6-1-1942

Pork production

Mississippi State University

BULLETIN No. 351 (Reprint of Edition of November 1940) JUNE 1942

PORK PRODUCTION

Compiled by H. O. WEST, Research Coordinator

Jointly Representing Mississippi State Vocational Board
and : : Mississippi Agricultural Experiment Station

MISSISSIPPI STATE COLLEGE
AGRICULTURAL EXPERIMENT STATION
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ACKNOWLEDGEMENTS

Acknowledgements are made to Mr. J. F. Scoggins, Associate Professor of Agricultural Education, State College; Mr. N. E. Wilson, Associate Professor of Agricultural Education, State College; Mr. P. G. Bedenbaugh, Assistant Professor of Animal Husbandry, State College; Mr. P. H. Sanders, Agricultural Editor, Mississippi Experiment Station, State College, for reading and criticizing the manuscript of this bulletin; to Dr. R. H. Stewart for reading and criticizing the Disease and Parasite sections; and to the U. S. Department of Agriculture for numerous photographs used in this bulletin.

Pork Production

Compiled by H. O. WEST*

Pork is the most widely used meat in Mississippi, a great deal of which is imported. There is little doubt but that increased quantities of pork would be used if it were produced in the State.

According to the 1935 census, Mississippi had a total of 311,683 farms, of which total, 210,727 farms reported hogs on farms January 1. This leaves a total of 91,956 farms, or 29.5 percent of the farms in Mississippi without hogs. These figures will indicate that at least 29.5 percent of the Mississippi farms have a problem of supplying the needed pork for home consumption. Pork needed for home use can be obtained only by (1) purchasing the needed pork for home use which in some cases is not possible due to the low cash farm income and results in many families going without sufficient pork, or (2) producing the needed pork on the home farm.

At the present time, while cooperating under the Soil Conservation program many farmers are confronted with the problem of land utilization; that is, trying to use their land to the best advantage. Probably on most Mississippi farms, pork production for home use offers a profitable means to utilize sufficient cultivatable land to produce the necessary feed. In addition to producing pork for home use feed may be marketed profitably by producing hogs for the market to replace the enormous amount of pork that is imported in Mississippi.

In this compilation on "Pork Production," an attempt has been made to present information on the most important phases of producing pork. The information is divided into sections as follows: (1) Selecting hogs for pork production, (2) Diseases and parasites, (3) Houses and equipment, (4) Care, management and feeding of brood sows and pigs, (5) Feeding pigs through the fattening period, (6) Killing, curing and storing pork.

All the above points are considered important and in most cases essential in setting up a sucessful system of pork production It is hoped that the information presented in this compilation will be useful in making decisions on questions that are raised while considering and planning a system of pork production.

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*Jointly representing Mississippi Agricultural Experiment Station and Mississippi State Vocational Board.

PART I

Selecting Hogs for Pork Production

Selecting hogs for pork production should receive careful consideration. The kind of hogs used has a direct bearing on the success or failure of the enterprise.

There are two distinct types of hogs, represented by the breeds of the lard type and breeds of the bacon type. The lard type hogs are used much more extensively in the United States than the bacon type. Principal breeds of the lard type are: Duroc-Jersey, Poland China, Chester White, Berkshire, Hampshire, and Spotted Poland China. The bacon breeds are Tamworth and Yorkshire.

In selecting the type or breed of hogs, the fact should be considered that there is as much variation in type within a breed as there is between breeds. Therefore comparable representatives should be selected when a study of breed efficiency is made. In addition to considering the purebreds, consideration should be given to a comparison of crossbreds versus purebreds, also to inbreeding and outbreeding. All of these points should be considered in selecting breeding stock to be used for pork production.

General Characteristics of the Lard Type

Within the last 30 years rather drastic changes have been made in the appearance of the lard-type hog. Formerly it was a rather low-set, broad, blocky, type of animal. Today most lard-type hogs are upstanding, having good length and depth, with medium width. The shoulders should be full and smooth, not coarse; the hams full and as wide as the shoulders, carried back well to the root of the tail, and fleshed down to the hock. The flesh should be evenly distributed over the body.

Duroc-Jersey

The Duroc-Jersey breed originated in the northeastern section of the United States. It was derived from mating strains of red hogs developed in sections of New York and New Jersey. Those in New Jersey were originally called Jersey Reds; those in New York are said to have been developed by a man who owned a noted stallion named Duroc, and people in that vicinity called the red hogs, which this man was breeding "Duroc" hogs. Several years after the independent breeding of Duroc and Jersey Reds, these hogs were intermingled in breeding, with the result that there was formed the breed known at the present time as Duroc-Jersey. The present tendency seems to be toward use of the single word, "Duroc." This breed is red in color, without admixture of any other colors. The popular color is referred to as cherry red; some animals, however, are dark, while others are light. There is no recognizable difference in the feeding or other qualities among hogs of the different shade of color in this breed.

From its early history the Duroc-Jersey breed was noted for hardiness and prolificacy. It began to be popular in the United States about the time Poland China breeders were producing the small type of hogs or so-called "hot bloods." This popularity had much to do with making the Duroc-Jersey breed as widespread as it is today. Animals of this breed had sufficient quality and hardiness to make them profitable to hog growers. In type they are similar to big-type Poland Chinas. The older boars when in show condition do not

as a rule acquire quite so much weight as those of the Poland China breed. The legs are of medium length, with good bone. The sows are prolific and are good milkers and mothers. Duroc-Jerseys are good grazers and are profitably adapted to following cattle in the feed lots

Pigs of the most desirable type attain a weight of 200 pounds at 6 months of age and are capable of producing a greater weight at a profit if market conditions justify their being fed for a longer time. Boars are massive and have good length and depth with good backs. In show condition they may attain a weight of 1,000 pounds. In breeding condition an aged boar generally weighs from 650 pounds up.

Duroc-Jersey sows generally are upstanding, having good depth with good backs as well as good feet and legs. One seldom finds a sow of this breed cross or fretful. In show condition sows generally weigh from 600 to 700 pounds. In some instances a greater weight is reached.

The association for recording hogs of this breed is the United Duroc Record Association, Peoria, Illinois.

Reference: Farmers' Bulletin 1263, "Breeds of Swine," pages 2, 3, and 4, United States Department of Agriculture, Washington, D. C.

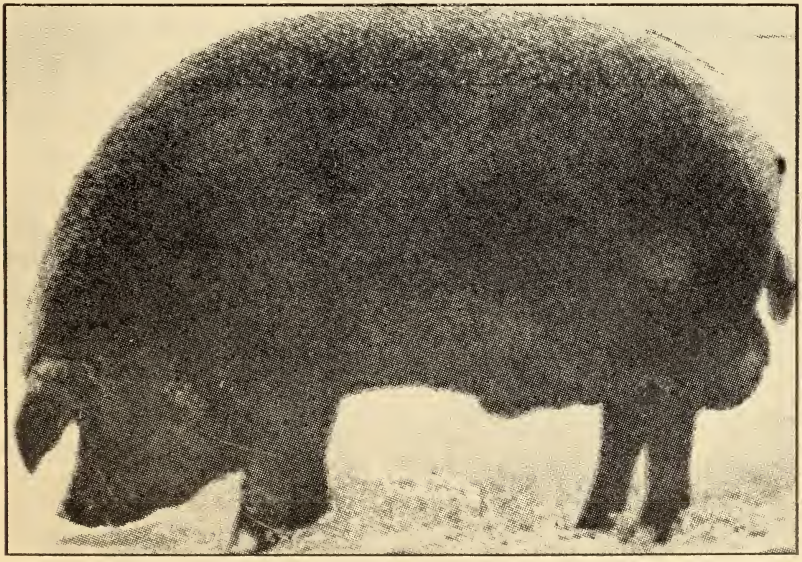

Figure 1. Duroc-Jersey Boar.

Poland China

The Poland China hog originated in Butler and Warren Counties, Ohio. This breed undoubtedly was derived from the crossing of several breeds. In the Seventies two farmers—A. C. Moore, of Canton, Ohio, and D. M. Magie, of Oxford, Ohio—developed a widespread reputation for their hogs and advertised them extensively. Their hogs were known at that time, respectively, as the Moore hogs and the Magie hogs. From the Moore and Magie hogs was developed the breed now known as the Poland China.

The early Poland China hog was a large, rugged, coarse-eared, heavy-boned, prolific, spotted animal that attained a good market weight but was not of the easiest feeding type. During the last decade of the nineteenth century and the first decade of the twentieth century many Poland China breeders, especially those breeding for the show ring, followed what may be termed a fad in their breeding operations. The fashionable type was a short-legged, small, compact-bodied hog popularly known as the "hot blood." It has six white points, namely, four white feet and a white splash on the end of the tail and at the point of the nose. The sows were neither prolific nor very good sucklers.

During the last 30 years the type of Poland China hog has been changed materially. On only very few farms can one find any of the old hot-blood Poland Chinas. On a large number of farms, however, Poland Chinas of what may be termed the "medium type" are produced. Many breeders of Poland Chinas still produce the large type, but not the extremely large type, which was popular among some breeders shortly after the close of the World War.

The boars have big, heavy bone, are rugged, possess plenty of length and depth, and with it all have good quality. Mature boars, of this type, in show condition weigh from 850 to 1,000 pounds. Some animals show greater weights. In breeding condition aged boars should weigh from 650 pounds up and sows from 500 pounds up. The sows are prolific, good sucklers, and are capable of raising good-sized litters. They have plenty of length, are smooth, with good, full shoulders and well-rounded hams. They are naturally active, take plenty of exercise, and are capable of producing strong litters at farrowing time. The color of the present-day Poland China generally is black. Many of them have white spots on different parts of the body.

The Poland China produces an excellent finished carcass at an early age. Hogs of this breed often weigh 200 pounds at 6 months of age.

There are three associations in the United States that register purebred Poland China hogs, namely: the American Poland China Record Association, Union Stock Yards, Chicago, Illinois; the Standard Poland China Record Association, Maryville, Missouri; and the National Poland China Record Association, Winchester, Indiana.

Reference: Farmers' Bulletin 1263, "Breeds of Swine," page 4, United States Department of Agriculture, Washington, D. C.

Berkshire

The Berkshire is one of the oldest of the improved breeds of swine. This breed originated in England and is still used extensively in that country. Many animals of this breed have been imported into the United States and Canada from English herds. Mention is made of the Berkshire hogs in England and Scotland as early as 1789, large specimens being compared with those of other breeds.

Berkshire hogs are found in noted herds in the United States. They are of medium size, generally smooth and of good length and depth, having legs of medium length with fair size. In color this breed is similar to the Poland China. The peculiarity of the Berkshire breed is the short, upturned nose. The face is usually dished and the ears are erect, but inclined slightly forward. Berkshire hogs have good width of body, the back is broad and the

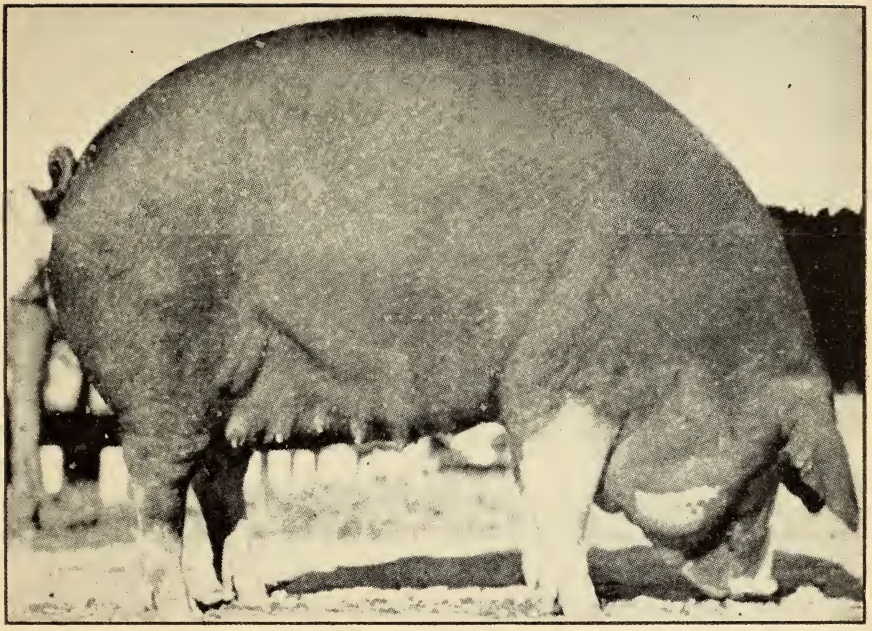

Figure 2. Poland China Sow.

ribs well sprung. The hams and shoulders are generally smooth and well fleshed. The meat of the Berkshire is smooth and well fleshed and is generally regarded as good in quality.

Berkshire pigs may be fed to market weight at around 6 months of age. Mature boars of this breed in show condition usually weigh from 600 to 850 pounds. Some attain a heavier weight. Mature sows should weigh from 450 to 650 pounds.

The record association for this breed is the American Berkshire Association, 508¼ East Monroe Street, Springfield, Illinois.

Reference: Farmers' Bulletin 1263, "Breeds of Swine," pages 7 and 8, United States Department of Agriculture, Washington, D. C.

Chester White

The Chester White originated in Chester County, Pennsylvania. The large, coarse hogs found in the Eastern States, especially in Pennsylvania, early in the nineteenth century were a mixture of the Yorkshire, Lincolnshire, and Cheshire hogs, all of which were of English origin. In Pennsylvania these large hogs were crossed on smaller type hogs, but the most successful cross was by using imported hogs from Bedfordshire, England. This crossing was continuously improved up to 1848, when the breed reached such a degree of purity that it could be relied on to reproduce its desirable qualities. It was named "Chester County White," in 1848, but the word "County" was soon dropped and the present name became established.

The first record association for the breed was formed in 1884, and to its records all individuals of the breed trace. Later there were eight different

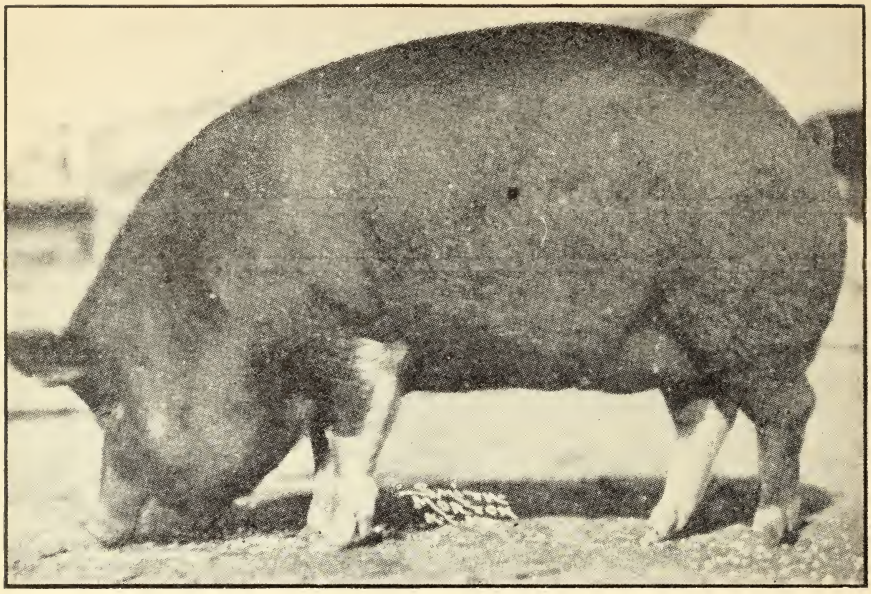

Figure 3. Berkshire Sow.

record associations catering to the business of the breed, and as these lessened the unity of action among the breed's advocates the popularity that the breed had acquired during the latter half of the nineteenth century seemed to wane, but in recent years it has regained its popularity.

The Chester White is a very prolific hog. It has a good disposition and easily adapts itself to its environment. It matures early, and, being a good grazer, a good feeder, and possessing good dressing qualities, has demonstrated its utility on many farms. From 1884 the uniformity of size for age of the Chester White has been commendable. The score-card type of the standard of excellence is very similar to the type of the other lard breeds of swine. Mature boars of this breed weigh from 600 to 900 pounds, some individuals showing a weight of 1,000 pounds. The sows weigh from 500 to 700 pounds.

The record associations for the breed are Chester White Record Association, Rochester, Ind.; the O.I.C. Swine Breeder's Association, Goshen, Ind.; and the Breeders' Chester White Record Association, 603 Third Street, Des Moines, Iowa.

Reference: Farmers' Bulletin 1263, "Breeds of Swine," pages 6 and 7, United States Department of Agriculture, Washington, D. C.

Hampshire

The Hampshire breed originated in the English county of the same name and was introduced into the United States during the first half of the last century. When the Hampshire hog first began to be popular in the United States it was often referred to as the "Thin Rind" hog and was classed as a bacon breed. It is now recognized as one of the lard breeds. Hampshires

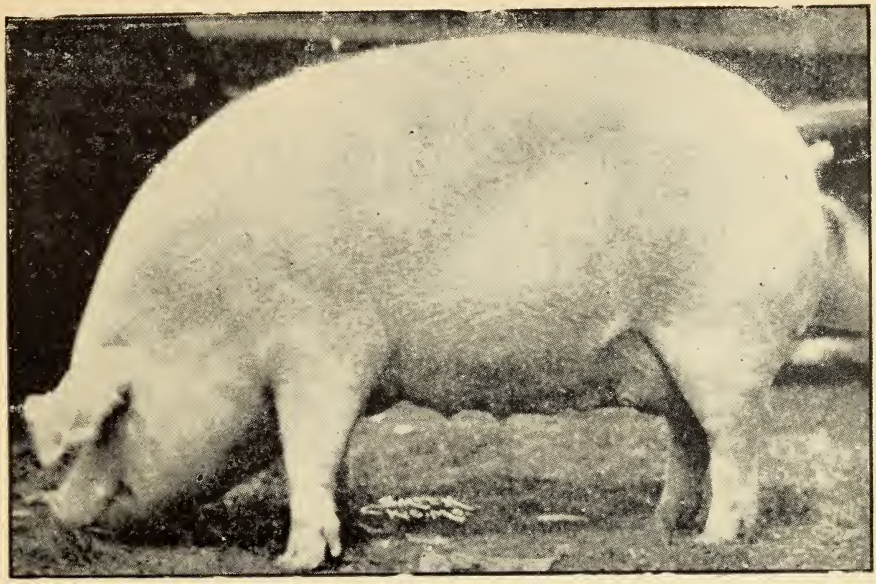

Figure 4. Chester White Sow.

have made rapid progress in popularity during the last 20 to 25 years. Sows of the breed are prolific. The mothers are good sucklers and make good use of grass in pasture.

The most striking characteristic of the Hampshire is the white belt around its body, including the shoulders and front legs. The standard of perfection for Hampshire looks with disfavor upon white showing high on the hind legs and on belts greater than one-fourth their body length. Hampshire breeders sometimes discard excellent animals in their breeding operations because of imperfect belts or because they have white hind feet or legs.

The Hampshire in general appearance is smooth and has legs with medium-sized bones. Hampshire breeders are making efforts to increase the size of the bone and the strength of the feet and legs. The body is often not so broad as that of typical hogs of the other lard breeds, but it is deep and smooth and produces desirable sides for bacon. The jowls are light, the head is small and narrow, the snout rather straight and of medium length, the ears erect, the shoulders smooth and well set, and the hams deep but usually not especially thick. The flesh is of good quality. Animals of this breed sell readily upon the open market.

The Hampshire possesses good growing and fattening qualities, and pigs may be brought to marketable weights at around 6 months of age. In show condition mature boars of the breed weigh from 600 to 850 pounds, some attaining a greater weight. Mature sows in show condition weigh from 500 to 700 pounds.

The record association for this breed is the Hampshire Swine Record Association, 915-917 Commercial Bank Building, Peoria, Illinois.

Reference: Farmers' Bulletin 1263, "Breeds of Swine," pages 9 and 10, United States Department of Agriculture, Washington, D. C.

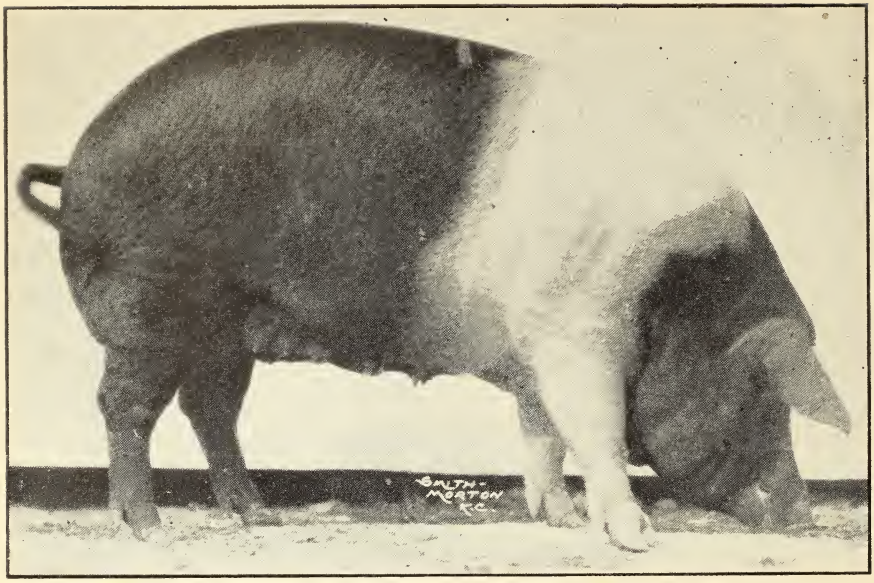

Figure 5. Hampshire Sow.

Spotted Poland China

The Spotted Poland China in many ways is similar to the Poland China, but there is much more white on the body of the former. The appearance is rather that of a black hog with numerous white spots. The standard requirement of the present record association for the breed is that at least 20 percent of the body be white. These hogs began to be noticed more during the time when there was a tendency throughout the country to get away from the hot-blood Poland Chinas. The Spotted Poland China hog, having more length and greater size than the hot-bloods attracted the attention of farmers who were looking for larger hogs. The first record association of this breed, known as the National Spotted Poland China Record Association, was organized January 1, 1914.

The general type found in this breed is a hog with good length, fairly straight, broad back, good depth of body, legs of medium length with heavy bone of medium quality. The head is short and broad, and the ears are somewhat larger than those of the Poland China breed. Some Glouster Old Spots, imported from England into the United States as foundation animals in some herds and recorded in the Spotted Poland China Record, have influenced the type in this breed to a considerable extent. Boars in show condition weigh from 650 to 1,000 pounds, and sows from 500 to 700 pounds. The sows are prolific and raise good-sized litters

The present record associations for this breed are the National Spotted Poland China Record Association, Bainbridge, Ind.; and the American Spotted Poland China Record Association, Moberly, Missouri.

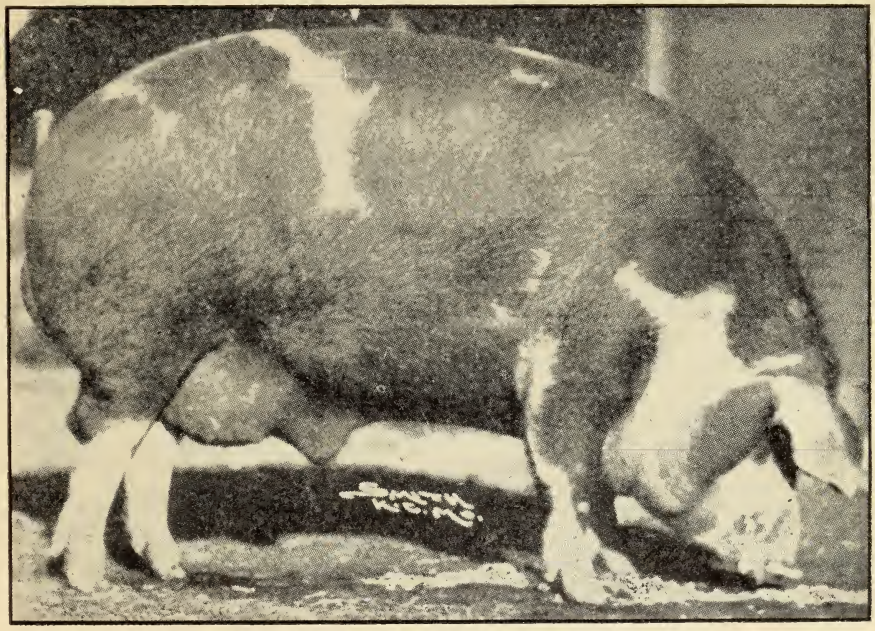

Figure 6. Spotted Poland China.

Bacon Type Breeds

Hog growers in the United States do not raise the bacon-type hog to any great extent, probably because of the fattening feeds commonly used, such as corn, peanuts, and sweet potatoes. The Tamworth and the Yorkshire, of English origin, are the two breeds grown in the United States which represent this type. The Tamworth breed is established in many localities over a wider area. The Yorkshire is confined principally to the Northern States.

Bacon hogs are different from lard-type hogs in that they have extreme length, the object of breeders being to produce the maximum amount of bacon with relatively small hams and shoulders. Animals of this type have good depth, deep sides, and are comparatively narrow, with generally smoother bodies than most of the hogs of the lard breeds.

Tamworth: The Tamworth is one of the oldest and probably one of the purest of all breeds of hogs. There is no evidence of its having been crossed with other modern breeds. On the other hand, there is evidence of pure breeding dating back more than 100 years. The name of the breed is derived from the town of Tamworth, located on the River Thames, in Staffordshire, near the north border of Warwickshire, England. Sir Robert Peel is credited with having introduced these hogs into England from Ireland about 1812, although their real origin is obscure. The first record of any of this breed having been brought to the United States appears to have been in 1881.

Hogs of the Tamworth breed are rather long-legged, with long, deep, smooth bodies, strong backs, narrow heads, rather long snouts, and fairly

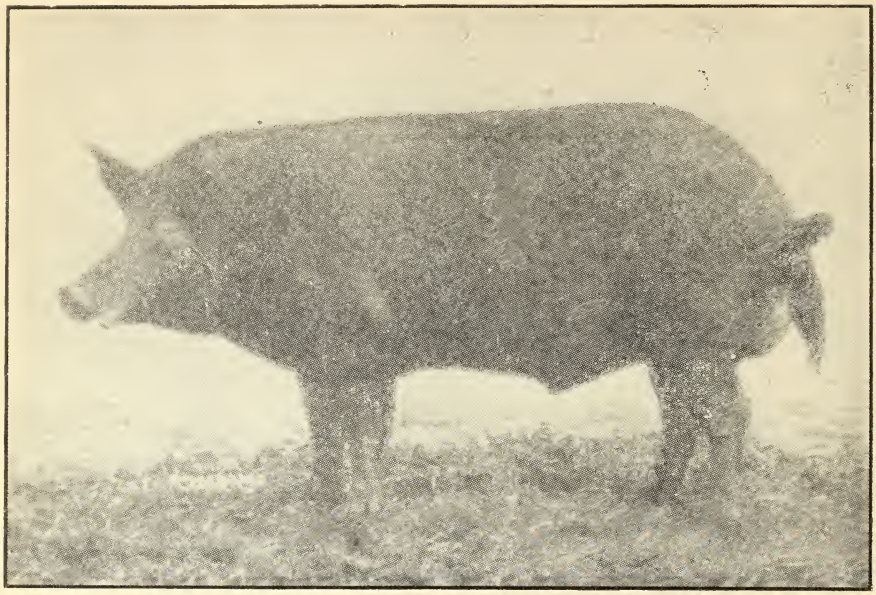

Figure 7. Tamworth

large ears, usually erect and often inclined forward. The jowls are light, and the bone is medium in size but generally of very good quality. The color is red, varying from light to dark. These hogs are good grazers and take on flesh readily. Pigs of 200 pounds weight at 6 months of age are not uncommon. They do not finish quite so early as some of the lard type. At the same time, they attain a market weight at as early age as any of the lard type breeds and can be fed profitably to great weight. Mature boars weigh from 700 to 1,000 pounds. Mature sows weigh from 550 to 800 pounds. The sows are prolific and generally good sucklers

The record association for this breed is the Tamworth Swine Association, Ames, Iowa.

Yorkshire

There are two distinct types of the Yorkshire breed, known as Large and Middle Yorkshires. Both originated in England, where they are known as Large and Middle Whites. The large Yorkshire greatly out-numbers the other and is the type raised by Yorkshire breeders in the United States.

They are large, white hogs with smooth, even, deep bodies, very long, capable of dressing out a large percentage of meat with bacon of very good quality. The body is supported by legs of good length, having bone of medium size and generally of very good quality. Occasionally there are black pigment spots in the skin of animals of this breed. This does not disqualify them, yet it is objectionable from the standpoint of breeders of pure-bred stock. Large Yorkshire sows are prolific and are generally very good sucklers. Mature boars of this breed weigh from 700 to 1,000 pounds. Mature sows should weigh from 500 to 800 pounds.

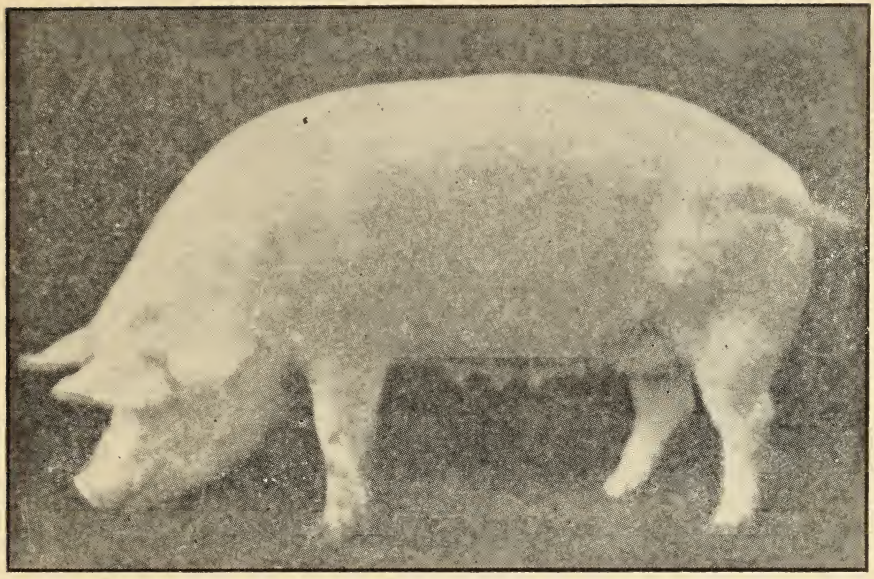

Figure 8. Yorkshire

The American Yorkshire Club, 1001 Lafond Street, St. Paul, Minn., is the recording association for this breed.

Reference: Farmers Bulletin 1263, "Breeds of Swine," Department of Agriculture, Washington, D. C.

CROSSBREEDING HOGS FOR PORK PRODUCTION IN IOWA

Conducted by: Iowa Agricultural Experiment Station.

Conducted at: Ames, Iowa.

Period: 1926-1933, 8 years.

Purpose: To determine the value of crossbreeding hogs for pork production.

Procedure and Conditions:

Animals Used: 1926—Six Poland China sows were "double-mated" to a purbred Poland China and a purebred Duroc-Jersey boar in the same heat period. This type of mating was used in order to produce both purebred and crossbred pigs in the same litter, thus reducing to a minimum the effect of the differences between sows as dams of the two kinds of pigs. The purebred and crossbred pigs from this sort of mating are easily identified by their color markings because the crossbred pigs are light red or sandy with numerous black spots.

1927—Six Poland China sows are double-mated to a Poland China and a Duroc-Jersey boar. In addition, three of the crossbred gilts saved from the litters farrowed in the previous year's work were mated to the Poland China boar and three other crossbred gilts from the same source were mated to the Duroc-Jersey boar. One of the gilts of the latter group did not settle to the first service of the Duroc-Jersey boar and was not continued in the experiment.

1928—Five purebred Duroc-Jersey gilts were used instead of the Poland Chinas. Instead of the crossbred gilts used in the 1927 work, three of the

three-quarter Poland China (one-quarter Duroc-Jersey) gilts farrowed in the spring of that year were mated to the purebred Poland China boar, and three of the three-quarter Duroc-Jersey (one-quarter Poland China) gilts were mated to the purebred Duroc-Jersey boar. This was done to find whether these backcross gilts had all or part of the hybrid vigor that was shown by the first-cross gilts. Some of the "seven-eighths blood" gilts from these litters were saved for further "grading up" the next year.

1929—Five purebred Duroc-Jersey sows were used, along with the high grade gilts. Two of the purebred sows were removed from the experiment, one because of death and one because of a retained placenta. The three remaining purebred sows farrowed only three crossbred pigs, only two of which reached weaning age. Consequently there are practically no data on crossbred pigs for that year.

1930—The high-grade gilts from the 1929 grade litter were saved and used as breeding stock. These gilts were fifteen-sixteenths pure Poland China or Duroc-Jersey, and both kinds were double-mated to boars to both breeds to produce the crossbred and near purebred pigs for comparison.

