1984

EC84-210 Swine Diet Suggestions

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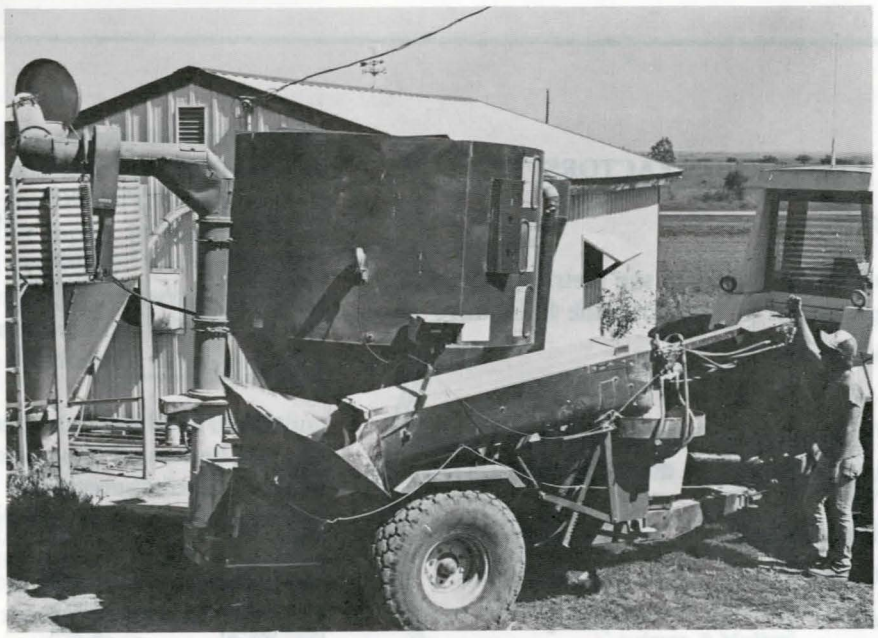
UNIVERSITY of NEBRASKA

swine diet suggestions



Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture. Leo E. Lucas, Director of Cooperative Extension Service, University of Nebraska, Institute of Agriculture and Natural Resources.

CONTENTS

CONVERSION FACTORS

Unit

The unit of weight (mass) in the metric system (SI - Systeme International d' Unites) is the kilogram - abbreviated kg.

Prefixes

To obtain units larger or smaller than the kilogram, prefixes are used as shown in the following table:

	Symbol	Meaning	Unit and symbol
mega	M	one million	megagram Mg
kilo	k	one thousand	kilogram kg
—	—	—	gram g
milli	m	one thousandth of a	milligram mg
micro	μ	one millionth of a	microgram μg

To convert from Imperial units to metric units

From	To	Multiply by
ounce (oz)	gram	28.3
pound (lb)	kilogram	0.454
ton	metric ton (megagram)	0.907

Other useful conversions

From	To	Multiply by:
mg/g	mg/lb	453.6
mg/lb	mg/g	0.0022
mg/lb	ppm (μg/g)	2.2
mg/g	ppm (μg/g)	1000
g/ton	ppm (μg/g)	1.1
ppm (μg/g)	mg/lb	0.4536
ppm (μg/g)	mg/g	0.001
ppm (μg/g)	g/ton	0.907

ppm = parts per million

University of Nebraska Swine Diet Suggestions

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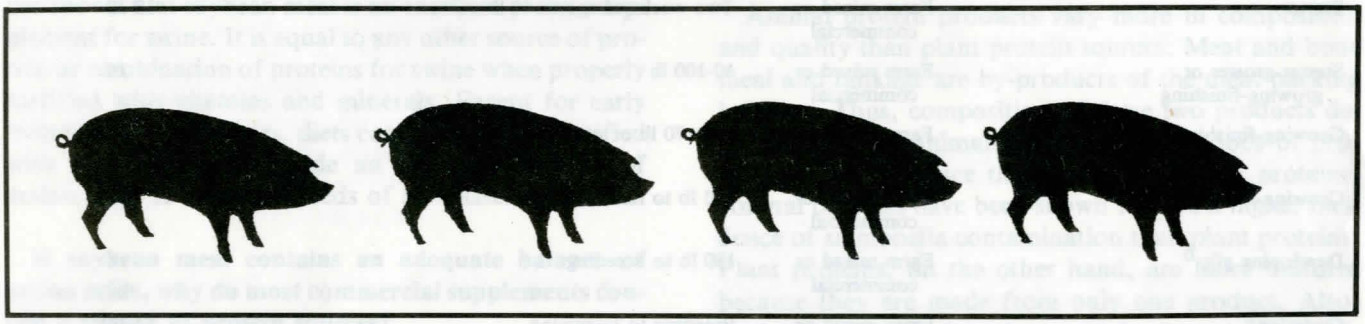

Feed is the largest single item among the costs of producing pork. Generally, it accounts for 50-60% of all costs (Figure 1) and represents 80% of the cash costs. It is also one of the most active inputs in the enterprise, with additional feed added every day. We suggest that pork producers adopt a comprehensive feeding program based upon nutrition principles and tailored to the operation. This publication provides the basis for such a feeding program.

Since diets, feed ingredients, and methods of feeding change rapidly, this publication will be revised periodically to provide the latest recommendations. In addition, this publication willanswer some of the more frequently asked questions.

In some instances, the nutrient levels suggested are higher than the minimum requirements established by the National Research Council (NRC), to reduce the risk of nutrient deficiencies.

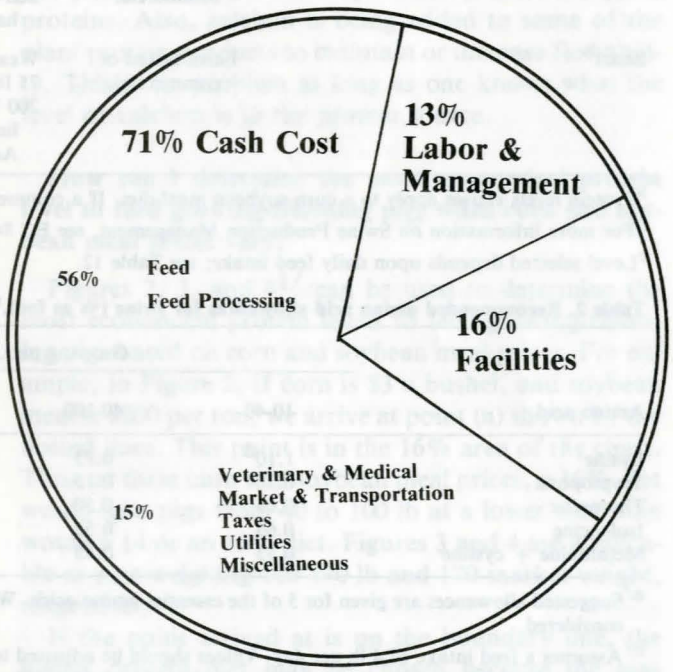

Figure 1. Total Production Cost

PROTEIN

The primary objective of pork production is high quality protein for human consumption. Protein in the diet of pigs is the raw material for pork production. Swine of all ages and stages of the life cycle require protein and amino acids to perform their body functions.

General recommendations for the level of protein in the diet for major classes of swine are given in Table 1.

What is the relationship between amino acids and protein?

Amino acids are the structural units of protein. During digestion, proteins are broken down into amino acids. Amino acids are taken into the body and used to build new proteins, such as muscle.

