



pork industry handbook

COOPERATIVE EXTENSION SERVICE • MICHIGAN STATE UNIVERSITY

Swine Rations

Authors

William G. Luce, Oklahoma State University
 Gilbert R. Hollis, University of Illinois
 Donald C. Mahan, Ohio State University
 Elwyn R. Miller, Michigan State University

Reviewers

Gerald Gehlbach, Lincoln, Illinois
 Virgil W. Hays, University of Kentucky
 Palmer Holden, Iowa State University
 Ernest R. Peo, University of Nebraska

A dependable and economic source of feed is the backbone of a profitable swine operation. Since 55-70% of the total cost of pork production is feed, the pork producer should be keenly aware of all aspects of swine nutrition and commodity buying.

The pig is an efficient converter of feed to meat. With today's nutritional knowledge, the model meat-type hog can be produced with 3.3 lb. or less of feed per pound of gain from 40 lb. to market. To obtain maximum feed utilization, it is necessary to feed well-balanced rations designed for specific purposes.

Composition of Feedstuffs

Values for crude fiber, metabolizable energy, crude protein, calcium, phosphorus and five amino acids are presented in Table 1 for the feedstuffs used in the rations suggested in this publication. Pork producers are cautioned, however, to recognize that feedstuffs vary not only in nutrient content but also in the availability of these nutrients. Table 1 lists average values for each feedstuff. When it is known that the nutrient content of a particular feedstuff differs considerably from that shown in Table 1, adjustments should be made in the suggested rations, supplements and base mixes in Tables 3 through 16.

Dicalcium phosphate was used in all the rations. Other calcium and phosphorus sources (Table 2) may be substituted for dicalcium phosphate. However, if a substitution is made, adjustments will be necessary since other sources contain different levels of calcium and phosphorus and their biological availability of phosphorus may differ from dicalcium phosphate.

Brood Sow Rations

The rations shown in Tables 3 and 4 are designed for both bred and lactating sows. For the rations in Table 3, yellow corn is the primary grain source; for those in

Table 4, grain sorghum, barley or wheat is the primary energy source.

For bred sows, it is suggested that these rations be fed at a daily level of 4-5 lb. per head. The exact level to feed during gestation depends on weight, age, condition of the animal, method of housing, age pigs are to be weaned, and climatic conditions or environmental temperature. Sows should gain between 50-75 lb. with gilts gaining 70-100 lb. during gestation. It may be necessary to feed slightly more of the barley rations (rations 5 in Table 4) because of their lower energy content. For bred animals on good quality, legume pasture (i.e. alfalfa or ladino), 2-3 lb. per head per day of one of the gestation rations presented in Tables 3 or 4 may suffice.

During lactation, rations may be limit fed during the first few days following farrowing. Increase the daily feed gradually to full feed or slightly less by 5-7 days after farrowing. If you feed one of the suggested rations that does not contain much bulk (i.e. fiber), such as rations 1, 6 and 7 (Table 3), constipation may be a problem around farrowing time. If constipation is a problem, substitute approximately 20% wheat bran or 10% dehydrated alfalfa meal or beet pulp for grain in the ration 3-4 days before farrowing and continue up to 1 week following farrowing. Some producers avoid this problem by adding 20 lb. of magnesium sulfate (Epsom salts) or 15 lb. of potassium chloride per ton of ration.

Baby Pig Rations

Baby pig rations in Table 5 may be used as either creep or starter rations. Rations 1 through 4 are formulated for pigs weighing 10-25 lb., while rations 5 through 8 are formulated for pigs weighing 25-40 lb.

Ration 5 is commonly called a simplified starter ration since it is built around a corn-soybean meal base. Pigs may not perform quite as well on this ration

Table 1. Average nutrient content of common feedstuffs¹.