1931—A new cross was introduced to determine whether the hybrid vigor observed in the crossbred animals was changed by further out-crossing. A Yorkshire boar, a Duroc-Jersey boar and a Poland China boar were used in various combinations with the Duroc-Jersey and the Poland China sows and with the Poland China-Duroc crossbred sows. The Yorkshire boar was single-mated to one of the Poland China sows as a test mating to determine whether he was pure (homozygous) for the white color. If this mating had produced any pigs which were not white it would have invalidated the double-matings in which the Yorkshire boar was used, because the Yorkshire crossbreds might not be distinguished from their purebred litter mates. Such double matings were made by using the Yorkshire and the Poland China boar on three crossbred Poland China-Duroc sows, and on a high grade Poland China sow. The Yorkshire boar was also used with a Duroc boar in double-matings with three almost purebred Duroc-Jersey gilts.

1932-1933—In 1932 and 1933, the Yorkshire crossbreeding was continued much the same as in 1931, except that only the Yorkshire and the Poland China boars were used. In these years the pigs were fed to 225 pounds in the Swine Record of Performance experiment and not a a separate part of the crossbreeding experiment.

Quarters: From 1926 through 1931 the pigs were fed out on bluegrass pasture. During 1932 and 1933 pigs were kept in small dry lots with concrete floors.

Rations: 1926 through 1931

Shelled corn, self-fed
Supplemental mixture, self-fed
- Tankage 50 percent
- Corn oil meal 25 percent
- Alfalfa meal 25 percent

Mineral mixture, self-fed
- Common salt 19.99 percent
- Wood ashes 39.98 percent
- Bone black 39.98 percent
- Potassium iodide .05 percent

Rations: 1932 and 1933

Shelled corn, self-fed
Supplemental mixture, self-fed
- Tankage 50 percent
- Linseed oil meal 25 percent
- Alfalfa meal 25 percent

Mineral mixture, self-fed
- Ground limestone 50.00 percent
- Special bonemeal 27.97 percent
- Common salt 20.00 percent
- Iron oxide 2.00 percent
- Copper sulphate .01 percent
- Potassium iodide .02 percent

Year	No. sows used	Breeding of sows	Type of breeding (double or single)	Breeding of sire or sires	Breeding of pigs	Pigs farrowed: Total no. farrowed	Pigs farrowed: Av. birth Wt.	Pigs weaned: No. weaned at 60 days	Pigs weaned: Av. weaning Wt.	Pigs fed to 225 pounds: No. fed	Pigs fed to 225 pounds: Av. daily gain in pounds	Pigs fed to 225 pounds: Lbs. of feed per 100 lbs. gain
1926	6	Poland China	double	Poland & Duroc	Litter mates purebred Poland China	23	2.85	13	36.3	13	1.33	343
					Litter mates crossbred Poland-Duroc	38	2.77	27	37.3	13	1.43	325
1927	6	Poland China	double	Poland & Duroc	Litter mates purebred Poland China	35	2.90	21	37.7	19	1.30	406
					Litter mates crossbred Poland-Duroc	26	2.74	15	43.3	15	1.36	358
	2	Poland x Duroc	single	Duroc	¾ Poland	31	2.84	26	27.3	24	1.15	411
	3	Poland x Duroc	single	Poland	¾ Duroc	19	2.90	19	32.6	19	1.20	370
1928	5	Duroc-Jersey	double	Poland & Duroc	Litter mates purebred Duroc-Jersey	11	2.91	7	33.3	7	1.31	316
					Litter mates crossbred Poland China	37	3.56	28	33.7	7	1.35	322
	3	¾ Duroc-Jersey	single	Duroc	⅞ Poland	16	3.39	13	42.2	11	1.31	401
	3	¾ Poland China	single	Poland	⅞ Duroc	25	2.81	18	34.0	18	1.29	364
1929	5	Duroc-Jersey	double	Poland & Duroc	Litter mates purebred Duroc-Jersey	56	3.00	22	35.3	7	1.03	432
					Litter mates crossbred Poland China	6	3.43	2	35.3	0		
	2	⅞ Duroc-Jersey	single	Duroc	15/16 Poland	22	2.89	14	38.6	9	1.24	407
	3	⅞ Poland China	single	Poland	15/16 Duroc	21	2.44	17	39.1	12	1.07	398
1930	3	15/16 Poland China	double	Poland & Duroc	Litter mates purebred Poland China	3	2.67	3	26.7	0	.....	.....
					Litter mates crossbred Poland-Duroc	25	3.05	19	37.1	12	1.44	327
	3	15/16 Duroc-Jersey	double	Poland & Duroc	Litter mates purebred Duroc-Jersey	26	3.16	20	32.4	9	1.44	316
					Litter mates crossbred Poland-Duroc	6	3.73	6	47.8	6	1.58	308
1931	1	Poland China*	single	Yorkshire	Litter mates purebred Poland China	3	2.77	3	27.3	0	.....	.....
					Litter mates crossbred Poland-Yorkshire	8	2.82	7	28.4	0		
	3	Poland x Duroc	double	Yorkshire & Poland	crossbred Poland-Yorkshire	10	2.66	8	41.4	0	.....	.....
	3	Duroc-Jersey*	double	Yorkshire & Duroc	Litter mates ¾ Poland China	13	2.90	11	34.7	9	1.46	290
					Litter mates three breed crossbreds	15	2.83	15	32.3	8	1.39	370
	1	Poland China*	double	Yorkshire & Poland	Litter mates purebred Duroc-Jersey	11	2.78	8	37.1	7	1.46	349
					Litter mates crossbred Duroc-Yorkshire	15	2.67	12	36.1	8	1.27	341
1932	5	Poland x Duroc	double	Yorkshire & Poland	Litter mates ¾ Poland China	14	2.87	12	39.0	0	.....	.....
					Litter mates three-breed crossbreds	36	3.10	33	37.7	4	1.73	334
	6	Poland China*	double	Yorkshire & Poland	crossbred Poland-Yorkshire	43	3.13	40	43.7	4	1.64	346
1933	5	Poland x Duroc	double	Yorkshire & Poland	Litter mates purebred Poland China	6	2.45	3	22.3	0	.....	.....
					Litter mates crossbred Poland-Yorkshire	27	2.80	20	44.8	4	1.41	373
	3	Poland China*	double	Yorkshire	Litter mates ¾ Poland China	8	3.02	8	49.2	4	1.35	394
					Litter mates three-breed crossbreds	55	2.85	38	45.8	4	1.62	346
All years					ALL BREEDS	690	2.95	509	37.6	253	1.32	364

*Very high grade (.97 or more, purebred)

Results:

COMPARISON OF CROSSBRED AND PUREBRED BROOD SOWS

	Crossbred sows	Purebred sows	Advantage for crossbreds
Total litters farrowed	18	20	—
Total number of pigs farrowed	191.00	184.00	—
Average size of litter	10.60	9.20	1.40
Average birth weight of litter	30.90	26.20	4.70
Average birth weight of pigs	2.91	2.85	.06
Total pigs weaned	162.00	137.00	—
Average number of pigs weaned per litter	9.00	6.85	2.15
Average weaning weight of litter	339.00	275.00	64.00
Average weaning weight of pigs	37.70	40.10	—2.40
Percentage of pigs farrowed that lived to weaning	85.00	74.00	11.00

Of the 20 purebred sows used, 3 were Duroc-Jerseys and 17 Poland China.

Reference: Iowa Agricultural Experiment Station Bulletin 380, "Crossbreeding Hogs for Pork Production," pages 86, 87, 88, 89, and 97, tables 1, 2 and 3, Ames, Iowa, June 1939.

A Comparison of Crossbred and Purebred Pigs as to Rate and Economy of Gains

Conducted by: South Carolina Agricultural Experiment Station.

Conducted at: Coast Station, Summerville, South Carolina.

Period: 2 years, 1936-1938.

Purpose: To compare crossbred and purebred pigs as to rate and economy of gain.

Procedure and Conditions: Beginning with the fall of 1936 and through the fall of 1938, 19 purebred Poland China sows were double-mated to a purebred Poland China and a purebred Duroc-Jersey boar, the interval between the services of the boars being only a few minutes. As a result of these 19 double-matings, six purebred litters, three crossbred litters, and 10 mixed litters composed of both purebred and crossbred pigs were farrowed. Of the 10 mixed litters, 39 pigs, or 40.625 percent, were crossbreds and 57 pigs, or 59.375 percent, were purebreds. Birth weights obtained on 17 crossbred pigs showed an average weight of 2.52 pounds, while that of 41 purebreds was 2.27 pounds. The average weaning weight obtained on 15 crossbreds was 49.95 pounds, while that of 23 purebreds was 41.71 pounds.

The rate and economy of gains of both purebred and crossbreds from mixed litters is given in the following table.

Results:

RATE AND ECONOMY OF GAINS OF CROSSBRED VERSUS PUREBRED HOGS

	Crossbreds	Purebreds
Number of pigs	23.000	25.000
Average initial weight	58.830	58.760
Average daily gain	1.846	1.664
Feed consumed per 100 lbs. gain		
Corn (pounds)	288.000	310.000
Fish meal (pounds	21.000	19.570

Reference: South Carolina Agricultural Experiment Station Fifty-second Annual Report, pages 101 and 102, table 34, Clemson, South Carolina, December 1939.

Purebred Versus Crossbred Pigs

Conducted by: Nevada Agricultural Experiment Station.

Conducted at: Reno, Nevada.

Period: 1938-1939.

Purpose: To determine the difference in the rate of growth and in economy of gains of purebred versus crossbred pigs.

Procedure and Conditions: In these tests purebred Duroc and crossbred Duroc-Poland China pigs were used. In all the experiments the method of feeding was essentially the same. Each pig received daily four pounds of skim milk and one-fourth pound of a mixture containing four parts fish meal and three parts linseed oil meal. In summer they grazed on alfalfa pasture and in winter three parts of alfalfa meal were added to the protein mixture given above.

In addition barley was fed in amounts based on the weight of pigs as shown in the table below. Pigs were weighed every two weeks and the barley ration was adjusted to the individual weight. Experiments were discontinued when an average weight of 200 pounds was obtained.

AMOUNT OF BARLEY FED DAILY TO PIGS OF DIFFERENT WEIGHTS

Weight of pig	Barley per day	Weight of pig	Barley per day
Lbs.	Lbs.	Lbs.	Lbs.
30	1.2	100	3.8
35	1.4	110	4.1
40	1.6	120	4.4
45	1.8	130	4.7
50	2.0	140	5.0
55	2.2	150	5.2
60	2.4	160	5.4
65	2.6	170	5.6
70	2.8	180	5.8
75	3.0	190	6.0
80	3.2	200	6.2
90	3.5	—	—

This series of tests included individual feed and group feeding. In the individual feeding experiments each pig was fed separately and in the 1938-39 individual feeding experiment alfalfa pasture was not available, therefore, alfalfa meal was included with the protein supplement. In the group-feeding experiment all pigs were fed together, the purebred and crossbred being kept separate. The amount of feed given was determined by the average weight of the group.

Results: CROSSBRED VERSUS PUREBRED PIGS

	Individual feeding				Group feeding	
	Summer 1938		Winter 1938-39		Summers 1938, 1939	
	Crossbred pigs	Purebred pigs	Crossbred pigs	Purebred pigs	Crossbred pigs	Purebred pigs
Number of pigs	6	6	6	6	10	10
Experiment began	May 24	May 24	Nov. 16	Nov. 16	May 21	May 21
Experiment ended	Sept. 16	Sept. 21	Mar. 1	Mar. 10	Sept. 1	Sept. 10
Days on experiment	115	120	105	114	105	112
Days per 100 lbs. gain	69	73	70	78	66	70
Initial weight (lbs.)	36	36	51	54	45	49
Final weight (lbs.)	202	201	201	201	202	203
Gain in weight (lbs.)	166	165	150	147	158	156
Daily gain (lbs.)	1.44	1.38	1.43	1.29	1.48	1.41
Daily gain (%)	1.52	1.44	1.35	1.31	1.43	1.38
Barley fed (lbs.)	432	447	413	453	406	441
Barley per 100 lbs. gain (lbs.)	260	271	275	308	257	276
Fish meal fed (lbs.)	16	17	11	11	15	16
Fish meal per 100 lbs. gain (lbs.)	10	10	7	7	10	10
Linseed oil meal fed (lbs.)	12	13	8	9	11	12
Linseed oil meal per 100 lbs. gain (lbs.)	7	8	5	6	7	7
Skim milk fed (lbs.)	460	480	419	455	420	448
Skim milk fed per 100 lbs. gain (lbs.)	277	291	279	310	265	282
Alfalfa meal (lbs.)	-----	-----	8	9	-----	-----
Alfalfa meal per 100 lbs. gain (lbs.)	-----	-----	5	6	-----	-----

References: Nevada Agricultural Experiment Station Bulletin 153, "Purebred and Crossbred Pigs, Comparison of Rate of Growth and Economy of Gains," pages 3, 4, 5, 6 and 7, tables 3 and 4, Reno, Nevada, June 1940.

INBREEDING AND OUTBREEDING OF SWINE

Conducted by: Oklahoma Agricultural Experiment Station.

Conducted at: Stillwater, Oklahoma.

Period: 12 years, 1925-1936.

Purpose: To determine the effect of continuous inbreeding as compared with outbreeding of sows.

Procedure and Conditions: The foundation stock for this study was obtained late in 1923 from the herd of Durocs maintained by the college. Three sows were selected and mated to the boar, Peerless Sensation V. Inbreeding of foundation animals was negligible, based on 5 generation pedigrees.

It was not always possible to make half-brother and half-sister matings, and boars were not always of the same generation as the sow, which resulted in sometimes hastening and sometimes slowing down the rate of inbreeding, but it was a continuous procedure of limited inbreeding. The outbreed group was always mated with a male or female that was not related in anyway.

The breeding stock for the inbred and outbred group was fed and housed under identically similar conditions. The pigs were farrowed in a central barn and moved to small houses at about one week of age, in yards with green pasture (rye, oats, wheat, sudan, or rape). A creep in each lot or pen was provided with feed so that the pigs could begin eating at any time after one week of age. The pigs were weaned at 60 days of age and transferred to self-feeders

supplied with shelled corn (yellow); wheat shorts, tankage (60 percent protein); and a mineral mixture consisting of: bonemeal, 38 parts; calcium carbonate, 39 parts; sodium chloride, 20 parts; ferrous sulphate, 2.5 parts; copper sulphate, 0.25 parts; and potassium iodide, 0.03 parts. Each litter was lotted separately throughout the fattening period insofar as possible; and when this procedure was not possible, the inbreds were fed as one group and the outbreds as another. When green pasture was not available, alfalfa meal was supplied at the rate of 5 pounds for each 100 pounds of feed. The pigs were fed to a weight of 225 pounds.

Results:

AVERAGE SIZE OF LITTERS FARROWED

Generation of inbreeding*	Inbred			Outbred		
	Number of litters	Total pigs	Live pigs	Number of litters	Total pigs	Live pigs
1	12	8.9	7.8	10	9.4	8.3
2	4	7.5	6.8	10	9.2	8.7
3	15	7.1	5.9	10	8.5	8.1
4	28	7.1	6.3	10	9.1	8.4
5	21	6.4	5.7	10	8.9	7.1
6	26	5.5	4.7	10	10.4	8.4
7	13	6.0	5.6	10	9.6	9.1
8	7	5.3	5.1	5	10.0	9.4
Average	—	6.6	5.8	—	9.3	8.4

*The generations of inbreeding and years did not coincide, so that the pigs in one generation were raised in several different years. This helped to lessen the variation between generations which was caused by environment.

AVERAGE BIRTH WEIGHT OF LIVEBORN PIGS FOR EACH GENERATION OF INBREEDING

Generation of inbreeding	Inbred line		Outbred line
	Average percent inbreeding	Average birth weight pounds	Average birth weight pounds
1	15.6	2.28	2.59
2	20.5	2.36	2.75
3	31.2	2.26	2.55
4	34.6	2.06	2.54
5	39.3	2.13	2.31
6	42.4	1.89	2.21
7	42.4	2.04	2.62
8	45.6	2.25	2.27
Average	—	2.13	2.47

NUMBER AND WEIGHT OF PIGS WEANED DURING EACH GENERATION OF INBREEDING

Generation of inbreeding	Number of pigs	Average number per litter	Average weaning	Percentage of pigs surviving to weaning
1	71	5.9	26.1	76.3
2	17	4.3	25.0	63.0
3	44	2.9	24.4	50.0
4	97	3.5	21.2	56.4
5	56	2.8	23.8	49.1
6	59	2.3	25.3	52.2
7	38	2.2	24.4	45.8
8	16	2.3	24.3	44.4
Average for inbreds*	398	3.1	23.8	54.8
Average for outbreds	404	5.4	26.7	64.2

*Based on total of 129 litters.

THE AVERAGE DAILY GAINS FOR SPECIFIC PERIODS FOR EACH GENERATION OF INBREEDINGS

Generation of inbreeding	Birth to 60 days		61 to 120 days		121 to 180 days		181 days to 225 lbs.	Birth to 225 lbs. weight
	Number of pigs	Average daily gain lbs.	Number of pigs	Average daily gain lbs.	Number of pigs	Average daily gain lbs.		
1	71	0.40	29	0.55	26	0.70	1.36	0.84
2	17	0.38	14	0.28	13	0.48	1.04	0.68
3	44	0.37	31	0.34	26	0.60	1.02	0.68
4	97	0.31	69	0.39	63	0.64	1.14	0.71
5	56	0.36	53	0.45	43	0.84	1.14	0.76
6	54	0.38	47	0.43	39	0.83	1.27	0.81
7	30	0.38	22	0.45	20	0.77	1.23	0.78
8	12	0.32	11	0.38	9	0.85	1.02	0.74
Av. for inbreds	381	0.36	271	0.45	235	0.72	1.15	0.77
Av. for outbreds	404	0.40	338	0.54	317	1.05	1.27	0.85

AMOUNT OF FEED (IN POUNDS) REQUIRED TO PRODUCE 100 POUNDS GAIN BY INBREDS AND OUTBREDS

Year	Inbreds						Outbreds				
	No. pigs finished	Inbreeding	Per 100 lbs. gain				No. pigs finished	Per 100 lbs. gain			
			Corn	Sh'rts	Tkg.	Total		Corn	Sh'rts	Tkg.	Total
1925	18	0.1464	246.8	149.8	20.9	417.5		No record			
1926	5	0.1430	240.3	164.1	27.4	431.9	16	——	——	—	412.4
1927	6	0.1854	289.9	155.9	29.8	475.6	16	——	——	—	414.9
1928	16	0.2549	299.1	160.6	24.7	484.4	29	——	——	—	469.0
1929	5	0.3098	296.9	154.8	31.9	483.6	7	304.3	130.5	18.3	453.1
1930	38	0.3464	292.2	133.1	24.4	449.7	7	211.9	141.7	24.9	378.5
1931	22	0.3484	283.8	132.3	24.3	440.4	41	260.9	112.4	18.0	391.3
1932	12	0.3974	293.1	132.6	26.3	452.0	48	306.1	96.3	21.9	424.3
1933	30	0.3963	261.3	100.1	19.4	380.8	43	269.4	94.4	19.9	383.7
1934	14	0.4006	240.3	80.1	21.7	342.1	18	255.6	85.1	21.3	362.0
1935	28	0.4057	344.4	71.8	17.9	434.1	27	304.6	61.9	15.1	381.6
1936	24	0.4206	295.8	109.0	26.1	430.9	18	300.8	108.1	26.1	435.0
Av.*	218	——	286.5	119.8	23.1	429.4	209	281.5	97.3	20.1	398.9
							270**	—	—	—	408.2**

*Average of feed per 100 pounds gain from 1929 to 1936 inclusive.
**Average total feed per 100 pounds gain from 1926 to 1936 inclusive.

COMPARISON OF INBRED AND OUTBRED BOARS WHEN MATED TO THE SAME OUTBRED SOWS

Boars Compared	Sows	Litters	Average no. pigs farrowed per litter	Average birth weight (lbs.)	Average no. weaned per litter	Average weaning weight (lbs.)	Average daily gains (lbs.)			Average no. days to 225 lbs.
							1st 60	2nd 60	3rd 60	
51A 4*	4	8	10.0	2.32	5.0	26.4	0.38	0.44	0.76	300
Miracle King	4	4	11.2	2.17	5.2	28.2	0.39	0.49	1.35	224
751A3*	1	2	11.0	1.83	3.5	18.7	0.28	0.28	0.83	306
Miracle King	1	1	11.0	2.60	5.0	34.0	0.52	0.57	1.41	224
792B 4*	1	2	10.5	1.94	5.5	27.7	0.42	0.60	1.27	246
Miracle King	1	1	11.0	2.60	5.0	34.0	0.52	0.57	1.41	224
51A 4*	4	5	10.8	2.47	5.6	24.9	0.33	0.49	0.81	276
Wavemaster Stilts	4	4	10.2	2.19	7.5	25.9	0.39	0.71	1.42	229
792B 4*	3	4	7.3	2.56	6.5	25.6	0.39	0.55	1.17	256
Helendale Lad	3	3	9.3	2.48	8.0	23.1	0.34	0.62	1.28	241

*Inbred Boars.

Reference: Oklahoma Agricultural Experiment Station Technical Bulletin 7, "An Experimental Study of Inbreeding and Outbreeding Swine," pages 12, 15, 17, 18, 19, 26, and 32, tables 2, 3, 4, 5, 6, 7 and 16, Stillwater, Oklahoma, September 1939.

GRADING UP HOGS BY THE USE OF PUREBRED SIRES

Conducted by: Alabama Agricultural Experiment Station.

Conducted at: Auburn, Alabama.

Period: 5 years, 1924-28. This test started in 1924 but the results are given only for 1927-28 for the entire series of tests with all crosses.

Purpose: To secure definite data on the economic benefits derived from grading up native sows with purebred boars.

Procedure and Conditions:

Breeding Animals: The scrub litters used in this experiment were progeny of three different scrub sows and two different scrub boars of unknown breeding. The 50 percent purebred litters were out of two different sows and by the same boar. The 75 percent purebred litters were from the same sow and boar, and the 87.5 percent purebred litters were from the same sow and boar. All the female breeding animals used, with the exception of the three scrub sows, were raised on the Experiment Station Farm. Duroc, Poland China, and scrub boars were used in the experiment.

Lots: Sows had the run of a permanent pasture composed of Bermuda grass and lespedeza during the gestation period. A few days before farrowing they were placed in individual lots where they remained during the suckling period. When weaned, each litter of pigs was placed in a separate lot where they remained during the feeding test. Each lot was approximately 12 x 40 feet and contained a covered concrete floor at one end which served as a feeding floor and as a shelter for the pigs during bad weather.

Feeds Used: Sows received a grain mixture during the gestation and suckling period composed of 8 parts white corn, 4 parts wheat shorts, and 1 part tankage. Immediately after wearning, pigs were placed on a fattening ration consisting of 8 parts yellow corn, 4 parts wheat shorts, and 1 part tankage, plus a mineral mixture of equal parts by weight of charcoal, marble dust, and salt. The grain mixture and the mineral mixture were supplied separately in open troughs and kept before the animals at all times.

Weights: Pigs were weighed individually at the beginning and at the close of the experiment and each 28 days during the experiment.

Results:

GRADING UP HOGS BY USE OF PUREBRED SIRES

	Fattening scrub pigs			Fattening 1st cross (50% purebred) pigs			Fattening 2nd cross (75% purebred) pigs			Fattening 3rd cross (87½% purebred) pigs		
Season litter was produced	Fall 1927	Spring 1928	Spring 1928	Spring 1927	Spring 1928	Fall 1928	Spring 1927	Fall 1927	Spring 1928	Spring 1927	Spring 1928	Fall 1928
No. pigs farrowed	7	6	6	6	7	7	9	8	7	7	4	6
No. pigs raised and fed	5	6	5	5	4	6	9	7	6	7	4	6
	Days	Days	Days	Days	Days	Days	Days	Days	Days	Days	Days	Days
Age weaned placed on experiment	56	56	56	56	56	56	56	56	56	56	56	56
Length of feeding period	184	186	193	145	135	156	143	142	150	122	131	140
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Av. initial weight per pig	21.0	20.0	26.0	33.0	33.12	22.0	28.89	27.14	29.17	37.50	40.00	30.00
Av. final weight per pig	201.0	200.0	200.0	201.0	200.6	200.0	200.0	210.43	200.00	200.36	201.25	200.00
Av. daily gain per pig	.98	.97	.90	1.16	1.24	1.14	1.20	1.23	1.15	1.33	1.23	1.21
Total feed consumed by pigs during fattening period	4438.50	5186.50	3637.50	3087.50	2694.50	4617.00	5290.00	5416.00	3989.00	3665.00	2448.50	4588.00
Feed required per 100 lbs. gain during fattening period	493.20	480.20	418.10	367.50	402.2	432.3	343.5	443.93	386.91	321.5	379.60	449.8
Feed consumed by sow 6 mos.	973.0	972.0	1048.0	1044.5	914.0	1014.0	1152.0	1157.0	1006.5	1142.50	998.50	1200.50
Total feed required by sow and litter	5411.50	6158.50	4685.50	4132.0	3608.5	5631.0	6442.0	6573.0	4995.5	4807.50	3447.0	5788.50
Feed required by sow and litter to produce 100 lbs. live weight	538.40	513.20	468.55	411.1	449.6	469.25	357.9	466.17	414.20	342.8	428.2	482.37

Reference: Alabama Agricultural Experiment Station Bulletin 234, "Grading Up Hogs by the Use of Purebred Sires," pages 3, 4, 5 and 6, tables 2, 3, 4 and 5, Auburn, Alabama, November 1930.

PART II

Diseases and Parasites

Diseases and parasites cause considerable loss to hog producers in the South. A successful hog producer should be able by diagnosis to recognize the common diseases or parasites that may be attacking the herd in order that the proper treatment may be given. Some diseases and parasites require the services of a skilled veterinarian for diagnosis and treatment. It is highly desirable that the successful producer of hogs should know when to call for the services of a skilled veterinarian.

To meet this need a discussion of the common diseases and internal and external parasites is given.

COMMON DISEASES OF SWINE

Hog Cholera: Hog cholera causes a greater annual loss to the swine industry than any other disease. It is very contagious and spreads rapidly through the herd, causing the death of practically all hogs infected. Quite often it appears in wide-spread epidemics and in such outbreaks it is responsible for the death of large numbers of hogs. Such epidemics are especially apt to occur when swine raisers decide to take a chance and do not vaccinate their hogs against the disease. Such a choice is always accompanied with great risk. The cost of vaccination is not very great when done at the proper age, which is at weaning time. It will be found that the cost of vaccination over a period of years is far less than the financial loss resulting from hog cholera outbreaks in herds not vaccinated.

Cause: Hog cholera is caused by a specific germ, technically known as the filterable virus of hog cholera, and hogs must become infected with this germ before they develop the disease. The virus gains entrance into the body mainly through contaminated feed and water. Sick hogs discharge the virus through the intestinal droppings, the urine, and discharges from the nose and eyes. Usually the symptoms are manifested within a week or ten days

Figure 9.—Hogs infected with hog cholera.

after exposure to the virus. The sick hog is the most dangerous agent in spreading the virus. However, the virus may be carried on the feet of persons, by wagon or truck wheels, and by running water.

Symptoms: There are two types of hog cholera: acute and chronic. In the acute type the following symptoms are present: sluggishness, a desire to remain in the accustomed sleeping quarters, loss of appetite, vomiting, coughing, labored and rapid breathing, discharge from the eyes even causing eyelids to be glued shut, high temperature, profound weakness, and constipation at onset of disease followed by diarrhea. The mortality rate is exceedingly high.

In the chronic type, the animal becomes grealty emaciated, weak and unthrifty. A pronounced cough is present. The hair may be shed in some cases and sore areas often develop over parts of the body.

Post-Mortem Examination: Post-mortem examination is essential to determine as early as possible the cause of the trouble. An early post-mortem may materially reduce the loss due to an out-break of hog cholera.

Upon examining hogs with acute cases of cholera, marked congestion or reddening of the skin on the thin-skinned regions of the body will usually be found. Most usual location for these spots is on the underside of the chest and belly. Frequently the congestion and reddened area are turning purple before death.

Internal examination usually shows hemorrhage (small blood spots), enlargement and congestion of the heart, lungs, spleen, kidneys, and inner lining of the urinal bladder. The intestines are usually congested. The lymph glands are also affected. The normal gland is small and of a yellowsih-white color, while these glands in case of cholera are generally large and congested. Sometimes the congestion is so severe as to give the gland almost the appearance of a blood clot.

Controlling: Vaccinating is the only means of control in communities where cholera occurs. The vaccination should be done when the pigs are 8 to 10 weeks old.

There are two kinds of serum on the market. One is commonly called the defibrinated blood serum, which is red and colored like blood. The other is called clear serum. This clear serum is merely defibrinated blood serum from which the red blood cells have been removed. It is believed that the clear serum may be superior to the defibrinated blood serum.

Treating: Two methods are used in protecting hogs from cholera by immunization: (1) the serum-alone treatment, and (2) the simultaneous inoculation treatment.

The serum-alone treatment is used in some cases in treating hogs already sick with the disease. This virus should be injected into one of the following places: (1) the abdominal cavity, (2) the flank, (3) between the forelegs, and (4) in the neck, back of the ears.

The serum-alone treatment does not produce permanent immunity. Immunity by this method usually lasts from two to six weeks. The following doses are recommended by the Department of Agriculture. Not more than 10 cubic centimeters of serum in the case of pigs, nor more than from 20 to 30 cubic centimeters in the case of larger animals, should be injected into one place unless the injection is made into the abdominal cavity.

MINIMUM DOSES, SERUM-ALONE TREATMENT

Animal and weight	Doses of serum		Animal and weight	Doses of serum	
	Clear	Defibrinated blood		Clear	Defibrinated blood
	c.c.	c.c.		c.c.	c.c.
Suckling pigs	16	20	Pigs 90 to 150 pounds	36-52	45-65
Pigs 20 to 40 pounds	24-28	30-35	Hogs 150 to 200 pounds	52-60	65-75
Pigs 40 to 90 pounds	28-36	35-45			

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The simultaneous inoculation treatment usually affords permanent immunity from cholera. In vaccinating by this method small doses of virus are administered in connection with the serum. The following doses are recommended by the United States Department of Agriculture:

MINIMUM DOSES, SIMULTANEOUS TREATMENT
(By Weight)

Animal weight	Doses of serum		Doses of virus
	Clear	Defibrinated blood	
	c.c.	c.c.	
Suckling pigs	16	20	At least 2 cubic centimeters of virus should be administered to each animal weighing more than 45 pounds; in the case of suckling pigs weighing less than 45 pounds, the dose may be reduced.
Pigs 20 to 40 pounds	24-28	30-35	
Pigs 40 to 90 pounds	28-36	35-45	
Pigs 90 to 150 pounds	36-52	45-65	
Hogs 150 to 200 pounds	52-60	65-72	

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In using this method of vaccinating, care must be exercised in handling the virus. If injections are not handled correctly death sometimes results. Do not expect wormy hogs to develop permanent immunity when inoculated with hog cholera virus. Hogs with temperatures should not be inoculated.

The simultaneous inoculation treatment, if possible, should be administered only by a competent veterinarian or by persons having considerable experience.

Care of Hogs: Special care should be given hogs before and after vaccinating. Hogs should be kept in dry, clean pens and given very little feed or water for 24 hours before they are vaccinated. Hogs should not be turned into muddy pens after treatment. Sloppy feed should be used for a few days after vaccination or if seasonable the hogs should be allowed to run on some form of green pasture as alfalfa, cowpeas or grass.

Reference: Florida Agricultural Experiment Station Bulletin 236, "Swine Production in Florida."

Swine Plague

The swine plague is technically known as hemorrhagic septicemia, which in reality is a form of hog pneumonia, and is sometimes found present in outbreaks of hog cholera. This disease is caused by the germ, **Pasteurella suisepticus** which is often found in the respiratory passages of healthy hogs but seems to be harmless until the vitality of the hog is lowered by disease or other causes.

It is quite impossible to distinguish between the symptoms of swine plague and hog cholera in the field. It seems, however, in swine plague the respira-

tory passages are involved more pronouncedly than in cases of hog cholera. Even with post mortem examination it is quite difficult to distinguish between cholera and swine plague. Swine plague rarely occurs as an independent disease.

Treatment: When swine plague occurs in connection with an outbreak of hog cholera the case should be handled and treated as hog cholera, as this disease is far more fatal. Serums are available for vaccinating against swine plague. Ths vaccination should be given when vaccinating for cholera to prevent the disease from attacking the hogs. Hogs that die of swine plague should be buried deeply, or preferably, burned.

Reference: Florida Agricultural Experiment Station Bulletin 236, "Swine Production in Florida."

Tuberculosis

Tuberculosis is a disease common to all domestic animals and man. In many cases it is slow in developing and hard to recognize until the later stages unless the tuberculin test is used.

Hogs usually contract tuberculosis by association with tuberculous poultry, eating tuberculous carcasses, being confined in infected feed lots, and following tuberculous cattle. When these sources of infection are eliminated, tuberculosis of swine will greatly decrease.