A diet that is "balanced" with respect to amino acids will contain a desirable level and ratio of the 10 essential amino acids required by the pig for maintenance, growth, and reproduction. The proteins of corn and other cereal grains are deficient in certain essential amino acids. Protein supplements are used to correct amino acid deficiencies in grains. For example, a combination of soybean meal and grain will provide a fairly good balance of amino acids.

The recommended allowances for some of the more critical amino acids are given in Table 2. Lysine is the first limiting amino acid (most deficient) in a corn-soybean meal diet. Generally, when using conventional feedstuffs, if the lysine requirement is met the other amino acids will also be adequate. *Checking the lysine level is usually a good measure of the overall amino acid adequacy of a swine diet.*

Table 1. General feeding program for swine.

Diet	Source	Age or size of pig	Level of protein[a] %
Pre-starter	Commercial	Early weaned or orphan pigs	22
Starter	Farm mixed or commercial	Two weeks of age to 40 lb	18-20
Starter-grower or growing-finishing	Farm mixed or commercial	40-100 lb	16
Growing-finishing	Farm mixed or commercial	100-170 lb or market weight	14
Growing-finishing	Farm mixed or commercial	170 lb to market weight	12
Developing gilts[b]	Farm mixed or commercial	180 lb to breeding	14
Gestation[b]	Farm mixed or commercial	Breeding to farrowing	12-16[c]
		or	
		Weaning to breeding	12-16
Lactation[b]	Farm mixed or commercial	Farrowing to weaning	14-16
		Self-feed during lactation or hand-feed to appetite	14-16
Boars[b]	Farm mixed or commercial	Weaning to 75 lb	18
		75 lb to 220 lb	16
		200 lb to 1 year limit feed 5 to 5.5 lb per day	14
		Adult-limit feed 4 to 5 lb per day	14

[a]Protein levels shown apply to a corn-soybean meal diet. If a commercial supplement is used, follow the manufacturer's recommendations.

[b]For more information on Swine Production Management, see EC 84-212.

[c]Level selected depends upon daily feed intake; see Table 12.

Table 2. Recommended amino acid allowances for swine (% as fed).[a]

Amino acid	Growing pigs, weights (lb)				Gestation[b]	Lactation[c]
	10-40	40-100	100-170	170 - Market wt.		
Lysine	1.10[d]	0.75	0.60	0.50	0.50	0.60
Tryptophan	0.20	0.15	0.13	0.11	0.11	0.13
Threonine	0.65	0.50	0.45	0.40	0.40	0.45
Isoleucine	0.65	0.55	0.50	0.45	0.45	0.50
Methionine + cystine	0.55	0.45	0.40	0.30	0.30	0.40

[a/]Suggested allowances are given for 5 of the essential amino acids. When formulating practical swine diets these are the only ones that need to be considered.

[b/]Assumes a feed intake of 4 lb per day. Values should be adjusted to maintain the same amino acid intakes if feed intakes are different, e.g., if feed intake is 3 lb per day, lysine allowance should be 0.50 x 4/3 = 0.66%.

[c/]Assumes an average feed intake of 12 lb per day. Adjustments should be made if average feed intake is different, e.g., if feed intake is 10 lb per day, lysine allowance should be 0.60 x 12/10 = 0.72%.

[d/]Lysine allowance should be somewhat higher for 10 to 20 lb, and somewhat lower for 20 to 40 lb.

If amino acids are so important, why do we give PROTEIN requirements?

Protein requirements quoted in this publication and elsewhere in the swine industry refer primarily to corn-soybean meal diets. In the standard diets, the given protein level meets the amino acid requirements for pigs of the intended weight and stage of the life cycle. If ingredients of similar amino acid levels and balance are used in the diet, specifying the protein level is satisfactory. If feedstuffs with markedly different amino acid patterns are included, it is recommended that the diet be formulated on an amino acid basis. In addition, the cost of analyzing ingredients for amino acids is considerably higher than analyzing for crude protein.

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

Research at midwest universities, 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. Except for early weaned and orphan pigs, diets containing grain fortified with soybean meal provide an adequate balance of amino acids to meet the needs of all classes of swine.

If soybean meal contains an adequate balance of amino acids, why do most commercial supplements contain a variety of protein sources?

There are three major reasons:

1. When feed manufacturers register feed, they list all feedstuffs that they may want to include. Then, depending on the price and limits of good nutrition, they substitute lower priced protein sources for higher priced ones. Thus, feed manufacturers are able to pass on these economic advantages to pork producers.
2. Since soybean meal is highly palatable to swine, the feed manufacturer may need to add less palatable ingredients, such as alfalfa meal, to help control supplement consumption for producers who feed supplement free choice with grain.
3. Habit. Commercial supplements have always listed many protein sources.

Is it economical to supplement swine diets with crystalline amino acids?

Sometimes yes, sometimes no. It depends upon the price of the crystalline amino acids and the price of supplemental protein sources such as soybean meal. The use of crystalline lysine is often economically sound, and it appears that tryptophan and possibly threonine may soon be available at competitive prices. Supplementing practical swine diets with methionine does not improve performance and often depresses performance.

When using crystalline lysine we recommend that no more than 100 lb of 44% soybean meal be replaced per ton of diet. A rule of thumb is that 3 lb of L-lysine•HCl (containing 78% pure lysine) plus 97 lb of corn contribute the same amount of available lysine as 100 lb of 44% soybean meal. Further information is available in NebGuide G74-128 Crystalline Lysine for Swine Diets.

Can meat and bone meal or tankage 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 of finishing swine. Our general recommendation is that meat and bone meal and/or tankage should not exceed 5% of the diet or 25% of the protein supplement. Obviously, economics will play a role in the level of these protein sources to be fed.

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

Animal protein products vary more in composition and quality than plant protein sources. Meat and bone meal and tankage are by-products of the meat packing industry. Thus, composition of these two products depends upon the animals slaughtered. Methods of processing also influence the quality of animal proteins. Animal proteins have been shown to have a higher incidence of salmonella contamination than plant proteins. Plant proteins, on the other hand, are more uniform because they are made from only one product. Also, 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 occur in the production of soybean meal and other plant proteins. Also, calcium is being added to some of the plant protein products to maintain or increase flowability. This is no problem as long as one knows what the level of calcium is in the protein source.

How can I determine the most economical protein level to feed growing-finishing pigs when corn and soybean meal prices vary?

Figures 2, 3, and 4[1/] can be used to determine the most economical protein levels to feed growing-finishing pigs based on corn and soybean meal prices. For example, in Figure 2, if corn is $3 a bushel, and soybean meal is $200 per ton, we arrive at point (a) shown by the dotted lines. This point is in the 16% area of the chart. Thus, at these corn and soybean meal prices, a 16% diet would take pigs from 40 to 100 lb at a lower cost than would a 14 or an 18% diet. Figures 3 and 4 are applicable to pigs weighing 100-170 lb and 170-market weight, respectively.

If the point arrived at is on the boundary line, the higher protein diet may be chosen because the pigs

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1/ Bitney, Larry L. and Bobby D. Moser. 1974. Feed prices and protein levels for pigs. Nebraska Swine Report, pp 3-4.