Nutrients ²	CF	ME	Ca	P	CP	Lys	Try	Thr	Met	Cys
Alfalfa hay, suncured	29.0	890	1.20	0.16	14.2	0.55	0.35	0.60	0.20	0.15
Alfalfa meal, dehydrated, 17%	25.0	1050	1.30	0.23	17.0	0.80	0.36	0.75	0.29	0.29
Barley	7.0	1275	0.06	0.36	11.7	0.36	0.16	0.36	0.18	0.19
Corn, yellow	2.5	1500	0.01	0.25	08.8	0.24	0.09	0.32	0.19	0.20
Cottonseed meal (solvent)	12.5	1150	0.15	0.95	41.0	1.65	0.48	1.35	0.49	0.65
Fat ³	-----	3550	-----	-----	-----	-----	-----	-----	-----	-----
Fish meal, menhaden	1.0	1290	5.20	2.90	60.0	4.60	0.71	2.67	1.88	0.62
Meat and bone meal, 50%	2.8	1100	8.10	4.10	50.0	2.50	0.29	1.81	0.65	0.62
Milk, dried skim	-----	1520	1.25	1.00	33.3	2.50	0.45	1.75	0.90	0.40
Oats	12.0	1220	0.08	0.33	12.0	0.34	0.13	0.31	0.18	0.15
Oat groats	3.0	1500	0.07	0.40	16.0	0.45	0.18	0.47	0.20	0.26
Sorghum, grain	2.7	1425	0.02	0.27	9.0	0.22	0.09	0.29	0.17	0.14
Soybeans, full-fat (cooked) ⁴	5.0	1609	0.25	0.58	38.0	2.40	0.52	1.50	0.50	0.60
Soybean meal, 44%	6.5	1475	0.25	0.60	44.0	2.88	0.55	1.87	0.56	0.66
Soybean meal, 48.5%	3.0	1520	0.20	0.65	48.5	3.14	0.63	2.00	0.73	0.82
Sunflower meal, 32%	23.7	1040	0.38	0.97	32.0	1.66	0.59	1.40	1.57	0.69
Sunflower meal, 41%	13.3	1340	0.43	1.04	41.0	2.00	0.60	1.52	1.60	0.71
Sugar	-----	1383	-----	-----	-----	-----	-----	-----	-----	-----
Tankage, 60%	2.0	980	4.60	2.50	60.0	3.89	0.58	2.48	0.75	0.52
Wheat, hard winter	2.4	1500	0.05	0.35	12.2	0.38	0.15	0.37	0.20	0.16
Wheat, soft winter	2.4	1500	0.05	0.35	10.2	0.31	0.12	0.32	0.20	0.20
Wheat, hard red spring	2.4	1515	0.04	0.39	13.5	0.34	0.18	0.37	0.19	0.26
Wheat, Durum	2.5	1505	0.10	0.40	12.7	0.39	0.16	0.43	0.19	0.26
Wheat bran	11.0	890	0.08	1.15	15.0	0.56	0.29	0.38	0.09	0.29
Wheat middlings	7.5	1300	0.05	0.80	16.0	0.64	0.18	0.54	0.16	0.18
Whey, dried	-----	1445	0.90	0.70	12.0	0.80	0.13	1.03	0.16	0.24
Calcium carbonate (limestone)	-----	-----	38.00	-----	-----	-----	-----	-----	-----	-----
Dicalcium phosphate	-----	-----	22.00	18.50	-----	-----	-----	-----	-----	-----
Defluorinated phosphate	-----	-----	32.00	18.00	-----	-----	-----	-----	-----	-----
Steamed bone meal	-----	-----	24.00	12.00	-----	-----	-----	-----	-----	-----

¹All values are on a 90% dry matter basis.

²Nutrient abbreviations are for crude fiber, metabolizable energy, calcium, phosphorus, crude protein, lysine, tryptophan, threonine, methionine and cystine, respectively.

³Different sources may contain different ME values.

⁴Soybeans should be cooked or roasted to a temperature of 220-250°F to destroy the trypsin inhibitor. The values reported are for heat treated soybeans.

Table 2. Composition of various calcium and phosphorus sources used in swine diets and the comparative biological value of phosphorus ¹.

Mineral source	Percent of mineral		Biological value of P ²
	calcium	phosphorus	
Limestone (Calcium carbonate)	38	0	-----
Limestone (Dolomite) ³	22	0	-----
Dicalcium phosphate	20-24	18.5	100
Dicalcium-monocalcium phosphate	15-18	21	105-110
Defluorinated phosphate	30-36	14-18	95-100
Soft rock phosphate (Colloidal clay)	18	9	25-35
Sodium tripolyphosphate ⁴	0	25	95-102
Steamed bone meal	23-28	13	90-100

¹Source: *Calcium and phosphorus in animal nutrition*. International Minerals & Chemical Corporation.

²The value expressed is the relative availability of phosphorus, using dicalcium phosphate as the standard (100).

³This product contains approximately 10% magnesium.

⁴This product contains approximately 31% sodium.

Table 3. Suggested sow rations with corn as grain source.

Ingredient	Ration number							
	1	2	3	4	5	6	7	8
	pounds							
Corn, yellow	1635	1665	1250	1295	1285	1645	1685	1485
Oats	-----	-----	400	-----	-----	-----	-----	-----
Wheat middlings	-----	-----	-----	400	-----	-----	-----	-----
Wheat bran	-----	-----	-----	-----	400	-----	-----	-----
Soybean meal, 44%	295	-----	280	235	250	210	160	250
Soybean meal, 48.5%	-----	265	-----	-----	-----	-----	-----	-----
Meat and bone meal, 50%	-----	-----	-----	-----	-----	100	-----	-----
Tankage, 60%	-----	-----	-----	-----	-----	-----	100	-----
Dehydrated alfalfa meal, 17%	-----	-----	-----	-----	-----	-----	-----	200
Calcium carbonate	20	20	20	25	27	10	15	13
Dicalcium phosphate	38	38	38	33	26	23	28	40
Salt	7	7	7	7	7	7	7	7
Vitamin trace mineral mix*	5	5	5	5	5	5	5	5
Total	2000	2000	2000	2000	2000	2000	2000	2000
Protein, %	13.70	13.70	14.10	14.10	14.20	14.40	13.90	13.70
Lysine, %	.62	.62	.62	.62	.62	.62	.62	.62
Tryptophan, %	.15	.16	.16	.16	.19	.14	.15	.18
Threonine, %	.53	.53	.51	.53	.51	.54	.53	.54
Methionine + cystine, %	.49	.53	.48	.46	.47	.50	.48	.50
Calcium, %	.85	.84	.86	.89	.86	.88	.85	.86
Phosphorus, %	.65	.65	.66	.70	.70	.68	.65	.65
Metabolizable energy, kcal/lb.	1444	1450	1384	1405	1326	1447	1431	1403

*See Table 17. It is also recommended that during the gestation period, additional choline (550 grams per ton) be added to the ration. This could be provided by adding 2.5 pounds of a choline chloride premix containing 50% choline.