Even though the disease may have been present in a herd for a considerable period of time it is hard to detect by clinical examination. Intestinal tuberculosis is frequently accompanied by general disturbance of the digestive functions, and constipation or diarrhea may be shown. Advanced tuberculosis of the lungs is shown by a persistent, dry, harsh cough, and by rapid breathing, especially on exercise. This cough is similar to that caused by lung worms and cannot be distinguished from it. In most cases the presence of the disease is not detected until the animal is slaughtered.

Treatment: Prevention is the best means of combating tuberculosis. By this is meant care should be exercised in feeding hogs behind cattle, association with poultry, and feeding on uncooked garbage or packing-house by-products. By correcting such practices tuberculosis will be materially reduced in hogs.

The tuberculin test should be used at regular intervals to detect tuberculosis. The reactors should be removed from the herd, thus preventing spread of the disease. Hogs known to be affected wih tuberculosis should not be sold to the local butcher.

Reference: United States Department of Agriculture Farmers' Bulletin 781, "Tuberculosis of Hogs."

Influenza

Influenza is an infectious disease of hogs. The disease is transmitted by a virus that is present in the discharge from the nasal passages of hogs that have the disease. Swope produced the disease by injecting a germ-free filtrate, made from the lung tissue and lymph glands of a hog that had influenza, into the nasal passage of a well hog.

Reference: Pork Production by W. W. Smith, 1937 Edition, page 560.

Swine flu is characterized by the attack of a large portion of a herd at one time. The hogs lose their appetite. Spasmodic breathing is one of the first

symptoms noticed. The disease is accompanied by violent fits of coughing, red and swollen eyes, and often a discharge from the nose streaked with blood. Occasionally a hog will vomit stringy mucous tinged with bile. Temperature at first usually ranges from 104° to 108° F., usually dropping to 103° to 104° F., in about a week, when, if the hogs survive, they are back on feed.

Treatment: The treatment for swine flu is almost entirely hygienic. Animals should be placed in warm, well bedded quarters with plenty of fresh air and drinking water. Little or no feed should be given during the first 24 hours.

Pig Diarrhea

Diarrhea or "scours" is a serious ailment of young pigs and usually takes considerable toll each year.

Scours is a condition resulting from improper care of both the sow and litter, and may occur in pigs varying in age and may continue from one day to several weeks. When this disease attacks very young pigs it is likely that the ration being fed the sow is responsible. Sometimes pigs allowed to stay in damp, unsanitary quarters, deprived of sunshine and exercise or exposed to cold, rainy weather contract diarrhea.

The chief symptom is a profuse discharge from the bowels. The discharge is of thin, fluid-like character, grayish-yellow in color and of a very foul odor. At first the appetite is not affected, but after a few days, pigs affected stop eating and nursing and soon begin to lose strength and flesh. The coat of hair becomes rough and pigs squall with pain when handled.

Treatment: Pigs attacked by scours when only a few days old usually die. Proper attention should be given to feeding the brood sow before and after farrowing to prevent anything of an irritating nature to be transmitted through the milk to the offspring. Nursing sows should be kept in a clean, warm, comfortable pen where the pigs have plenty of room, air, and sunshine. Pigs affected should receive a dose of castor oil to clean out whatever irritating substance there is in the bowels. If the diarrhea persists after this treatment, each pig should receive 2 cc. of subnitrate of bismuth.

INTERNAL PARASITES OF SWINE

The internal parasites which occur in swine show a wide variation in structure, size, shape, habits, location and degree of infestation. Some of these parasites are very simple in structure and so minute that they can be seen only through a high-power microscope. These minute parasites are known as protozoa. Other parasites are worms having a more or less complex structure. Worm parasites fall into three distinct groups, namely: flukes, tapeworms, and round worms. Round worms, or thread worms, are the most common or prevalent parasites of swine in this country.

Some swine parasites live in various portions of the digestive tract, others occur in the lungs, liver, kidneys, muscles and various other locations outside of the digestive tract.

Swine are seriously affected by internal parasites of various kinds, the parasitic infestations of these food animals being second only to hog cholera. Parasites cause unthriftiness, stunting, weakness and a striking high mortality among young pigs and in many cases cause injury to many vital organs, which later are more liable to become infested with bacteria and other dis-

ease producing agents. The migration of developing worms through various organs and tissues results in various disabilities.

Young pigs seem to be much more susceptible to infestations of internal parasites and suffer more severely than older pigs from such infestations, which would indicate that young pigs should receive special preventive care. This does not mean that older pigs are not damaged by internal parasites but that the damage is much more noticeable in young pigs.

The United States Department of Agriculture Zoological Experiment Station at Moultrie, Georgia, has conducted experiments to determine the effect of internal parasites on the growth and weight of pigs.

EFFECT OF INTERNAL PARASITES ON GROWTH AND WEIGHT OF PIGS
Average of All Tests—(3 Year Average)

Method of growth	Age of hogs at marketing	Average weight	Difference in length of feeding period	Gain per day
Not controlled (wormy way)	10 mo. 15 days	191 lbs.	3 mo. 10 days	.60 lbs.
Controlled (sanitary way)	7 mo. 5 days	187 lbs.		.86 lbs.

U.S.D.A. Zoological Experiment Station, Moultrie, Georgia.

The following tabulation shows the annual value of meat loss due to internal parasites at a single federally-inspected packing plant.

Annual loss from Kidney Worms—(6 Year Average)

Annual no. hogs	Condemned pork	Livers	Kidneys	Loins	Leaf lard	Other parts	Total loss	Loss per hog
147,504	$6,891	$20,145	$2,740	$7,860	$20,487	$1,640	$59,763	$0.40

Internal parasites also affect the size of litters raised. This fact is brought out in an experiment conducted by the Illinois Agricultural Experiment Station.

During 1925 a total of 608 farmers in 61 Illinois counties practiced a simple system of swine sanitation on their farms with striking success. These farmers were men who had volunteered to cooperate with the College of Agriculture, University of Illinois, in demonstrating the merits of swine sanitation in economical pork production.

By the end of the year one-fourth of these cooperating sent in similar reports. A summary of their experiences shows among other things that they were able to raise the usual number of pigs from one-fourth fewer sows than were raised under the old system of raising hogs; that they raised 98 percent of the pigs saved at farrowing time; that there were almost no runts among the sanitation pigs and that the pigs raised this way were heavier at four months of age, were produced more cheaply, were more uniform and reached market earlier than pigs raised under common conditions.

EFFECT OF INTERNAL PARASITES ON SIZE OF LITTERS RAISED

Conditions reported	Wormy pigs	Sanitation pigs
Total number of litters	112	229
Total number of pigs at 4 months	567	1623
Average number litters at 4 months	5.1	7.1
Total number runts at 4 months	103	13
Percentage of runts	18%	1%
Weight of pigs at 4 months	68 lbs.	86 lbs.

Four simple but necessary steps constitute the sanitation system. They are designed to protect the little pigs, until they are at least four months old and reasonably resistant to infestation from swallowing an incubated worm egg. These steps as used by the 608 project leaders in Illinois are as follows:

1. Clean the farrowing quarters by scrubbing them with 1 pound of lye to 30 gallons boiling hot water. The hot water kills worm eggs; the lye loosens the dirt; the disinfectant destroys germs of infectious diseases.

2. Washing the sows sides and udder with soap and water before putting her in a clean farrowing pen. This removes worm eggs from the sow so that the little pigs cannot get them when they suck.

3. Hauling (not driving) the sow and pigs to the pasture where no hogs have run for at least a year. Preferably this pasture should be a field which has been cultivated since last used by hogs. This avoids contamination from filthy hog lots.

4. Confining the pigs in clean pasture until they are at least 4 months old.

Experience has shown the hogs raised without access to contaminated hog lots or pastures until four months old are usually relatively thrifty.

Three systems were used to water pigs.

1. When the distance was short, water was sometimes piped from the barn lot well through pipes laid temporarily on top of the ground.

2. In parts of the country where the land is porous enough for tile drainage to be successful, many shallow wells were used until long after the water level sank below the tile. Most of them were dug with a post hole auger, the handle of which was extended by 4-foot lengths of gas pipe as the depth increased. The time required to put down a 15 to 20 foot well usually was not more than half a day for one or two men. If the ground crumbles easily, the well is lined with 6 inch tile. These can be let down one at a time with a pole into which a nail has been driven, near the end to support the tile while it is being lowered.

3. On many farms water was hauled to the field in a barrel or tank. An ingenious scheme was used on the farms of Ray Ferguson and William Stenzel in Henry County. A float was attached to a trough in the field. One end of a short rubber hose was coupled on the pipe leading to the float valve and the other end was coupled to the outlet pipe, of the wagon tank. The wagon stood in the field until it had been emptied through the float valve as the water was used. This saved the expense of an extra field tank.

Reference: Illinois Agricultural Experiment Circular 306, "Cheaper and More Profitable Pork Through Sanitary Swine Production," pages 3, 4, 11, 12 and 13, table 4, Urbana, Illinois, February 1926.

The above experiment clearly illustrates that internal parasites are detrimental to pork producers. To produce hogs successfully some attention should be given to controlling internal parasites. This attention can be given with less expense and trouble while the pigs are young, resulting in a much larger saving than waiting until the pigs are older.

Control Measures

Prevention in the broad sense covers all efforts that are directed toward avoiding infestation or minimizing its effects. The cardinal principle of prevention is sanitation or cleanliness. In the mind of many persons the term "swine" is practically synonymous with filth, this association being due no doubt to the filthy conditions under which swine are kept in some places.

Old hog lots with an accumulation of manure and litter combined with hog wallows are anything but a pleasing sight as illustrated in figure 10.

To expect animals to develop normally and produce healthy off-spring in such surroundings usually results in disappointment. For a normal growth and development, swine, like all other farm animals, require sanitary surroundings, a balanced and adequate ration and relative freedom from parasites as in figure 11.

Figure 10. Hog lot with corn cobs and other litter favorable to development of parasites. The three pigs shown are the same age; the two small pigs show the effects of parasites and other hog-lot infections

Figure 11. Sow and litter on clean, temporary pasture. Note uniform size of pigs and complete absence of runts. These pigs harbored very few parasites.

Sanitary surroundings include clean housing, free from manure, litter and dirt. The outdoor surroundings should consist of pasture sowed to suitable forage crops. The pastures should be well drained and provided with good fences to prevent pigs from getting into low, wet areas. Pastures should be free from litter, since eggs and larvae of parasites are deposited under accumulations of all sorts.

Permanent pastures are far less desirable than temporary pastures, but if permanent pastures must be used, it is desirable to rotate stock so as not to keep pigs year after year on the same pasture. Temporary pastures, if well kept, well drained and sowed to suitable forage crops offer the best and simplest solution to the control of swine parasites. Pigs produced under these conditions are more uniform in size, grow faster; and almost always more profitable pigs are produced than under less favorable conditions in that they are ready for market earlier and the loss of young pigs usually is much smaller.

In brief, the problem to be solved in connection with parasite control is the protection of pigs from parasites harbored by sows and older pigs. This can

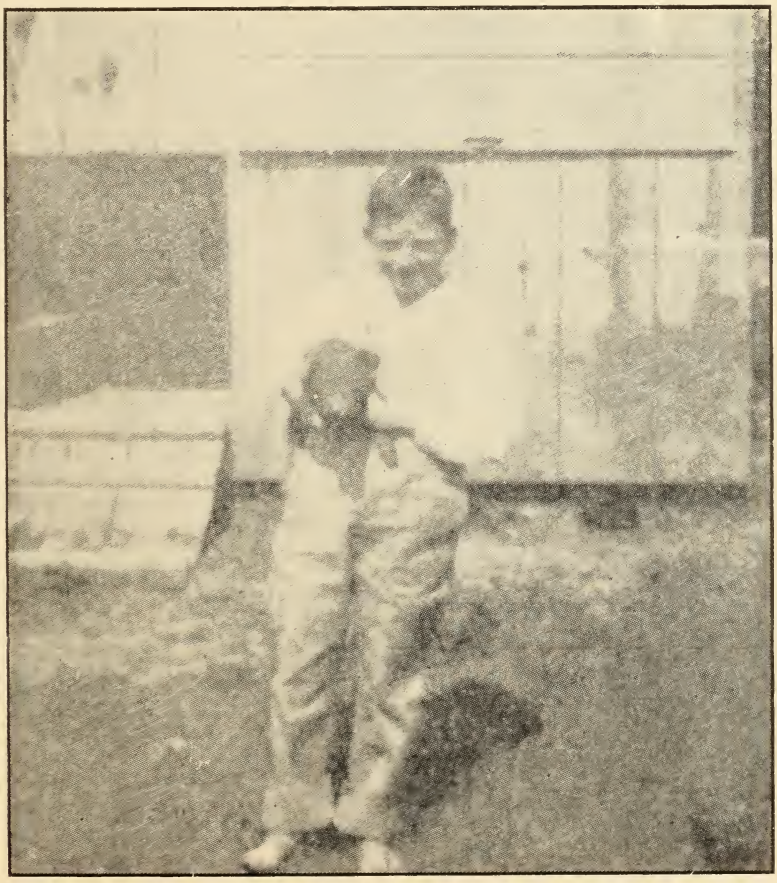

Figure 12. Individual portable farrowing house suitable for use in the South.

best be done by transferring the sows before farrowing to a temporary pasture that has not been used recently by other hogs. It is desirable to provide individual portable farrowing houses as illustrated in figure 12, on these temporary pastures. It is also important to keep all hogs, other than the sows, away from the suckling litters and young pigs to prevent contamination of the pasture with parasite eggs and larvae. These precautions will not prevent parasitic infection of the suckling pigs altogether, but will keep the infestation down to a low level. If the pigs are properly fed and housed, protected from association with old hogs, other than their mothers, and kept on clean pastures, before and after weaning, the little infection that they will inevitably acquire from association will do comparatively little harm.

By following a sanitary method the grower can reduce considerably the cost of producing his pig crop. The pigs are usually more uniform in size as illustrated in figure 13, runtiness being greatly reduced and the time for raising the animals to market age can be shortened by from four to eight weeks. This effects a saving in feed and care and reduces the risk of loss from infectious diseases because of the shorter holding period.

The control of parasites, especially the kidney worms, will be greatly facilitated by using a pasture arrangement as illustrated in figure 14. The bare area around the house, water barrel, feed pens and the area around the fence are usually much drier than the remainder of the pasture. A higher percentage of the eggs and larvae of the parasites will be deposited in these areas where they perish from exposure to sun light, heat and drying. In the absence of vegetation the top soil is sufficiently dry except during wet seasons to destroy life in the eggs and larvae of these worms.

By providing a separate feeding pen for the sow and at some distance away a creep and self-feeder for pigs, a considerable portion of infested ma-

Figure 13. Pigs raised under the sanitation system; note uniformity in size and quality. These pigs averaged 220 pounds when they were 6½ months old.

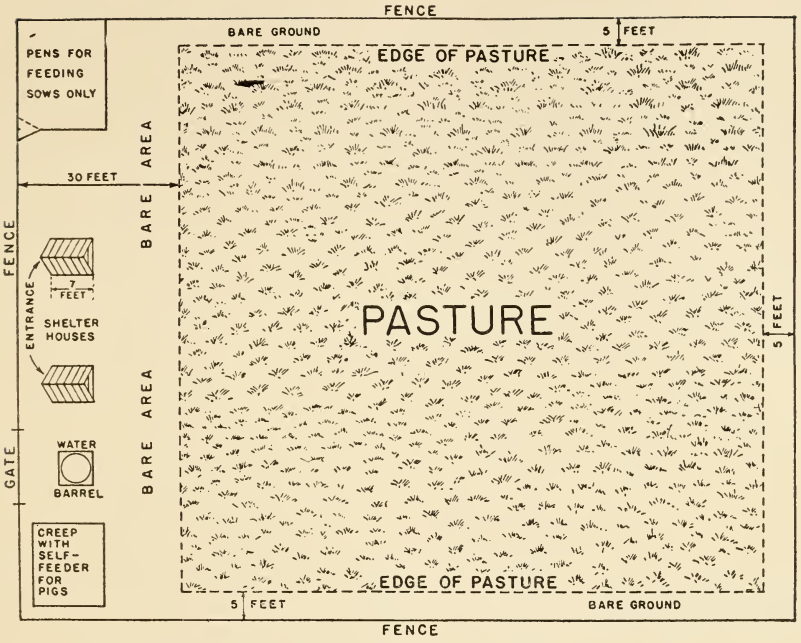

Figure 14. Use of bare-ground areas to control swine parasites.

terial will be kept away from the pigs. The pigs should not be allowed to enter the sow's feeding pen.

This arrangement of feeding and pasture is very effective in combating the kidney worm infestation which is one of the most serious parasites which infest swine.

LIFE CYCLE OF INTERNAL PARASITES OF HOGS

Internal parasites	Life cycle			
	1	2	3	4
Lung fluke	Adult fluke in lungs produces eggs which are coughed up and swallowed.	Eggs discharged in droppings, hatch in swampy areas and young flukes get in aquatic snails and crawfish	Pigs eat crawfish containing young flukes	Young flukes in digestive tract bore their way through intestinal walls and reach the lungs and there develop to maturity
Hydatid (tapeworm)	Adult tapeworm in the intestines shed ripe segments	Ripe segments containing numerous eggs are discharged with droppings	Hogs acquire hydatids by swallowing feed or water contaminated with segments or eggs	Eggs hatch in intestinal tract and reach liver or other organs through the blood stream
Trichinae	Adult worms in the intestines produce numerous young	Young worms are carried to muscles by the blood	Worms enter muscles and develop there becoming enclosed in cysts	Pigs acquire Trichinae by eating scraps of raw pork or infested rats. The parasites are liberated from the cysts in the intestines
Thorn-headed worm	Adult worms in the intestines produce numerous eggs	Eggs eliminated in droppings of infested swine	May beetle grubs swallow the eggs and become infested	Hogs acquire thorn-headed worms by swallowing infested grubs
Lungworms	Adult worm in lungs produce eggs which are coughed up and swallowed	Eggs are eliminated by droppings and eaten by earthworms which live only in damp places and swamps	Pigs pick up eggs which live in litter and swallow while eating food	Eggs hatch and penetrate to the lungs
Roundworms (intestinal)	Adults in intestines produce eggs	Eggs eliminated in droppings, and stay alive in litters, shade and damp places	Pigs swallow infestive larvae with food or water through broken skin	Eggs hatch and larvae go back to intestines
Kidney worms	Adults in kidney and uriters	Eggs eliminated in urine and stay alive along fences in old pastures, and shady spots and develop into infestive stages in 4-6 days	Pigs eat earthworms with lung worm eggs	Larvae penetrates to liver, loins, kidney and ureters

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U.S.D.A. Farmers' Bulletin 1787, "Internal Parasites of Swine."

LIFE CYCLE OF INTERNAL PARASITES OF HOGS (Continued)

Internal parasite	Description	Damage	Treatment	Control
Lung fluke	Thick, oval worms about ¾ inch long about 1/5 inch wide. Located in sacks or cysts in substances of lung	No special symptoms have been noted	No known treatment for removal of fluke worms	Keeps hogs off wet, boggy areas
Hydatid	Bladder worms located principally in the liver and lungs of swine. Vary in size and shape, in swine from the size of an orange downward. The bladder is filled with clear fluid containing minute objects resembling grains of sand. Each minute object is capable of giving life to a tapeworm	No distinctive symptoms have been noted to infected swine. Due to the size of the cysts and their location in vital organs these parasites are decidedly injurious. This parasite often infests human beings, necessitating surgical operations of a very serious nature		Control wandering of dogs over pasture and hog lots. Periodic treatment of pigs to remove tapeworms
Trichinae	Slender thread worms adults in small intestines, larvae stage in the blood. From blood to cysts in muscles. Adults 1/16 to 1/6 inch long. Size of very fine thread. Occur not only in swine but also in humans, rats, mice, dogs, cats and various other animals	Produces disease known as Trichinosis. Affected hogs usually take no food, vomit at times, move with difficulty and frequently lie motionless in one place. There may be considerable swelling, especially of the eyelids. Infected hogs usually recover. The encyster worms may remain alive in the muscles for a year or longer	There is no known effective treatment for	Trichinosis in swine involves management tending to eliminate the sources of infestation. Hogs should not be allowed to eat uncooked pork, garbage or offal from slaughter houses. Hogs that die on the farm should be buried deeply in quick lime or preferably burned. Sanitary methods should be used in producing
Thorn-headed worm	Milk white to bluish in color, cylindrical in shape, the largest being about the size of a lead pencil. The head is provided with a spiny proboscis (snout)	At point of attachment to the intestinal wall a swelling or nodule appears. Sometimes the injury is so deep that the intestine is perforated which causes peritonitis. This condition often results in death of the animal, causes great unthriftiness that is nearly always associated with parasitic infection	Drugs are rather ineffective in removing thorn-headed worms. Control measures are about the only hope at present of keeping swine free from thorn-headed worms	Ringing the noses of swine, sanitation and the avoidance of old hog lots and permanent pastures

Lungworms

Three species of lungworms, **Metastrongylus elongatus, M. salmi,** and **Choerostrongylus pudendotectus,** occur in swine; the first- and third-named species occurring in relatively large numbers, as a rule, whereas the species listed second usually occurs in small numbers, when present. Swine are usually infested by two or all three species, all of which are relatively long, slender, whitish worms, from about one-half to 2 inches long by about one-fiftieth of an inch or less wide as illustrated in figure 15.

These parasites are found occasionally in the windpipe, more often in its two main branches called the bronchi, their preferred location, however, being the smaller bronchi and the bronchioles (the finer branches of the bronchi), and especially those in the lower portions of the lungs. So far as is known, the three species of lungworms which parasitize swine are equally injurious, the degree of injury produced depending upon the number of worms present in individual pigs.

Damage produced: The most outstanding symptom of lungworm infestation is a cough, a condition which weakens an animal, particularly a young animal, and lowers its vitality. Young pigs have been known to die as a result of heavy lungworm infestations. In heavy infestations the finer bronchi and bronchioles are plugged with worms, and this produces a localized pneumonia. During the early stages of invasion by these worms, the lungs are peppered with hemorrhages resulting from the perforation of the walls of the delicate blood vessels in the lungs. In infestations of long standing the posterior tips of the lungs commonly show grayish, hardened areas marking the location of worms in the bronchi and bronchioles.

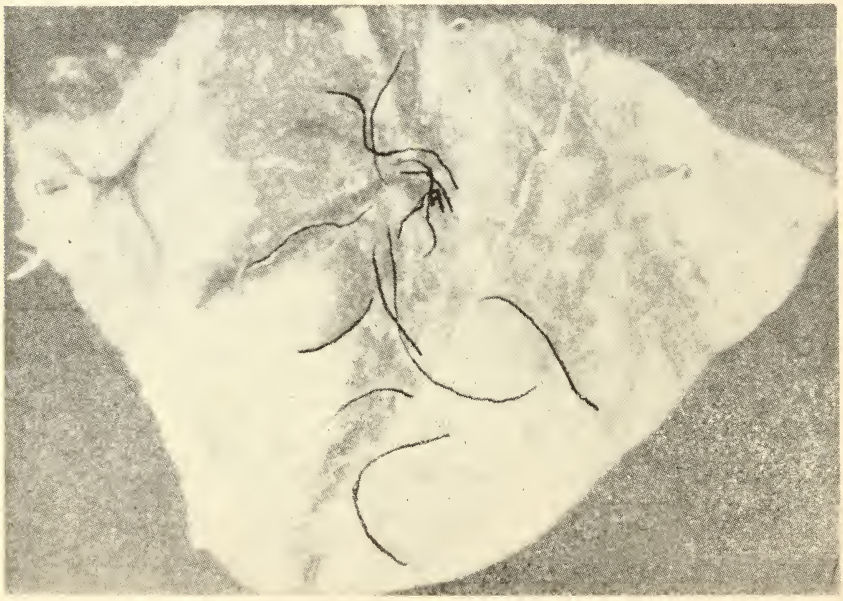

Figure 15. Lower portion of swine lung partially cut open to show the nests of lungworms. Several lungworms were removed to show their size and shape.

Treatment: There is no known medicinal treatment effective in removing these worms from the lungs. Infested animals should be taken off the pasture or out of the lot and placed in a dry, clean pen, preferably one with a concrete floor, to insure against further infestation from swallowing infested earthworms. While kept in isolation, sick pigs should be supplied with good feed in abundance, safe drinking water, and good bedding that is renewed at fairly frequent intervals.

Prevention: The control of lungworm infestation in pigs involves arrangements which will reduce the number of earthworms on pasture and lots and prevent swine from rooting. Earthworms thrive in old hog lots in which manure and litter accumulate, on permanent pastures, and in low fields which receive drainage from higher fields. Well-drained fields, on which crops are cultivated seasonally, contain comparatively few earthworms.

Effective control of lungworm infestation involves the use of the sanitation system of swine management, the absolute avoidance of old hog lots, and the selection of well-drained pastures, fencing off, if necessary, the lowest portions of pastures to which rain and wind carry manure and other litter. As an additional precaution, it is important to ring the noses of swine to prevent excessive rooting.

The Large Intestinal Roundworm

The large intestinal roundworm, **Ascaris suis,** is a large, thick, yellow or pink worm about the size of an ordinary lead pencil. The normal location of the adult parasites is the small intestine; wandering adults may occur also in the stomach, in the lower portion of the alimentary canal, in the bile ducts of the liver, in the gall bladder and in other parts of the body which have channels of communication with the gut. The young migrating worms occur in the blood stream, the liver, lungs, and other organs and tissues.

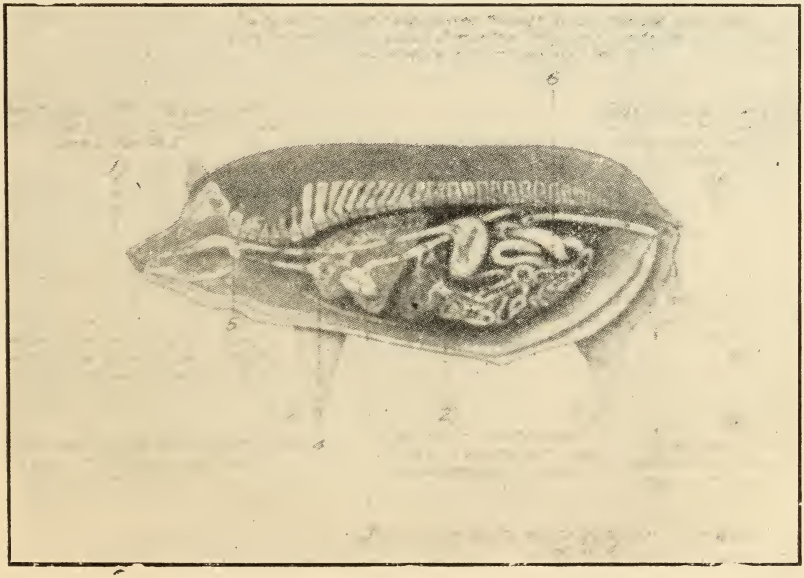

Figure 16. The roundworm's journey through the pig.

Damage produced: Roundworms in the intestine may produce digestive disturbances and a capricious appetite, retard growth and development, and interfere with the well-being of pigs in other ways.

In exceptional cases, particularly when pigs are on an inadequate diet, infested animals may become anemic, suffer from colic and, in extreme cases, they may suffer from convulsions. During the migration of numerous young ascarids through the lungs, pigs have difficulty in breathing and may die of pneumonia. Probably many, if not most, cases of thumps in young pigs are caused by ascarid migrations through the lungs, but other causes of thumping must not be overlooked. Pigs that survive a severe infestation of the lungs with ascarid larvae may not recover fully and often fail to grow and develop at a normal rate. Pigs are far more susceptible to ascarids than grown hogs, and very young pigs suffer seriously from the effects of these parasites.

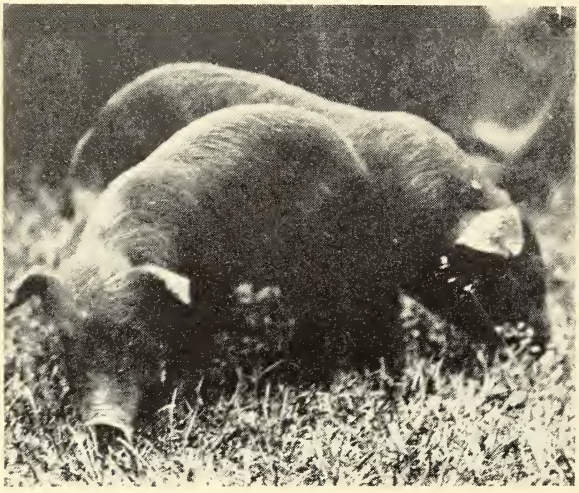

Figure 17. Pigs showing the effects of roundworm invasion of the lungs 8 days after infection.

Although the damage to the liver and lungs done by the migrating larvae heals as a rule, the liver is sometimes permanently affected by the massive migration of young worms. The repair to the damage results in numerous scars, the entire surface of the liver becoming peppered with whitish areas. In some lots of hogs as many as 35 percent of the livers have been thus affected.

Treatment: The most satisfactory treatment for the removal of ascarids from the intestines of swine consists in the administration with a dose syringe or by means of a stomach tube of wormseed oil (oil of chenopodium) at the rate of one-half to 1 fluid dram (2 to 4 cubic centimeters) to a 100-pound animal, immediately preceded or followed by at least 2 fluid ounces (60 cubic

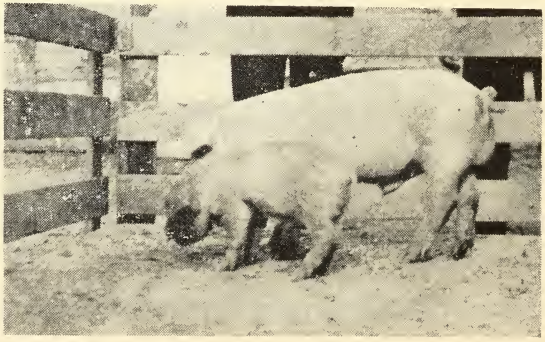

Figure 18. Two pigs of the same age. The large one is normal; the small one was stunted by roundworms and other hog-lot infections.

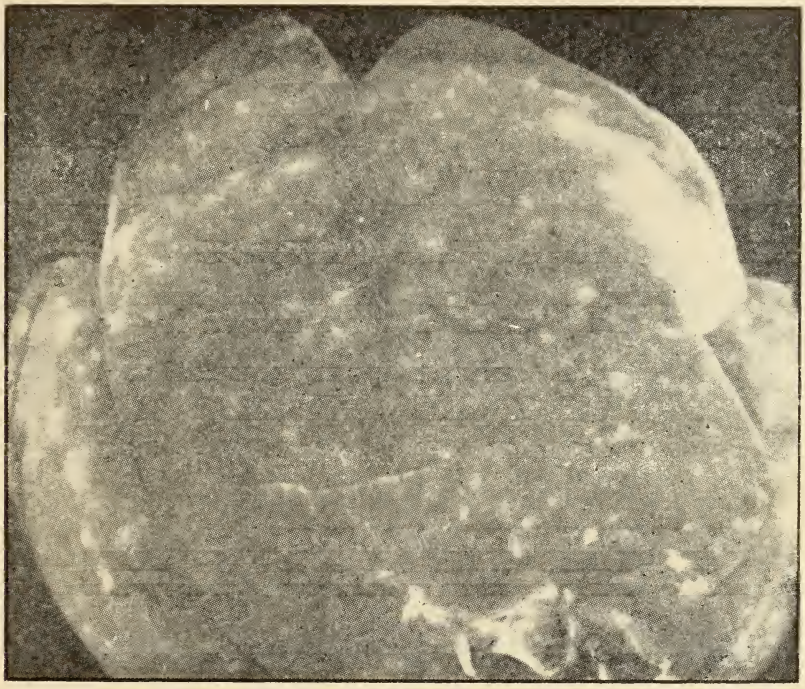

Figure 19. Swine liver showing numerous small scars (whitish areas) produced by migrating ascarid larvae.

centimeters) of castor oil, or the drug may be administered in the oil. Some veterinarians substitute calomel or aloes for castor oil; others use Glauber's salt or Epsom salt in solution on oats or in slops at the rate of 1 pound of salt to 10 hogs, 3 hours after treatment. Although doses for animals of various sizes are usually computed on the basis of weight, it is likely that a dose of 2 fluid drams of oil of chenopodium is adequate for hogs weighing 300 to 400 pounds. Swine should be fasted for 18 to 24 hours prior to treatment and should not be fed or watered for 3 hours after treatment. Oil of chenopodium should not be administered to animals suffering from fever, constipation, intestinal catarrh, or necrotic enteritis, and the treatment should not be given to very young animals or to pregnant sows.

Santonin, for a long time regarded as an effective remedy for the removal of roundworms from swine and commonly recommended for this purpose, is not very effective in the doses which have been usually recommended. When santonin is administered in relatively large doses, one-sixth to two-thirds grain per pound of body weight, followed in 12 hours by 1 gram of Epsom salt per pound of body weight, a large percentage of ascarids is removed.

