; niacin, 4.0 mg.; calcium pantothenate, 4.5 mg.; choline chloride, 50.0 mg.; MSB, 1.0 mg. and antibiotics, 25–125 mg.

Table 9. Rations for various classes of swine.

	Growing-Finishing			*Gestation and Boars*[c]
	Percent Protein			*Percent Protein*
	16	*14*	*12*	*14*
Ground Corn or Milo	1471 lbs.	1583 lbs.	1700 lbs.	1554 lbs.
44% Soybean meal	410	296	178	300
17% Dehydrated alfalfa	50	50	50	50
Ground Limestone	17	16	15	6
Dicalcium phosphate	20	23	25	58
Salt (iodized)[a]	10	10	10	10
Trace mineral mix[a]	2	2	2	2
Vitamin–antibiotic premix[b]	20	20	20	20
	2000	2000	2000	2000

[a]The trace mineral mix and/or iodized salt should supply: 90 grams of zinc: 0.15–0.20 grams of iodine: 90 grams of iron and 10 pounds of salt per ton of feed.

[b]Composition of vitamin premix shown in Table 10.

[c]Fed at rate of 4 lbs. per hd/day.

4. Iodized salt and trace minerals can be replaced by trace mineralized salt so that it will supply 90 grams of zinc and 90 grams of iron, 9.2 gram of iodine, and 10 pounds of salt per ton.

5. Leafy ground alfalfa hay can replace dehydrated alfalfa meal.

Can I mix my own protein supplement?

Yes. Table 11 is an example of a good home-mixed supplement. However, there is little need to mix a protein supplement when it is just as easy to mix a complete feed.

Table 10. Recommended vitamin additions per ton of feed.

	Growing-Finishing			*Gestation and Boars*[a]
	Percent Protein			*Percent Protein*
Vitamin	*16*	*14*	*12*	*14*
Vit. A, I.U.	3,000,000	2,400,000	2,400,000	5,000,000
Vit. D_2 or D_3, I.U.	400,000	400,000	400,000	400,000
Riboflavin, gms	2.0	2.0	2.0	5.0
Niacin, gms	16.0	16.0	16.0	20.0
Pantothenic Acid, gms	9.0	6.0	6.0	12.0
Choline, gms	200.0	200.0	200.0	300.0
Vitamin B_{12}, mg.	20.0	10.0	10.0	30.0
Vitamin K[b], gm.	2.0	2.0	2.0	2.0
Antibiotics, gms	50–250	20–50	0–20	Variable

[a] Fed at rate of 4 lbs. per hd/day.

[b] MSB (menadione sodium bisulfite or equivalent).

Table 11. Example of a good home-mixed supplement.

	36% Protein Supplement[a]
Ingredient	*lb.*
44% Soybean Meal	1618.0
17% Dehydrated Alfalfa Meal	80.0
Dicalcium Phosphate	106.0
Ground Limestone	86.0
Salt (iodized)[b]	50.0
Trace Mineral Mix[b]	10.0
Vitamin–antibiotic premix[c&d]	50.0

[a] When mixing a 12% protein ration, add 8 lbs. limestone per ton of complete feed.

[b] The trace mineral mix and/or iodized salt should supply: 450 grams zinc; 1.0 gram iodine; 450 grams iron; and 50 lbs. salt per ton of supplement.

[c] The vitamin–antibiotic premix should supply: 15,000,000 I.U. Vitamin A; 2,000,000 I.U. Vitamin D; 10 grams riboflavin; 80 grams niacin; 30 grams calcium pantothenate; 1000 grams choline chloride; 50 mgs. Vitamin B_{12}, 10 gm. MSB and 100 to 250 grams of antibiotic or allowable equivalent of arsenicals per ton of supplement.

[d] If this is fed to sows, the Vitamin A level should be increased to 25,000,000 I.U. per ton of supplement.

Table 12. Gestation-lactation rations.

Ingredient	*Rations*	
	Gestation–Lactation (Hand-fed) lbs.	*Gestation (Self-fed) lbs.*
Ground milo or corn	1148	854
44% Soybean meal	384	180
17% Dehydrated alfalfa meal	100	176
Alfalfa hay (good quality)	– – –	176
Wheat bran	100	150
Ground oats	– – –	400
Ground dried beet pulp	200	– – –
Dicalcium phosphate	32	32
Ground limestone	4	– – –
Salt (iodized)[a]	10	10
Trace minerals[a]	2	2
Vitamin premix[b]	20	20
	2000	2000

[a]The trace mineral and/or iodized salt should supply 90 grams of zinc; 0.15–0.20 grams of iodine; 90 grams of iron and 10 pounds of salt per ton of feed.

[b]The vitamin premix should supply the following amounts per ton of complete feed for gestation–lactation and self-fed gestation rations: Vitamin A 3,000,000 I.U.; Vitamin D 400,000 I.U.; riboflavin 2.0; niacin 12.0 grams; calcium pantothenate 6.0 grams; choline chloride 200 grams; Vitamin B_{12} 20.0 milligrams, MSB 2 gm.

Gestation-lactation rations.

The 16 percent and 14 percent corn-soy ration previously described can be hand-fed to sows and gilts as indicated on Page 12.