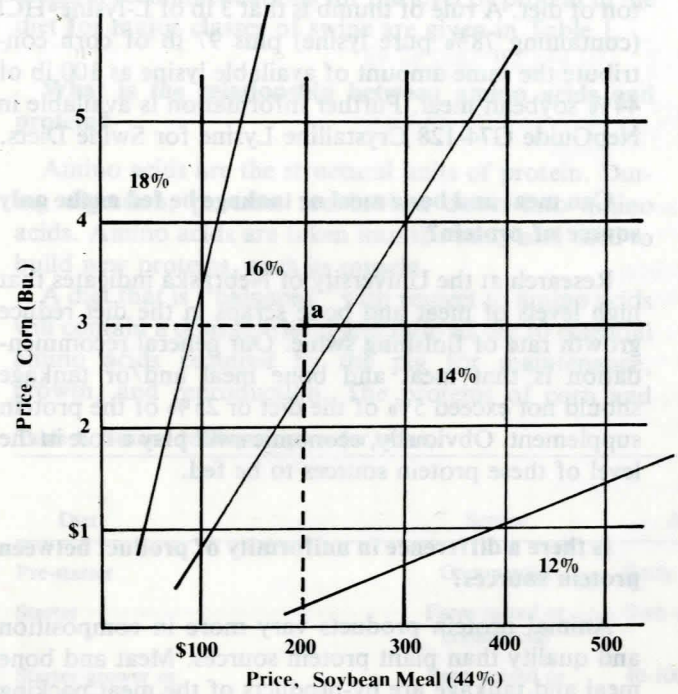

Figure 2. Suggested protein levels for growing-finishing diets, based on corn and soybean meal prices, for pigs from 40-100 pounds.

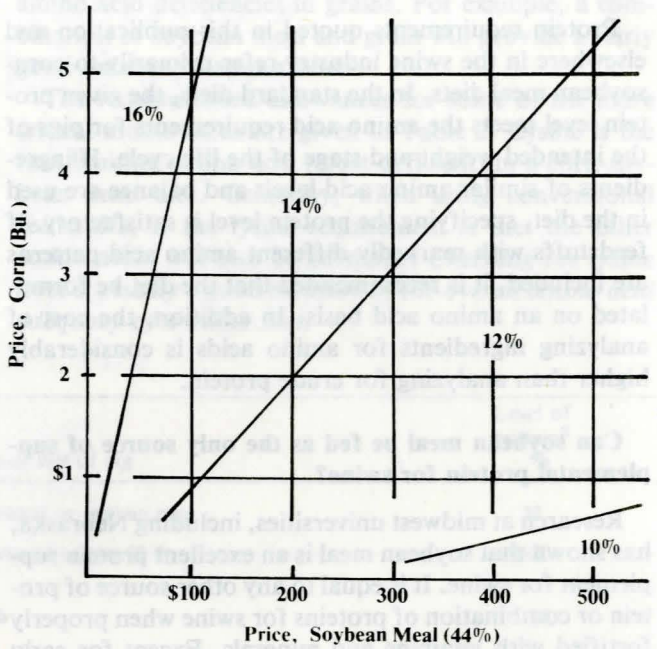

Figure 3. Suggested protein levels for growing-finishing diets, based on corn and soybean meal prices, for pigs from 100-170 pounds.

would probably reach market weight at the same time or sooner for the same cost. Other alternatives are:

1. Feed the higher protein diet while the pigs are in the lower part of the weight range, and then start feeding the lower protein diet when they reach the upper part of the weight range.
2. Consider feeding a diet with a protein level which is between the two levels of protein on each side of the boundary line.
3. If a new group of pigs is not waiting for the facility and if the producer has extra time to care for the pigs, the lower protein level could be chosen. *The figures consider the added costs of slower gaining pigs resulting from the lower protein diets.*

Does protein poisoning occur?

No. Extremely high protein levels may cause diarrhea in pigs, but these protein levels are not usually associated with a sick or poisoned condition.

Can raw soybeans be used as a protein source in swine diets?

Yes, but only for mature swine. Gestation diets using raw soybeans to replace soybean meal have supported acceptable reproductive performance. Limited studies using raw soybeans as the protein source in lactation diets have also provided encouraging results. Research at the North Platte Station does not support the use of raw soybeans for the young pig through market weight.

If raw soybeans are fed, they should be fed as a part

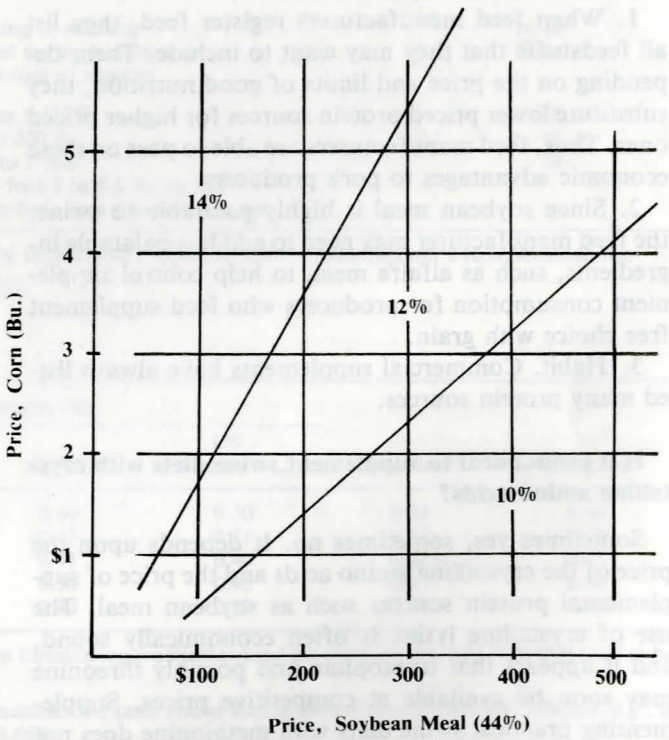

Figure 4. Suggested protein levels for growing-finishing diets, based on corn and soybean meal prices, for pigs from 170 pound-market weight.

of a complete diet. We recommend that they be ground through a 1/2 inch screen and mixed with the other diet ingredients. Because the protein content of whole soybeans may vary, chemical analysis is recommended before formulating the diet. Since whole soybeans contain less protein than soybean meal, a greater quantity of whole soybeans will be required to meet a specified diet protein level than would be needed with soybean meal.

The storage requirements of raw soybeans are similar to those of corn. Rancidity can be a problem with raw soybean storage. It is recommended that an antioxidant be used when storing ground soybeans during warm weather or over a prolonged period of time.

Can processed whole soybeans be used as a protein source?

Processing of raw soybeans with extruders or roasters will produce an acceptable source of protein for swine. The heat of the processing destroys the anti-growth factors present in raw soybeans. The anti-growth factors make raw soybeans unacceptable as a protein source for nursery and growing-finishing pigs. The desirability of processing soybeans on the farm will depend primarily on economics (see the 1981 Nebraska Swine Report).

MINERALS

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

See Table 3 for minerals and levels to be included in swine diets. Daily mineral allowances for replacement gilts and sows are shown in Table 4.

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

Instances have been reported in Nebraska where swine fed free choice minerals have overeaten or undereaten minerals. If you wish to make sure that pigs meet their daily requirements for minerals, and do not exceed them, feed minerals in a complete mixed diet.

What occurs if high levels of minerals are fed?

Most commercial protein supplements are fortified with minerals to meet the pig's needs when the supplement is combined with grain according to the manufacturer's recommendation. Minerals should not be added haphazardly. If problems develop such as leg abnormalities, or when there is a reduction in performance, all management components including diets, genetic defects, disease, type of floor and floor surface should be analyzed before changes or additions in the mineral content are made. Warning! *Adding minerals without reason may cause more harm than good.*

What are the major sources of minerals for swine?

Major sources of the minerals commonly added to swine diets are listed in Table 5.

What levels of calcium and phosphorus should be fed?