It has been shown, by experiment, that hexylresorcinol will remove a large percentage of ascarids from swine in doses of 1 dram (4 grams) for pigs weighing between 30 to 50 pounds. This treatment was given after a preliminary fasting period of at least 36 hours and the treatment was followed immediately by 1 to 2 fluid ounces (30 to 60 cubic centimeters) of castor oil.

The high cost of the drug and the long period of fasting make this treatment rather impractical.

Although there has been a great demand for treatment that can be administered in the feed to a number of swine at the same time, this method of administering drugs is not recommended, despite the fact that it would save time and labor. After careful testing, mineral mixtures, often recommended as valuable in removing worms, and preventing infestation, have been found to be ineffective for these purposes. Mineral mixtures have their value in swine management and should be used for the purpose of supplying necessary mineral constituents, but they should not be considered as worm remedies.

Control: Control of ascarid infestation in swine can be accomplished successfully by following the sanitation system of swine management. This system was developed by the Federal Bureau of Animal Industry with farmers in the Middle West, in the South, and elsewhere in the United States. The swine-sanitation system, outlined in the section entitled "Internal Parasites of Swine," is the basis on which control measures for all swine-parasites should be undertaken, the system as a whole requiring certain modifications here and there, in order to adapt it to the control of parasites other than ascarids. Modifications already worked out in detail for kidney worms are discussed elsewhere in this bulletin. The basic sanitation principles as worked out for ascarids, will control effectively or to some extent practically all the important swine parasites.

Swine Kidney Worm

The full-grown parasite, **Stephanurus dentatus,** is a thick, mottled worm, from a little less than 1 inch to somewhat more than 2 inches long and from about one-twentieth to one-tenth of an inch wide. The mature worms occur

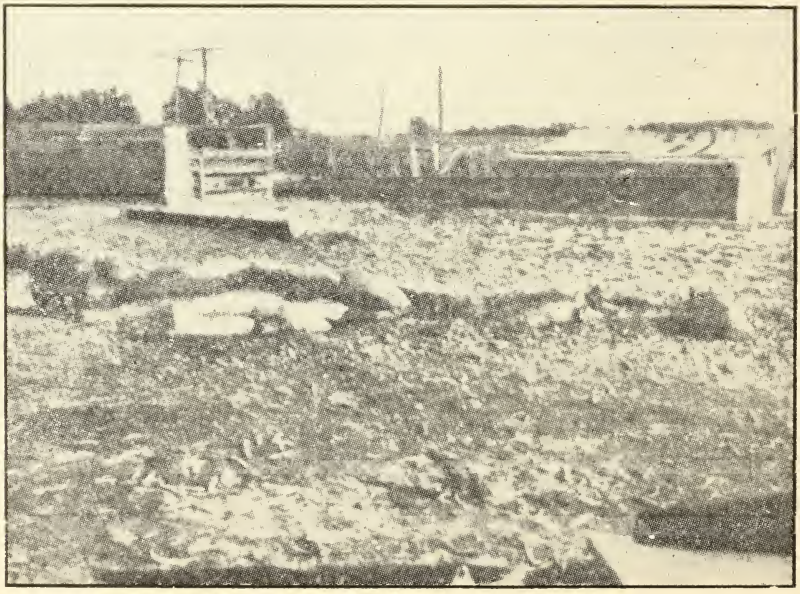

Figure 20. Hog lot in which kidney-worm larvae as well as eggs and larvae of other swine parasites are likely to be abundant.

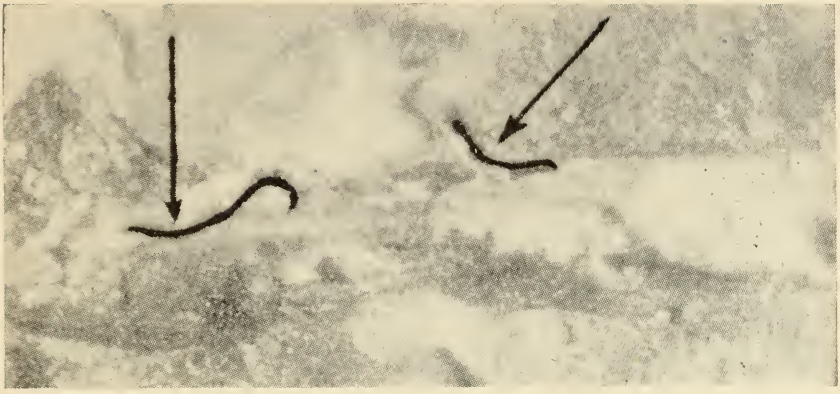

Figure 21. Portion of spine of a hog split open to show kidney worms in spinal canal. Arrows point to the worms (seen as long dark bodies).

in cysts in the fat surrounding the kidney and sometimes in the kidney tissue proper. The incompletely developed and sexually immature worms occur principally in the liver, in various blood vessels, especially those of the liver, free in the abdominal cavity, embedded in the loin muscles, and in the lungs; occasionally kidney worms penetrate the spine

Damage produced: Aside from general unthriftiness and arrested development, symptoms common to parasitic infestations of all kinds, there are no readily observable symptoms that are especially characteristic of kidney-worm infestation. Infested animals discharge urine which at times contains pus, this being characteristic of kidney-worm infestation. Posterior paralysis is sometimes due to the penetration of kidney worms in the spine. (Figure 21.)

Most cases of paralysis of the hind quarters are due, however, to other causes.

Post-mortem on a sow at the Mississippi Experiment Station showed evidence of kidney worms causing sufficient hemorrhage to produce death in the host.

It is evident that parasites as widely distributed throughout the bodies of swine as are kidney worms will produce more or less serious damage in the tissues and organs in which they lodge or with which they come in contact. The principal injury inflicted by the kidney worm involves the liver. The worms that migrate through the liver and perforate its capsule produce bloody tracks as illustrated in figure 22. As these active lesions heal, the damaged liver cells are replaced by hard connective tissue which produces the grayish-white liver scars characteristic of kidney worm infestation. These hard areas may be small, circumscribed, and more or less superficial or large and striking and extending deeply into the liver tissue. Pus is commonly associated with the worms which lodge in the liver lesions. Under meat-inspection procedure considerable losses are sustained owing to the rejection and condemnation of affected livers. The invasion of the loin muscles necessitates considerable trimming of expensive parts of hog carcasses. When the infestation is excessive and is accompanied by pus, considerable portions of a carcass and sometimes an entire carcass must be condemned. These losses are ultimately borne by swine producers, who receive a lower price for hogs because of ex-

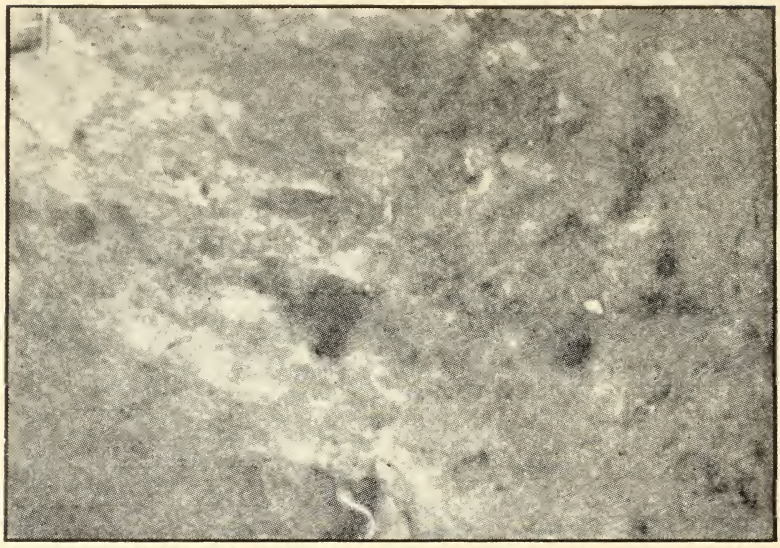

Figure 22. Swine liver with numerous bloody tracks produced by kidney-worm migration.

pected injuries as well as because of the injuries to hog carcasses actually produced by the parasites.

Other important injuries produced by kidney worms involve the lungs, which contain hard nodular masses marking the locations of the worms and associated pus; the blood vessels, in which incompletely grown worms become arrested and in which they produce changes that interfere with the circulation of the blood; the ureters, the walls of which become thickened when the worms lodge in them; the kidney fat, which is unfit for rendering into lard because of the infestation with worms; and the spleen and other organs which are sometimes invaded by the parasites.

Treatment: There is no known medicinal treatment for the removal of kidney worms from the blood vessels, liver, kidney fat, kidney proper, lungs, loin muscles, or the other locations in which these parasites occur.

Prevention: The control of kidney worm infestation must be based on preventive measures. Prevention in this case means reducing pasture contamination by observing certain fundamental precautions as regard sanitation, this in turn involves arrangement which will expose kidney worm eggs and larvae to the sun, prevent the accumulation of litter and trash on hog pasture and provide good drainage.

The system of pasture arrangement as outlined in figure 14 above is very effective in controlling the kidney worm.

EXTERNAL PARASITES OF HOGS

External parasites tend to lower the vitality of hogs making them more susceptible to different contagious diseases and cause considerable damage to the hog producer. The more common external parasites are hog lice, hog mange and screw worms. In some cases heavy infestation of these parasites,

especially the screw worms, results in death. If hogs are to be produced successfully steps should be taken to control these parasites.

Controlling lice and mites (or mange): Hog lice are prevalent in all parts of the United States where hogs are raised. The lice obtain their food by puncturing the skin of the host animal and sucking the blood and lymph. A new puncture in the skin is made each time a louse feeds. Each skin puncture causes considerable irritation and itching and as each louse feeds at frequent intervals the irritation and itching is almost constant in cases of gross infestation. To relieve the itching the infested animals scratch themselves with their feet and rub violently against any convenient object, resulting in the destruction of the hair in patches often causing wounds in the skin. The lice congregate around these wounds and thus cause further irritation.

Lice may attack hogs of any age or condition causing an increase in the quantity of feed required to produce a pound of gain. It is estimated that young pigs allowed to remain infested with lice until butchered lose from 2 to 6 percent of their market value, and in many cases, due to the lower vitality, the hogs are much more susceptible to other parasites and contagious diseases.

The full grown female often attains a length of one-fourth of an inch. The male louse is slightly smaller and can be distinguished by a black streak on the underside of the abdomen along the middle of the last three segments.

The entire life cycle is passed on the host. Eggs or "nits" are deposited or glued on the hair close to the skin. Favorite locations for egg deposits are the lower half of the sides, around the shoulders, neck and flanks. Females lay from 3 to 6 eggs per day, the average length of the laying period is about 25 days. Eggs hatch in from 12 to 20 days, the majority hatch in from 12 to 15 days. Young lice become active soon after hatching and seek the parts covered by tender skin for feeding. Large numbers of young lice feed inside the ear, especially during cold weather. The young lice reach maturity and mating occurs when about 10 days old. The female begins laying eggs when about 12 days old and the average length of life is about 35 days.

Hog Mange: Mange is a term applied to two contagious skin diseases caused by insect-like parasites known as mites which live in the skin. The two species of mites are (1) Sarcoptes and (2) Demodex.

Sarcoptic mange mite: These mites are whitish colored and mature females measure about 1/50 inch and the male about 1/60 of an inch in length. The body is round and the bluntly rounded head is as broad as it is long. When mature these mites have four pairs of short, thick legs, the fourth pair and usually the third pair not extending beyond the length of the body.

The entire life cycle is passed on the body of the host animal. The mites penetrate through the upper layer of the skin and excavate burrows or galleries in which the eggs are laid. The female may lay from 10 to 25 eggs during the laying period which probably lasts from 12 to 15 days after which the female dies in her burrow. The eggs hatch in from 3 to 10 days and young mites reach maturity and begin laying eggs in 10 to 12 days. A new generation of mites may be produced every 15 days.

Sarcoptic or common mange may start on any part of the body, but usually the lesions are found first on the head around the eyes, nose or ears. From these parts it spreads finally involving the entire body. The presence

of the mites on the "quick" or sensitive skin tissues causes great irritation and the skin under and around each burrow becomes inflamed and swollen. These swollen areas are somewhat larger than a pinhead and often have a yellowish-colored granule or dried serum adhering to it. The hair over the affected part stands erect and some of it drops out or is rubbed off. The affected areas of skin often take on a dry, scurfy, or leather-like appearance. The intense itching causing the animal to scratch the affected part until the skin becomes raw thus causes a running together of the small granular areas, and large scabs are formed. The surface of the lesion may have a dry, pearl-gray appearance or it may be moist and stained a reddish-yellow by blood and serum. In chronic cases the odor from the moist form sometimes is very offensive.

Sarcoptic or common mange of hogs is contagious and is usually spread by direct contact with infected animals. The disease is readily transmissible to man and also from hogs to other animals. The disease may persist in man for 30 days or longer and cause extreme annoyance.

Demodectic Mange (Follicular Mange): Mites causing this type of mange are truly microscopic in size; the full grown female reaches approximately 1/100 inch in length. They penetrate into the hair follicles and sebaceous glands of the skin where the entire life cycle is completed. In small numbers they apparently cause the animal no serious inconvenience, but in large numbers well marked lesions are caused in the skin of the affected animal. The disease is contagious to all classes of hogs. Lesions appear first on the snout or around the eyelids and spread slowly to the underside of the neck, breast, abdomen, inner sides of the hind legs and other parts of the body where the skin is thin and tender. In the early stages of the disease the affected skin may be red and scurfy, and small hard nodular lumps ranging in size from that of a pinhead to that of a hazelnut appear in the skin. A nodule may be dark red or it may be light red with a whitish or cream colored center. As the disease advances the nodules break and distribute a cream-like pus or lumps of matter of a cheese-like consistence.

There is no specific cure for demodectic mange, although frequent dippings in crude petroleum checks the progress of the disease and heals many of the old lesions.

Treatment for Lice and Mange: The common methods of applying treatment for lice and mange are:

(1) **Hand applications:** The following remedies when applied by hand have proven effective for lice and mange: (1) crude petroleum, (2) cottonseed oil and kerosene (equal parts) and (3) kerosene and lard mixed in proportions of one-half pint kerosene to 1 pound of lard. These remedies may be applied with a brush, mop or cloth, and should be distributed in a thin even coating over the entire surface of the head and body, including the inner surface of the ears and between the thighs.

(2) **Spraying:** Spraying is a rather expensive method of treating lice and mange, as much of the dip runs off and is wasted. An ordinary hand spray pump is suitable for the purpose and any of the dips recommended for scab may be applied in the form of a spray.

(3) **Hog oilers or rubbing posts:** Hog oilers or rubbing posts are devices so arranged that when a hog rubs against them a small quantity of oil

is deposited on or near the spot of skin being rubbed. They may be divided into two general classes, (1) home-made rubbing posts and (2) the patented hog oilers. This will help to some extent, but will not eradicate. If complete eradication is desired, burnt oil drained from crank case used unsparingly will eradicate lice.

(4) **Medicated hog wallows:** By medicating the water in properly constructed wallows, remedies for lice and mange may be applied in a satisfactory manner with a minimum expenditure of money, time and labor.

For pigs weighing from 40 to 80 pounds the wallow should be charged with liquid to a depth of about 3 inches. For hogs weighing from 80 to 150 pounds about 4 inches of liquid is sufficient. For a lot of mixed sizes from 3 to 4 inches of liquid should be used. The wallow should not be medicated under 24 to 48 hours at one time. Medicaments may be added every week or ten days until the desired results are obtained. In using oil in wallows add about 1 pint for each pig and about 1 quart for each hog.

(5) **Dipping:** Dipping consists in immersing animals in a medicated liquid that will kill the parasites. During dipping, the liquid in the vat should be from 40 to 48 inches deep, which is sufficient to swim the tallest animal.

Men with dipping forks should be stationed along the vat to render assistance and to keep each animal's body submerged while it is swimming through the vat. The head of each animal should be completely submerged at least once before it leaves the vat, being sure that dip enters the ears of each animal.

There are a lot of different dips that may be used. Oil dip: Fill vat to within 6 or 8 inches of dip line after which add the oil. Fuel oil may be improved by adding 1 gallon of kerosene to 10 gallons of fuel oil. The oil dips are used cold and 1 dipping is usually sufficient to eradicate lice or mange. This is the most effective dip used.

Lime sulphur dip may be used for hog mange when four or more dippings are made with an interval of 6 or 7 days between dippings. The temperature of the dip while the animals are in it should be maintained at from 95° to 100° F. Lime sulphur dip is made in the proportion of 12 pounds of unslaked lime (or 16 pounds of commercial hydrated lime) and 24 pounds of flowers of sulphur to 100 gallons of water. Slake the lime in a shallow water-tight box or tank and add water enough to form a thin paste. Sift the sulphur into the paste and mix well until the mixture is about the consistency of mortar, adding water as required. Put the mixture into 30 gallons of boiling water, adding slowly so as not to interrupt the boiling. The boiling should continue from 1½ to 2 hours until the sulphur has disappeared from the surface and the mixture is a chocolate or dark amber color.

Coal-tar-creosote dips: The coal-tar-creosote dips when properly used in soft water are fairly effective in eradicating hog lice if two or more dippings are given with an interval of 15 or 16 days between dippings. This is necessary because the first dipping does not destroy the eggs. These dips have not proved to be dependable remedies for mange. They may be used cold or warm, but the temperature of the dip while the hogs are in it should not exceed 95° F.

The dips are sold under many different trade names, and the principal ingredient is so-called creosote oil which is made soluble in or miscible with

water by means of soap. In the undiluted coal-tar-creosote dips, especially in cold water, a separation of naphthalene and other constituents of the dip may occur. Care should be taken, therefore, to see that the dip is homogenous in character before using any portion of it. These dips should be diluted for use in accordance with the directions given on the containers.

Arsenical Dip: The arsenical dip as used for eradicating cattle ticks in the Southern States is an effective remedy for hog mange when four dippings are given with intervals of six or seven days between dippings. As crude-petroleum dip is much more economical and effective, the use of arsenical dip for hogs is not recommended except when a farmer in the southern tick area may have a few infected hogs he can dip in a cattle vat.

Reference: U. S. Department of Agriculture Farmers' Bulletin 1085, "Hog Lice and Hog Mange, Methods of Control and Eradication."

Screw worms: Life History—The primary screw worm fly has four stages in its life cycle; these are the egg, the larva or screw worm, the pupa, and the adult fly. The adult female cements masses of eggs to the edge of a wound or to the soiled skin below the wound. The egg hatches in 11 to 21 hours. Young screw worms invade the wound, feeding close together and forming a pocket in the living flesh. Screw worms become fully developed in 4 to 10 days, crawl out of the wound, drop to the soil, conceals itself near the surface of the ground, and changes to the pupa or resting stage. This stage usually lasts about 7 days. When the flies emerge from the pupa case they mate, and within 5 to 10 days the females are ready to lay eggs. The average life cycle is about 24 days.

The adult fly is about the size of the common house fly, bluish-green in color with 3 dark stripes on the back between the wings and with a yellowish-red face. Newborn pigs may be attacked in the navel and not infrequently in the mouth around the teeth or any place where there is blood or a fresh wound.

Treatment: Proper treatments, as described below, kill screw worms without injuring the wounds.

(1) Swab the wound with cotton to remove pus, blood, and blood serum. Spray benzol (commercial 90 percent) into the wound with a rubber-bulb syringe to stop the flow of serum and blood.

(2) Add more benzol and plug the opening of the wound with cotton. The excess benzol is absorbed by the cotton, and fumes are confined to the cavity of the wound. The fumes of benzol kill screw worms when they are breathed by the worms. Do not remove worms or cotton, for they will drop out naturally.

(3) Cover the cotton plug and wound with dehydrated pine-tar oil (specific gravity 1.065) to keep flies away and to aid healing. Thin applications of pine-tar oil should be made to the wounds every day or two until healing is complete.

Mistreatments with coal-tar creosote and strong stock dips delay healing and cause large wounds that furnish breeding places for screw worms for a long time.

When wounds are difficult to treat or when they occur in valuable animals, the services of a competent veterinarian should be secured.

Reference: U. S. Department of Agriculture Leaflet 162, "Screw-worm Control."

PART III

Houses and Equipment

Equipment occupies an important place in a production program of any kind. The planning of a system of pork production should include and provide for the necessary equipment that will enable the most profitable production of pork.

Due to the generally mild climate in Mississippi it is not necessary to provide expensive houses for hogs. Farrowing houses are desirable, especially for sows farrowing during the winter months. Portable farrowing houses are very desirable. Figures 23 and 24 illustrate the box type portable farrowing house and figure 25 illustrates the "A" type farrowing house. Each house is so constructed as to provide proper ventilation during the summer months.

The shed type house is preferred in most cases. The "A" type house is hard to clean, and sows very often get back against the wall and it is hard for them to get on their feet again.

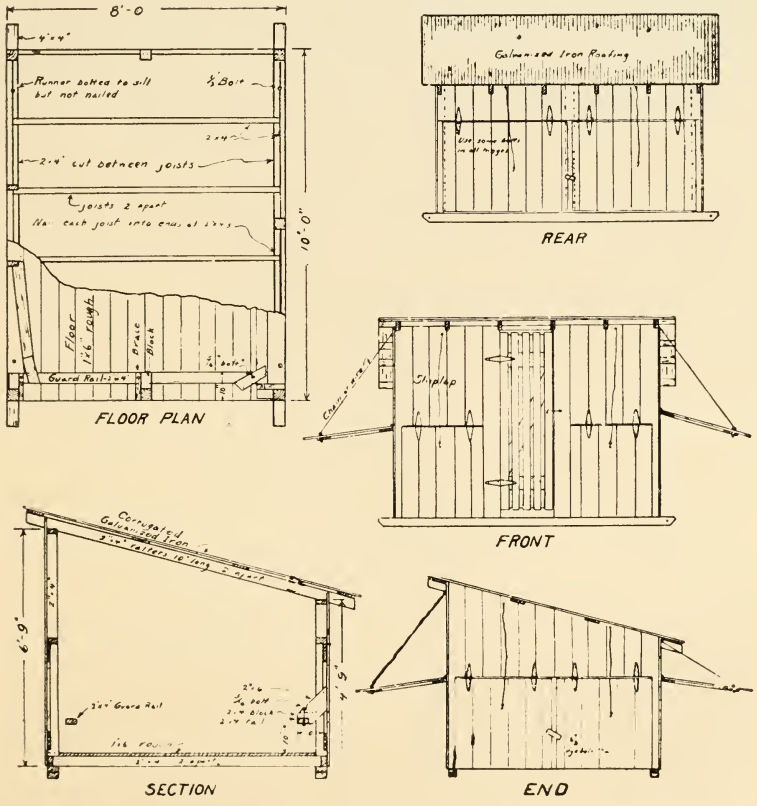

Figure 23. Texas shed-roof portable farrowing house.

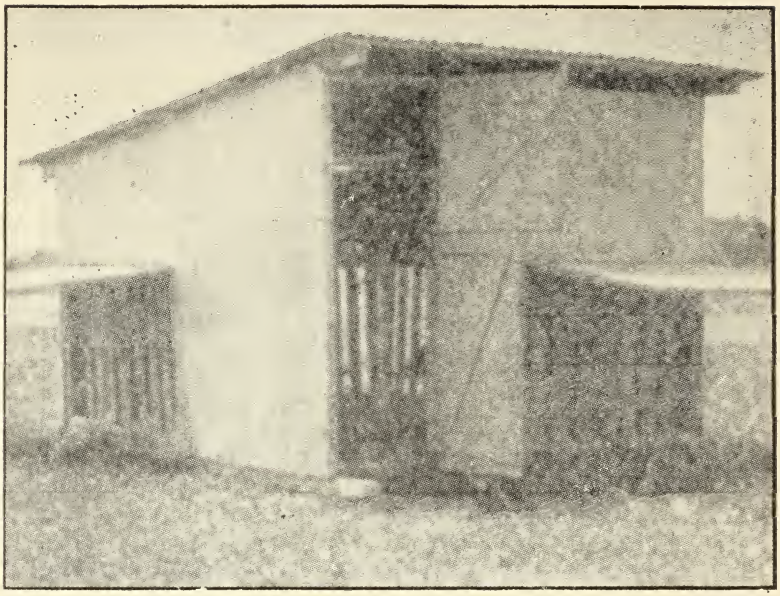

Figure 24. Texas shed-roof portable farrowing house.

BILL OF MATERIALS FOR TEXAS SHED-ROOF PORTABLE FARROWING HOUSE
(8 feet wide, 7 feet deep)

No. pieces	Dimensions
2	4″ x 4″ x 10′ for runners
2	2″ x 4″ x 4′6″ for frame
2	2″ x 4″ x 3′6″ for frame
2	2″ x 4″ x 8′ for frame
2	2″ x 4″ x 7′ for guard rail
1	2″ x 4″ x 6′8″ for guard rail
6	1″ x 8″ x 8′ for back wall
26	1″ x 8″ x 7′ for floor and ends
13	1″ x 8″ x 8′ for roof

Hardware:

4 sheets galvanized roofing 2′ x 8″ for roof
5 pounds lead-head roofing nails for roof
5 pounds 10-penny nails
5 pounds 8-penny nails
3 pounds 20-penny nails

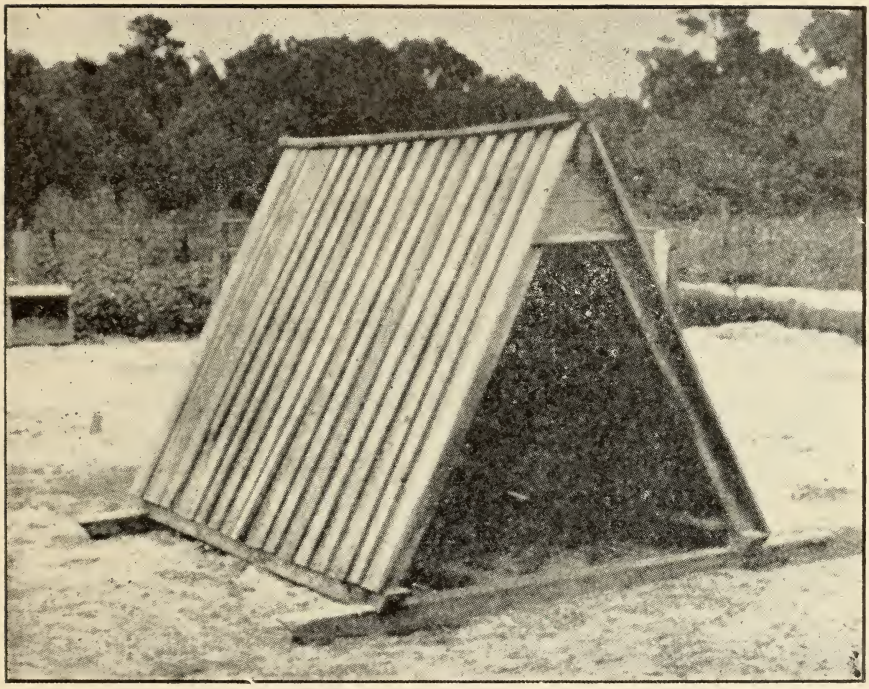

Figure 25. The A-shaped hog house is desirable for use with sow and pigs and grazing shoats.

BILL OF MATERIAL FOR IMPROVED A-TYPE HOUSE

No. pieces	Dimensions	Board feet
2	4″ x 4″ x 10′ for runners	28*
1	2″ x 6″ x 8′ to cover side doors	8
5	2″ x 4″ x 16′ for frame work and bracing	54
1	1″ x 12″ x 18′ for ridge	18
8	1″ x 12″ x 16′ for siding and doors	128
1	1″ x 12″ x 10′ for front door	10
6	1″ x 8″ x 16′ shiplap for ends	64
9	1″ x 6″ x 16′ rough fence planks for floor	72
16	1″ x 4″ x 16′ for bracing and slats	86
		468

*All board feet were figured to nearest even foot above actual number of feet when fractions of a foot resulted.

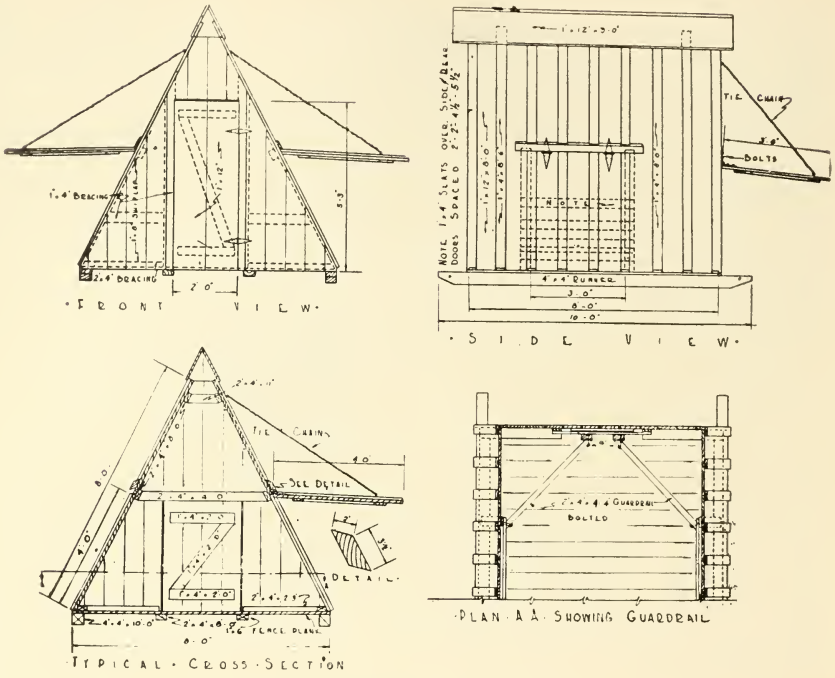

Figure 26. Improved "A" type house.

References: Agricultural Education, Volume 12, No. 4, December 1935, Clemson, South Carolina.

Florida Agricultural Experiment Station Bulletin 236, "Swine Production in Florida," June 1931, Gainesville, Florida.

Stocker or fattening hogs should be provided with protection from cold weather in winter and from the heat in the summer. This protection may be afforded by the use of farrowing houses when not being used by sows, or by construction of separate houses for winter protection as illustrated in figure 27 and constructing a shade with brush or straw for summer protection if shade trees are not available as illustrated in figure 28.

Troughs are very important in feeding hogs. There are two general types of troughs, the V-type and the flat-botton. The V-type is usually preferred as a milk or slop trough and the fla-bottom is preferred as a water trough.

Figure 27. Combination movable winter and summer shade for hogs, with back raised in hot weather. With back let down and with one or both ends boarded up, this makes a good winter shed.

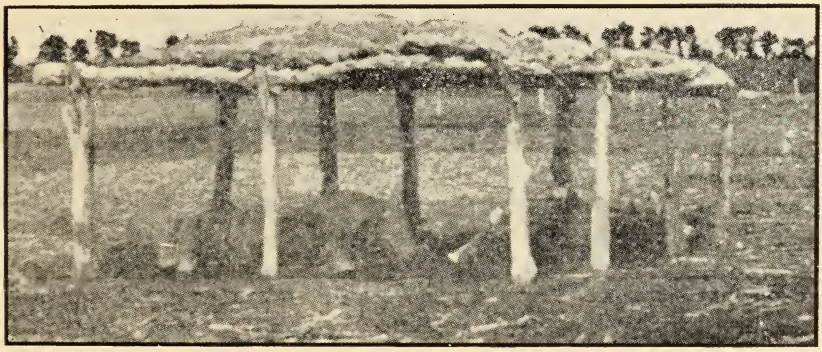

Figure 28. An economical shed for shade.

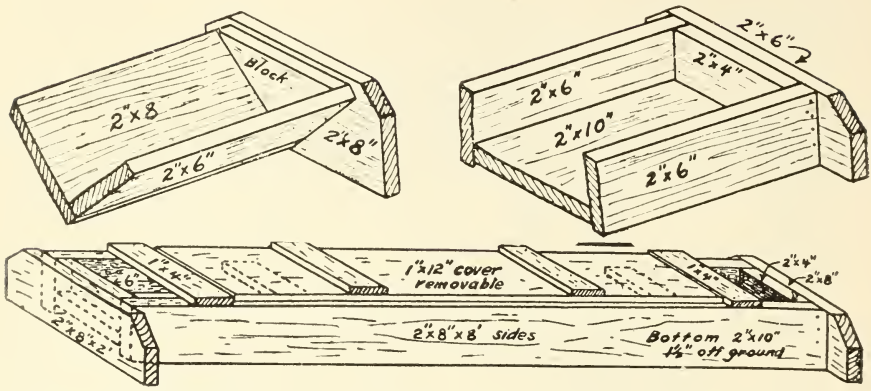

Figure 29. One end of V-shaped trough (left). One end of flat-bottom trough (right); Flat-bottom trough.

Pig Creeps: The use of pig creeps is very useful in feeding small pigs in that they are separated from the sows at feeding time. Creeps covered with wire will afford protection from chickens. The pig creep is illustrated in figure 30.