Table 4. Suggested sow rations with grain sorghum, barley or wheat as the grain source.

Ingredient	Ration number							
	1	2	3	4	5	6	7	8
	pounds							
Grain sorghum	1620	1650	1640	1470	-----	-----	-----	-----
Barley	-----	-----	-----	-----	1715	1730	-----	-----
Wheat	-----	-----	-----	-----	-----	-----	1730	1575
Soybean meal, 44%	310	-----	220	265	220	130	200	165
Soybean meal, 48.5%	-----	280	-----	-----	-----	-----	-----	-----
Meat and bone meal, 50%	-----	-----	100	-----	-----	100	-----	-----
Dehydrated alfalfa meal, 17%	-----	-----	-----	200	-----	-----	-----	200
Calcium carbonate	20	20	10	13	23	13	25	15
Dicalcium phosphate	38	38	18	40	30	15	33	33
Salt	7	7	7	7	7	7	7	7
Vitamin trace mineral mix*	5	5	5	5	5	5	5	5
Total	2000	2000	2000	2000	2000	2000	2000	2000
Protein, %	14.10	14.20	14.70	14.10	14.90	15.50	15.00	14.90
Lysine, %	.62	.62	.62	.62	.62	.62	.62	.62
Tryptophan, %	.16	.15	.15	.18	.21	.19	.19	.21
Threonine, %	.52	.52	.54	.54	.52	.52	.51	.52
Methionine + cystine, %	.44	.48	.45	.45	.45	.46	.43	.44
Calcium, %	.86	.85	.85	.87	.85	.88	.89	.84
Phosphorus, %	.66	.66	.67	.67	.66	.70	.66	.66
Metabolizable energy, kcal/lb.	1383	1389	1385	1348	1255	1254	1446	1408

*See Table 17. It is also recommended that during the gestation period, additional choline (550 grams per ton) be added to the ration. This could be provided by adding 2.5 pounds of a choline chloride premix containing 50% choline.

Table 5. Suggested baby pig rations.

Ingredient	Ration number for							
	Pigs 10-25 lb.				Pigs 25-40 lb.			
	1	2	3	4	5	6	7	8
	pounds							
Corn, yellow	1,088	975	768	783	1,395	1,245	1,045	615
Grain sorghum	-----	-----	-----	-----	-----	-----	-----	615
Ground oats	-----	-----	-----	-----	-----	-----	200	-----
Oat groats	-----	-----	200	200	-----	-----	-----	-----
Soybean meal, 44%	500	570	620	560	543	500	500	513
Dried whey	-----	400	200	400	-----	200	200	200
Dried skim milk	200	-----	-----	-----	-----	-----	-----	-----
Sugar	100	-----	100	-----	-----	-----	-----	-----
Fat	50	-----	50	-----	-----	-----	-----	-----
Calcium carbonate	15	13	15	15	15	15	13	15
Dicalcium phosphate	35	30	35	30	35	28	30	30
Salt	7	7	7	7	7	7	7	7
Vitamin-trace mineral mix*	5	5	5	5	5	5	5	5
Total	2000	2000	2000	2000	2000	2000	2000	2000
Protein, %	19.11	19.20	19.80	19.80	18.10	17.70	18.00	18.00
Lysine, %	1.10	1.10	1.10	1.10	.95	.95	.95	.95
Tryptophan, %	.23	.23	.23	.24	.21	.20	.21	.21
Threonine, %	.81	.90	.85	.91	.72	.76	.77	.76
Methionine + cystine, %	.64	.62	.62	.62	.60	.58	.58	.57
Calcium, %	.85	.84	.85	.87	.75	.75	.75	.77
Phosphorus, %	.71	.71	.72	.73	.65	.64	.66	.66
Metabolizable energy, kcal./lb.	1,457	1,440	1,486	1,439	1,446	1,447	1,419	1,421

*See Table 17.

as compared with performance on the more complex ones also shown in Table 5. However, the simplified ration may be more economical since it is usually cheaper to mix and inventory requirements are less. When postweaning scours are a problem, the substitution of 200-400 lb. of ground oats for corn or grain sorghum in rations 5, 6 and 8 (Table 5) for the first 2 or 3 weeks after weaning may be helpful.

Growing Rations

The rations shown in Tables 6 and 7 are designed for pigs weighing between 40-125 lb. Yellow corn is the primary energy source for the rations in Table 6, whereas barley or grain sorghum is the primary energy source for those shown in Table 7.