The success of feeding less than full feed levels to sows and gilts depends upon controlling the intake of each female. Care must be taken to see that each gets its share. Individual sow feeding stalls are effective devices for controlling boss sows.

For producers who wish to self-feed sows, the following rations are suggested. If sows become overly fat, add alfalfa hay at the expense of corn.

If constipation is a problem before and immediately after farrowing the additional substitution of 5 to 10% wheat bran or dried beet pulp for corn or milo is recommended (see Table 12).

How are sow rations adjusted for limit feeding?

Rations for a gestating sow must meet her daily requirement for all essential nutrients. When limit feeding, energy is the only nutrient which should be limited. Daily nutrient requirements for vitamins and minerals are given in Table 13. The daily allowance for protein is 0.65 lb. The daily requirements must be met, regardless of the level of feeding.

Table 13. Mineral needs of bred sows (daily requirements).

Mineral	*N. R. C. requirement*	*Nebraska's allowances*
Calcium, gms/day	15.0	16.0
Phosphorus, gms/day	10.0	14.5
Salt, gms/day	10.0	10.0
Zinc, mg/day	90.0	180.0
Iodine, mcg/day	364.0	400.0
Copper, mg/day	11.0	18.0
Iron, mg/day	– – –	180.0
Manganese, mg/day	36.0	50.0

Table 14. Vitamin needs of bred sows (daily requirements).

Vitamin	*N. R. C. requirement*	*Nebraska's allowances*
Vit. A, I.U./day	8,200	10,000
Vit. D, I.U./day	550	800
Riboflavin, mg/day	8.2	12.0
Niacin, mg/day	44.0	60.0
Pantothenic Acid, mg/day	33.0	36.0
Choline, mg/day	– – – –	1,800.0
Vit. B_{12}, mcg/day	28.0	60.0
Thiamine, mg/day	2.8	4.0
Vit. K (menadione sodium bisulfite) mg/lb	– – – –	4.0

Analysis Table

Feedstuffs	*Protein%*	*Fat%*	*Fiber%*	*Calcium%*	*Phosphorus%*	*Mg/lb*			
						Ribo-flavin	*Niacin*	*Pantothenic Acid*	*Choline*
Alfalfa meal (dehydrated)	17	2.0	26.0	1.40	.20	6.5	14.0	13.5	400
Alfalfa meal	13	1.5	33.0	1.20	.20	4.0	9.0	10.0	300
Barley	11.5	1.8	8.0	.06	.40	0.70	24.0	2.5	450
Beet Pulp	8	0.5	21.0	.68	.12	0.3	7.0	0.70	370
Corn (yellow)	8.8	3.8	2.5	.01	.25	.50	9.5	2.2	200
Corn & Cob meal (yellow)	7	3.0	8.0	.04	.20	.40	7.2	2.0	160
Fish meal, sardine	65	4.0	1.0	4.5	2.4	2.50	28.0	3.0	1,300
Meat & bone scraps	50	6.0	2.5	10.00	5.00	1.5	21.0	1.8	750
Millet	12	4.0	8.0	.05	.33	1.0	10.0	– – –	– – –
Milo (maize)	9.0	2.5	2.5	.02	.30	0.40	18.0	4.0	280
Molasses, beet	6	0.0	0.0	.10	.02	1.00	17.0	2.0	400
Molasses, cane	3	0.0	0.0	.50	.05	1.00	20.0	17.0	300
Oats	12	4.0	12.0	.10	.33	.50	7.5	5.0	425
Oats, feed rolled, oat groats	16	5.5	3.0	.05	.40	0.50	3.7	5.6	500
Rye	11	3.0	2.0	0.05	0.35	0.80	6.6	3.5	– – –
Skim milk, dried	33	.5	0.0	1.25	1.00	9.00	5.0	1.50	500
Soybean meal (solvent)	44	.5	7.0	.25	.60	1.30	12.0	6.0	1,200
Soy meal (solv.) (dehulled)	49	.5	3.0	.20	.65	1.2	9.5	6.0	1,300
Tankage	60	8.0	3.0	6.00	3.00	1.00	18.0	1.0	1,000
Wheat, hard	11.0	1.5	2.9	.05	.40	0.40	24.0	5.0	350
Wheat, bran	15	3.5	11.0	.10	1.20	1.00	65.0	12.0	460
Wheat, middlings	16	4.0	8.0	.10	.90	0.80	44.0	8.0	460
Whey, dried whole,	12	.5	0.0	.80	.70	12.00	5.0	20.0	900
Dicalcium phosphate	– – –	– – –	– – –	24.0	18.5	– – –	– – –	– – –	– – –
Steamed bone meal	– – –	– – –	– – –	24.0	12.0	– – –	– – –	– – –	– – –
Defluorinated rock phosphate	– – –	– – –	– – –	33.0	18.0	– – –	– – –	– – –	– – –
Disodium phosphate	– – –	– – –	– – –	– – –	20.5	– – –	– – –	– – –	– – –
Monosodium phosphate	– – –	– – –	– – –	– – –	25.5	– – –	– – –	– – –	– – –
Ground limestone	– – –	– – –	– – –	38.0	– – –	– – –	– – –	– – –	– – –
Sodium Tri-Poly phosphate	– – –	– – –	– – –	– – –	25.5	– – –	– – –	– – –	– – –