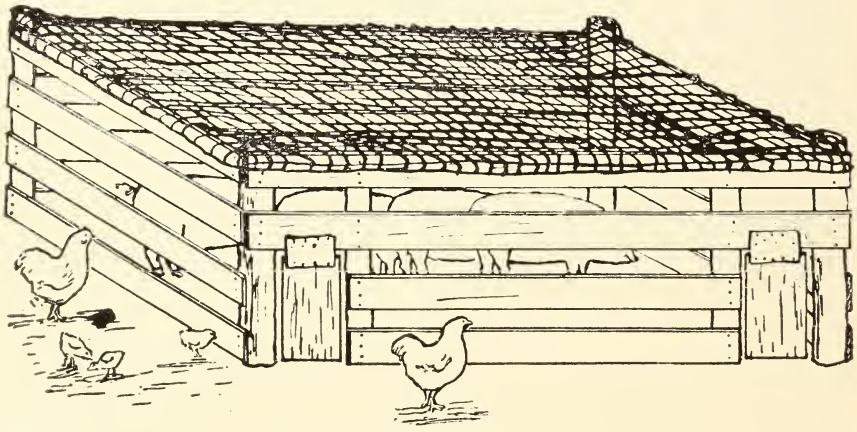

Figure 30. Wire-covered pig creep

Self-feeders: Self-feeders are used in many cases in feeding hogs. Self-feeders are great labor savers and render valuable service as a container in the field for protein supplements while crops are being hogged down. Feeders should be built on skids so that it may be moved from one place to another to prevent the formation of mud holes at the feeding place. Figures 31, 32 and 33 show the plan and material required in constructing two types of self-feeders.

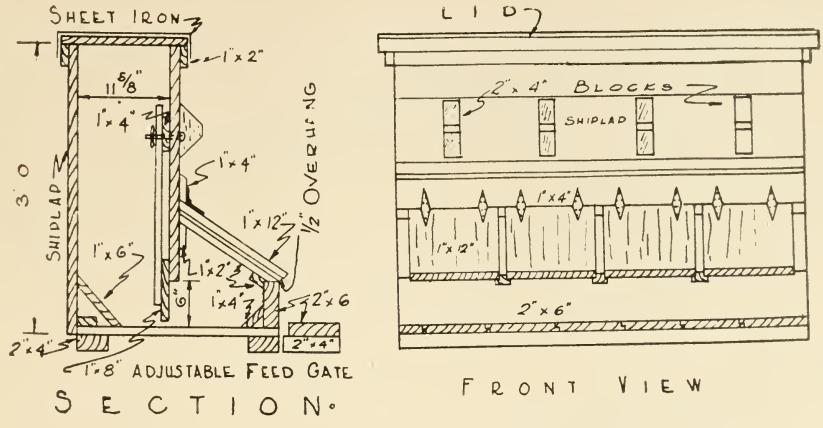

Figure 31. Improved self-feeder.

Reference: Agricultural Education, Volume 12, No. 4, December 1935. Clemson, South Carolina.

BILL OF MATERIALS FOR IMPROVED SELF-FEEDER

No. pieces	Dimensions	Board feet
1	½" x 2" x 14'	2
2	1" x 2" x 16'	6
1	1" x 2" x 12'	2
1	1" x 4" x 10'	4
1	1" x 8" x 4'	3
4	1" x 8" x 16' shiplap	44
1	1" x 12" x 14'	14
1	2" x 6" x 10'	10
1	2" x 12" x 8'	16
		101

Hardware:

4 pr. 4" strap hinges
1 pc. sheet iron 25" x 5' cut to 21" x 4'8"
3 ½" threaded wing nuts
Nails, 4-penny, 8-penny, and 16-penny

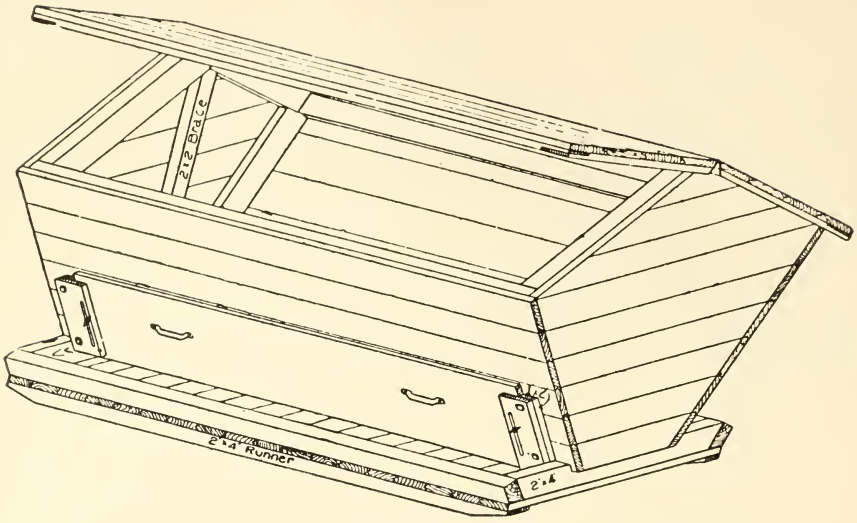

Figure 32. Two-way feeder.

BILL OF MATERIALS FOR TWO-WAY SELF-FEEDER

No. pieces	Dimensions
2	2" x 4" x 10' framing for ends
2	2" x 4" x 12' top frame and sides of feed trough
1	2" x 4" x 14' runners
1	2" x 4" x 10' ends of feed trough and center brace
13	1" x 4" x 12' flooring for ends, side and floor
2	1" x 4" x 12' for cleats and braces on top
1	1" x 8" x 12' deflector boards
1	1" x 10" x 6' adjustable slide
4	1" x 8" x 14' shiplap for top
1	2" x 3" x 12' support for deflector boards and for bracing

Hardware:

4 wing-nut bolts
1½ pair hinges
Nails

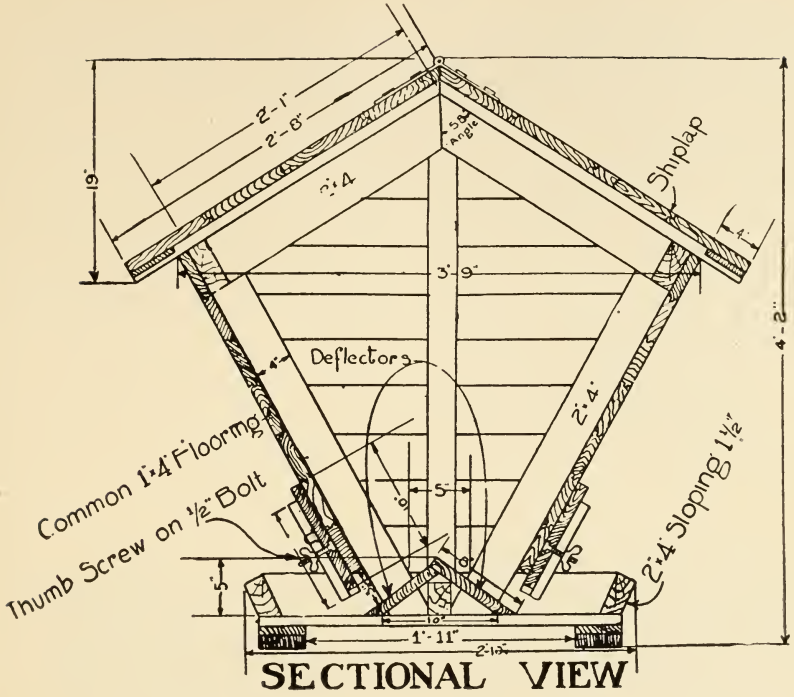

Figure 33. Cross-section of a two-way feeder.

The two-way feeder illustrated above is designed for feeding shelled corn and ground feed to a herd of 35 to 50 hogs. To feed a small number of hogs the size of the feeder may be reduced in proportion to the number of hogs to be fed.

Reference: Missouri Agricultural Experiment Station Bulletin 144, "Self-Feeders for Fattening Swine with Directions for Constructing a Self-Feeder" February 1917, Reprinted April 1920, Columbia, Missouri.

The arrangement of hog houses and feeding equipment is very important. Houses and feeding lots should be located in well drained places where plenty of sunshine is available. Feeding places should never be located in the shade of trees or in the houses provided for protection. Figure 14 page 35 illustrates a well planned feeding arrangement and pasture which may be very helpful in controlling disease and parasites.

PART IV

Care, Management, and Feeding of Brood Sow and Young Pigs

Profitable hog production is not possible unless a system of care and management is planned and operated. An important part of such a system is properly handling the sow and young pigs.

The time to start raising a litter of pigs is before the sow is bred. The sow should be in a medium condition, not too fat or too poor. Many hog producers breed the sow so as to get two litters of pigs per year. The following breeding dates are recommended by the Georgia Experiment Station for successful breeding of two litters per year:

April 20*—Start flushing sow for fall litter
May 1 to 10—Breed sow for fall litter
September 1—Farrow fall litter
October 20 to November 1—Wean fall litter
October 20*—Start flushing sows for spring litter
November 1 to 10—Breed the sow for spring litter
March 1—Farrow spring litter
April 20 to May 1—Wean spring litter

It is just as important not to over-feed the sows during the gestation period as it is to feed a well-balanced ration. Sows should not be allowed to become too fat or too thin during this period. A mature sow which is in thin, active condition at the beginning of the breeding season should be fed to gain 75 to 85 pounds by farrowing time. Most of this gain should be made during the last 4 or 6 weeks of the gestation period rather than during the first part, for most of the growth of a litter occurs then.

Plenty of clean fresh water should be furnished the brood sow and the supply should be conveniently accessible so that they will take enough for their body requirements.

Brood sows should always be supplied with salt, which may best be fed in a suitable box or self-feeder so they can get what they need. Iodized salt is preferable to common salt. In many cases rations fed are low in a calcium and phosphorus, making it necessary to supply the ration with these minerals. These minerals are very important in the ration of a brood sow.

An abundance of exercise during the gestation period is necessary if thrifty pigs are to be expected. Sows may be forced to exercise by feeding at a point quite a long ways from their sleeping quarters. By feeding ear corn, and making the proper allowances, sows will spend considerable time searching for the last kernels. This will keep the sow on her feet and is good for her health.

Care at farrowing time is very important. The sow should be separated from the rest of the herd at least three days before she is to farrow. The farrowing place should be sufficiently warm so that a deep nest is not necessary to prevent the newborn pigs being chilled, for they may be crushed in a deep bird-like nest. Cut straw or hay, chaff and leaves are the best for bedding. Every farrowing pen should be supplied with fenders to protect the

*Flushing is a practice of increasing the feed in order that the sow may be in good flesh or gaining in weight. This practice seems to stimulate the reproductive organs which results in most cases in producing larger litters.

little pigs during and after farrowing. These consist of 2" x 8" planks fastened as shelves about 8 inches from the floor along all sides of the farrowing pen.

A short time before farrowing the sow should be fed a mixture containing at least one-third by weight of wheat bran. Feed about the same volume of this mixture as the sow previously received. It will keep her satisfied and in a good laxative condition.

At birth, pigs have long sharp tusks and so far as is known are of no benefit to the pigs. On the other hand, they are apt to lacerate the udder of the sow and also to cut the other pigs as they tussle among themselves. Many hogmen remove these tusks close to the gums with nippers made for the purpose, as illustrated in figure 34. One should not injure the gums for such cuts make a very good place for infection to set in.

The sow should receive no feed for about 24 hours after farrowing, but she should be supplied with all the lukewarm water she will drink. After the first day she should be given a small amount of wheat bran and shorts or a mixture of bran, ground grain and a little tankage, gradually increasing the amount as her milk flow grows larger, until after 10 to 14 days she will be on a full ration. Many pigs are lost each year through feeding the sow too heavy during the first two weeks.

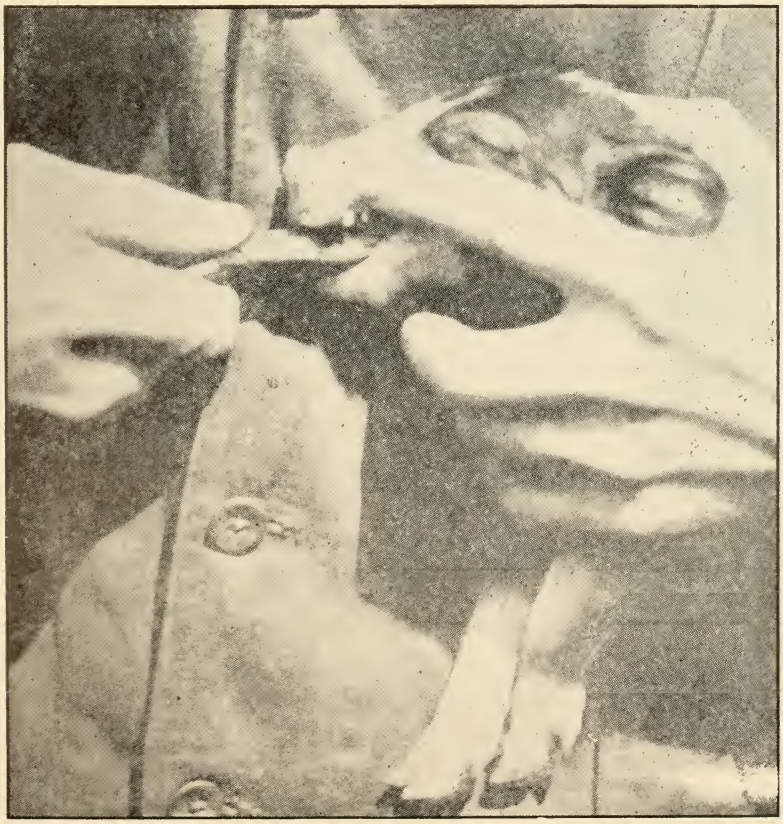

Figure 34. Removing temporary tusks.

Young pigs should be provided with plenty of exercise, especially when well fed, or a number are sure to die from thumps. This needed exercise may be provided by placing the sow and litter on pasture, being careful not to allow the young pigs out in the weather if cold or damp. Care should be taken to keep the lot and feeding pens sanitary.

References: Wisconsin Agricultural Experiment Station Bulletin 400, "Feed and Care of the Brood Sow and Litter," Madison, Wisconsin, July 1928.

Louisiana Extension Circular 144, "Care and Management of Hogs in Louisiana," Baton Rouge, Louisiana, Revised June 1935.

Pig Production Studies

The Indiana Agricultural Experiment Station has conducted experiments dealing with the problems (1) the effect of age of sows on productivity, and (2) the effect of weight at birth in the development of pigs from birth to weaning.

EFFECT OF AGE ON THE PRODUCTIVITY OF SOWS*

	Age of sows		
	1 year	2 years	3 to 5 years
Farrowing record			
Number of sows farrowed pigs	125.00	103.00	129.00
Number pigs farrowed per litter	7.78	8.38	10.46
Average weight of pigs farrowed	2.50	2.70	2.60
Percentage strong	63.70	70.76	65.81
Percentage born dead	4.96	4.91	6.54
Percentage died during suckling	42.26	27.46	34.40
Percentage weaned	60.83	67.62	60.21
Weaning record			
Number sows weaned pigs	117.00	99.00	126.00
Average number pigs in weaned litter	6.54	8.13	8.27
Average weight of litters weaned	125.96	189.33	180.77
Average weight of pigs weaned	23.50	28.29	27.85
Percentage strong	68.55	86.67	84.75
Percentage medium	25.18	10.15	12.29
Percentage weak	6.26	3.15	2.94

*Sows in Experimental Swine Farm Herd (1921-1934.)

THE EFFECT OF WEIGHT AT BIRTH ON THE DEVELOPMENT OF PIGS FROM BIRTH TO WEANING* (56 days)

Birth weight pounds	Number pigs farrowed	Percentage born dead	Percentage died during suckling	Percentage weaned	Average weaning weight pounds	Average daily gain during suckling pounds
1.00	56	46.43	53.57	.00	.00	.00
1.25	107	14.02	84.11	1.87	8.63	.13
1.50	270	15.93	71.11	12.96	18.42	.30
1.75	291	7.90	58.08	34.02	19.97	.33
2.00	674	6.08	44.66	49.26	20.91	.34
2.25	832	4.33	32.33	63.34	22.78	.37
2.50	1,531	4.38	28.22	67.40	24.49	.39
2.75	1,157	3.54	22.30	75.16	26.24	.42
3.00	1,354	4.14	18.54	77.32	27.50	.44
3.25	587	2.73	14.82	82.45	29.39	.47
3.50	426	3.05	11.27	85.68	30.22	.48
3.75	143	2.80	13.29	83.91	30.86	.48
4.00	93	1.08	15.05	83.87	34.72	.55
4.25	28	3.57	10.71	85.72	36.72	.58
4.50	2	.00	.00	100.00	30.00	.46
4.75	2	.00	.00	100.00	38.67	.61
Average	—	5.07	28.63	66.30	26.14	.42

*Litters in Experimental Swine Farm Herd (1921-1935.)

Reference: Indiana Agricultural Experiment Station Bulletin 412, "Feeding and Management Experiment with Brood Sows and Litters," Lafayette, Indiana, March 1938.

Method of Handling Sows and Young Pigs

Conducted by: Florida Agricultural Experiment Station.

Conducted at: Gainesville, Florida.

Procedure and Conditions: Records were kept of birth weights, and weekly weights were taken of individual pigs until they reached the feeder stage. There was found to be a significant difference in the rate of growth of spring and fall-farrowed pigs.

Results:

A COMPARISON OF SPRING AND FALL LITTERS

	Sow No.	Spring			Fall		
		No. pigs raised in litter	Av. wt. at birth	Av. wt. at 8 weeks	No. pigs raised in litter	Av. wt. at birth	Av. wt. at 8 weeks
Mature sows			Lbs.	Lbs		Lbs.	Lbs.
Duroc-Jersey	16	10	3.80	44.40	10	3.08	20.70
Poland China	33	3	4.17	52.27	5	3.22	29.72
Poland China	18	8	3.19	32.30	10	2.77	19.60
Poland China	122	8	3.01	29.81	7	2.81	25.57
Average	—	7.25	3.45	40.61	8	2.95	22.83
Gilts (first litter in spring, second in fall)							
Duroc-Jersey	24	9	2.61	30.97	10	2.92	27.61
Poland China	25	8	3.75	35.45	8	2.62	20.63
Poland China	36	7	2.40	25.00	8	2.43	19.40
Poland China	3	8	3.13	25.80	7	3.30	21.60
Poland China	29	6	3.00	28.60	7	2.74	24.40
Poland China	17	8	2.70	27.43	7	2.71	21.80
Average	—	7.67	2.93	29.02	7.83	2.78	22.79

Reference: Florida Agricultural Experiment Station 1939 Annual Report, pages 75 and 76, June 30, 1939, Gainesville, Florida.

The Effect of Rations and Management During Gestation

Conducted by: Purdue University Agricultural Experiment Station.

Conducted at: Experimental Swine Farm, Lafayette, Indiana.

Purpose: To determine the effect of rations, effect of exercise, and effect of condition during gestation.

The following comparisons were made:

1. Effect of rations during gestation
   a. Shelled corn alone
   b. Shelled corn 2/3 and whole oats 1/3 by weight
   c. Shelled corn 2/3 and whole oats 1/3 by weight, plus 5 percent tankage in the ration*
2. Effect of exercise during gestation
   a. Liberal exercise
   b. Limited exercise
3. Effect of condition during gestation
   a. Medium condition
   b. Fat condition

*Tankage increased to 8 percent for gilts during the last six weeks of gestation.

Procedure and Conditions: Only sows bred for spring farrow were used in the experiments. All the experiments were conducted on the Experimental Swine Farm, where a herd of fifty to sixty high grade Duroc-Jersey sows was available for the work. The herd was composed of approximately three-fifths mature sows and two-fifths spring gilts, when the experiments were started at breeding time in November. In all cases, the sows and gilts received well-balanced rations prior to starting the experiment.

The sows were fed in individual stalls, to control the condition of the sows for a study of the effect of medium and fat condition on their ability to farrow and raise pigs. The arrangement of lots was also different in the first five experiments. In these experiments, a study was made of the effect of exercise during gestation. It was necessary to confine some of the sows to small lots for limited exercise, while the others were forced to take liberal exercise by placing the sleeping quarters and the feeding floors at opposite ends of long lots. In the other experiments, all sows were forced to take exercise in the long lots; and all were fed for medium condition of flesh. The exercise lots were 30 feet wide by 30 rods long. The small lots, used for confinement of sows, measured approximately 30 by 40 feet.

The general procedure at farrowing time was to move the sows a few days prior to farrowing from their experimental lots to the central farrowing house. When the litter was approximately one to two weeks old, the sow and pigs were moved out to an individual house on either rye or timothy pasture. Timothy pasture was used in the earlier experiments and rye pasture in the later experiments. The sows and pigs were kept in the pasture lots during the suckling period. In the majority of the experiments, the experimental rations were discontinued at farrowing time and the lots received like rations during the suckling period. Measurement of results from feeding the different gestation rations was based on the number and strength of pigs farrowed, and the number of pigs weaned. In some of the experiments, the comparison of feeds was carried through both the gestation and suckling periods. In all cases, the sows and their litters were fed like rations. The sows were hand-fed, however, while the pigs were self-fed in open troughs. All pigs were weaned at 56 days of age, at which time they were finished in the experiments. The sows and their litters were divided into small groups during the suckling period. Each pasture lot contained from 2 to 4 sows and their litters. This arrangement saved pigs, and made it possible to keep accurate check on the litters.

Animals Used: The first experiment contained 18 mature sows. Each of the other experiments that followed contained 24 mature sows and 12 gilts. The sows and gilts in each experiment were divided into three equal groups for the ration comparison. Each of these groups was subdivided for the condition comparison. Further division was made in the various sub-groups for the exercise comparison.

The plan is presented in tabular form as follows:

RATION	CONDITION	EXERCISE
Group I—Corn alone 4 gilts, 8 sows	Sub-group A—medium 2 gilts, 4 sows	Lot 1—liberal 1 gilt, 1 two year old sow, 1 older sow
		Lot 2—limited 1 gilt, 1 two year old sow, 1 older sow
	Sub-group B—fat 2 gilts, 4 sows	Lot 3—liberal 1 gilt, 1 two year old sow, 1 older sow
		Lot 4—limited 1 gilt, 1 two year old sow, 1 older sow
Group II—Corn and oats 4 gilts, 8 sows	Sub-group C—medium 2 gilts, 4 sows	Lot 5—liberal 1 gilt, 1 two year old sow, 1 older sow
		Lot 6—limited 1 gilt, 1 two year old sow, 1 older sow
	Sub-group D—limited 2 gilts, 4 sows	Lot 7—liberal 1 gilt, 1 two year old sow, 1 older sow
		Lot 8—limited 1 gilt, 1 two year old sow, 1 older sow
Group III—Corn, oats and tankage 4 gilts, 8 sows	Sub-group E—medium 2 gilts, 4 sows	Lot 9—liberal 1 gilt, 1 two year old sow, 1 older sow
		Lot 10—limited 1 gilt, 1 two year old sow, 1 older sow
	Sub-group F—fat 2 gilts, 4 sows	Lot 11—liberal 1 gilt, 1 two year old sow, 1 older sow
		Lot 12—limited 1 gilt, 1 two year old sow, 1 older sow

CONDITION OF SOWS DURING GESTATION AS AFFECTING LITTERS PRODUCED

Average of five experiments

Farrowing record	Sows in medium condition							Sows in fat condition						
	1	2	3	4	5	Total	Av.	1	2	3	4	5	Total	Av.
Number of litters	10	15	15	14	16	70	—	6	17	17	18	15	73	—
Total number of pigs	86	122	143	127	147	625	8.93	58	136	154	179	129	656	8.99
Average weight of pigs	2.33	2.40	2.79	2.67	2.81	—	2.63	2.53	2.36	2.52	2.54	2.87	—	2.56
Strong pigs	55	61	117	82	112	427	—	44	70	96	90	98	398	—
Medium pigs	18	35	12	27	20	112	—	6	41	27	56	14	144	—
Weak pigs	11	21	8	16	6	62	—	7	19	14	21	8	69	—
Dead pigs	12	5	6	2	9	24	—	1	6	17	12	9	45	—
Weaning record														
Number sows weaned pigs	10	14	15	14	16	69	—	6	16	12	17	15	66	—
Total number of pigs	61	92	91	76	111	431	6.25	39	74	66	94	88	361	5.47
Average weight of pigs	24.53	23.07	30.01	28.51	24.75	—	26.13	23.11	26.41	29.93	30.74	24.00	—	27.24
Strong pigs	51	66	86	67	89	359.0	—	25	61	56	84	62	288	—
Medium pigs	9	22	1	9	15	56	—	10	12	10	6	19	57	—
Weak pigs	1	4	4	0	7	16	—	4	1	0	4	7	16	—

Farrowing record	Sows receiving liberal exercise							Sows receiving limited exercise						
	1	2	3	4	5	Total	Av.	1	2	3	4	5	Total	Av.
Number of litters	8	18	18	16	16	76	—	8	14	14	16	15	67	—
Total number of pigs	73	130	163	158	136	660	8.68	71	128	134	148	140	621	9.27
Average weight of pigs	2.41	2.39	2.79	2.64	2.86	—	2.65	2.41	2.37	2.48	2.54	2.82	—	2.54
Strong pigs	53	68	129	93	100	443	—	46	63	84	79	110	382.0	—
Medium pigs	10	41	22	41	16	130	—	14	35	17	42	18	126.0	—
Weak pigs	8	17	5	18	11	59	—	10	23	17	19	3	72.0	—
Dead pigs	2	4	7	6	9	28	—	1	7	16	8	9	41.0	—
Weaning record														
Number sows weaned pigs	8	16	16	16	16	72	—	8	14	11	15	15	63	—
Total number of pigs	46	86	101	101	90	424	5.89	54	80	56	69	109	368	5.84
Average weight of pigs	24.68	24.78	29.70	28.93	24.60	—	24.89	23.37	24.31	30.47	30.47	24.27	—	26.34
Strong pigs	35	68	89	89	69	350	—	41	59	53	62	82	297	—
Medium pigs	11	14	9	9	12	55	—	8	20	2	6	22	58	—
Weak pigs	0	4	3	3	9	19	—	5	1	1	1	5	13	—

RESULTS: EFFECT OF RATIONS AND MANAGEMENT DURING GESTATION.

Group	I				II				III			
Ration	Corn alone				Corn and oats				Corn, oats and tankage			
Sub-group	A		B		C		D		E		F	
Condition	Medium		Fat		Medium		Fat		Medium		Fat	
Lot	1	2	3	4	5	6	7	8	9	10	11	12
Exercise	Liberal	Limited	Liberal	Limited	Liberal	Limited	Liberal	Limited	Liberal	Limited	Liberal	Limited
No. sows farrowed	13	8	13	12	12	11	12	13	13	13	13	10
No. sows weaned pigs	13	8	10	9	12	11	12	12	12	13	13	10
Av. weight when bred	366.77	358.62	358.15	353.58	364.58	335.00	350.42	361.69	359.23	338.38	341.85	373.40
Av. total gain during gestation	57.54	80.63	141.00	148.42	51.82	61.18	124.83	129.62	73.77	91.77	158.69	167.40
Av. daily gain during gestation	.50	.71	1.25	1.30	.46	.54	1.10	1.14	.65	.81	1.40	1.46
Av. daily feed during gestation	4.75	5.45	8.53	8.65	5.24	5.14	8.50	8.44	5.25	5.42	9.17	8.83
Av. daily feed per 100 lbs. live weight during gestation	1.20	1.34	1.96	1.98	1.33	1.40	2.04	1.96	1.33	1.41	2.15	1.93
Av. weight loss of farrow	30.92	33.00	37.69	39.36	33.75	35.09	36.75	32.62	31.00	32.62	35.92	36.20
Av. weight loss during suckling	41.31	28.00	56.62	88.38	30.45	40.64	56.91	65.00	38.75	51.54	81.00	52.00
Av. total loss in weight	72.23	61.00	94.31	127.74	64.20	95.73	93.66	97.62	69.75	84.16	116.92	88.20

RESULTS: EFFECT OF RATIONS AND MANAGEMENT DURING GESTATION.

Group	I				II				III			
Ration	Corn alone				Corn and oats				Corn, oats, and tankage			
Sub-group	A		B		C		D		E		F	
Condition	Medium		Fat		Medium		Fat		Medium		Fat	
Lot	1	2	3	4	5	6	7	8	9	10	11	12
Exercise	Liberal	Limited	Liberal	Limited	Liberal	Limited	Liberal	Limited	Liberal	Limited	Liberal	Limited
Breeding record*												
No. sows bred	14	14	13	13	14	14	13	13	14	14	13	13
No. sows settled	13	12	13	12	12	11	12	13	13	13	13	10
Farrowing record												
No. sows farrowed	13	8	13	12	12	11	12	13	13	13	13	10
Av. no. pigs in litter	7.85	9.50	8.69	9.42	8.75	9.45	9.50	9.69	8.69	9.54	8.69	9.00
Av. litter weight	22.06	25.84	21.38	21.90	22.79	22.89	24.44	22.10	23.73	24.10	23.58	25.38
Av. pig weight	2.81	2.72	2.46	2.33	2.60	2.42	2.57	2.54	2.73	2.55	2.71	2.80
Strong pigs, percent	68.63	69.74	54.87	74.29	74.29	51.92	62.28	68.14	69.91	75.00	73.45	65.55
Medium pigs, percent	22.55	17.11	25.66	25.66	12.38	28.85	26.32	19.47	16.81	11.29	14.16	20.00
Weak pigs, percent	5.88	7.89	13.27	18.58	9.52	16.35	6.14	9.73	7.96	10.48	10.62	3.33
Dead pigs, percent	2.94	5.26	6.19	15.04	3.81	2.88	5.26	2.65	5.31	3.22	1.77	11.11
No. sows raised pigs	13	8	10	9	12	11	12	12	12	13	13	10
No. sows lost all pigs	0	0	3	3	0	0	0	1	1	0	0	0
No. sows aborted	0	4	0	0	0	0	0	0	0	0	0	0
No pigs per weaned litter	6.08	4.25	4.60	4.78	6.83	6.82	5.67	5.92	6.25	6.61	5.69	5.90
Av. litter weight	168.75	124.31	121.07	123.17	181.27	162.48	146.90	148.50	167.94	161.38	157.27	192.35
Av. pig weight	27.77	29.25	26.32	25.78	26.53	23.83	25.92	25.09	26.87	24.39	27.63	32.60
Strong pigs, percent	89.87	82.35	84.78	79.07	79.26	82.66	77.94	70.42	85.33	80.23	78.38	91.53
Medium pigs, percent	6.33	17.65	13.04	11.63	12.20	14.67	19.12	22.54	12.00	17.44	16.22	8.47
Weak pigs, percent	3.80	0.00	2.17	9.30	8.54	2.67	2.94	7.04	2.67	2.33	5.40	0.00
No. pigs weaned per sow farrowed	6.08	4.25	3.54	3.58	6.83	6.82	5.67	5.46	5.77	6.61	5.69	5.90
No. pigs weaned per sow bred	5.64	2.43	3.54	3.31	5.86	5.36	5.23	5.46	5.36	6.14	5.69	4.54
Percentage of pigs weaned	77.45	44.74	40.71	38.05	78.10	72.12	59.65	67.83	66.37	69.35	65.49	65.55

All sows and pigs had a ration composed of corn, wheat shorts, and tankage during the suckling period.

*Lots 1 and 2, 5 and 6, 9 and 10 each contained 10 sows and 4 gilts at breeding time.

Lots 3 and 4, 7 and 8, 11 and 12 each contained 9 sows and 4 gilts at breeding time.

Reference: Purdue University Agricultural Experiment Station Bulletin 413, "Feeding and Management Experiments with Sows and Litters," pages 3, 4, 5, 6, 7, 8, 9, 10, 14, and 15; tables 1, 2, 3, 4, 5, 6, 8 and 9, Lafayette, Indiana, May 1936.

Comparison of Corn Alone, Corn and Oats, and Corn with Oats and Tankage for Sows During Gestation

Conducted by: Purdue University Agricultural Experiment Station.

Conducted at: Experimental Swine Farm, Lafayette, Indiana.

Procedure and Conditions: High grade Duroc-Jersey sows bred for spring farrow were used in the experiment.

All sows were forced to take exercise in the long lots; and all were fed for medium condition of flesh. The exercise lots were 30 feet wide by 30 rods long. The small lots, used for confinement of sows, measured approximately 30 by 40 feet.

The general procedure at farrowing time was to move the sows from their experimental lots to the central farrowing house, a few days prior to farrowing. When the litter was approximately one to two weeks old, the sows and pigs were moved out to an individual house on either rye or timothy pasture. Timothy pasture was used in the earlier experiments and rye pasture in the later experiments. The sows and pigs were kept in the pasture lots during the suckling period. In the majority of the experiments, the experimental rations were discontinued at farrowing time, and the lots received like rations during the suckling period. Measurement of results from feeding the different gestation rations was based on the number and strength of pigs farrowed, and the number and strength of pigs weaned. In some of the experiments, the comparison of feeds was carried through both the gestation and suckling periods. In all cases, the sows and their litters were fed like rations. The sows were hand-fed, however, while the pigs were self-fed in open troughs. All pigs were weaned at 56 days of age, at which time they were finished in the experiments. The sows and their litters were divided into small groups during the suckling period. Each pasture lot contained from 2 to 4 sows and their litters. This arrangement saved pigs, and made it possible to keep accurate check on the litters.