The optimum levels of calcium and phosphorus to feed are shown in Table 3. Regardless of level, we recommend that the ratio of calcium to phosphorus not exceed 1.3 parts total calcium to 1 part total phosphorus.

When should replacement gilts begin receiving "Breeding Herd" levels of minerals?

A good time to start replacement gilts on increased levels of mineral fortification is when they are separated from market hogs, preferably at 175-180 lb. Calcium and phosphorus levels in finishing diets support excellent rates of gain, but are not sufficient to build the skeletal structure and mineral reserves needed by brood sows. Selected gilts should be restricted in energy intake at this time, but receive enough feed to continue to

Table 3. Mineral levels for swine diets.

	10 to 40 lb	40 lb to market	Breeding Herd[a]
TOTAL LEVEL			
Calcium, %	0.80	0.65	0.90
Phosphorus, %	0.70	0.50	0.80
ADDITIONS			
Salt, %	.25-.50	.25-.50	.25-.50
Zinc, g/ton (ppm)	90(100)	90(100)	90(100)
Iodine, g/ton (ppm)	.15(.165)	.15(.165)	.15(.165)
Iron, g/ton (ppm)	90(100)	90(100)	90(100)
Copper, g/ton (ppm)	9(10)	9(10)	9(10)
Manganese, g/ton (ppm)	25(27.5)	25(27.5)	25(27.5)
Selenium, g/ton (ppm)[b]	.27(.3)	.09(.1)	.09(.1)

[a]Based on a complete diet; 4 lb/head/day before and during gestation, full feed during lactation.

[b]Maximum legal addition.

Table 4. Daily mineral allowances for gilts and sows.

Mineral	Nebraska allowance per day
TOTAL LEVEL	
Calcium, g	16.0
Phosphorus, g	14.5
ADDITIONS	
Salt, g	5-10
Zinc, mg	180
Iodine, μg	400
Iron, mg	180
Copper, mg	18
Manganese, mg	50
Selenium, μg[a]	180

[a]Legal addition

Table 5. Sources of minerals for swine.

Mineral	Source	Mineral %		Mineral Availability
		Ca%	P%	
Calcium and phosphorus	Ground limestone (calcium carbonate)	38	0	Inexpensive Excellent
	Dicalcium phosphate	20-24	18.	Excellent
	Monocalcium phosphate	16-19	21	Excellent
	Sodium tripolyphosphate or monosodium phosphate	0	25	Excellent
	Defluorinated phosphate	30-34	18	Excellent
	Steamed bone meal	24	12	Good-excellent
	Low fluorine rock phosphate	30-36	14	Fair
	Soft rock phosphate	17-20	9	Poor
Iron	Ferrous sulfate (7 H_2O)	20.1		Good
	Ferrous sulfate (1 H_2O)	32.9		Good
	Ferric chloride	20.7		Fair
	Ferrous carbonate	48.2		Variable
	Ferrous oxide	77.8		Limited
Copper	Cupric carbonate	50-55		All are good
	Cupric oxide	79.7		
	Cupric sulfate	25.4		
Manganese	Manganese carbonate	47.8		All are good
	Manganese oxide	77.4		
	Manganese sulfate	22.8		
Zinc	Zinc carbonate	56		All are good
	Zinc oxide	80.3		
	Zinc sulfate	22.7		
Iodine	Calcium iodate	65.1		All are good
	Potassium iodide	76.4		
	Cuprous Iodide	66.6		
Selenium	Sodium selenite	45.7		Good
	Sodium selenite	41.8		Good

grow. If gilts are switched to the higher levels of fortification (0.9% Ca and 0.8% P) at 175-180 lb or 70 days before breeding, they will have sufficient time to develop an adequate skeleton.

What is parakeratosis and what is its relation to zinc?

A deficiency of zinc in the diet will cause a nutritional disease called parakeratosis. Also, the combination of high level of calcium (over 0.9%) and zinc level below 50 ppm may result in parakeratosis. The condition can be identified by the animal's mangy appearance. The skin becomes dry and scaly, particularly behind the ears, on the hind legs, tail, and under region of the body. The condition can be prevented by keeping the level of calcium below 0.9% and by adding 100 ppm of zinc per ton of complete diet.

Should selenium be supplemented in Nebraska swine diets?

Selenium deficiency and toxicity are regional problems within the United States. Grains grown in Nebraska are generally considered adequate in this element. Some areas of northeast Nebraska have a history of too high selenium content. Therefore, swine diets containing Nebraska grown feed grains should be adequate in selenium. If selenium supplementation is needed, it can be legally added up to .1 ppm of a complete feed (.3 ppm for pigs up to 50 lb). Because symptoms of selenium deficiency such as mulberry heart and white muscle disease have been diagnosed in Nebraska, as a safety factor we recommend that the legal addition be added to all swine diets, as shown in Table 3.

Is iron carbonate an available source of iron for pigs?

Research indicates that iron from iron carbonate is often poorly utilized by pigs. Iron sulfate is an excellent source of iron and is preferred over the carbonate form. For baby pigs, we recommend injectable sources of supplemental iron.

How important are dietary electrolytes?

Electrolytes can serve a useful purpose in maintaining water balance in pigs. Dietary electrolytes may be particularly important for young pigs because they are more susceptible to stress and diarrhea, conditions that can cause severe loss of body water. The major electrolytes are sodium, potassium, magnesium, and calcium, but sodium and potassium predominate. Stress condi-

tions that may warrant use of electrolytes in drinking water for pigs include diarrhea, reduced feed intake, high environmental temperatures and stressful handling. Electrolyte packs are available and should be used as directed on the package. Properly used, they can serve a valuable role.

VITAMINS

Certain vitamins need to be added routinely to swine diets. The recommended vitamin additions per ton of complete diet are shown in Table 6. Daily vitamin additions for diets for bred gilts and sows are shown in Table 7. Vitamin potency may decrease with extended storage and can be destroyed when in contact with minerals over a prolonged period of time. Therefore, we prefer that vitamins and minerals be purchased in separate premixes. If the vitamins and minerals are purchased in one premix, they should be used within 30 days of purchase. Vitamin and mineral premixes should be stored in a cool, dry and dark place. Stabilizing agents have increased the shelf-life of vitamin-mineral premix combinations.

Should vitamin E be added to Nebraska swine diets?

Vitamin E and selenium are interrelated and are usually present in adequate amounts in Nebraska grown feedstuffs. Vitamin E and selenium are both antioxidants. Vitamin E spares selenium. Since feedstuffs vary in their vitamin E content, it may be desirable to add vitamin E to swine diets as a safety factor. Leafy alfalfa hay is an excellent source of vitamin E.

Should choline be supplemented in swine diets?

Yes. Research indicates that supplementing choline at a level of 500 grams per ton of complete diet during gestation increases the number of live pigs born and weaned. Choline supplementation is recommended at a 200 gram level per ton of a complete growing-finishing swine diet. Although the requirement for this vitamin has not been defined, this 200 gram level is our recommendation for prevention of a possible choline deficiency in the growing-finishing pig. Choline has not corrected the "shaker" condition at birth in either university or field tests. Evidence indicates that the condition may be caused by a virus or combination of viruses. Genetic causes are not implicated.

Should swine diets be supplemented with biotin?

Recent research indicates that biotin can be deficient in brood sow diets. However, biotin is an expensive vitamin and its inclusion must be balanced against the benefits received. Dehydrated alfalfa meal is an excellent natural source of biotin.

What is the approximate cost of adding premixes to corn-soybean meal diets?

Table 6. Recommended vitamin additions per ton of complete feed.