Pigs usually do not gain as efficiently on barley rations as on corn or grain sorghum rations largely because of the lower energy and higher fiber content of barley. Lightweight barley (less than 48 lb./bu.) contains more fiber which may result in reducing energy consumption and rate of gain. Pigs may also gain slightly less efficiently on grain sorghum rations as compared to corn rations.

Finishing Rations

Rations shown in Tables 8 and 9 are formulated for pigs weighing from 125 lb. to market weight and destined for slaughter. Replacement gilts for the breeding herd should be removed from the market pigs when weighing 150 to 200 lb. and fed a ration similar to the sow rations presented in Tables 3 and 4. For rations shown in Table 8, yellow corn or wheat is the primary grain source, while in Table 9, barley or grain sorghum is the primary energy source. The comments previously made about barley and grain sorghum for growing swine also apply for finishing swine.

At times it may be desirable to feed finishing rations that contain .05% less lysine than the rations listed. Such circumstances include: (1) economics, such as when the price of protein supplement is high compared to grain; (2) when barrows are fed separately from gilts (barrows require less lysine than gilts); or (3) if the hogs are below average in muscling. This adjustment can be made by adding 40 lb. less soybean meal per ton and 40 lb. more corn or grain sorghum. For example, ration 1 in Table 8 would contain .05% less lysine if it contained 1706 lb. of corn and 250 lb. of soybean meal.

Table 6. Suggested growing rations (40-125 lb) with corn as the major grain source.

Ingredient	Ration number									
	1	2	3	4	5	6	7	8	9	10
	pounds									
Corn, yellow	1,558	1,587	1,429	1,427	800	1,363	1,222	1,573	1,588	1,613
Wheat, hard winter	-----	-----	-----	-----	800	-----	-----	-----	-----	-----
Oats	-----	-----	-----	-----	-----	200	-----	-----	-----	-----
Wheat middlings	-----	-----	-----	-----	-----	-----	400	-----	-----	-----
Soybean meal, 44%	390	-----	-----	420	350	385	330	330	310	330
Soybean meal, 48.5%	-----	360	-----	-----	-----	-----	-----	-----	-----	-----
Soybean, full-fat (cooked)	-----	-----	520	-----	-----	-----	-----	-----	-----	-----
Meat and bone meal, 50%	-----	-----	-----	-----	-----	-----	-----	65	-----	-----
Tankage, 60%	-----	-----	-----	-----	-----	-----	-----	-----	60	-----
Fat	-----	-----	-----	100	-----	-----	-----	-----	-----	-----
Lysine, 78% L-lysine	-----	-----	-----	-----	-----	-----	-----	-----	-----	2
Calcium carbonate	15	17	16	16	18	12	21	10	12	17
Dicalcium phosphate	27	26	25	27	22	30	17	12	20	28
Salt	7	7	7	7	7	7	7	7	7	7
Vitamin-trace mineral mix*	3	3	3	3	3	3	3	3	3	3
Total	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Protein, %	15.40	15.70	16.10	15.50	16.10	15.70	15.80	15.80	15.60	14.30
Lysine, %	.75	.75	.79	.77	.75	.75	.75	.75	.75	.75
Tryptophan, %	.17	.18	.20	.18	.19	.18	.18	.17	.17	.16
Threonine, %	.60	.61	.62	.62	.60	.60	.61	.62	.61	.56
Methionine + cystine, %	.53	.58	.56	.54	.51	.53	.50	.55	.53	.51
Calcium, %	.64	.65	.65	.66	.65	.62	.64	.63	.63	.68
Phosphorus, %	.56	.55	.56	.55	.55	.60	.57	.54	.55	.56
Metabolizable energy, kcal/lb.	1,456	1,464	1,490	1,558	1,457	1,428	1,419	1,460	1,449	1,454

*See Table 17.

Table 7. Suggested growing rations (40-125 lb.) with barley or grain sorghum as the grain source.

Ingredient	Ration number									
	1	2	3	4	5	6	7	8	9	10
	pounds									
Barley	1,643	1,661	1,522	1,523	843	-----	-----	-----	-----	-----
Grain sorghum	-----	-----	-----	-----	-----	1,548	1,579	1,410	800	1,558
Wheat, hard winter	-----	-----	-----	-----	800	-----	-----	-----	793	-----
Soybean meal, 44%	310	-----	-----	330	310	400	-----	-----	355	345
Soybean meal, 48.5%	-----	290	-----	-----	-----	-----	370	-----	-----	-----
Soybean full-fat, cooked	-----	-----	430	-----	-----	-----	-----	540	-----	-----
Fat	-----	-----	-----	100	-----	-----	-----	-----	-----	-----
Meat and bone meal, 50%	-----	-----	-----	-----	-----	-----	-----	-----	-----	60
Calcium carbonate	20	22	21	17	20	17	18	17	17	12
Dicalcium phosphate	17	17	17	20	17	25	23	23	25	15
Salt	7	7	7	7	7	7	7	7	7	7
Vitamin-trace mineral mix*	3	3	3	3	3	3	3	3	3	3
Total	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Protein, %	16.40	16.70	17.10	16.20	16.60	15.80	16.10	16.60	16.20	16.10
Lysine, %	.74	.75	.79	.77	.75	.75	.76	.80	.75	.74
Tryptophan, %	.22	.22	.24	.21	.21	.18	.19	.20	.19	.17
Threonine, %	.59	.59	.59	.58	.59	.59	.60	.61	.60	.60
Methionine + cystine, %	.49	.53	.52	.48	.49	.48	.53	.52	.48	.49
Calcium, %	.66	.65	.68	.63	.63	.66	.65	.66	.67	.70
Phosphorus, %	.55	.55	.56	.56	.54	.56	.55	.56	.58	.58
Metabolizable energy, kcal/lb.	1,275	1,279	1,316	1,392	1,366	1,398	1,406	1,439	1,427	1,397