The experimental rations were composed chiefly of home grown feeds. Yellow corn was used in all rations. In this test all sows and pigs had a ration composed of shelled corn 40 parts, ground corn 40 parts, wheat shorts 20 parts, and 60 percent tankage 10 parts. They also had a mineral mixture composed of wood ashes 10 parts, 16 percent superphosphate 10 parts, and com-

Results:

COMPARISON OF CORN ALONE, CORN AND OATS, AND CORN WITH OATS AND TANKAGE FOR SOWS DURING GESTATION

	Corn ⅔ whole oats ⅓ 60% tankage 1/20	Corn ⅔ whole oats ⅓	Corn alone
Amount of feed (lbs.)			
Corn	416	454	611
Oats	208	227	—
Tankage	32	—	—
Average number pigs per litter	10.7	9.1	8.7
Average weight per pig (lbs.)	2.56	2.65	2.52
Percent strong pigs	64.4	70.3	59.9
Percent dead pigs	8.4	5.5	8.9
Percent pigs reaching weaning age	72.9	73.4	66.2
Average gain per sow (lbs.)	55.3	53.8	59.6

Note: 23 mature sows bred; 22 mature sows settled; 1 sow died.

mon salt 1 part during the suckling period. The grain ration was hand-fed to the sows and self-fed to the pigs. The mineral mixture was self-fed in all lots.

Reference: Purdue University Agricultural Experiment Station Bulletin 413, "Feeding and Management Experiments with Brood Sows," pages 3, 4, 5, 12, and 16, tables 10 and 11, Lafayette, Indiana, March 1938.

Temporary Winter Pastures for Brood Sow

Conducted by: Louisiana Agricultural Experiment Station.

Conducted at: Jeanerette Station, Jeanerette, Louisiana.

Period: February 1 to April 19, 1936.

Purpose: To determine the value of wintering brood sows on various pastures.

Procedure and Conditions: Winter oats, winter legumes and winter cereals were compared as a pasture for brood sows. The sows in the dry Bermuda lot were practically under dry lot conditions, but one-half acre of Bermuda sod was available for exercise and there was a limited amount of grazing.

Results:

WINTER PASTURES FOR BROOD SOWS

	Winter oats	Winter legumes	Winter cereals	Dry Bermuda (limited)
	Lot 1	Lot 2	Lot 3	Lot 4
Number of sows	5	5	5	5
Average initial weight (lbs.)	303	303	302	298
Average final weight (lbs.)	366	349	361	337
Average gain (lbs.)	63	46	59	39
Average daily gain (lbs.)	.94	.71	.89	.55
Average daily feed:				
Rice bran (lbs.)	1.85	1.88	1.83	3.07
Corn (lbs.)	.93	.94	.92	1.53
Protein mixture (lbs.)	.19	.19	.18	.31
Total	2.94	3.01	2.93	4.91

Rates of seeding were as follows: Lot 1, 2 bushels winter oats per acre; Lot 2, 30 pounds Austrian winter peas, 30 pounds Canadian peas, and 15 pounds hairy vetch per acre; Lot 3, 1½ bushels winter oats, ½ bushel winter barley, and 10 pounds Italian rye grass per acre.

Reference: Louisiana Agricultural Experiment Station Bulletin 303, "Pork Production," pages 16 and 17, table 6, Baton Rouge, Louisiana, November 1938.

Pastures for Sows and Young Pigs

Conducted by: Louisiana Agricultural Experiment Station.

Conducted at: Baton Rouge, Louisiana.

Period: April 3 to May 9, 1933.

Purpose: To compare white clover pasture, winter oats and rape, and alfalfa pasture for sows and pigs.

Procedure and Conditions: The experiment started when the pigs were about 3 weeks of age and ended at weaning time at 8 weeks of age.

Results:

PASTURES FOR SOWS AND SUCKLING PIGS

	Dry lot	Legume pasture clover or alfalfa	Oats and rape
Number of sows and litters	2	3	3
Number of pigs	14	24	21
Acres of pasture	—	1.5	1
Average weight of sows, April 3 (lbs.)	353.5	440.0	395.0
Average weight of sows, May 9 (lbs.)	319.5	412.0	357.0
Average loss in weight (lbs.)	34.0	28.0	38.0
Total weight of pigs, April 3 (lbs.)	144.0	249.0	192.0
Total weight of pigs, May 9 (lbs.)	437.0	877.0	712.0
Total gain of pigs (lbs.)	293.0	628.0	520.0
Average gain per pig (lbs.)	20.9	26.2	24.9
Gain per pig per day (lbs.)	.57	.73	.69
Net gain, sow and litter (lbs.)	225.0	545.0	406.0
Average gain per sow and litter (lbs.)	112.5	181.7	135.0
Feed per sow and litter (lbs.)	583.5	486.3	470.6
Pounds feed per 100 pounds gain	518.6	268.4	347.7

Reference: Louisiana Agricultural Experiment Station Bulletin 303, "Pork Production," pages 15 and 16, table 5, Baton Rouge, Louisiana, November 1938.

Effect of Age of Pigs on the Rate and Economy of Gains

Conducted by: Ohio Agricultural Experiment Station.
Conducted at: Wooster, Ohio.
Period: 1916-1917.

Purpose: To study the effect of age or weight of pigs full-fed in dry lot, on rate of gain, the amount of feed consumed per unit of increase in weight, the character of the gain produced, and to obtain information relative to the factors influencing the weight at which pigs that are full-fed from birth should be slaughtered.

Procedure and Conditions: Pigs Used: Purebred Duroc-Jersey barrows from related dams were used. Those with the least possible difference in weight, age, thrift and uniformity were chosen for the experiments.

Quarters: Until the individual feeding was started in the first two experiments, the pigs were housed in "A" houses and allowed to run on a small bluegrass plot. During the day their dams were turned out on a larger area of bluegrass. While fed individually the pigs were kept in two 10 by 12 feet pens of a central house having a concrete floor. Wooden over-lays on which the pigs slept were provided during the winter. They were also allowed the run of a small dry lot in which the feed troughs were located. The quarters were cleaned daily. A small amount of straw was used for bedding.

Weighing: The pigs were weighed weekly. Their first weights were taken the day after they were farrowed. When the individual feeding was started the weighing time was changed to the same day of the week for all the pigs. The weights were taken just after noon. Care was taken to have the conditions at the time of weighing as nearly normal as possible. On weight-taking days, water was withheld from 10 A. M. until after weighing.

Feeding: The pigs were fed twice daily at regular hours. The amount fed was determined by what each pig would clean up readily and without

waste. All proportions were determined by weight. The feeds were mixed dry. The daily feed for each pig was weighed out into morning and evening portions and just before feeding was mixed with sufficient water to thoroughly moisten it; during cold weather warm water was used. With the exception noted, drinking water was kept before the pigs at all times.

Feeds Used: Feeds used in this experiment were ground corn, tankage, linseed meal, middlings, and skim milk. The pigs were not fed all these feeds at one time. During the suckling period different combinations of these feeds were used. Some received corn, linseed meal and tankage while others received corn middlings, and tankage, supplemented with skim milk. The results of the different rations were not tabulated separately. The main rations consisted of ground corn, middlings and tankage.

Results:

EFFECT OF WEIGHT ON RATE AND ECONOMY OF GAINS

	From birth to 100 lbs. in weight	100 lbs. to 200 lbs. in weight	200 lbs. to 300 lbs. in weight	300 lbs. to 400 lbs. in weight	400 lbs. to 500 lbs. in weight
Number of pigs	37	30	23	16	7
Average no. days required	137.33	59.20	54.27	57.66	65.83
Average initial weight	2.65	100.39	201.53	301.50	402.02
Average final weight	100.25	200.95	299.93	398.79	504.64
Total gain per pig	97.64	100.58	98.40	97.30	102.61
Average daily gain	.80	1.69	1.82	1.37	15.71
Total feed per pig	296.73	360.59	408.79	457.51	524.09
Daily feed per pig	2.15	6.09	7.55	7.99	8.00
Feed daily per 100 lbs. wt.	4.21	4.04	3.01	2.28	1.76
Feed per 100 lbs. gain	304.1	358.8	414.5	410.03	510.10
Number killed	7.0	7.0	7.0	9.0	7.0
Average dressing percent	76.86	82.42	85.59	87.56	87.69

The above tabulation is an average of three separate experiments conducted at the Ohio Agricultural Experiment Station. Experiment 1 was conducted in 1916 using spring pigs. Experiment 2 was conducted in the fall of 1916 using fall pigs in this experiment. Experiment 3 was conducted in the fall of 1917 using fall pigs in the experiment.

Reference: Ohio Agricultural Experiment Station Bulletin 335, "Effect of Age of Pigs on the Rate and Economy of Gains," pages 545, 546, 548, and 550, tables 2, 3, and 5, Wooster, Ohio, March 1919.

Value of Fall Sown Rape Pasture for Pigs

Conducted by: Alabama Agricultural Experiment Station.

Conducted at: Auburn, Alabama.

Period: January 6 to March 28, 81 days.
March 28 to April 18, 21 days.

Purpose: To determine the value of fall sown rape pasture for pigs.

Procedure and Conditions: Dwarf Essex rape sown in drills on sandy upland, October 13, 1900, was ready for pasturage January 6, 1901, when four pigs, weaned about three weeks before, were confined on it with hurdles which were moved about once a week. The first growth of rape afforded pasturage until March 28. The second growth, on land previously grazed over, afforded pasturage from March 28 to April 18.

Throughout the whole period that the pigs were on rape they received

also about a half ration of corn meal. Less rapid and more expensive gains were made in March, when the plants had become tough and ready to seed, than during January and February. The most rapid and economical growth was made during the brief period, while the succulent second growth was being consumed.

March 28, the rape having begun to blossom and having become relatively unpalatable, the hurdles were placed about the rape grazed in January and part of February, on which the second growth was by this time in good condition for pasturage, though small.

Results:

FALL SOWN RAPE PASTURE FOR PIGS

	Rape pasture	
	First growth	Second growth
Number of pigs	4.00	4.000
Total gain (lbs.)	181.00	82.000
Total gain per acre (lbs.)	567.00	491.000
Gain per day per pig (lbs.)	.558	.976
Acres per pig for period grazed	.080	.042
Feed consumed		
Rape pasture	.319	.167
Corn meal (lbs.)	524.00	168.000

Reference: Alabama Agricultural Experiment Station Bulletin 122, "Grazing and Feeding Experiments with Pigs," pages 12 and 13, Auburn, Alabama, January 1903.

To Compare Rations for Weanling Pigs on Dry Lot and Pasture

Conducted by: Missouri Agricultural Experiment Station.

Conducted at: Columbia, Missouri

Purpose: To determine whether any dry lot ration would give as good results as a ration containing green foliage.

Procedure and Conditions: The hogs in lots I, II and III (dry lots) were fed 105 days while those in lot IV (on pasture) were on experiment 112 days. A mineral mixture composed of equal parts of ground limestone, bonemeal and salt was self-fed to all lots except lot I in which case the mineral was a part of the mixed supplementary concentrate. Shelled yellow corn was fed all lots. Lots I, II and III were self-fed corn and supplemented free choice while IV was full-fed by hand twice daily.

The rations were as follows:

Lot I	Lot II	Lot III	Lot IV
Dry lot	Dry lot	Dry lot	Rape and oats pasture
Corn	Corn	Corn	(Corn 12)
Mixed concentrate*	Milk	(Tank. 60)	(Tank. 1)
Milk		(L.O.M. 15)	
		(Alf.M. 10)	
		(C.S.M. 15)	

*Corn 67.5%, liver meal 15%, dried buttermilk 10%, Alfalfa meal 5%, mineral (equal parts ground bonemeal and salt) 2.5%.

Results:

RATIONS FOR WEANING PIGS IN DRY LOT AND PASTURE

	Lot I	Lot II	Lot III	Lot IV
Average initial weight (lbs)	31.7	32.3	31.9	36.06
Average final weight (lbs.)	177.14	146.07	131.18	174.00
Average daily gain per head (lbs.)	1.33	1.09	.87	1.23
Average daily feed (lbs.)	3.68	2.62	—	—
Per head (lbs.)	6.44**	6.12**	3.08	4.2
Feed per 100 lbs. gain (lbs.)				
Corn	276.08***	239.16	270.51	314.87
Supplement	483.20**	559.60**	83.03	26.24
Total			353.54	341.11

**Milk.

***Corn plus mixed concentrate.

Reference: Missouri Agricultural Experiment Station Bulletin 376, "Rations for Weanling Pigs," pages 4 and 5, table 2, Columbia, Missouri, January 1937.

Rations for Weanling Pigs

Conducted by: Missouri Agricultural Experiment Station.

Conducted at: Columbia, Missouri.

Period: 112 days in summer 1930.

Procedure and Conditions: During the summer of 1930, 5 lots of 10 weanling pigs each were self-fed shelled corn (yellow or mixed, usually yellow) in dry lot. Two different mixtures of feeds were used to furnish the protein needed to balance the corn consumed.

Supplement "A" consisted of equal parts of tankage, linseed oil meal, fish meal, liver meal, dried skim milk and alfalfa meal. The mixture contained 40 to 45 percent protein.

Supplement "B" was made up of tankage 3 parts, linseed oil meal 1 part, and alfalfa meal 1 part, and contained about the same percentage of protein as supplement "A."

It will be noticed that there were three feeds in supplement "A," not found in supplement "B" viz, fish meal, dried skim milk and liver meal, previous experiments having indicated that each of these feeds was especially valuable in rations for young pigs. Corn was placed in one compartment of the feeder and the mixed supplement in another so the hogs could choose between the carbohydrous and nitrogenous concentrates.

All lots were self-fed a mineral mixture of equal parts precipitated calcium carbonate, decalcium phosphate, and salt. The nitrogenous supplements were fed to the various lots as follows:

	Supplement "A"	Supplement "B"
Lot I	First 28 days	Last 74 days
Lot II	First 56 days	Last 56 days
Lot III	First 74 days	Last 28 days
Lot IV	Entire period (112 days)	
Lot V		Entire period (112 days)

Results:

RATIONS FOR WEANLING PIGS

10 pigs per lot	Lot I	Lot II	Lot III	Lot IV	Lot V
Av. initial weight (lbs.)	30.9	30.7	30.9	30.9	31.1
Av. final weight (lbs.)	208.13	209.40*	198.40	218.8	195.78
Av. daily gain per head (lbs.)	1.58	1.56	1.50	1.66	1.47
Av. daily feed per head (lbs.)	5.27	5.38	4.91	5.50	4.76
Feed per 100 lbs. gain (lbs.)					
Corn	278.05	273.31	258.03	267.03	265.51
Supplement "A"	19.07	36.09	59.76	64.33	——
Supplement "B"	35.83	23.92	10.50	——	58.38
Total	332.95	333.32	328.29	331.36	323.89

*Average nine pigs only; one pig removed from this lot October 16 because of not doing well. It was posted by the Veterinary Department and found to be affected with necroenteritis. The entire record of this pig was eliminated from the data.

Reference: Missouri Agricultural Experiment Station Bulletin 376. "Rations for Weanling Pigs," pages 5 and 6, table 3. Columbia, Missouri, January 1937.

Self-feeding Compared with Hand-feeding Sows and Litters During Suckling Period

Conducted by: United States Experiment Farm.

Conducted at: Beltsville, Maryland.

Period: 1921 and 1922.

Purpose: To compare self-fed with hand-fed sows and litters during the suckling period.

Procedure and Conditions: In this experiment the following breeds were used: Duroc-Jersey, Poland China, Chester White, Hampshire, Tamworth, and Berkshire. In addition to these some grade sows and litters were on test. In most of the tests, pastures of various kinds were used. Pastures were usually rye, but a mixture of oats and some native grasses was used.

In the self-fed lots, certain feeds were constantly accessible in self-feeders to the sows and pigs during the entire period. The sows and pigs in the hand-fed lots were given twice daily all they would readily eat of identically the same feeds used in the self-fed lots. In the hand-fed lots, the young pigs had access to self-feeders placed in creeps providing supplementary feed after they had reached three weeks of age. Corn alone was provided in the self-feeders for the young pigs for the first two or three weeks. After this time the protein feeds were added.

Results:

SELF-FEEDING COMPARED WITH HAND-FEEDING SOWS AND LITTERS DURING SUCKLING PERIOD

	Hand-fed	Self-fed
Total number of lots on test	7	3
Total number of sows with litters	55	22
Average duration of test (days)	41	44.33
Initial number of pigs per sow	6.5	7.1
Final number of pigs per sow	6.2	6.9
Average age of pigs at start of test (days)	29.62	31.73
Average initial weight of sows (lbs.)	338.58	320.73
Average final weight of sows (lbs.)	351.35	309.14
Average gain or loss per sow (lbs.)	21.77	—11.59
Average daily gain or loss per sow (lbs.)	0.32	—0.26
Average initial weight of pigs (lbs.)	13.22	12.59
Average final weight of pigs (lbs.)	33.60	30.60
Average gain per pig (lbs.)	20.38	17.01
Average daily gain per pig (lbs.)	.51	.39
Pork produced per sow and litter (lbs.)	145.45	109.00
Feed consumed per sow and litter (lbs.)	641.54	657.36
Corn (lbs.)	531.58	436.68
Middlings (lbs.)	46.38	174.18
Tankage (lbs.)	78.76	44.68
Mineral mixture (lbs.)	2.82	1.82
Feed per 100 lbs. gain (sow and litter) (lbs.)	441.06	603.09
Corn (lbs.)	353.09	400.63
Middlings (lbs.)	31.88	159.80
Tankage (lbs.)	54.15	40.99
Mineral mixture (lbs.)	1.94	1.67

Reference: U. S. Department of Agriculture Farmers' Bulletin 1504, "Self-Feeding Versus Hand-Feeding Sows and Litters," pages 2 and 3, table 1, August 1926.

PART V

Feeding Pigs Through the Fattening Period

In this section consideration is given to the feeding of young pigs after the weaning period, through the fattening period. After pigs have passed the weaning stage a well planned feeding program is one of the most important factors of successful pork production.

In setting up a feeding program, consideration should be given to several points of feeding. Points that should be considered are: (1) carbohydrate feeds, (2) protein supplements, (3) mineral supplements, (4) soiling crops, (5) permanent pastures, (6) temporary pastures and feed preparation and methods of feeding. After careful consideration is given to these points a well planned hog feeding program should result.

Carbohydrate Feeds for Fattening Hogs

Carbohydrates are composed of carbon, hydrogen and oxygen with the ratio of hydrogen to oxygen the same as in water. Carbohydrate feeds commonly used in feeding hogs are: corn, small grains, seeds of legumes, and potatoes.

Carbohydrates are primarily fat and energy producing nutrients. These nutrients are stored in the grain by the plant and the hog utilizes the stored nutrients. Hogs require large amounts of carbohydrate feeds during the fattening period, especially if they are to make satisfactory gains.

Corn is an important carbohydrate feed, and often when hog feeding is discussed corn is the main feed considered, and is often the only feed given hogs. Corn alone does not contain sufficient quality, quantities, and right proportions of all the food elements to supply the needs of hogs if they are to make satisfactory gains. There are other carbohydrate feeds that may compare favorably with corn as a hog feed. All carbohydrate feeds should be considered, along with the economy of their production, before deciding which feed or feeds to use.

Substitutes for Corn for Growing and Fattening Pigs

Conducted by: Ohio Agricultural Experiment Station.

Conducted at: Wooster, Ohio.

Period: From 1920s up to 1930s.

Purpose: To secure information on various feeds as complete or partial substitutes for corn in swine feeding.

Procedure and Conditions: In the tabulation given below a number of experiments conducted at the Ohio Agricultural Experiment Station are summarized. They were conducted over a considerable period of time, beginning in the 1920s and running up into the 1930s. The pigs were not fed in the same way throughout the different experiments; some were self-fed and others were hand-fed. All experiments were conducted in dry lots.

Results: SUBSTITUTES FOR CORN FOR GROWING AND FATTENING PIGS

	Complete Substitute						Partial Substitute		
	Corn	White hominy feed	Yellow hominy feed	Barley	Oats	Ground hulled oats	Corn, ground oats	Ground corn, ground hulled oats	Corn, wheat middlings
	Supplement	Supplement	Supplement	Supplement	Supplement	Supplement	Supplement	Supplement	Supplement
Number of comparisons	25	5	2	5	8	7	6	4	4
Pigs at start	226	58	29	45	75	50	61	38	28
Initial wt. per pig (lbs.)	54.4	57	54.5	55.8	53	50.9	58	58.7	77
Pigs at close of test	54	55	26	45	73	44	60	37	27
Final wt. per pig (lbs.)	199.1	194.	200.5	204.4	199.0	202.0	204.0	201.3	211.9
Average daily gain (lbs.)	1.17	1.20	1.13	1.12	.96	1.19	1.14	1.15	1.25
Days required to gain 160 lbs.	138.	134.	141.	143.	167	135.	141.	140.	128.
Daily feed per pig (lbs.)									
Corn	3.95	—	—	—	—	—	3.13	3.04	3.92
White hominy feed	—	4.23	—	—	—	—	—	—	—
Yellow hominy feed	—	—	3.85	—	—	—	—	—	—
Wheat middlings	—	—	—	—	—	—	—	—	1.03
Barley	—	—	—	4.09	—	—	—	—	—
Oats	—	—	—	—	4.35	—	1.08	—	—
Ground hulled oats	—	—	—	—	—	3.57	—	.85	—
Tankage	.37	.31	.28	1.22	.18	.16	.39	.36	.29
Linseed meal	.11	.06	.14	.08	.05	.05	.12	.09	—
Ground alfalfa	.11	.06	.15	.09	.12	.11	.15	.14	.02
Minerals	.06	.05	.05	.04	.06	.06	.07	.07	.02
Total	4.60	4.71	4.48	4.52	4.76	3.95	4.94	4.55	5.28
Feed per 100 lbs. gain (lbs.)									
Corn	338.53	—	—	—	—	—	274.92	264.88	312.79
White hominy feed	—	352.22	—	—	—	—	—	—	—
Yellow hominy feed	—	—	339.09	—	—	—	—	—	—
Wheat middlings	—	—	—	—	—	—	—	—	82.04
Barley	—	—	—	366.26	—	—	—	—	—
Oats	—	—	—	—	453.10	—	94.96	—	—
Ground hulled oats	—	—	—	—	—	300.70	—	73.65	—
Tankage	31.73	26.03	24.65	20.22	18.65	13.50	39.79	31.16	22.69
Linseed meal	9.66	5.17	12.33	6.92	5.23	3.73	10.33	8.16	—
Ground alfalfa	9.67	5.20	12.88	7.76	12.83	9.50	12.99	11.87	1.75
Minerals	5.06	3.66	4.86	3.36	6.01	4.97	6.34	5.88	1.60
Total	394.68	392.28	393.82	404.52	495.82	332.40	433.13	395.60	420.87

Reference: Ohio Agricultural Experiment Station Bulletin 607, "Substitutes for Corn for Growing and Fattening Pigs," pages 5, 7, 15, 17, 19, and 29, tables 1, 2, 7, 8, 9, and 16, Wooster, Ohio, September 1939.

Feeding Tests with Velvet Beans

Conducted by: Georgia Agricultural Experiment Station.

Conducted at: Experiment, Georgia.

Purpose: To determine the value of velvet beans in the ration for hogs.

Procedure and Conditions: Five groups of pigs were fed the following rations:

Lot 1
Shelled corn
Digester tankage
Mineral Mixture
Self-fed, free choice

Lot 2
Mixture of 50% shelled corn and 50% velvet beans
Ground digester tankage
Mineral mixture
Self-fed, free choice

Lot 3
Shelled velvet beans
Digester tankage
Mineral mixture

Lot 4
Shelled velvet beans
Mineral mixture
Self-fed, free choice

Lot 5
Shelled and cooked velvet beans
Mineral mixture
Self-fed, free choice

Results:

VELVET BEAN FEEDING TEST

	Lot 1	Lot 2	Lot 3	Lot 4	Lot 5
Av. gain per animal	214.4	181.9	88.6	55.8	120.7
Av. feed consumption per animal					
Corn (lbs.)	959.8	397.9	—	—	—
Velvet beans (lbs.)	—	397.9	362.2	261.4	505.7
Tankage (lbs)	30.0	81.1	161.0	—	—
Mineral mixture (lbs.)	1.2	1.4	3.9	3.6	4.4
Av. grading for fat hardening	Hard	Medium hard	Medium soft	Medium soft	Medium hard

Reference: Georgia Agricultural Experiment Station Circular 84, "Swine Feeding and Quality of Pork," page 2, Experiment, Georgia, March 1929.

Peanuts for Fattening Hogs in Dry Lot

Conducted by: Alabama Agricultural Experiment Station.

Conducted: On the farm of Parke Thompson, Goshen, Alabama.

Period: 1921-1923.

Purpose: To determine the amount of picked runner peanuts required to produce 100 pounds of gain on fattening hogs in the dry lot.

To compare the relative feeding value of runner peanuts alone; peanuts and corn; peanuts and tankage; and peanuts, corn and tankage.

To test the influence of the above rations on the quality of the carcass.

Procedure and Conditions:

Animals Used: All hogs were purebred Poland China of the large type.

Rations: The following rations were fed:

Lot 1—Runner peaunts, self-fed

Lot 2—Runner peanuts
Shelled corn
Free choice

Lot 3—Runner peanuts
60 percent tankage
Free choice
Lot 4—Runner peanuts
Shelled corn
60 percent tankage
Free choice

The hogs had access at all times to water and to a simple mineral mixture composed of equal parts by weight of air-slaked lime, salt, and charcoal.

Results:

PEANUTS FOR FATTENING HOGS IN DRY LOT

	Lot 1	Lot 2	Lot 3	Lot 4
Number of hogs to lot	6	6	6	6
	Lbs.	Lbs.	Lbs.	Lbs.
Average initial weight	104.0	105.1	103.9	104.9
Average final weight	259.2	249.8	271.3	268.6
Average daily gain per hog	2.03	1.92	2.30	2.17
Average daily feed per hog				
Runner peanuts	7.39	4.57	7.76	5.65
Shelled corn	—	3.29	—	2.48
60% tankage	—	—	.22	.15
Total	7.39	7.86	7.98	8.28
Feed for 100 pounds gain				
Runner peanuts	361.83	245.0	351.30	264.41
Shelled corn	—	165.9	—	112.66
60% tankage	—	—	11.06	7.30
Total	361.83	410.9	362.36	384.37

Unfortunately, a record of the amount of mineral mixture consumed was not kept in any of these experiments.

The hogs in experiment 1 were slaughtered at the plant of Swift and Company, Andalusia, Alabama. All carcasses were soft or oily.

The hogs from the second experiment were slaughtered at the plant of the Birmingham Packing Company, Birmingham, Alabama. All carcasses were soft or oily. The carcasses of lots 1 and 3 appeared somewhat softer than those of lots 2 and 4 but there was not enough difference to affect the commercial value.

Hogs in experiment 3 were sold to a local dealer. Slaughter data were not obtained, as the results of the two former experiments showed that these rations produced soft or oily carcasses.

Reference: Alabama Agricultural Experiment Station Bulletin 223, "Peanuts for Fattening Hogs in the Dry Lot," pages 2, 3, 4, 5, and 6, tables 1, 2, and 3, Auburn, Alabama, June 1924.

Sweetpotatoes As a Feed for Swine

Conducted by: Georgia Agricultural Experiment Station.
Conducted at: Experiment, Georgia.
Period: Test 1—November 1, 1927 to January 10, 1928.
Test 2—November 7, 1928 to January 16, 1929.
Test 3—October 12, 1933.
Test 4—March 5, 1930 to May 14, 1930.

Procedure and Conditions: This series of tests deals with the feeding of sweetpotatoes in different combinations. These tests were started in 1927 and continued to 1933. The same type pigs were used in all tests as nearly as possible.

Test 1. Composed of two lots, 12 purebred Poland China pigs to each lot. Average age, 230 days at start of test. Group 1 fed sweetpotatoes, digester tankage and mineral mixture, self-fed, free choice.

Group 2 fed shelled corn, digester tankage and mineral mixture, self-fed, free choice.

The mineral mixture composed of 75 pounds powdered wood charcoal, 6 pounds common salt, 6 pounds marble dust, 3 pounds flowers of sulphur, 6 pounds Glauber's salts, 3 pounds raw rock phosphate and 1 pound powdered copperas.

Pigs were weighed at 14-day intervals throughout the test. Porto Rico potatoes and Whatley Prolific corn were used. The pigs were fed in dry lot.

Test 2.—Composed of two lots, 10 purebred Poland China pigs to each lot. The first group was fed sweetpotatoes with mineral mixture supplement, free choice.

The second group received sweetpotatoes, digester tankage and mineral mixture. Both groups were fed in dry lot.

Mineral mixture same as used in Test 1.

Test 3. Composed of two groups, 9 pigs to each group. The potato lot composed of 6 purebred Poland China and 3 O. I. C. pigs; corn lot composed of 7 Poland China and 2 O. I. C. pigs. The pigs averaged 140 pounds each at the beginning of the test.

The pigs in this test were grazed on one acre of sweetpotatoes and one acre of corn. Yields were estimated at 30 bushels corn per acre and 90 bushels sweetpotatoes per acre. Both groups were allowed access to self-feeder containing digester tankage and mineral mixture. The mineral mixture was composed of equal parts by weight of marble dust, steam bonemeal, hardwood ashes and salt. The pigs in the potato field were hand-fed shelled corn at the rate of about 2 pounds per head daily.

Test 4. This test was composed of two groups of 9 pigs each. Pigs used in this test were Duroc-Jersey and of mixed Duroc-Jersey and Poland China breeding, fairly uniform in type. The average initial weight at start of tests was between 125 and 130 pounds. The pigs were weighed regularly at 14-day intervals, with triple weights at 1-day intervals for the start and close of the experiment.

Pigs were fed under dry lot conditions, first lot receiving sweetpotatoes and protein mineral supplementary mixture, free choice, self-fed, with shelled corn hand-fed once daily, 2 1/3 pounds per head. The second lot received shelled corn and the same protein supplementary mineral mixture, free choice, self-fed. Shelled corn for the first lot was hand-fed late in the afternoon. The protein mineral supplementary mixture contained 60 parts by weight of cottonseed meal, 15 parts fish meal, 7½ parts digester tankage, 7½ parts buttermilk, 7½ parts alfalfa leaf meal, 1 part common salt, 1 part marble dust and 1 part cod-liver oil.

Results:

	Test 1		Test 2		Test 3		Test 4	
	Sweetpotatoes vs. shelled corn		Sweetpotatoes vs. sweetpotatoes and tankage		Sweetpotatoes grazed and corn vs. corn grazed		Sweetpotatoes and corn vs. corn dry lot	
	Sweet-potatoes	Shelled corn	Sweet-potatoes no tankage	Sweet-potatoes and tankage	Sweetpotatoes grazed plus corn	Corn grazed	Sweetpotatoes plus shelled corn	Corn (no potatoes)
Length of test (days)	70	70	70	70	42	30	70	70
Number pigs in test	12	12	10	10	9	9	9	9
Average initial weight (lbs.)	96.9	98.5	105.2	105.4	140.9	139.6	126.6	129.1
Average final weight (lbs.)	145.6	207.1	122.7	156.3	213.5	180.7	220.2	251.1
Average daily gain (lbs.)	0.7	1.55	0.25	0.73	1.73	1.37	1.34	1.74
Average total gain per pig (lbs.)	48.7	108.6	17.5	50.9	72.6	41.1	93.6	121.9
Av. daily feed consumption per pig								
Sweetpotatoes (lbs.)	14.82	—	14.94	14.95	—	—	11.13	—
Sweetpotatoes grazed* (lbs.)	—	—	—	—	14.2	—	—	—
Shelled corn	—	6.27	—	—	1.95	—	2.33	7.15
Corn grazed* (lbs.)	—	—	—	—	—	6.2	—	—
Digester tankage (lbs.)	0.80	0.59	—	0.77	0.99	0.66	—	—
Mineral mixture (lbs.)	0.029	0.009	0.04	0.028	0.05	0.06	—	—
Supplement mixture (lbs.)	—	—	—	—	—	—	1.40	1.03
Feed per 100 lbs. gain (lbs.)								
Sweetpotatoes	2129.3	—	5974.3	2056.0	—	—	831.6	—
Sweetpotatoes grazed*	—	—	—	—	820.7	—	—	—
Shelled corn	—	404.6	—	—	114.6	—	174.0	410.9
Corn grazed*	—	—	—	—	—	452.6	—	—
Digester tankage	115.0	38.8	—	105.9	57.9	48.1	—	—
Minerals	4.19	0.61	17.71	3.92	3.09	4.59	—	—
Supplement mixture	—	—	—	—	—	—	104.5	59.4

*Assuming the estimated yields were correct and that all sweetpotatoes and corn was eaten.

Reference: Georgia Agricultural Experiment Station Bulletin 181, "Sweetpotatoes As a Feed for Swine," pages 5, 6, 8, 9, 10, and 14, tables 1, 2, 3, and 5, Experiment, Georgia, April 1934.