	Pig Weight, lb			
	10-40	40-100	100 to market	Breeding herd[a]
Vitamin A, (million IU)	4	3	2	5
Vitamin D2 or D3 (thousand IU)	500	500	500	500
Riboflavin (g)	3	2	2	5
Niacin (g)	20	16	16	30
Pantothenic acid (g)	9	9	6	18
Choline (g)	200	200	200	500
Vitamin E (g)[b]	10	10	10	20
Vitamin K (g)[c]	2	2	2	2
Vitamin B_{12} (μg)	20	20	10	15

[a]Based on a complete diet; 4 lb/head/day before and during gestation, full feed during lactation.

[b]1g Vit E is 1000 IU Vit. E.

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

Table 7. Daily vitamin additions from premix for gilts and sows.

Vitamin	Nebraska allowance per day
Vitamin A, IU	10000
Vitamin D, IU	1000
Riboflavin, mg	10
Niacin, mg	60
Pantothenic acid, mg	36
Choline, mg	1000
Vitamin E, mg	40
Vitamin K, (MSB)[a/], mg	4
Vitamin B_{12}, μg	30

[a/]MSB (menadione sodium bisulfite or equivalent).

As a guide, a premix containing only vitamins will cost $4 to $6 to fortify a ton of complete feed. A premix containing both vitamins and minerals may cost $8 to $15 to fortify a ton of complete feed.

FEED ADDITIVES

What antibiotics should be fed and at what levels?

The response to specific antibiotics varies considerably due to age of pig, disease level, kind and level of antibiotic, season of year, and other environmental factors. Rotation of antibiotics and use of approved mixtures seem to be more effective than antibiotics used singly or continually. Rotation may be annually 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 diet?

Level of usage depends upon the type of antibiotic selected. Thus, when using antibiotics comply with the manufacturer's directions.

Is copper sulfate an effective growth promoting additive?

Copper has been established as a required nutrient for normal pig growth. It is routinely added to swine diets at 10-15 ppm to meet the pig's nutritional need. While research has demonstrated a growth promoting effect in nursery and growing-finishing diets from the addition of 125 to 250 ppm copper (1 to 2 pounds copper sulfate per ton), the Food and Drug Administration currently does not allow a feed manufacturer to include this claim on the feed tag. The incorporation of higher levels (over 250 ppm) may cause toxicity problems.

How about feeding antibiotics to the breeding herd?

Herds that have experienced problems with conception rates and litter size have often been helped by the addition of antibiotics to brood sow diets.

The routine feeding of antibiotics to the breeding herd is discouraged unless there is a history of reproductive problems, a specific diagnosis has been made and the antibiotic has been prescribed by a veterinarian.

When should arsenicals be used in diets?

Besides their growth-promoting effect, arsenicals may also help where scours is a problem. Arsenicals can be added in the form of arsanilic acid, sodium arsanilate or 3-nitro-4 hydroxy phenylarsonic acid (3-nitro). Follow the manufacturers directions for use.

What are the withdrawal periods for feed additives?

Certain feed additives must be withdrawn from the feed before slaughter at varying intervals to insure residue-free carcasses. Some withdrawal periods for commonly used feed additives are listed in Table 8. The availability and withdrawal time of feed additives can change. The law requires the withdrawal time to be placed on all feed tags.

What are probiotics?

Probiotics, which means in favor of life, play a different role than antibiotics in the digestive tract. It has been theorized that probiotics increase the population of desirable microorganisms instead of killing or inhibiting undesirable organisms. The most common microorganism included in probiotic products is lactobacillus, a normal bacterial inhabitant of the digestive tract of healthy animals. These bacteria may help remove waste products and inhibit the growth of certain undesirable bacteria.

Research has shown that stress conditions such as weaning, diet, environmental changes, or poor sanitation can alter the microflora of the digestive tract. Probiotics may be advantageous, especially for early weaned pigs, to combat these stresses. However, most research does not show any positive response in pigs fed probiotics.

Table 8. Withdrawal time for additives in swine feeds[a/]

Feed additive	Time before slaughter
Arsanilic acid	5 days
ASP 250 (sulfamethazine)	15 days
CSP 250 (sulfathiazole)	7 days
CSP 250 (sulfamethazine)	15 days
Atgard (Dichlorvos)	none
Aureomycin (Chlortetracycline)	none
Bacitracin	none
Banminth	1 day
Erythromycin	none
Flavomycin (Bambermycins)	none
Hygromycin	15 days
Lincomycin	6 days
Mecadox (Carbadox)	10 weeks
NF 180 or Furox (Furazolidone)	5 days
Neomycin Sulfate	20 days
Penicillin	none
Piperazine	none
Roxarsone (3 Nitro)	5 days
Spectinomycin (baby pig)	21 days
Terramycin (Oxytetracycline)	none
Tramisol	72 hours
Tylan (Tylosin)	none
Tylan - Sulfa	15 days
Virginiamycin	none

[a/] Effective as of printing date.

SOURCES OF ENERGY

Feed grains are the usual energy sources for swine diets. From time to time, economic conditions make other energy sources attractive for inclusion in swine diets.

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

Feeding values of energy sources compared to corn are given in Table 9. Although some feed grains may produce the same weight gain as corn, the amount of feed required to produce a unit of gain may be greater, as in the case of milo (5% more). Thus, the overall value of milo is reduced when compared to corn.

Is milo a good energy source for swine diets?

Yes, milo, or grain sorghum, is an excellent grain for swine diets. A good procedure is to substitute milo for corn pound for pound. Milo should be ground finely for swine for best utilization, but there are other factors to consider in the decision on how finely to grind grain (see page 13).

What limits the use of oats in growing-finishing diets?

The high fiber content of oats (11.5%) reduces the

Table 9. Relative feeding value.

Ingredient (air dry)	Feeding value relative to corn %[a]	Maximum recommended percent of complete diet[b] Starter	Grower-finisher	Gestation	Lactation	Remarks
Alfalfa meal-dehydrated	45-50	0	5	50	10	Low energy, high in B vitamins
Alfalfa mean-sun cured	30-40	0	5	66	10	Low energy, high in B vitamins
Animal fat (stabilized)	210-220	5	10	5	5	High energy, reduces dust
Bakery surplus	75-90	20	40	40	40	High energy, about 13% fat
Barley (48 lb/bu)	85-90	25	85	80	80	Hard, less energy than corn
Beet pulp, dried	70-80	0	0	10	10	Bulky, high fiber, laxative
Corn, yellow	100	60	90	80	80	High energy, low lysine
Corn, high lysine	100-105	60	95	90	90	Test lysine level
Corn and cob meal	80-90	0	0	70	10	Bulky, low energy
Corn grits byproduct (hominy)	100-105	0	60	60	60	Subject to rancidity
Corn silage (25-30% D.M.)	20-30	0	0	90	0	Bulky, low energy, use for sows
Millet, proso	90-95	60	85	80	80	Low lysine
Milo, grain sorghum	95-100	60	90	80	80	Nearly equal to corn
Molasses (77% D.M.)	55-65	5	5	5	5	Energy source, used in pelleting
Oats (36 lb/bu)	80-90	20	20	70	15	Low energy, but excellent feed
Oats, high protein	90	20	50	70	30	Low energy, but excellent feed
Oat groats	110-115	20	90	90	90	Palatable, but expensive
Potatoes (22% D.M.)	20-25	0	30	80	0	Should be cooked, low protein
Rye	90	0	75	75	75	Watch for ergot toxicity
Triticale	90-95	20	85	80	80	Watch for ergot toxicity
Wheat, hard	100-105	60	90	80	80	Low lysine, good feed grain
Wheat bran	60-65	0	0	30	10	Bulky, high fiber, laxative
Wheat aids	90-95	5	10	30	10	Partial grain substitute
Whey, dry	100-110	20	5	5	5	High lactose content, salty

[a]When fed at no more than the maximum recommended % of complete diet.