*See Table 17.

Table 8. Suggested finishing rations (125 lb. to market) with corn or wheat as the grain source¹.

Ingredient	Ration number									
	1	2	3	4	5	6	7	8	9	10
	pounds									
Corn, yellow	1,666	1,692	906	-----	-----	1,473	1,327	1,677	1,700	1,693
Wheat, hard winter	-----	-----	800	1,752	-----	-----	-----	-----	-----	-----
Wheat, soft winter	-----	-----	-----	-----	1,705	-----	-----	-----	-----	-----
Oats	-----	-----	-----	-----	-----	200	-----	-----	-----	-----
Wheat middlings	-----	-----	-----	-----	-----	-----	400	-----	-----	-----
Soybean meal, 44%	290	-----	252	208	256	283	231	236	205	261
Soybean meal, 48.5%	-----	264	-----	-----	-----	-----	-----	-----	-----	-----
Meat and bone meal, 50%	-----	-----	-----	-----	-----	-----	-----	60	-----	-----
Tankage, 60%	-----	-----	-----	-----	-----	-----	-----	-----	60	-----
Lysine, 78% L-lysine	-----	-----	-----	-----	-----	-----	-----	-----	-----	1
Calcium carbonate	17	17	18	21	20	17	20	11	14	17
Dicalcium phosphate	17	17	14	9	9	17	12	6	11	18
Salt	7	7	7	7	7	7	7	7	7	7
Vitamin-trace mineral mix ²	3	3	3	3	3	3	3	3	3	3
Total	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Protein, %	13.70	13.80	14.40	15.30	14.30	13.90	14.10	14.10	13.80	13.20
Lysine, %	.62	.62	.62	.62	.62	.62	.62	.62	.62	.62
Tryptophan, %	.15	.16	.17	.19	.17	.16	.16	.15	.16	.15
Threonine, %	.54	.53	.53	.51	.51	.53	.54	.54	.53	.51
Methionine + cystine, %	.50	.53	.47	.45	.50	.49	.46	.51	.49	.49
Calcium, %	.55	.55	.55	.55	.55	.56	.56	.56	.56	.56
Phosphorus, %	.45	.45	.46	.45	.46	.46	.50	.46	.45	.45
Metabolizable energy, kcal/lb.	1,464	1,469	1,466	1,467	1,468	1,435	1,428	1,465	1,455	1,462

¹Rations for market slaughter pigs. See rations in Tables 3 and 4 for replacement gilts.

²See Table 17.

Supplements

Some pork producers prefer to mix a supplement or have it custom mixed at a commercial feed mill and then later mix it with grain. Suggested supplements are shown in Table 10. It is impossible to formulate supplements with a fixed level of calcium and phosphorus and then to use it for all classes of hogs if we want a balanced diet at each stage of production.

Tables 11 through 13 show rations using the supplements from Table 10. The rations in Table 11 are for growing pigs (40 to 125 lb.). The calcium levels are slightly higher than needed for growing pigs; however, it is necessary to have the higher calcium level when the same supplement (using a smaller amount) is used to meet the calcium needs of finishing pigs in Table 12. The finishing rations in Table 12 are designed for pigs weighing 125 lb. to market weight.

If the supplements in Table 10 are to be used in sow rations, it is necessary to add additional calcium and phosphorus for their reproductive needs. The suggested sow rations in Table 13 contain 15 lb. of dicalcium phosphate per ton of feed in addition to a supplement and yellow corn for rations 1 through 5 and 20 lb. of dicalcium phosphate per ton of feed for rations 6 and 7.

Base Mixes

Another popular method of building swine rations is to purchase or prepare on the farm a base mix (com-

plete swine premix). The base mix is then blended with ground grain and soybean meal to make a complete ration. Suggested base mixes are shown in Table 14. Base mixes 1 and 2 are satisfactory for growing and finishing swine while base mixes 3 and 4 are satisfactory for sow rations during gestation and lactation. Mixes 1 and 3 are formulated to be added at the rate of 60 lb. and 80 lb., respectively; whereas, base mixes 2 and 4 are designed for adding at the rate of 100 lb. per ton of complete feed.