Sweetpotato Feeding Experiment with Hogs

Conducted by: Louisiana Agricultural Experiment Station.

Conducted at: Baton Rouge, Louisiana.

Period: Test 1—December 8, 1927 to January 19, 1928.
Test 2—January 25, 1928 to March 12, 1928.
Test 3—December 12, 1928 to January 30, 1939.

Purpose: To determine the value of sweetpotatoes as a feed for swine.

Procedure and Conditions: In 1927 the Louisiana Experiment Station started a series of tests to determine the value of sweetpotatoes as a feed for hogs. Various comparisons and combinations of feeding sweetpotatoes was used in this series of tests.

Test 1 consisted of three lots of 10 hogs per lot. Grade hogs were used in this test. In this test comparisons were made of (1) sweetpotato fed in dry lot with and without tankage, and (2) sweetpotatoes versus corn. Tankage was fed free choice.

Test 2 consisted of two lots of nine hogs each. One hog in each lot died of pneumonia during the test. Feeding was done in dry lot, tankage being fed free choice.

Test 3 consists of two lots of 20 hogs each. Each lot of 20 hogs was placed on a 2-acre plot of Porto Rico sweetpotatoes of an estimated yield of 194 bushels per acre. Lot 1 had sweetpotatoes in the field plus tankage fed in a self-feeder, lot 2 received sweetpotatoes in the field and no tankage.

Results:

	Test 1			Test 2		Test 3	
	Tankage with sweetpotatoes in dry lot			Corn, sweetpotatoes and tankage vs. corn and tankage		Sweetpotatoes grazed with and without tankage	
	Corn, tankage	Sweetpotatoes, tankage	Sweetpotatoes, no tankage	Corn, Sweetpotatoes, tankage	Corn and tankage	Sweetpotatoes in field, tankage	Sweetpotatoes in field, no tankage
Length of test (days)	42	42	42	42	42	35	35
No. pigs in test	10	10	10	9	9	20	20
Av. initial weight	104.3	104.3	104.3	71.7	73.6	93.5	93.5
Av. final weight	168.5	142.7	115.5	98.7	116.3	144.5	123.9
Gain per pig	64.2	38.4	11.2	27.0	42.7	51.0	30.45
Av. daily gain	1.53	.91	.27	.64	1.01	1.46	.87
Av. daily ration							
Corn	5.1	—	—	1.98	3.84	—	—
Sweetpoatoes	—	15.3	15.6	10.98	—	31.04*	31.04*
Tankage	.88	1.58	—	0.5	0.44	.46	—
Feed per 100 lbs. gain							
Corn	333.8	—	—	273.4	335.5	—	—
Sweetpotatoes	—	1671.9	5852.7	1515.2	—	2132.2	3567.8
Tankage	57.9	173.2	—	66.5	38.9	31.9	—
Minerals	1.09	2.34	3.56	—	—	—	—

*Estimated amount of potatoes eaten daily per pig.

Reference: Louisiana Agricultural Experiment Station Bulletin 236, "Hogging Off Corn and Sweetpotatoes," pages 19, 21, and 22, tables 6, 7, and 8, March 1933, Baton Rouge, Louisiana.

Value of Tankage for Swine on Grazing Peanuts

Conducted by: Georgia Agricultural Experiment Station.

Conducted at: Experiment, Georgia.

Purpose: To obtain the direct value of tankage as a supplement for swine on peanut grazing.

Procedure and Conditions: Twenty head of Poland China pigs, averaging about 80 pounds were selected and divided into two uniform groups according to sex, weight, and thriftiness. Two acres of peanuts were fenced, both acres yielding approximately 1,000 pounds of peanuts per acre. Ten pigs were put on each acre. Both lots of pigs received 2 pounds of corn per head daily and a mineral mixture self-fed, free choice. Both lots had free access to water. One lot received tankage self-fed, free choice, and the other received no tankage. The lot receiving tankage did not consume all of the two pounds of corn each day, this being weighed back and subtracted from their allotted amount.

Results:

VALUE OF TANKAGE FOR SWINE ON GRAZING PEANUTS

	Lot 1 no tankage	Lot 2 tankage
Extra feed consumed:		
Corn (lbs.)	966	700
Tankage (lbs.)	—	200
Minerals (lbs.)	6	6
Value of extra feed (dollars)	8.69	9.91
Number of days on test	49.0	43.0
Total weight at start (lbs.)	836.66	784.34
Average weight at start (lbs.)	83.86	78.43
Total weight at end (lbs.)	1296.00	1351.00
Average weight at end (lbs.)	129.60	135.10
Total gain (lbs.)	457.34	566.66
Average gain per pig (lbs.)	45.73	56.66
Average daily gain (lbs.)	0.919	1.317

Reference: Georgia Agricultural Experiment Station Circular 118, "Protein Supplements for Swine," page 7, table 4, Experiment, Georgia, July 1939.

Deficiencies of Peanuts When Used as a Feed for Swine

Conducted by: Florida Agricultural Experiment Station.

Conducted at: Gainesville, Florida.

Period: Tests 1 and 2—132 days.
Test 3—117 days.

Purpose: To determine the value of peanuts as a feed for swine.

Procedure and Conditions: Three separate dry-lot tests with feeder pigs in which No. 1 shelled peanuts formed the basal ration have been completed. In each test the 10 pigs were divided into five groups of two pigs each. Each pig, however, was kept in an individual pen and fed separately. The data reported are the averages for the six pigs of each lot. The initial weight of the pigs in test 1 was 57.8 pounds; test 2, 49.2 pounds; and test 3, 46 pounds.

Results:

DEFICIENCIES OF PEANUTS AS FEED FOR SWINE

Lot	Average daily gain	Peanuts required per pound of gain (pounds)
1 Peanuts	0.43	3.13
2 Peanuts*	0.47	2.87
3 Peanuts, 99 parts; calcium carbonate, 1 part*	1.00	2.03
4 Peanuts, 99 parts; cod-liver oil, 1 part*	0.53	3.09
5 Peanuts, 98 parts; cod-liver oil, 1 part: calcium carbonate, 1 part*	0.81	2.18

*Feed two grams of common salt per pig per day.

Reference: Florida Agricultural Experiment Station 1939 Annual Report, page 75, June 30, 1939, Gainesville, Florida.

Peanuts Grazed Alone Versus Peanuts Grazed Supplemented With Corn and Cottonseed Meal Self-fed in Mississippi

Conducted by: Mississippi Agricultural Experiment Station.

Conducted at: State College, Mississippi.

Period: October 20, 1930 to November 17, 1930.

Procedure and Conditions: In the fall of 1930, 16 pigs averaging 47.12 pounds were divided into two lots of eight each. Lot 1 was grazed on peanuts alone while lot 2 was grazed on a comparable area of peanuts and in addition was allowed access to a self-feeder containing a mixture of two parts ground corn and one part cottonseed meal. Lot 2 receiving corn and cottonseed meal made forty pounds more gain than lot 1 on peanuts alone. To produce this extra gain the pigs in lot 2 consumed 258.5 pounds of the mixture of corn and cottonseed meal, the small consumption of grain evidencing the palatability of the peanuts.

Results:

GRAZING PERIOD: OCTOBER 20, 1930 TO NOVEMBER 17, 1930

	Peanuts grazed alone	Peanuts grazed Supplemented with corn and cottonseed meal
Number of pigs used	8	8
Length of grazing period (days)	28.	28.
Average initial weight (lbs.)	47.12	47.12
Average final weight (lbs.)	83.37	88.37
Average gain per pig (lbs.)	36.25	41.25
Average daily gain per pig (lbs.)	1.29	1.47
Grain fed per pig (lbs.)	—	32.5
Average amount of grain fed daily (lbs.)	—	1.16
Grain fed per cwt. of gain (lbs.)	—	78.9

Grazing Trials With Peanuts at State College, Mississippi

Conducted by: Mississippi Agricultural Experiment Station.

Conducted at: State College, Mississippi.

Period: 1919-1922.

Procedure and Conditions: Grazing trials with peanuts were conducted in 1919, 1921 and 1922. The stand during each of the latter two years was probably less than 50 percent of the normal which accounts for the small

amount of pork producted per acre in these trials. The figures for 1919 are therefore more nearly representative of the results which may be expected in this section of the State with an ordinarily good crop of peanuts. The yield of peanuts that year was estimated at 45 bushels per acre. In 1922 the average daily gain per hog was smaller than either of the other years, owing partially to the scarcity of peanuts in the field during the last week of the trial.

Results:

PEANUTS FOR PORK PRODUCTION

	1919	1921	1922
Date of starting	October 15	September 30	October 6
Area grazed (acres)	2.3	4.75	4.75
Number of hogs used	12.	12.	12.
Length of grazing period (days)	36.0	39.5	38.5
Initial weight, total (lbs.)	1389.0	1161.0	1515.0
Average initial weight (lbs.)	115.75	96.7	126.3
Final weight, total (lbs.)	2196.0	2050.0	2153.0
Average final weight (lbs.)	182.5	170.8	179.4
Total gain (lbs.)	801.0	889.0	638.0
Average gain per hog (lbs.)	66.75	74.08	53.2
Average daily gain per hog (lbs.)	1.85	1.88	1.38
Pork produced per acre (lbs.)	347.8	187.16	134.32

Reference: Mississippi Agricultural Experiment Station Bulletin 218, "Grazing and Feeding Trials with Hogs," pages 6 and 7, tables 3 and 4, State College, Mississippi, June 1923.

Hogging Off Corn, Runner Peanuts, and Sweetpotatoes

Conducted by: Georgia Coastal Plain Experiment Station.

Conducted at: Tifton, Georgia.

Period: November 19, 1938 to March 17, 1939.

Purpose: To determine the comparative value of corn, runner peanuts, and sweetpotatoes as a hog feed.

Procedure and Conditions: Pigs were placed on these crops on November 19, 1938, and were removed at the completion of the hogging-off period, March 17, 1939. An attempt was made to place the number of feeder pigs on these various crops so that the pigs would reach approximately 225 pounds in weight at the end of the hogging-off period. It was necessary, during the feeding period, to remove some of the pigs and add others.

The sweetpotatoes produced 299.59 pounds of gain in liveweight per acre. The potatoes started decaying to a small extent in early January. On February 1, it was estimated that 20 percent of the potatoes in the ground at that time were decayed. By March 17 no good potatoes were found. It was estimated that the pigs consumed approximately 70 percent of the potatoes produced.

The runner peanuts produced 401.43 pounds of pork per acre. It was estimated that 15 percent of the peanuts remaining in the ground on February 7 were spoiled. By March 17 practically all the nuts remaining in the ground were either sprouted or decayed. It was estimated that from 10 to 15 percent of the peanuts produced either sprouted or decayed and of course were not consumed by the pigs. This loss was experienced during the latter part of the hogging-off period.

The corn produced 381.86 pounds of liveweight gain per acre. The corn kept well in the field, and just prior to the end of the feeding on March 17, very little decaying or weevil damage was noticed

Results:

HOGGING OFF WINTER FATTENING CROPS 1938-1939

	Corn	Runner peanuts	Sweet-potatoes
Number of acres in field	7.33	7	4.94
Number of pigs	25	24	19
Date on test	Nov. 19	Nov. 19	Nov. 19
Date off test	Mar. 17	Mar. 17	Mar. 17
Total number days on test	118.	118.	118.
	Lbs.	Lbs.	Lbs.
Total yield of crop	16183	12430	44850
Crop yield per acre	39 bu.	1776	9078
Total initial weight	1840	1775	1725
Total final weight	4639	4585	3205
Total gain (pounds pork)	2799	2810	1480
Average daily gain	1.25	1.51	.956
Total pounds protein supplement fed	1110	512	1581
Total minerals fed	28	28	25
Total feed consumed by pigs	17321	12970	46456
Crop hogged-off	16183	12430	44850
Protein supplement	1110	512	1581
Mineral	28	28	25
Total feed consumed per pound of gain:	6.19	4.61	31.39
Crop hogged-off	5.78	4.42	30.30
Protein supplement	.40	.18	1.07
Mineral	.01	.01	.02
Gain per acre	381.86	401.43	299.59

(Gain per acre includes protein supplement and minerals fed)

Reference: Georgia Coastal Plain Experiment Station Nineteenth Annual Report, 1938-1939, pages 71 and 73, table 48, Tifton, Georgia, July 1939.

Molassses in Rations for Pigs

Conducted by: Ohio Agricultural Experiment Station.

Conducted at: Wooster, Ohio.

Purpose: To determine the optimum amount of molasses in rations for pigs.

Procedure and Conditions: Cane or blackstrap molasses was fed to fattening pigs with ground corn in the proportions of 20:80 and 40:60. The pigs were full-fed in dry lot and were given a half-pound of tankage daily a head in the two feeds.

Results:

DIFFERENT AMOUNTS OF MOLASSES IN RATIONS FOR PIGS

	Corn plus 0.5 lbs. of tankage daily	Corn 80 molassss 20 plus 0.5 lbs. of tankage daily	Corn 60 molasses 40 plus 0.5 lbs. of tankage daily
Pigs at start	5	5	5
Initial weight per pig, lbs.	95.5	95.2	99.0
Pigs at close	5	5	5
Final weight per pig, lbs.	202.4	187.9	169.1
Average daily gain, lbs.	1.53	1.32	1.00
Days required to gain 160 lbs.	105	122	160
Daily feed per pig, lbs.:			
Corn, ground	5.08	3.66	2.91
Molasses	—	.92	1.94
Tankage	.50	.49	.49
Total	5.58	5.07	5.34
Feed per 100 lbs. gain, lbs:			
Corn, ground	332.46	276.59	290.93
Molasses	—	69.15	193.38
Tankage	32.65	37.22	49.22
Total	365.11	382.96	533.52
Feed per 100 lbs. gain with molasses reduced to 100% of moisture, lbs.	—	375.04	511.39
Value of molasses with shelled corn as 100 percent	—	73.7%	5.2%

Reference: Ohio Agricultural Experiment Station Bulletin 607, "Substitute for Corn for Growing and Fattening Pigs," page 41, table 25, Wooster, Ohio, September 1939.

Cane Molasses as a Supplement for Swine

Conducted by: Hawaii Experiment Station.

Conducted at: Honolulu, Hawaii.

Period: 1929-1932.

Purpose: To determine the value of cane molasses as a supplement for swine.

Procedure and Conditions: The pigs used in these experiments were raised on the university farm and were of Tamworth, Berkshire and Duroc-Jersey-Berkshire crossbred. In dividing them into lots for experimental purposes not only were weight, sex, condition, and probable outcome considered and balanced as equal as possible, but also ancestry and age, information on which is frequently not available about purchased pigs.

The following rations were used:

Control ration	10 percent cane molasses ration	20 percent cane molasses ration
88 lbs. rolled barley	78 lbs. rolled barley	68 lbs. rolled barley
8 lbs. tankage	10 lbs. cane molasses	20 lbs. cane molasses
2 lbs. linseed oil cake meal	8 lbs. tankage	8 lbs. tankage
1 lb. salt	2 lbs. linseed oil cake meal	2 lbs. linseed oil cake meal
1 lb. steamed bone-meal	1 lb. salt	1 lb. salt
	1 lb. steamed bone-meal	1 lb. steamed bone-meal

Results:

CANE MOLASSES RATION FOR PIGS

	Average gain	Daily concentrate feed consumed per pig	Amount of concentrate feed per lb. of gain	Value of molasses as compared with barley lb. for lb.
	Lbs.	Lbs.	Lbs.	Percent
Experiment II, 6 pigs, initial weight 70 lbs., 70 day test:				
Control (no molasses)	1.43	7.12	4.99	—
Fed 10 percent molasses	1.16	5.82	5.02	99.4
Fed 20 percent molasses	.92	5.20	5.65	88.3
Experiment III, 4 pigs, initial weight 102 lbs., 70 day test:				
Control (no molasses)	1.50	7.02	4.69	—
Fed 10 percent molasses	1.64	6.92	4.23	110.9
Fed 20 percent molasses	—	—	—	—
Experiment IV, 5 pigs, initial weight 49 lbs., 126 day test:				
Control (no molasses)	1.03	4.34	4.33	—
Fed 10 percent molasses	1.12	4.34	3.88	111.6
Fed 20 percent molasses	—	—	—	—
Experiment V, 5 pigs, initial weight 81 lbs., 76 day test:				
Control (no molasses)	1.36	6.17	4.54	—
Fed 10 percent molasses	1.44	6.32	4.40	103.2
Fed 20 percent molasses	1.45	6.29	4.34	104.6

Reference: Hawaii Agricultural Experiment Station Bulletin 69, "Cane Molasses As a Supplement to Fattening Ration for Swine," pages 5, 6, and 9, table 10, Honolulu, Hawaii, November 1933.

Protein Supplements for Fattening Hogs

Proteins are nitrogen-bearing compounds composed of carbon, hydrogen, oxygen, and sometimes sulphur, phosphorus, and iron—a group of nutrients essential to animal life. Proteins contain all the elements that carbohydrates do and in addition, nitrogen. Due to the composition of proteins and oxygen, they are energy foods, and due to the nitrogen content they supply building material. Proteins are important constituents of every living cell in the body and of all the muscles of animals. The protein requirements for maintenance alone is much less than for growth and reproduction.

When proteins are used for building purposes the nitrogen is of primary importance. Proteins supplied in excess of the amount required for building is wasted, because proteins cannot be stored and used later. It is important to determine the amount of protein necessary for building and for energy so as to prevent an under- or over-supply.

There are a number of protein feeds available in Mississippi that may be used in supplementing feeds for hogs. Protein supplements are important in the fattening hog ration, because during this period the hog should be constantly growing and building, and this is one of the main functions of protein. Experimental information should be examined closely before deciding what protein feed, or combination of protein feeds, is best to use in setting up a hog feeding program.

Protein Supplements to Corn in Dry Lot for Fattening Pigs

Conducted by: South Carolina Agricultural Experiment Station.

Conducted at: Clemson, South Carolina.

Period: 1924-1926.

Purpose: To compare single protein-rich feeds of plant and animal origin as supplements to corn; combinations of plant and animal proteins as supplements to corn, and these protein-rich feeds and combinations of these feeds as supplements to corn.

Procedure and Conditions: The pigs used were purebred or crossbred Berkshires, Duroc-Jerseys, Hampshires, and Poland Chinas. All pigs were raised on the college farm and were given the double treatment for hog cholera and the treatment for round worms before being put on test. These pigs averaged between 65 and 70 pounds at the beginning of the trials and were carried on test until they reached an average of 200 pounds.

All pigs were fed in dry lots 28 feet by 100 feet in size. Trees and shed-type hog houses furnished shade and shelter. Plenty of fresh water was supplied from a pipe line.

The rations were figured according to Morrison's feeding standards for fattening pigs, and the proportions were changed after periods of 50 pounds gain. No. 2 yellow corn and high grade protein-rich feeds were used.

Individual weights were taken on three consecutive days at the beginning and at the close of the tests and the average of these three weights was taken as the initial and final weights. Individual weights were also taken at regular intervals of 14 days during the tests.

The pigs in all lots were given free access to the following mineral mixture: 12 parts charcoal, 4 parts ground limestone, and 1 part salt.

Results:

PROTEIN SUPPLEMENTS TO CORN IN DRY LOT

	Lot 1	Lot 2	Lot 3	Lot 4	Lot 5	Lot 6
	Corn and tankage	Corn and fish meal	Corn and soybean meal	Corn and peanut feed	Corn soybean meal and fish meal	Corn peanut feed and fish meal
No. pigs in lot	9.71	10	10	9.93	10	10
No. days on test	83.3	72.3	91	102.3	72.3	72.3
Av. initial wt. (lbs.)	68.07	68.23	67.66	68.93	67.91	67.5
Av. final wt. (lbs)	202.1	203.71	199.05	202.04	203.96	200.97
Gain per pig (lbs.)	133.79	135.50	131.38	129.80	126.05	133.47
Av. daily gain (lbs.)	1.61	1.87	1.46	1.28	1.88	1.84
Av. daily feed (lbs.)						
Corn	5.93	6.04	5.07	4.53	5.80	5.78
Tankage	.62	—	—	—	—	—
Fish meal	—	.93	—	—	.46	.55
Soybean meal	—	—	.86	—	.46	—
Peanut feed	—	—	—	1.31	—	.55
Minerals	.03	.03	.11	.12	.08	.09
Feed per 100 lbs. gain: (lbs.)						
Corn	369.34	322.51	349.58	359.22	308.64	313.73
Tankage	38.3	—	—	—	—	—
Fish meal	—	49.64	—	—	24.18	29.97
Soybean meal	—	—	58.91	—	24.18	—
Peanut feed	—	—	—	102.96	—	29.97
Minerals	1.68	1.65	7.2	9.36	4.02	4.82

Reference: South Carolina Agricultural Experiment Station Bulletin 234, "Protein Supplements to Corn in Dry Lots for Fattening Pigs," pages 3, 4, 7, and 12, table 6, Clemson, South Carolina, October 1926.

Experiments with Tankage and Shrimp Meal Singly and in Combination with Cottonseed Meal as Supplements to Corn for Swine. Effects of Adding Cod-Liver Oil to Rations of Fall Pigs

Conducted by: Louisiana Agricultural Experiment Station.

Conducted at: Baton Rouge, Louisiana.

Period: 70 days, January 31 to April 11, 1930.

Purpose: To compare shrimp meal with standard digester tankage as protein supplement for swine.

To determine the value of cottonseed meal in replacing half of the tankage or shrimp meal.

To determine the value of adding cod-liver oil to a winter fattening ration for fall pigs.

Procedure and Conditions: Nearly all of the pigs used in this test were purebred Duroc-Jerseys, Poland Chinas, and Hampshires raised in the University herd. Nine grade Duroc-Jerseys were purchased from a local feeder. All these pigs had been wormed and vaccinated for cholera.

Feeds were fed in self-feeders with separate compartments for corn, protein supplements, and minerals. Where two protein supplements were used they were mixed and fed together in the same compartment of the self-feeder.

The cottonseed meal was a 7 percent nitrogen meal, the tankage was standard 60 percent digester tankage, and the cod-liver oil was a standard commercial grade.

Results:

Pigs Per Lot	Lot 1 8 Corn shrimp meal minerals	Lot 2 8 Corn tankage minerals	Lot 3 8 Corn shrimp meal cod-liver oil minerals	Lot 4 8 Corn tankage cod-liver oil minerals	Lot 5 8 Corn shrimp meal cottonseed meal minerals	Lot 6 8 Corn tankage cottonseed meal minerals
Av. initial weight (lbs.)	68.6	69.0	68.9	69.9	69.1	68.8
Av. final weight (lbs.)	168.3	145.4	150.1	131.3	175.0	168.0
Av. total gain (lbs.)	99.7	7.64	81.2	70.4	105.9	99.2
Av. daily gain (lbs.)	1.42	1.09	1.16	1.01	1.51	1.43
Average daily ration (lbs.)						
Corn	4.36	3.97	3.97	3.76	4.09	4.05
Tankage	—	.48	—	.42	—	.40
Shrimp meal	.59	—	.49	—	.42	—
Cottonseed meal	—	—	—	—	.42	.40
Cod-liver oil	—	—	.02	.02	—	—
Feed per 100 lbs. gain (lbs.)						
Corn	306.4	363.5	341.7	374.2	270.7	285.4
Tankage	—	43.5	—	41.7	—	28.0
Shrimp meal	41.15	—	42.24	—	27.6	—
Cottonseed meal	—	—	—	—	27.6	28.0
Cod-liver oil	—	—	2.23	2.19	—	—
Minerals	.12	.22	.16	.22	.15	.19
Total concentrates	347.55	407.00	383.94	415.90	325.90	341.40

Reference: Louisiana Agricultural Experiment Station Bulletin 228, "Protein Supplements and Pastures for Swine," pages 26 and 27, Baton Rouge, Louisiana, July 1932.

Value of Tankage as a Supplement to Corn for Fattening Pigs

Compiled by: Illinois Agricultural Experiment Station.

This summary includes twelve tests from the Ohio Station, three from Kansas, two each from Nebraska and Michigan, and one each from Indiana, Iowa, Alabama and Mississippi.

VALUE OF TANKAGE AS A SUPPLEMENT TO CORN

	Light pigs in dry lot		Heavy pigs in dry lot		Light pigs on pasture	
	Corn	Corn and tankage	Corn	Corn and tankage	Corn	Corn and tankage
Number of tests	6	6	8	8	9	9
Total pigs	24	29	69	69	77	79
Av. days in test	102	102	84	84	113	110
Av. initial weight	63	62	132	134	52	52
Av. final weight	116	186	223	267	161	199
Av. daily gain	.54	1.16	1.04	1.56	.57	1.34
Av. daily ration						
Corn	3.10	3.80	5.63	6.35	3.96	4.63
Tankage	—	.40	—	.54	—	.27
Feed for 100 lbs. gain						
Corn	581.	350.	537.	410.	409.	345.
Tankage	—	36.	—	34.	—	20.
Corn saved by 100 lbs. tankage	—	642.	—	374.	—	320.

Reference: Illinois Agricultural Experiment Station Circular 395, "Feeding Hogs on Illinois Farms," page 11, table 2, Urbana, Illinois, June 1932.

Corn and Protein Supplement Versus Corn Alone for Fattening the Pig

Conducted by: Mississpipi Agricultural Experiment Station.

Conducted at: State College, Mississippi.

Period: 199 days.

Purpose: To compare corn alone, self-fed in dry lot versus corn and tankage self-fed on Bermuda grass pasture for fattening pigs.

Procedure and Conditions:

Animals used: Crossbred Poland China-Duroc-Jersey barrows, all from same litter.

Rations:

Lot 1—Corn
Tankage
Bermuda grass pasture

Lot 2—Corn alone

Results:

	Lot 1	Lot 2
Number of hogs	3	3
Total initial weight (lbs.)	196	206
Average initial weight (lbs.)	65.33	68.66
Total final weight (lbs.)	1126.0	556.0
Average final weight (lbs.)	375.33	185.33
Total gain (lbs.)	930.	350.
Average gain per hog (lbs.)	310.	116.66
Average daily gain (lbs.)	1.55	0.58
Total feed consumed		
Corn (lbs.)	3665.	2424.
Tankage (lbs.)	161.	—
Total feed consumed per 100 lbs. gain		
Corn (lbs.)	394.	692.5
Tankage (lbs)	17.3	—
Total (lbs.)	411.3	692.5

Reference: Mississippi Agricultural Experiment Station Circular 78, "Fattening The Pig: Corn and Protein Supplement Versus Corn Alone," State College, Mississippi, May 1928.

Wheat Middlings as a Complete Substitute for Corn

Conducted by: Ohio Agricultural Experiment Station.

Conducted at: Wooster, Ohio.

Purpose: To determine the value of wheat middlings as a complete substitute for corn.

Procedure and Conditions: The trials were run in which wheat middlings were used as a complete substitute for corn; in one, standard middlings were fed and in the other, flour middlings were fed. Both experiments were run on dry lot.

Results:

WHEAT MIDDLINGS AS A COMPLETE SUBSTITUTE FOR CORN

	For growing and fattening pigs		For fattening shoats	
	Ground corn tankage	Standard middlings tankage	Ground corn tankage	Flour middlings tankage
Number of comparisons	1	1	1	1
Pigs at start	5	5	5	5
Initial weight per pig, lbs.	68	69	102	111
Pigs at close	5	5	5	5
Final weight per pig, lbs.	180	178	245	250
Average daily gain, lbs.	1.22	1.04	1.57	1.52
Days required to gain 160 lbs.	132	154	102	160
Daily feed per pig, lbs.:				
Corn	4.74	—	5.23	—
Middlings	—	4.36	—	5.16
Tankage	.59	.63	.58	.57
Total	5.33	4.99	5.81	5.73
Feed per 100 lbs. gain, lbs.:				
Corn	387.42	—	329.83	—
Middlings	—	419.71	—	335.16
Tankage	48.34	60.40	36.65	37.24
Total	435.76	480.11	366.48	372.40

Reference: Ohio Agricultural Experiment Station Bulletin 607, "Substitute for Corn for Growing and Fattening Pigs," page 28, table 15, Wooster, Ohio, September 1939.

Skim Milk as a Supplement to Corn

Conducted by: Ohio Agricultural Experiment Station.

Conducted at: Wooster, Ohio.

Period: 70 days, January 20 to March 31, 1915.

Purpose: To compare various proportions of skim milk as a supplement to corn in dry lot feeding.

Procedure and Conditions: The pigs used in the experiments were a little less than 4 months old at the beginning of the feeding period and averaged 58 pounds in weight at that time. Until then they had received a ration of corn, 14 parts; linseed oil meal, 4 parts; and tankage, 1 part.

Feeds used: The five lots were fed as follows:

Lot 1—Corn, 9; tankage 1
Lot 2—Corn, 1; skim milk 1
Lot 3—Corn, 1; skim milk 3
Lot 4—Corn, 1; skim milk 5
Lot 5—Corn and skim milk, both ad libitum

The feeds designated as having been fed ad libitum were not accessible at all times, but were fed at regular intervals, the pigs being given all they would consume within 2 hours. Of the rations so designated, skim milk was fed three times daily and the corn twice daily. No skim milk was fed at noon on weighing days.

Results:

VARIOUS PROPORTIONS OF CORN AND SKIM MILK

	Lot 1	Lot 2	Lot 3	Lot 4	Lot 5
	Corn 9; tankage 1	Corn 1; skim milk 1	Corn 1; skim milk 3	Corn 1; skim milk 5	Corn and skim milk ad lib
Av. initial weight (lbs.)	56.7	61.7	59.3	54.6	58.4
Av. final weight (lbs.)	125.375	155.0	133.125	149.5	178.5
Total gain (lbs.)	273.0	381.5	337.0	399.5	512.5
Av. daily gain (lbs.)	.83	1.16	1.024	1.213	1.558
Feed consumed:					
Corn (bu.)	19	22	16	15.5	15.5
Supplement (lbs.)	118.1	142. gals.	312. gals.	506. gals.	952. gals.
Total (lbs.)	1181.0	2454.0	3584.0	5223.0	9061.0
Feed per 100 pounds gain:					
Corn (bu.)	5.2	5.7	4.7	3.9	3.0
Supplement (lbs.)	43.3	36. gals.	93. gals.	127. gals.	186. gals.
Total (lbs.)	432.6	643.2	1063.5	1307.4	1768.0

1 pig taken out of each lot March 10. Lot 1, 55 lbs., Lot 2, 70 lbs., Lot 3, 101 lbs., Lot 4, 74.5 lbs., and Lot 5, 90.5 lbs.

Reference: Ohio Agricultural Experiment Station Bulletin 316, "Proportion of Supplements to Corn for Fattening Swine," pages 23 and 24, table 15, September 1917, Wooster, Ohio.

Value of Different Protein Supplements for Hogs

Conducted by: South Carolina Agricultural Experiment Station.

Conducted at: Clemson, South Carolina.

Period: Four years.

Purpose: To determine the value of different protein supplements for hogs.

Procedure and Conditions:

Animals: Purebred Poland China and Berkshire pigs were used as far as possible in these tests. However, each year it was necessary to purchase some grade pigs whose breeding record and previous feed treatment were unknown. The same number of purebreds was used in each lot. All pigs were double treated for cholera and treated for worms before the feeding tests were started.

Lots: Each lot of pigs was fed in a dry lot 28 by 100 feet in size. Shade and shelter were furnished by trees and shed-type houses. Water was supplied from pipe line.

Feeds: Number 2 yellow corn was used. Menhaden fish meal was used. It was purchased from several mills and showed considerable variation in analysis.

The soybean oil meal was secured from mills in North Carolina. There was very little variation in the protein or fat content of the meals used during these tests.

The cottonseed meal varied very little in protein or fat content and was secured from a local mill.

The peanut meal was purchased from the Suffolk Oil Mills of Suffolk, Virginia. It was a good quality when judged by odor and taste. The protein content varied from 32.75 to 38.88 percent.

The following rations were used:

Lot 1
Corn
Fish meal
Free choice

Lot 2
Corn
Tankage
Soybean meal
Hand-fed

Lot 4
Corn
Tankage
Soybean meal
Hand-fed

Lot 5
Corn
Fish meal
Cottonseed meal 7%
Hand-fed

Lot 8
Corn
Fish meal
Peanut meal
Hand-fed

The following mineral mixture was self-fed to all lots:
10 parts ground limestone
10 parts special steamed bonemeal
2 parts salt

Weights: Individual weights were taken on three successive days at the beginning and close of the tests. The average of these weights were taken as the average initial and average final weights. Individual weights were taken every 14 days during the test.

Results:

VALUE OF DIFFERENT PROTEIN SUPPLEMENTS FOR HOGS

	Lot 1	Lot 2	Lot 4	Lot 5	Lot 8
Av. initial weight (lbs.)	60.5	59.95	58.37	64.45	58.58
Av. final weight (lbs.)	202.85*	201.79	202.93	201.12	202.96*
Av. daily gain (lbs.)	1.50	1.59	1.56	1.61	1.57
Feed per 100 lbs. gain (lbs.)					
Corn	348.9	310.1	327.4	318.9	329.0
Fish meal	27.0	24.0	—	36.2	26.0
Soybean meal	—	24.0	21.0	—	—
Peanut meal	--	—	—	—	26.0
Cottonseed meal	--	--	—	26.5	—
Tankage	—	—	21.0	—	—

*Average for hogs on feed at close of test.