[b]Higher levels may be fed, although performance may decrease.

energy content of diets. Consequently, reduced growth rate and feed efficiency of growing-finishing pigs occur when oats exceed 20% of the diet. Adding oats to the diet of newly weaned pigs or purchased feeder pigs may help in the prevention of edema disease and reduce the incidence of nutritional scours. Oats is an excellent feed grain, particularly for brood sows. New high protein varieties of oats show good promise as the only feed grain for swine.

Can wheat be fed to swine?

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. Reformulating diets containing wheat on a lysine basis will save some of the supplemental protein costs. Do not formulate wheat based diets on a protein basis. Since wheat tends to flour, it should be coarsely ground. If ground too fine, the palatability may decrease and result in lowered performance.

What is high lysine corn?

High lysine (Opaque-2) corn is higher than regular corn in all the essential amino acids except leucine. High lysine corn is especially higher in lysine and tryptophan. Since the lysine content may vary, it is suggested that the high lysine corn be analyzed for lysine content. High lysine corn should be ground more coarsely than normal corn. Some producers prefer a roller mill for processing high lysine corn.

If high lysine corn contains .38% lysine or higher on an 86% dry matter basis or .44% lysine or higher on a 100% dry matter basis, the protein level of the diet can be reduced by 2%. That is, if the requirement is 16% with normal corn, a 14% diet will give the same performance if high lysine corn is used.

If swine producers consider growing high lysine corn, they must evaluate such economic factors as the yield of high lysine corn and the price of normal corn and supplemental protein (see the 1972, 1973 and 1983 Nebraska Swine Reports for further information).

Should fat be added to swine diets?

Fat is an excellent high-potency source of energy for swine. Like any diet ingredient, the cost of its inclusion must be weighed against the benefits received. Surprisingly, the addition of fat to swine diets has a greater effect in the summertime than during the cooler periods of the year. This appears to be due to the increased energy consumption by pigs on fat supplemented diets. Fat additions generally improve the palatability of diets. Diets containing 5% fat have been shown to reduce dust by 50% in the building where it is being fed. Reduced dust levels have health implications for both pigs and people.

It has been shown that the addition of 3-5% fat to the diet of growing-finishing pigs will improve growth rate and feed efficiency with little effect on backfat thickness. Addition of fat above 5% will further improve feed conversion but may reduce carcass quality.

Research with sows suggests that the addition of fat to the diet before farrowing has the potential of improving pig survival. To improve piglet survival, the sow must receive a total of 2.2 lb of added fat during the two weeks preceding farrowing.

Fat additions can be particularly helpful in the diet of lactating sows. As many farrowing houses are maintained at temperatures higher than is comfortable for the sow, reduced feed consumption may occur. This results in reduced pig weights at weaning and in delayed return to estrus after weaning. These problems are most prevalent among first litter sows and highly productive white sows. These problems are more common during the hot summer months. Fat additions to the lactation diet increase the energy consumption of the sow and reduces the frequency and severity of these problems.

What sources of fat are available?

Animal fats and soybean oil are the most common fat sources for swine diets. Several qualities of tallow and lard are available. These are solid and require melting to be added to the diet. Although considerably more expensive, soybean or other vegetable oils can be added to swine diets in the liquid form. Probably the easiest method of adding soybean oil to diets is to use whole soybeans. Diets utilizing whole beans as the supplemental protein source contain 3-4% added fat. Commercial supplements and complete diets containing added fat are available. Fat that is added to a swine diet must be stabilized and of good quality.

What are the problems associated with fat additions to swine diets?

The major problems associated with fat additions are physical in nature. Animal fats are solid at normal temperatures and must be melted for addition to diets and to assure proper mixing. As the fat content of diets is increased above 3-4%, the diet becomes sticky and tends to bridge and hang up in delivery tubes, bins and feeders.

ALFALFA IN SWINE DIETS

Should alfalfa be considered in formulation of swine diets?

Yes. Gestation diets containing from 25 to 66% good quality alfalfa hay have supported good reproductive performance. High levels of alfalfa hay can be fed most accurately when mixed with other components in a pelleted diet. However, the cost may not justify feeding a pelleted diet. Therefore, if diets contain more than 66% alfalfa hay, feed the daily level of ground alfalfa hay plus 1 lb of a corn-vitamin-mineral mixture per head per day. In this case, the proper levels of supplemental vitamins and minerals will be mixed with ground corn, which serves as a carrier. The alfalfa hay is fed separately from the corn-vitamin-mineral mixture. If diets contain 66% alfalfa hay or less, alfalfa hay can be fed as a ground mixture with other needed diet constituents. Alfalfa is often added in growing-finishing swine diets at the rate of 2.5% of the total diet. This level serves as a safety factor to help insure the presence of certain vitamins and minerals. Higher levels of alfalfa in the growing-finishing diet depend on the price of the supplemental protein source, energy source, such as corn, and the performance desired. Due to its fiber content, alfalfa has a greater feeding value in a cool environment than in a warm environment. Recent Nebraska research has indicated that alfalfa hay can replace oats in weaning diets.

METHODS OF FEEDING

The most common method of feeding swine is to use a complete diet. Another method is grain and supplement free choice.

We recommend the use of a complete diet because it provides better control of protein, mineral, and vitamin intake. Over-consumption of protein supplement is eliminated. Each pig gets a balanced diet with every unit of feed. Although complete diets 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 formulate and mix diets on the farm?

One method of mixing a complete diet is blending ground grain with a commercial supplement in proportions suggested by the manfacturer. The mixing can be done either commercially or with a grinder-mixer. A self-unloading wagon is not a mixer and does a poor job of mixing corn and supplement.

A second method is to use the feeding program suggested in this bulletin. This requires the producer to buy all ingredients indicated in the diets in Tables 10, 11, 12 and 13 and to do a thorough job of mixing. Horizontal feed mixers are preferred but vertical mixers are capable of providing adequate blending.

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 the diet ingredients, and qualified labor. Proper proportioning is one of the critical steps in mixing a diet. Diets cannot be accurately made without the use of scales.

When considering home mixing, don't overlook the role that the feed manufacturer plays in providing valuable services to the swine industry.

What influence does fineness of grind have on pig performance?

All grains and feedstuffs, such as whole beans and alfalfa, should be ground for swine. However, fineness of grind depends on several factors. 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. From a practical standpoint it appears that a medium grind 3/8" to 1/2" screen will give the best total results. Grinding finer than this tends to increase feed wastage and may increase the incidence of gastric ulcers. Grinder speed, condition and maintenance will affect the particle size and uniformity of the finished product.

What is the feed value of high moisture grain?

High moisture grain, harvested or reconstituted, is similar in feed value to regular grain on a dry matter basis. Automated systems are available today for feeding complete diets with high moisture grain. If high moisture grain is fed, diets should be prepared frequently (every 1 or 2 days) to prevent spoilage. Mold inhibitors show good promise for extending the shelf-life of high moisture grain diets. Diets should be prevented from bridging in the feeders. The major factor to consider in deciding to feed high moisture grain is how the producer desires to harvest and store grain.