Formulas in Tables 15 and 16 are rations using base mixes from Table 14. Those in Table 15 show suggested growing, finishing and sow rations using corn as the grain source while in Table 16 grain sorghum is the primary grain source.

These suggested rations do not contain much bulk; therefore, if constipation is a problem, follow the recommendations given in the section titled "Sow Rations."

Vitamin and Trace Mineral Premix

The levels of vitamins and trace minerals in the rations, supplements and base mixes are based on the composition of the premix given in Table 17. Be sure to check the composition of the premix you use and the manufacturers' recommendations and adjust the amount in your rations accordingly. Most vitamin-trace mineral premixes are manufactured to add to swine rations at the rate of 2-10 lb. per ton of complete feed.

Table 9. Suggested finishing rations (125 lb. to market) with barley or grain sorghum as the grain source.¹

Ingredient	Ration number									
	1	2	3	4	5	6	7	8	9	10
	pounds									
Barley	1749	1769	1633	956	1923	-----	-----	-----	-----	-----
Grain sorghum	-----	-----	-----	-----	-----	1652	1679	903	1663	1818
Wheat, hard winter	-----	-----	-----	800	-----	-----	-----	800	-----	-----
Soybean meal, 44%	212	-----	227	205	30	304	-----	256	251	130
Soybean meal, 48.5%	-----	192	-----	-----	-----	-----	277	-----	-----	-----
Meat and bone meal, 50%	-----	-----	-----	-----	-----	-----	-----	-----	60	-----
Fat	-----	-----	100	-----	-----	-----	-----	-----	-----	-----
Lysine, 78% L-lysine	-----	-----	-----	-----	6	-----	-----	-----	-----	6
Calcium carbonate	20	20	20	20	20	17	17	18	12	17
Dicalcium phosphate	9	9	10	9	11	17	17	13	4	19
Salt	7	7	7	7	7	7	7	7	7	7
Vitamin-trace mineral mix ²	3	3	3	3	3	3	3	3	3	3
Total	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Protein, %	14.90	15.00	14.60	15.00	11.90	14.10	14.30	14.60	14.50	11.10
Lysine, %	.62	.62	.62	.62	.62	.62	.62	.62	.62	.62
Tryptophan, %	.20	.20	.19	.19	.16	.16	.16	.17	.15	.12
Threonine, %	.52	.51	.50	.50	.37	.52	.52	.52	.52	.38
Methionine + cystine, %	.45	.48	.44	.44	.37	.45	.49	.44	.45	.36
Calcium, %	.56	.55	.56	.55	.56	.56	.55	.55	.56	.56
Phosphorus, %	.46	.46	.45	.46	.46	.47	.47	.46	.45	.46
Metabolizable energy, kcal/lb.	1271	1274	1386	1360	1248	1401	1407	1432	1403	1391

¹ Rations for market slaughter pigs. See rations in Tables 3 and 4 for replacement gilts.

² See Table 17.

Table 10. Recommended protein supplements.

Ingredient	Supplement						
	1	2	3	4	5	6	7
	pounds						
Soybean meal (48.5%)	-----	-----	1675	-----	1290	1505	-----
Soybean meal (44.0%)	1705	1610	-----	1275	-----	-----	1665
Dehydrated alfalfa meal (17%)	-----	100	-----	-----	100	-----	-----
Meat and bone meal (50%) ¹	-----	-----	-----	550	400	-----	-----
Fish meal, menhaden (60%)	-----	-----	-----	-----	-----	200	-----
Calcium carbonate	95	90	105	55	65	95	105
Dicalcium phosphate	140	140	160	60	85	140	160
Vitamin-trace mineral mix ²	25	25	25	25	25	25	25
Salt	35	35	35	35	35	35	35
Lysine-98 (78.4% L-lysine)	-----	-----	-----	-----	-----	-----	10
Total	2000	2000	2000	2000	2000	2000	2000
Protein, %	37.51	36.26	40.62	41.80	42.13	42.50	36.63
Lysine, %	2.46	2.35	2.63	2.53	2.56	2.82	2.79
Tryptophan, %	.47	.46	.53	.43	.49	.54	.46
Threonine, %	1.59	1.55	1.68	1.69	1.69	1.78	1.56
Methionine + cystine, %	1.04	1.01	1.30	1.13	1.28	1.42	1.02
Calcium, %	3.56	3.51	3.93	4.09	3.98	4.02	3.97
Phosphorus, %	1.81	1.79	2.02	2.06	2.04	2.08	1.98
Metabolizable energy, kcal/lb.	1257	1240	1273	1242	1253	1273	1228

¹The meat and bone meal was considered to have 8.10% calcium and 4.10% phosphorus. If meat and bone meal with a higher concentration of calcium and phosphorus is used, the amount of dicalcium phosphate should be reduced accordingly.

²See Table 17.

Table 11. Growing rations (40-125 lb.) using recommended protein supplements in Table 10.

Ingredient	Ration number						
	1	2	3	4	5	6	7
	pounds						
Yellow corn	1495	1475	1545	1555	1565	1575	1600
Supplement 1	505	-----	-----	-----	-----	-----	-----
Supplement 2	-----	525	-----	-----	-----	-----	-----
Supplement 3	-----	-----	455	-----	-----	-----	-----
Supplement 4	-----	-----	-----	445	-----	-----	-----
Supplement 5	-----	-----	-----	-----	435	-----	-----
Supplement 6	-----	-----	-----	-----	-----	425	-----
Supplement 7	-----	-----	-----	-----	-----	-----	400
Total	2000	2000	2000	2000	2000	2000	2000
Protein, %	16.00	16.00	16.00	16.10	16.00	16.00	14.40
Lysine, %	.80	.80	.78	.75	.75	.79	.75
Tryptophan, %	.19	.19	.19	.16	.18	.18	.16
Threonine, %	.64	.65	.63	.62	.62	.63	.57
Methionine + cystine, %	.55	.55	.60	.56	.59	.61	.51
Calcium, %	.90	.93	.91	.90	.88	.86	.80
Phosphorus, %	.65	.65	.65	.64	.64	.64	.60
Metabolizable energy, kcal/lb.	1438	1432	1448	1442	1446	1452	1446

Do not purchase more than a 3-4 month supply of a vitamin-trace mineral premix at one time. Vitamins may lose their potency, especially in the presence of trace minerals. Be sure and store all premixes in a cool, dry place.

varies among farms. The greatest benefits from antibiotics or other feed additives are usually in the baby pig and growing rations. Often, there is also a response when they are used in finishing rations. In general, antibiotics are not needed in sow rations except perhaps at breeding time and just before and after farrowing. When using feed additives, be sure to follow labeling guidelines for levels to feed and abide by any withdrawal regulations listed on the label. For a more complete discussion on feed additives see PIH-31.

Antibiotics and Other Feed Additives

Antibiotics and other feed additives have not been included in the rations since the choice of additive

Table 12. Finishing rations (125 lb. to market) using recommended protein supplements in Table 10.

Ingredient	Ration number						
	1	2	3	4	5	6	7
	pounds						
Yellow corn	1635	1620	1670	1670	1675	1690	1700
Supplement 1	365	-----	-----	-----	-----	-----	-----
Supplement 2	-----	380	-----	-----	-----	-----	-----
Supplement 3	-----	-----	330	-----	-----	-----	-----
Supplement 4	-----	-----	-----	330	-----	-----	-----
Supplement 5	-----	-----	-----	-----	325	-----	-----
Supplement 6	-----	-----	-----	-----	-----	310	-----
Supplement 7	-----	-----	-----	-----	-----	-----	300
Total	2000	2000	2000	2000	2000	2000	2000
Protein, %	14.00	14.00	14.00	14.20	14.20	14.00	13.00
Lysine, %	.65	.65	.63	.62	.62	.64	.62
Tryptophan, %	.16	.16	.17	.15	.16	.16	.15
Threonine, %	.55	.55	.55	.54	.54	.55	.50
Methionine + cystine, %	.51	.51	.54	.51	.53	.55	.48
Calcium, %	.66	.68	.66	.67	.64	.63	.61
Phosphorus, %	.53	.54	.54	.54	.53	.53	.51
Metabolizable energy, kcal/lb.	1455	1451	1462	1457	1460	1465	1459

Table 13. Complete sow rations using recommended protein supplements in Table 10.

Ingredient	Ration number						
	1	2	3	4	5	6	7
	pounds						
Yellow corn	1620	1605	1655	1655	1660	1670	1670
Dicalcium phosphate	15	15	15	15	15	20	20
Supplement 1	365	-----	-----	-----	-----	-----	-----
Supplement 2	-----	380	-----	-----	-----	-----	-----
Supplement 3	-----	-----	330	-----	-----	-----	-----
Supplement 4	-----	-----	-----	330	-----	-----	-----
Supplement 5	-----	-----	-----	-----	325	-----	-----
Supplement 6	-----	-----	-----	-----	-----	310	-----
Supplement 7	-----	-----	-----	-----	-----	-----	310
Total	2000	2000	2000	2000	2000	2000	2000
Protein, %	14.00	14.00	14.00	14.20	14.10	14.00	13.00
Lysine, %	.64	.64	.63	.62	.62	.64	.63
Tryptophan, %	.16	.16	.16	.14	.16	.16	.15
Threonine, %	.55	.55	.54	.54	.54	.55	.51
Methionine + cystine, %	.51	.50	.53	.50	.53	.55	.49
Calcium, %	.83	.85	.83	.85	.82	.85	.85
Phosphorus, %	.67	.68	.68	.68	.68	.71	.70
Metabolizable energy, kcal/lb.	1444	1439	1451	1448	1449	1450	1443

Table 14. Recommended base mixes (complete pre-mixes).