DIETS FOR SWINE

Baby Pig Diets

Orphan Pig Diets. There is no replacement for the sow's colostrum. If the newborn pig does not receive colostrum, it has little chance of surviving. However, a pig can obtain colostrum by being placed with another sow that has just farrowed (foster sow). An orphan pig should remain with a foster sow after receiving colostrum. If this is not possible, a milk replacer can be used. Some excellent commercial milk producers are available today. An example of a homemade milk replacer is the following mixture:

1 quart milk
1 pint half-and-half
1 raw egg

Portions of this mixture can be fed every three hours. If possible the orphan pig should be fed a dry 22% prestarter (Table 10) from 5-7 days of age until 2-3 weeks of age. At this time the pig can be switched to a 20 or 18% pig starter.

Creep or Starter Diets. Creep feed is recommended beginning at about 2 weeks of age. The complexity of good starter diets plus the small amount consumed are primary factors responsible for recommending commercial pig starters. If you wish to mix your creep feed, diets in Table 10 are suggested.

Use the complex diets (pre-starter) for pigs weighing less than 13 lb at weaning. Heavier pigs can start on the simple starter. The 16% starter-grower diet may be more acceptable to a pig when changing from a complex starter to a simpler corn-soy diet. Also, it can be used for slow growing pigs that are beyond the starter stage.

Growing-Finishing Diets

Diets for the growing-finishing pig are listed in Table 11. Some possible substitutions when using these diets are:

1. Milo, wheat, or millet can be substituted for corn pound for pound.

Table 10. Sample diets for young pigs (% of diet).

	Percent protein			
Ingredients	**22 Per-starter**	**20 Simple starter**	**18 Starter-grower**	**16 Starter-grower**
	%	%	%	%
Sugar (beet or cane)	10.00	-----	-----	-----
Ground yellow corn	21.3	41.3	46.7	68.8
Ground oats	5.0	10.0	15.0	-----
Ground wheat	5.0	-----	-----	-----
44% soybean meal	6.4	27.7	22.1	17.8
Dried skimmilk	40.0	-----	-----	-----
Dried whey	-----	10.0	5.0	2.5
Dried fish solubles	5.0	2.5	2.5	2.5
Dried brewer's yeast	1.0	1.0	1.0	1.0
Animal fat (stabilized)	3.0	3.0	3.0	3.0
Dicalcium phosphate (24% Ca. 18.5% P)	0.3	1.2	1.4	1.2
Ground limestone	0.5	0.9	0.9	1.2
Salt	0.3	0.3	0.3	0.3
Trace mineral mix[a]	0.1	0.1	0.1	0.1
Vitamin-antibiotic[b] mix	2.0	2.0	2.0	2.0
TOTAL (%)	100.0	100.0	100.0	100.0

[a]See Table 3 for levels. Percent of diet will depend upon carrier.

[b]See Table 6 for levels. Percent of diet will depend upon carrier.

Table 11. Sample diets for growing-finishing swine (% of diet).

	% Protein				
	18	16	14	12	10
Ground corn or milo	67.4	73.2	78.7	84.3	89.8
Soybean meal, 44%	26.9	21.1	15.5	9.9	4.3
Alfalfa meal, 17% dehydrated	2.5	2.5	2.5	2.5	2.5
Ground limestone	1	.9	.8	.9	.8
Cicalcium phosphate (24% Ca, 18.5% P)	.8	.9	1.1	1	1.2
Salt	.3	.3	.3	.3	.3
Trace mineral mix[a]	.1	.1	.1	.1	.1
Vitamin-antibiotic premix[b]	1	1	1	1	1
Total (%)	100	100	100	100	100

[a]See Table 3 for levels. Percent of diet will depend upon carrier.

[b]See Table 6 for levels. Percent of diet will depend upon carrier.

Table 12. Gestation diets (% of diet).

				Alfalfa		Fat		Whole soybeans		Oats	
	lb/day			30%	50%	5%				30%	50%
Ingredient	3	4	5	4	5	5	3	4	4	4	5
Corn or milo	70.7	84.1	89.1	56	42	79.4	65	80.4	55.4	38.7
Soybean meal, 44%	23.5	11.3	7	9.9	5	11.7			10	7.5
Soybeans, whole							29.2	15		
Oats									30	50
Alfalfa hay, 15%				30	50					
Beet pulp										
Tallow						5				
Ground limestone	.4	.5	.6			.6	.5	.5	.5	.6
Dicalcium phosphate	4	2.7	1.9	2.7	.6	1.9	3.9	2.7	2.7	1.8
Monosodium phosphate					1					
Salt	.3	.3	.3	.3	.3	.3	.3	.3	.3	.3
Trace mineral mix[a]	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1
Vitamin premix[b]	1	1	1	1	1	1	1	1	1	1
	100	100	100	100	100	100	100	100	100	100
Calculated analysis										
protein %	16.63	12.46	11.01	14.14	13.94	12.21	16.59	12.71	12.93	12.74
calcium %	1.18	0.88	0.72	1.04	0.76	0.73	1.21	0.89	0.90	0.74
phosphorus %	1.08	0.80	0.64	0.80	0.65	0.64	1.07	0.81	0.81	0.65
energy (Kcal/lb)	1425	1462	1479	1262	1146	1570	1475	1486	1362	1310
Ca/P	1.10	1.10	1.12	1.31	1.17	1.13	1.13	1.10	1.11	1.13
Daily intake										
protein lb	0.50	0.50	0.55	0.57	0.70	0.61	0.50	0.51	0.52	0.64
calcium g	16.14	16.04	16.33	18.96	17.36	16.55	16.51	16.19	16.42	16.72
phosphorus g	14.70	14.58	14.60	14.52	14.84	14.62	14.61	14.74	14.78	14.79
energy Kcal	4275	5847	7395	5046	5730	7848	4424	5945	5447	6549

[a]See Table 4 for levels. Percent of diet will depend upon carrier.

[b]See Table 7 for levels. Percent of diet will depend upon carrier.

2. High protein (47.5%) soybean meal can replace 44% soybean meal by substituting 90 lb of 47.5% soybean meal and 10 lb of corn or milo for each 100 lb of 44% soybean meal.

3. Dehydrated alfalfa meal is included as a nutrient safety factor in these diets. It can be replaced with corn pound for pound provided adequate vitamin and mineral supplements are available. Alfalfa meal also provides a visual check of mixing adequacy.

4. Ground leafy alfalfa hay can replace dehydrated alfalfa meal.

5. Iodized salt and trace minerals can be replaced by trace mineralized salt.

Diets for the Breeding Herd

A wide variety of gestation and lactation diets are listed in Tables 12 and 13. The variety is intended to help meet the sow's energy requirements under a variety of conditions.

Table 13. Lactation diets (% of diet).

Ingredient	Corn-soy	Beetpulp	Fat 5%	Oats 20%	Alfalfa	Whole Soybeans
Corn or milo	80	69.2	73.3	61.3	71.4	75.3
Soybean meal, 44%	15.4	16.1	17	14	14	
Soybeans, whole						20
Oats				20		
Alfalfa hay, 15%					10	
Beet pulp		10				
Tallow			5			
Ground limestone	.6	.5	.6	.6	.5	.6
Dicalcium phosphate	2.6	2.8	2.7	2.7	2.7	2.7
Salt	.3	.3	.3	.3	.3	.3
Trace mineral mix[a/]	.1	.1	.1	.1	.1	.1
Vitamin premix[b/]	1	1	1	1	1	1
	100	100	100	100	100	100
Calculated analysis						
protein %	13.98	14.21	14.08	14.08	14.19	14.18
calcium %	0.91	0.98	0.93	0.94	1.01	0.94
phosphorus %	0.80	0.82	0.81	0.82	0.81	0.83
energy Kcal/lb	1456	1418	1549	1388	1388	1487
Ca/P	1.14	1.20	1.16	1.15	1.24	1.14

[a]See Table 3 for levels. Percent of diet will depend upon carrier.