Ingredients	Base mix			
	growing-finishing		brood sow	
	1	2	3	4
Calcium carbonate	560	340	490	400
Dicalcium phosphate	840	480	960	760
Salt	240	140	180	140
Vitamin-trace mineral mix*	100	60	125	100
Soybean meal, 44%	260	980	245	600
Total	2000	2000	2000	2000
Protein, %	5.72	21.56	5.39	13.20
Lysine, %	.37	1.41	.35	.86
Tryptophan, %	.07	.26	.07	.16
Threonine, %	.24	.90	.23	.56
Methionine + cystine, %	.16	.59	.15	.37
Calcium, %	19.92	11.86	19.89	16.04
Phosphorus, %	7.85	4.73	8.95	7.21
Metabolizable energy, kcal/lb.	192	723	181	442

* See Table 17

Table 15. Complete corn rations using base mixes.

Ingredient	Growing (40 to 125 lb.)		Finishing (125 lb. to market)		Sow	
	Ration numbers					
	1	2	3	4	5	6
Corn, yellow	1555	1560	1655	1660	1630	1630
Soybean meal, 44%	385	340	285	240	290	270
Base Mix 1*	60	-----	60	-----	-----	-----
Base Mix 2*	-----	100	-----	100	-----	-----
Base Mix 3*	-----	-----	-----	-----	80	-----
Base Mix 4*	-----	-----	-----	-----	-----	100
Total	2000	2000	2000	2000	2000	2000
Protein, %	15.50	15.40	13.70	13.70	13.80	13.80
Lysine, %	.75	.75	.62	.62	.62	.62
Tryptophan, %	.18	.17	.16	.16	.15	.15
Threonine, %	.62	.61	.54	.53	.54	.54
Methionine + cystine, %	.53	.54	.49	.50	.50	.50
Calcium, %	.66	.64	.64	.62	.84	.84
Phosphorus, %	.55	.54	.53	.52	.66	.65
Metabolizable energy, kcal/lb.	1456	1457	1457	1458	1443	1443

*See Table 14.

Table 16. Complete grain sorghum rations using base mixes.

Ingredient	Growing (40 to 125 lb.)		Finishing (125 lb. to market)		Sows	
	Ration number					
	1	2	3	4	5	6
Grain sorghum	1545	1545	1640	1645	1620	1620
Soybean meal, 44%	395	355	300	255	300	280
Base Mix 1*	60	-----	60	-----	-----	-----
Base Mix 2*	-----	100	-----	100	-----	-----
Base Mix 3*	-----	-----	-----	-----	80	-----
Base Mix 4*	-----	-----	-----	-----	-----	100
Total, lb.	2000	2000	2000	2000	2000	2000
Protein, %	15.80	15.80	14.20	14.10	14.10	14.10
Lysine, %	.75	.75	.62	.62	.62	.62
Tryptophan, %	.18	.17	.15	.15	.15	.16
Threonine, %	.60	.59	.53	.52	.53	.53
Methionine + cystine, %	.48	.49	.43	.44	.43	.44
Calcium, %	.67	.65	.66	.64	.86	.85
Phosphorus, %	.57	.56	.55	.54	.67	.66
Metabolizable energy, kcal/lb.	1398	1399	1396	1396	1382	1382

*See Table 14.

Table 17. Suggested vitamin-trace mineral mix¹.

Ingredient ²	Amount per ³ pound of premix
Vitamin A	800,000 I.U.
Vitamin D	80,000 I.U.
Vitamin E	3,000 I.U.
Vitamin K (Menadione)	660 mgs.
Riboflavin	1,000 mgs.
Pantothenic acid	4,500 mgs.
Niacin	7,000 mgs.
Choline chloride	20,000 mgs.
Vitamin B12	5 mgs.
Copper	.4 %
Iodine	.008 %
Iron	3.2 %
Manganese	.8 %
Zinc	4.0 %

¹Vitamin and trace mineral mixes may be purchased separately. This is advisable if a combination vitamin-trace mineral premix is to be stored longer than 3 or 4 months. Vitamins may lose their potency in the presence of trace minerals if stored for a prolonged period.

²Selenium should be added to the above premix in areas where deficiencies occur. This is generally east of the Mississippi River. A suggested amount for the above premix is .004%.

³Premix is designed to be used at a rate of 5 lb. per ton of complete feed for sows and baby pigs and 3 lb. per ton of complete feed for growing and finishing swine.

MICHIGAN STATE UNIVERSITY



COOPERATIVE
EXTENSION
SERVICE

MSU is an Affirmative Action/Equal Opportunity Institution. Cooperative Extension Service programs are open to all without regard to race, color, national origin, or sex.

Issued in furtherance of cooperative extension work in agriculture and home economics, acts of May 8, and June 30, 1914, in cooperation with the U.S. Department of Agriculture. Gordon E. Guyer, Director, Cooperative Extension Service, Michigan State University, E. Lansing, MI 48824.

This information is for educational purposes only. Reference to commercial products or trade names does not imply endorsement by the Cooperative Extension Service or bias against those not mentioned. This bulletin becomes public property upon publication and may be reprinted verbatim as a separate or within another publication with credit to MSU. Reprinting cannot be used to endorse or advertise a commercial product or company.

1P1R-2M-3:83-UP-KMF. Price 35 cents.

O-14160