[b]See Table 6 for levels. Percent of diet will depend upon carrier.

Should sows be limit-fed or full-fed?

A "limit feeding" program is recommended for gilts and sows during prebreeding and gestation. However, a 'limit feeding" program limits only the energy intake and not the other nutrients such as protein, minerals, and vitamins. The energy is limited to keep sows from becoming too fat. Excessive feeding of gilts and sows leads to increased feed cost and interferes with reproduction. Sows that are over fed immediately after breeding or throughout gestation often suffer high embryonic mortality, thus producing smaller litters than sows fed the proper amounts. Sows that become too fat have a tendency to have more farrowing difficulties and crush more pigs. This is especially true during the summer, when sows are subject to heat stress.

Diets for the pregnant female must meet her daily requirements for all essential nutrients. During normal (spring/fall) weather conditions about 6,000 kcal of metabolizable energy per head per day (4 lb of a corn-soybean meal diet) will keep sows in "good" condition. However, energy intake may need to be increased or decreased depending upon the condition of the sow and as the environment changes. This is usually accomplished by increasing or decreasing the amount of feed given to the sows daily.

The daily allowance for protein is 0.5 lb. This allowance can be met by feeding 4 lb of a 12.5% protein diet per day. During the summer, feed intake may be reduced to about 3-3.5 lb per head per day. In this case the protein level of the diet must be increased to about 16%, to meet the 1/2 lb per head per day requirement. Feeding levels lower than 4 lb will also require an increase in the level of minerals and vitamins to maintain the proper amounts on a daily basis. Daily nutrient requirements for brood sows during gestation are given in Tables 4 and 7.

The success of limit-feeding sows and gilts depends upon controlling the intake of each female. Care must be taken to see that each gets her share. Individual sow feeding stalls are effective devices for controlling boss sows. Interval feeding during gestation has had good success. Interval feeding means feeding every other day or every three days. Of course, the amount fed is adjusted accordingly. For example, instead of feeding 4 lb each day during gestation, 8 lb is fed every two days.

Sows should be full-fed during lactation to obtain maximum milk production. Hand feeding sows to appetite the first two or three days after farrowing may aid in the detection of milking problems. Sows going off feed and constipation are two of the symptoms of the MMA complex.

Can sow constipation be controlled by supplemental feeding of a specific feed ingredient?

Feed ingredients with a high fiber content and a high water binding capacity, such as dried beet pulp, can be used as a top dress on sow feed to alleviate constipation. Caution should be taken to avoid feeding a beet pulp that has been ammoniated or mixed with urea. Water, which is a critical nutrient, is particularly important when this type of diet is fed. The value of potassium chloride (KCl) as a laxative for addition to lactation diets has not been demonstrated.

Table 14. Feed analysis (as fed moisture level).

Feedstuffs	Protein %	Metabolizable energy Kcal/lb	Fiber %	Calcium %	Phosphorus %	Riboflavin	Niacin	Pantothenic acid	Choline	Lysine %
						mg/lb				
Alfalfa meal (dehydrated)	17	900.0	24.3	1.30	.24	6.5	20.0	13.6	680	.80
Alfalfa hay (early bloom)	16	850.0	27.0	1.20	.28	5.4	19.0	9.0	550	.60
Barley	11.5	1350.0	8.0	.08	.42	.5	26.0	3.0	460	.40
Beet pulp	9	1200.0	19.0	.68	.10	.3	7.0	.7	370	.60
Corn (yellow)	8.9	1550.0	2.5	.02	.28	.5	10.0	2.2	240	.25
Corn & cob meal (yellow)	8	1330.0	9.0	.04	.27	.4	9.0	2.0	160	.18
Dried brewer's yeast	45	1205.0	2.7	2.0	1.50	17.0	210.0	45.0	1750	3.40
Dried fish solubles	54	1270.0	3.5	1.50	1.00	7.0	135.0	20.0	2200	3.00
Fish meal, medhaden	65	1170.0	1.0	4.50	2.40	2.5	28.0	3.0	1300	4.80
Meat & bone scraps	50	1106.0	2.5	10.00	5.00	1.9	21.0	2.0	900	3.00
Millet	12	1225.0	8.0	.05	.28	.7	24.0	3.4	360	.25
Milo (sorghum)	9	1470.0	2.7	.03	.30	.5	18.0	5.0	310	.22
Molasses, beet	6	1060.0	0.0	.16	.02	1.0	18.0	2.0	400	----
Molasses, cane	3	1060.0	0.0	.50	.08	1.5	16.0	17.0	350	----
Oats	12	1210.0	11.5	.10	.33	.7	7.0	5.8	420	.40
Oats, feed rolled, oat groats	16	1550.0	3.5	.07	.43	.6	3.7	6.5	500	.6
Rye	12.2	1300.0	2.2	.08	.34	.8	.5	3.3	----	.45
Skim milk, dried	33	1530.0	0.0	1.25	1.00	9.0	5.0	1.5	500	2.80
Soybean meal (solvent)	44	1400.0	6.5	.25	.60	1.3	12.0	6.5	1200	2.90
Soybean meal (solvent dehulled)	47.5	1550.0	3.0	.20	.62	1.3	9.6	6.2	1225	3.20
Soybeans, whole	37	1589.0	5.0	.25	.58	1.4	10.0	6.6	1200	2.40
Sugar	----	1690.0	----	----	----	----	----	----	----	----
Tallow, Feed Grade	----	3500.0	----	----	----	----	----	----	----	----
Tankage	60	1200.0	2.2	5.50	3.00	1.0	17.0	1.2	1000	4.00
Wheat, hard	13	1509.0	2.5	.05	.40	.45	24.0	5.0	400	.40
Wheat, bran	15	1055.0	10.5	.12	1.15	1.4	95.0	12.5	500	.60
Wheat, middlings	16	1340.0	7.0	.08	.70	1.0	22.0	8.0	500	.65
Whey, dried whole	12	1450.0	0.0	.90	.75	13.3	5.09	21.0	900	1.00
Dicalcium phosphate	----	----	----	24.00	18.50	----	----	----	----	----
Monocalcium phosphate	----	----	----	20.00	21.00	----	----	----	----	----
Steamed bone meal	----	----	----	28.00	14.00	----	----	----	----	----
Defluorinated rock phosphate	----	----	----	32.00	18.00	----	----	----	----	----
Disodium phosphate	----	----	----	----	21.00	----	----	----	----	----
Monosodium phosphate	----	----	----	----	25.50	----	----	----	----	----
Ground limestone	----	----	----	38.00	----	----	----	----	----	----
Sodium (Tri-Poly) phosphate	----	----	----	----	25.00	----	----	----	----	----

Boar Diets

Boars can be fed a corn-soybean meal diet fortified similarly to the gestation diets. The daily feeding rate recommended in Table 1 may have to be changed to reflect differences due to season, condition, and workload of the boar. Boars under heavy use should be fed 6 lb/head/day of that diet.

Water

Water is one of the most important parts of a feeding program for swine. It is often overlooked. The importance of a continuous supply of clear fresh water cannot be overstated. Water is vital to all body functions. Larger quantities are used in warm environments and during periods of stress.