Reference: South Carolina Agricultural Experiment Station Bullein 281, "Dry Lot Rations for Fattening Hogs," pages 5, 6, 7, and 9, table 3, Clemson, South Carolina, October 1931.

Peanut Meal Compared with Tankage as a Protein Supplement for Hogs

Conducted by: Alabama Agricultural Experiment Station.

Conducted at: Auburn, Alabama.

Period: 104 days, March 1 to June 12, 1918.

Purpose: To compare peanut meal with tankage as a protein supplement for hogs.

Procedure and Conditions:

Animals: The animals used in most of the experiments were purebred Duroc-Jersey or Poland Chinas. In a few cases high grades or crossbreds were used. In each experiment special care was taken to have the lots as uniform as possible in age, thrift, weight, breed, sex, and conformation.

Lots: The experiment was conducted in dry lots containing shelters.

Feeds: The hogs were fed the following rations:

Lot 1	Lot 2	Lot 3	Lot 4
Corn—8	Corn—1	Corn—2	Corn—3
40% tankage—1	Peanut meal—1	Peanut meal—1	Peanut meal—1

All hogs were hand-fed.

No. 2 white corn was used. Peanut meal means the product containing hulls.

Water and a simple mineral mixture composed of equal parts by weight of charcoal, air-slaked lime and salt was accessible to hogs at all times.

Weighing: Individual weights were taken on two consecutive days at the beginning and end of experiments.

Results:

PEANUT MEAL COMPARED WITH TANKAGE AS A PROTEIN SUPPLEMENT

	Lot 1	Lot 2	Lot 3	Lot 4
	Lbs.	Lbs.	Lbs.	Lbs.
Average initial weight	54	54	54	54
Average final weight	173	170	171	177
Average daily gain per hog	1.14	1.11	1.12	1.18
Average daily feed per hog:				
Ground corn	4.24	2.40	3.11	3.59
Peanut meal	—	2.40	1.55	1.19
Tankage	0.53	—	—	—
Feed for 100 lbs. gain.:				
Ground corn	372.5	216.0	277.4	303.75
Peanut meal	—	216.0	138.6	101.25
Tankage	46.5	—	—	—

Reference: Alabama Agricultural Experiment Station Bulletin 224, "Peanut Meal As a Protein Supplement to Corn for Fattening Hogs in Dry Lot," pages 4 and 5, table 1, Auburn, Alabama, August 1924.

Fish Meal Compared with Tankage for Hogs

Conducted by: Georgia Agricultural Experiment Station.

Conducted at: Experiment, Georgia.

Period: 85 days.

Purpose: To compare fish meal with tankage as protein supplement for fattening swine.

Procedure and Conditions:

Animals: Twenty-four pigs were divided in two comparable lots and fed for 85 days from self-feeders.

Feeds: The animals were fed the following rations:

Lot 1	Lot 2
Shelled corn	Shelled corn
50% tankage	"Atco" fish meal
Minerals	Minerals

Weights: The pigs were weighed individually every 2 weeks during the experiment.

Results: COMPARISON OF TANKAGE AND FISH MEAL

	Tankage lot 1	Fish meal lot 2
Average initial weight	109.2 lbs.	106.9 lbs.
Average gain per animal after 57 days feeding	99.1	123.3
Average gain per animal after 85 days feeding	149.6	167.7
Average feed consumption first 57 days		
Corn	386.3	417.0
Mineral	.67	.58
Average feed consumption per animal during entire 85 days		
Corn	591.5	642.5
Supplement	54.1	51.1
Mineral	1.13	1.00

Reference: Georgia Agricultural Experiment Station Circular 84, "Swine Feeding and Quality of Pork," pages 4 and 5, Experiment, Georgia, March, 1929.

Protein Supplement for Fattening Hogs

Conducted by: South Carolina Agricultural Experiment Station.

Conducted at: Coast Station, Summerville, South Carolina.

Period: 4 years, 1935-1939.

Purpose: To determine the value of Menhaden fish meal, meat and bone scraps, digester tankage and sardine meal as protein supplements.

Procedure and Conditions: Ten purebred Poland China pigs of fall farrow have been used in each lot and the feeding period has been continued until an average weight of 20 pounds was reached.

The ration of white corn and protein supplement was full-fed free choice in all lots. In addition to the concentrates each lot of pigs was allowed to graze at all times on one acre of rye.

Results: PROTEIN SUPPLEMENTS FOR FATTENING HOGS

	Menhaden fish meal	Meat and bone scrap	Digester tankage	Sardine meal
Days on test	83.75	86.50	91.25	82.00
Pigs per lot	10.00	10.00	10.00	10.00
Average initial weight (lbs.)	62.31	62.73	62.74	62.33
Average final weight (lbs.)	201.97	200.45	200.59	202.41
Average gain per hog (lbs.)	139.66	137.72	137.85	140.08
Average daily gain (lbs.)	1.667	1.591	1.509	1.704
Feed per 100 pounds gain (lbs.)				
Corn	320.20	319.36	317.86	320.84
Supplement	23.57	43.93	33.23	27.34
Total	343.77	363.29	351.09	348.18

Reference: South Carolina Agricultural Experiment Station Fifty-second Annual Report, pages 100 and 101, table 33, Clemson, South Carolina, December 1939.

Feeding Varying Amounts of Cottonseed Meal to Find the Optimum That Can Be Safely Used in Swine Production in Texas

Conducted by: Texas Agricultural Experiment Station.

Conducted at: College Station, Texas.

Period: Two tests, each run 120 days each.

Purpose: To determine the optimum amount of cottonseed meal that can be safely used in swine rations.

Procedure and Conditions: The pigs used in this experiment were purebred Duroc-Jersey pigs, bred by the Texas Agricultural Experiment Station. They were placed on test about 30 days after weaning, or as soon as they recovered from cholera inoculation and worm treatment.

The experiment was conducted in dry lots, and the rations were mixed and fed in self-feeders placed on concrete floors in the feeding barn. Water was available for the pigs at all times. This experiment, being run in dry lots, and using pigs weighing 55 to 65 pounds live weight, is a severe test, for many of the deficiencies of a feed may never come to the attention of the investigator where the pigs weigh from 90 to 110 pounds live weight before being placed on test, or when they are fed on green pasture.

Previous to going on experiment, the pigs in this experiment were fed a mixture of milo 85 parts, wheat gray shorts 15 parts, and tankage 10 parts.

	Rations fed—pounds of feed in rations					
	Lot 1	Lot 2	Lot 3	Lot 4	Lot 5	Lot 6
	Milo chops 90 tankage 10	Milo chops 89 tankage 8, C. S. meal 3	Milo chops 88 tankage 6, C. S. meal 6	Milo chops 87 tankage 4, C. S. meal 9	Milo chops 86 tankage 2, C. S. meal 12	Milo chops 85 C.S. meal 15
No. pigs at beginning	20	20	20	20	20	20
No. of pigs at close	20	20	20	20	20	17
Average initial weight (lbs.)	60.2	60.2	60.2	60.2	60.2	60.2
Average final weight (lbs.)	282.7	283.3	257.3	255.8	239.5	215.3
Average daily gain (lbs.)	1.85	1.85	1.64	1.62	1.46	1.29
Average total gain (lbs.)	222.6	223.1	197.2	195.6	179.3	155.1
Feed required per 100 lbs. gain (lbs.)						
Ground milo	354.	337.	346.	348.	347.	346.
Cottonseed meal	—	11.5	23.7	36.0	48.6	61.0
Tankage	39.0	30.0	23.7	16.0	8.0	—

Reference: Texas Agricultural Experiment Station Bulletin 410, "Cottonseed Meal As a Feed for Hogs," pages 19, 20, 21, and 22, tables 12, 13, 14, 15, 16, and 17, College Station, Texas, March 1930.

Minerals for Fattening Hogs

There are several mineral elements needed for the proper development of animals. Some of the most important elements are: calcium, phosphorus, iron, potassium, and magnesium. Calcium and phosphorus are the most important of these elements in the development of the body tissues and frame

work. Most feeds contain some of the essential mineral elements, but often not in sufficient quantities.

The lack of mineral elements for growing and fattening hogs often causes a weak skeleton, which results in breaking down in the back and pasterns. Often times, fattening hogs are cripples which may be caused in many cases by mineral deficiencies. A sufficiency of minerals also lowers feed requirements per unit of gains. It is generally necessary to provide hogs with additional minerals from sources other than plants unless they have access to a large variety of plants.

A Simple Mineral Mixture for Fattening Hogs

Conducted by: Alabama Agricultural Experiment Station.

Conducted at: Auburn, Alabama.

Period: Experiment 1—106 days, January 5 to April 21, 1923.
Experiment 2—74 days, March 10 to May 23, 1923.

Purpose: To determine the value of adding a simple mineral mixture to a ration of corn and peanut meal.

Procedure and Conditions:

Animals used: All the pigs used in these experiments were purebred Poland Chinas, Duroc-Jerseys, or crosses from purebred of these two breeds. Two lots were fed in each experiment. In both cases special care was taken to have the two lots as nearly alike as possible in breed, thrift, weight, sex, conformation, and condition.

Quarters: The quarters used were pens with concrete floors in the experimental hog barn at Auburn. These pens were well lighted and ventilated. In each experiment the two lots were fed in adjoining pens.

Rations: Lot 1—Ground corn—2 parts
Peanut meal—1 part
Mineral mixture
Self-fed

Lot 2—Corn—2 parts
Peanut meal—1 part
Self-fed

The mineral mixture was composed of:
Charcoal—1 pound
Marble dust—1 pound
Salt—1 pound

Water was kept before the hogs at all times.

Feeding: The corn was ground and mixed with the peanut meal. The mixture was fed in self-feeder. A close watch was kept on the feeders to insure a supply of feed being kept before the hogs at all times.

The peanut meal used in both experiments was made from the whole peanut (hulls included) and was guaranteed to contain 36 percent of protein.

Results:

SIMPLE MINERAL MIXTURE FOR FATTENING HOGS

	Experiment 1		Experiment 2	
	Lot 1	Lot 2	Lot 1	Lot 2
Number of hogs to lot	10.	10.*	9.	9.**
Average initial weight (lbs.)	72.9	73.0	56.6	57.6
Average final weight (lbs.)	171.0	118.0	157.1	122.2
Av. daily gain per hog (lbs.)	.93	.46	1.36	.97
Av. total gain per hog (lbs.)	98.1	45.0	100.5	64.6
Average daily feed per hog:				
Ground corn (lbs.)	2.51	1.75	3.36	2.81
Peanut meal (lbs.)	1.25	0.88	1.68	1.41
Mineral mixture (lbs.)	.07	—	0.13	—
Total (lbs.)	3.83	2.63	5.17	4.22
Feed for 100 lbs. gain				
Ground corn (lbs.)	271.5	381.0	247.2	291.5
Peanut meal (lbs.)	135.7	191.0	123.6	145.7
Mineral matter (lbs.)	7.7	—	0.093	—
Total	414.9	572.0	380.4	437.2

*2 hogs died in non-mineral lot.

**2 hogs were removed from non-mineral lot on account of broken legs.

Reference: Alabama Agricultural Experiment Station Bulletin 222, "A Simple Mineral Mixture for Fattening Pigs," pages 5, 6, 7, and 8, tables 1 and 2, Auburn, Alabama, February 1924.

Temporary Pastures for Hogs

The soil and climatic conditions in Mississippi are such that many crops are grown successfully. These crops include cowpeas, velvet beans, soybeans, sorghum, rye, oats, rape, wheat, sudan grass, vetch. Austrian winter peas, and others. Some or all of these crops may be used as temporary grazing for hogs. By proper planning it is possible to have green feed available for hogs practically the year round, which materially reduces the amount of grain necessary to produce 100 pounds of pork.

The average yield of corn in Mississippi is very low, which might make pork production in some sections of the state unprofitable. Where the corn yield is very low the use of soiling crops and temporary grazing may be used as a means of producing pork profitably. The use of soiling crops and temporary grazing should be considered in setting up a production program for hogs in Mississippi.

Cowpeas Grazed

Conducted by: Mississippi Agricultural Experiment Station.

Conducted at: State College, Mississippi.

Period: Two years, 1917-1918.

Purpose: To determine the value of cowpeas grazed for fattening hogs.

Procedure and Conditions: In the fall of 1917, eight shoats (purebred Duroc-Jerseys) averaging 126.75 pounds were turned on 1.5 acres of cowpeas. The peas had made a rank growth but showed very little fruit. What fruit there was in the field was ripe and a second growth of vines had already started. The pigs were turned into the field August 29 and the cowpeas were completely exhausted September 26.

In the fall of 1918, ten shoats averaging 11.5 pounds were turned on 1.75

acres of cowpeas. The peas showed a luxuriant growth of vines and a good crop of fruit. On August 23 when the pigs were turned into the field about two-thirds of the pods were ripe. The cowpeas were exhausted September 28.

Results:

GRAZING COWPEAS

	1917	1918
Length of trial (days)	28	36
Number of hogs used	8	10
Area grazed (acres)	1.5	1.75
Average initial weight (lbs.)	126.75	111.5
Average final weight (lbs.)	131.5	151.1
Average gain per hog (lbs.)	4.75	39.6
Average daily gain per hog	.17	1.1
Pork produced per acre (lbs.)	25.3	226.3

Reference: Mississippi Agricultural Experiment Station Bulletin 218, "Grazing and Feeding Trials with Hogs," page 5, table 2, State College, Mississippi, June 1923.

Velvet Bean Grazing for Fattening Hogs

Conducted by: Mississippi Agricultural Experiment Station.

Conducted at: State College, Mississippi.

Period: Two years, 1917-1918.

Purpose: To determine the grazing value of velvet beans for fattening hogs.

Procedure and Conditions: Four lots of six hogs each were used and were handled as follows:

Lot 1 was grazed on velvet beans as grown alone.

Lot 2 was grazed on velvet beans which had been grown with corn, the corn having been gathered before the hogs were turned on to the field.

Lot 3 was grazed on velvet beans which had been grown with corn, the corn having been gathered and the beans being supplemented with corn hand-fed.

Lot 4 was grazed on velvet beans and corn as grown together in the field.

The hogs in lot 1 were purebred Duroc-Jerseys while those in the other lots were good grades of mixed breeding.

In all lots the beans used were the Early Speckled. Those in lot 1 were in rows four feet apart, while in the other lots the corn and beans were in alternate rows three and one-half feet apart, each thinned to two feet apart in the row. The yield of corn in lot 2 was 26.3 bushels and the yields in lots 3 and 4 were estimated to have been the same. The beans in all lots were well fruited, the yields in lots 2, 3, and 4 being estimated each at eight hundred pounds of beans and pod. It was estimated in all instances that about ninety percent of the beans were matured at the beginning of the grazing period. No shelter was provided in any of the lots.

Results:

VELVET BEAN GRAZING FOR FATTENING HOGS

Date of starting	Lot 1 Oct. 31	Lot 2 Oct. 25	Lot 3 Oct. 25	Lot 4 Oct. 25
Area grazed (acres)	1.25	1.	1.	1.
Number of hogs used	6.	6.	6.	6.
Length of grazing period (days)	57.	70.	90.	81.
Average initial weight (lbs.)	125.5	118.7	130.7	121.7
Average final weight (lbs.)	160.5	147.7	224.	196.
Total gain (lbs.)	210.	174.	560.	446.
Average gain per hog (lbs.)	35.	29.	93.3	74.3
Average daily gain per hog (lbs.)	.61	.41	1.04	.92
Corn fed (lbs.)	—	—	2655.1	—
Corn fed per hog (lbs.)	—	—	442.5	—
Average amount of corn fed per hog per day (lbs.)	—	—	4.92	—
Corn consumed per cwt. of gain (lbs.)	—	—	474.1	330.*
Pork produced per acre (lbs.)	168.	174.	560.	446.*

*Based on yield of 26.3 bushels.

Reference: Mississippi Agricultural Experiment Station Bulletin 218, "Grazing and Feeding Trials with Hogs," pages 8 and 9, table 5, State College, Mississippi.

Soybean Pasture for Fattening Hogs

Conducted by: Maryland Agricultural Experiment Station.

Conducted at: College Park, Maryland.

Period: 84 days.

Purpose: To determine the value of soybean pasture for fattening hogs.

Procedure and Conditions: The test was conducted on leased land adjoining the Station farm. Shade was provided by pine brush supported on frame-work, or by trees adjacent to the lots occupied by the pigs.

Animals: Duroc-Jersey pigs raised at the Station were divided into lots of 10 pigs each, with 7 barrows and 3 gilts in each lot. The pigs were thrifty and were similar in breeding, type, age and condition for the different lots.

Feeds: No. 2 yellow shelled corn was fed. The tankage was guaranteed to carry 60 percent of protein and was purchased from the manufacturers, a Baltimore packing firm. Steamed bonemeal, specially prepared for feeding; finely ground raw limestone, ordinary granulated stock salt were self-fed in the form of a mixture made up of these three materials.

The soybean forage used in this experiment was of the Virginia variety drilled solid on productive land. Seeding was done on May 26, and grazing was begun on July 15. At that time the plants had made good growth, averaging perhaps eight to ten inches in height. The forage was made up chiefly of the leafy part of the plant; extensive seed formation was prevented by the moderately heavy grazing to which the forage was subjected. Some seeds were formed, but it is not believed that they constituted any important part of the forage eaten. A generous growth of forage was made, and when the experiment closed very little forage remained on any of the plots.

The lots received the following rations:

Lot 1	Lot 2	Lot 3
Dry lot	Soybean forage	Soybean forage
Self-fed corn	Light ration of corn first 56 days	Self-fed corn
Tankage	.2 lbs. tankage daily per pig	Tankage
Minerals	Minerals	Minerals

Approximately the following areas of forage were provided:
Lot 2—136 square rods, 84 days
Lot 4—85 square rods, 60 days
42½ square rods, 24 days.

The mineral mixture consisted of steamed bonemeal 2 parts; finely ground raw limestone, 2 parts; common stock (barrel) salt, 1 part.

Weighing: Individual weights of all pigs were taken once each two weeks. At the beginning of the experiment only one weight was taken of the individual pigs; the final weights are the averages of weights taken on three successive days. In only one instance did a pig lose weight during any two-week period.

Results: SOYBEAN PASTURE FOR FATTENING HOGS

	Lot 1	Lot 2	Lot 3
	Lbs.	Lbs.	Lbs.
Initial weight	687.0	682.0	684.0
Final weight	1960.17	1654.67	2073.5
Daily gain	1.52	1.16	1.65
Feed consumed per 100 pounds gain			
Shelled corn	321.80	271.86	313.29
Tankage	35.03	17.27	22.12
Minerals	3.60	6.02	2.68
Grazing crops (acres)	0.0	.087	.057

Reference: Maryland Agricultural Experiment Station Bulletin 376, "Soybean Pasture for Fattening Hogs," pages 299, 300, and 301, table 1, College Park, Maryland, June 1935.

Corn and Soybeans for Pork Production

Conducted by: Mississippi Agricultural Experiment Station.
Conducted at: State College, Mississippi.
Period: Lot 1—1917-1919.
Lot 2—1918-1922.
Lot 3—1919-1921.
Lot 4—1918-1922.
Lot 5—1918-1921.

Purpose: To determine the value of soybeans and corn for pork production.

Procedure and Conditions: The soybean crop for each of the five lots was handled as follows:

Lot 1—Growing and grazing soybeans alone.
Lot 2—Growing soybeans with corn, the corn being gathered and the beans grazed.
Lot 3—Growing soybeans with corn, the corn being gathered and the beans grazed and supplemented with a small amount of corn hand-fed.

Lot 4—Growing soybeans with corn, the corn being gathered and the beans grazed and supplemented with a medium amount of corn hand-fed.

Lot 5—Growing and grazing soybeans and corn together.

The soybeans used in all trials were Mammoth Yellow. When grown together, the corn and beans were usually planted from April 20 to May 1, about one and one-half inches deep in from three to three and one-half foot rows, stalks of corn being left about every twenty-four inches with two or three hills of beans between each hill of corn. The beans were planted at the same time as the corn by driving back over the rows made in planting the corn, setting the planter to put the beans in the ground just enough to insure covering. (Planters with duplex hoppers have come into general use since this experiment was conducted.)

The cultivation was the same as for corn, weeds being kept down and the soil mulched. The soil ranged from a light to a heavy clay loam, the former during an ordinarily favorable year, capable of producing from twenty-five to thirty bushels of corn per acre, the latter under like conditions capable of producing from thirty-five to forty bushels.

The hogs used in this work were either raised on the Station farm or were purchased locally. Those raised by the Station were from purebred boars and sows of lard type. The hogs purchased were not usually of as good quality as those grown on the Station farm, being in good thrift but frequently of mixed breeding.

Results:

CORN AND SOYBEANS FOR PORK PRODUCTION

	Lot 1 1917-1919	Lot 2 1918-1922	Lot 3 1919-1921	Lot 4 1918-1922	Lot 5 1918-1921
Date of starting	October	September	September	October	September
Area grazed (acres)	1.44	1.96	1.94	1.42	2.45
Number of hogs used	7.3	10.	10.3	9.8	22.4
Length of grazing period (days)	39.0	42.4	42.4	45.3	52.3
Average initial weight (lbs.)	116.3	102.5	110.0	109.5	99.2
Average final weight (lbs.)	168.0	148.4	168.7	176.4	170.5
Average gain per hog (lbs.)	51.6	46.0	58.7	66.3	71.2
Average daily gain per hog (lbs.)	1.07	1.07	1.37	1.47	1.65
Corn fed per hog (lbs.)	—	—	62.8	135.48	—
Average amount of corn fed per hog per day (lbs.)	—	—	1.45	3.05	—
Corn fed per cwt. of gain (lbs.)	—	—	108.35	206.42	—
Pork produced per acre	260.91	219.95	313.28	435.32	461.6

Lot 1: In 1917 the soybeans were described as being a good stand and showing abundant fruit, and in 1918 as being a good crop, ripening fairly uniformly. At the beginning of the 1917 trial, the beans were in the hard dough stage, only a very few being ripe and the leaves were starting to turn yellow and shed. In 1918 the hogs were turned on when the beans were just starting to pop out of the pods.

Lot 2: In 1918 soybeans and corn were grown together in rows three and one-half feet apart with beans in every row and corn in every other row. There was a light yield of beans that year due to the dry season and thin land. Normal crops of beans were grown in 1920 and 1921, but in 1922 the yield was extremely light. This latter year the pork produced per acre was

not secured as the hogs were moved to a new lot before the one in which they were originally grazed was completely exhausted.

Lot 3: In 1919 the soybeans and corn were grown together, the rows being three feet apart with beans in every row and corn in every other row. The corn which was gathered prior to the beginning of the trial yielded thirty-two bushels per acre. The yield of beans, however, was probably not as good as in 1920 and 1921.

Lot 4: The 1918 trial differed from the other reported under this heading in that the beans were grown alone. They were described as a good crop, ripening fairly uniformly. At the beginning of the grazing period, the beans were just starting to pop out of the pods. The corn and soybeans in 1919 were planted in the same manner as those in the same year where the soybeans were supplemented by a small amount of corn. The yield of corn per acre was 26.8 bushels.

Lot 5: In 1918 and 1919 corn and soybeans were grown together with beans in every row and corn in every other row. In 1918, however, the rows were three and one-half feet apart, while in 1919 they were three feet apart. In the former year the land was thin and the season extremely dry, resulting in a light yield of beans. In 1919 a second and larger lot was handled in this manner, the hogs used being grades purchased locally. The corn in the smaller lot in 1919 was estimated at twenty-five bushels per acre.

Reference: Mississippi Agricultural Experiment Station Circular 49, "Corn and Soybean for Pork Production," pages 1, 2, 3, 4, and 5, tables 1, 2, 3, 4, and 5, State College, Mississippi, April 1923.

Value of Spring Sown Rape, Sorghum, and Spanish Peanuts for Hogs

Conducted by: Alabama Agricultural Experiment Station.

Conducted at: Auburn, Alabama.

Period: Rape—May 27 to June 23, 1899.
Sorghum—June 24 to September 2, 1899.
Spanish peanuts—September 1 to November 4, 1899.

Purpose: To compare the value of spring sown rape, sorghum, and Spanish peanuts for hogs.

Procedure and Conditions: The rape pasture was grown on sandy bottom land of medium grade.

The rape which had been grazed made a second growth which was ready for pasturing within a month after the removal of the shoats, but was ruined by the Harlequin cabbage bug before it could be utilized.

The sorghum was grazed at the stages of growth between early bloom and complete maturity and most of it was about five feet high. The yield was rather light, the land being poor, sandy upland, moderately fertilized. The sorghum was drilled and cultivated.

There was only about a two-third stand of peanuts.

Results:

VALUE OF SPRING SOWN RAPE, SORGHUM, AND SPANISH PEANUTS

	Test 1	Test 2	Test 3
	Rape pasture	Sorghum	Spanish peanuts
Feeding period (days)	29	71	28
Feed consumed			
Grazing crop (acres)	.10	.545	.243
Supplement			
Corn meal	317.6	—	333.0
Corn meal and cowpea meal	—	812.0	—
No. pigs on test	7	7.	7.
Total gain (lbs.)	103.0	224.0	121.0
Total gain per acre (lbs.)	1030.0	411.0	498.0
Gain per day per pig (lbs.)	.526	.450	.617
Acres per pig for period grazed	.014	.078	.035

Reference: Alabama Agricultural Experiment Station Bulletin 122, "Grazing and Feeding Experiments with Pigs," pages 11, 14, and 15, Auburn, Alabama, January 1903.

Oats with Vetch or Austrian Peas as Grazing Crops for Fattening Hogs

Conducted by: Alabama Agricultural Experiment Station.

Conducted at: Auburn, Alabama.

Period: 1926-1929 inclusive.

Purpose: To determine the value of oats with vetch or Austrian winter peas as a supplement to corn and tankage for fattening hogs.

Procedure and Conditions: Each of these four feeding trials included (1) one group of pigs in pasture receiving a ration of corn and tankage, self-fed, free choice; (2) another group on pasture received a ration of corn and tankage limited to 5 percent of the liveweight, and (3) a third group in a dry lot given corn and tankage self-fed, free choice. The pasture lots consisted of 1 acre. Grazing crops used were oats and vetch in 1926-27 and oats and Austrian winter peas in 1928-29. The dry lot was 20 x 60 feet.

The pigs were placed on pasture as soon as sufficient growth was available, dry lot was started at the same time as the grazing groups.

Pigs varying in weight were used in each of the experiments, animals used were purebred Poland Chinas, purebred Duroc-Jerseys, and Poland China-Berkshire cross. Average age of pigs varied each year according to the time pigs could be placed on the pasture crop. All pigs were kept under similar condition prior to being placed on experiment. In each trial the animals were divided into three lots as nearly uniform as possible with reference to breed, sex, weight, conformation and condition.

A mineral mixture composed of equal parts by weight of charcoal, bonemeal, and salt was supplied to all lots in self-feeders.

Results:

OATS WITH VETCH OR AUSTRIAN PEAS AS GRAZING CROP FOR HOGS

Rations	Lot 1 Corn tankage minerals self-fed free choice pasture	Lot 2 Corn 12 tankage 1 hand-fed 3% of liveweight minerals self-fed, pasture	Lot 3 Corn tankage minerals self-fed free choice in dry lot
Total number of animals	29	37	37
Av. initial weight per animal (lbs.)	73.15	72.95	73.19
Av. initial value per animal (dol.)	6.02	5.95	6.06
Av. final weight per animal (lbs.)	195.90	164.45	177.55
Av. daily gain per animal (lbs.)	1.76	1.33	1.50
Concentrates required per 100 lbs. gain			
Corn (lbs.)	341.24	274.01	392.12
Tankage (lbs.)	19.83	24.66	27.70
Total (lbs.)	361.07	298.67	419.82

Reference: Alabama Agricultural Experiment Station Bulletin 233, "Oats and Vetch or Austrian Peas as Grazing Crops for Fattening Hogs," pages 4, 5, and 12, table 5, Auburn, Alabama, July 1930.

A Comparison of Winter Forage Crops for Fattening Hogs As to Rate and Economy of Gains

Conducted by: South Carolina Agricultural Experiment Station.

Conducted at: The Coast Experiment Station, Summerville, South Carolina.

Period: 1931-32 to 1934-35.

Purpose: To compare rye, oats, barley, and rape as green grazing crops for fattening hogs.

Procedure and Conditions:

Animals used: The hogs used in these tests were fall pigs which weighed 50 to 90 pounds, on the average, at the beginning of the tests, and which had been previously treated for cholera and worms. They were put on forage about the middle of December and were carried to an average final weight of approximately 200 pounds.

Most of the hogs used at the Coast Station were purebred Poland China.

Quarters: Small dry lots with some shade were used for the check lots. The forage lots were one acre in size and were without shade or shelter other than that furnished by houses about 8 x 10 feet in size.

Rations: The following rations were fed.

Lot 1—Shelled white corn and fish meal free choice in dry lot.

Lot 2—Shelled white corn and fish meal free choice in green barley.

Lot 3—Shelled white corn and fish meal free choice on green oats.

Lot 4—Shelled white corn and fish meal free choice on green rape.

Lot 5—Shelled white corn and fish meal free choice on green rye.

Lot 6—Shelled white corn and a mixture of one-half fish meal and

Shelled native-grown white corn was used.

A mineral mixture of five pounds oystershell lime, five pounds bonemeal, and one pound of salt was self-fed all lots.

Water was furnished all lots from a pipe line.

The varieties of forage crops used and the method and rate of seeding were as follows:

Forage	Variety Used	Rate of Seeding	Method
Barley	Tennessee Beardless	2 bushels	Broadcast
Rye	Abruzzi	1.5 bushels	Broadcast
Oats	Fulghum	2.5 bushels	Broadcast
Rape	Dwarf Essex	20 pounds	30-inch rows

Results:

COMPARISON OF WINTER FORAGE FOR FATTENING HOGS

Lot number	Lot 1	Lot 2	Lot 3	Lot 4	Lot 5	Lot 6
Forage	None	Barley	Oats	Rape	Rye	Rye
Number of tests	5	5	4	5	4	3
Days on test	85.4	77.2	77.25	77.20	77.75	81.33
Pigs per lot	9.34	10.0	10.00	10.00	10.00	10.00
Total initial weight (lbs.)	661.80	657.80	682.50	659.00	677.50	609.00
Average initial weight (lbs.)	70.18	65.78	68.25	65.90	67.75	60.90
Total final weight (lbs.)	1915.00	2014.40	2027.50	2016.60	2018.50	2013.00
Average final weight (lbs.)	203.07	201.44	202.75	201.66	201.85	201.30
Total gain (lbs.)	1253.20	1356.60	1345.00	1357.60	1341.00	1404.00
Gain per pig (lbs.)	132.89	135.66	134.50	135.76	134.10	140.40
Average daily gain (lbs.)	1.56 .06	1.76 .03	1.74 .03	1.76 .03	1.72 .03	1.73 .03
Total feed consumed: (lbs.)						
Corn	4170.8	4284.00	4372.20	4293.20	4293.00	4398.67
Supplement	399.2	335.20	327.50	317.80	340.74	566.66
Total	4570.00	4700.20	4611.50	4690.00	4633.75	4965.33
Mineral	24.4	8.2	5.75	7.6	11.00	12.66
Forage, acres	—	.5	.5	.5	.5	.5
Feed per pig per day (lbs.)						
Corn	5.18	5.65	5.55	5.66	5.52	5.41
Supplement	.50	.43	.42	.41	.44	.70
Total	5.68	6.08	5.97	6.07	5.96	6.11
Mineral	.03	.01	007	.01	.014	.016
Forage	—	.00065	.00065	.00065	.00064	.00061
Feed per 100 lbs. gain (lbs.)						
Corn	332.81	321.76	318.51	322.05	320.13	312.30
Supplement	31.85	24.71	24.35	23.41	25.41	40.36
Total	364.66	346.47	342.86	345.46	345.54	353.66
Mineral	1.95	.60	.43	.56	.82	.90
Forage, acres	—	.037	.037	.037	.037	.036

Reference: South Carolina Agricultural Experiment Station Circular 54, "Winter Forages for Fattening Hogs," pages 3, 4, and 8, table 4, Clemson, South Carolina, June 1936.

Soybeans, Cottonseed Meal, and Winter Pasture for Fattening Hogs

Conducted by: Mississippi Agricultural Experiment Station.
Conducted at: State College, Mississippi.
Period: Winter of 1932-33.

Purpose: To compare rations of corn and home-grown proteins to a ration of corn and a bought protein, both in the dry lot and while on pasture. Tests were made to determine the quality of carcasses produced by these feeds.

Results:

SOYBEANS, COTTONSEED MEAL, and WINTER PASTURE FOR FATTENING HOGS

	Lot 1	Lot 2	Lot 3	Lot 4	Lot 5	Lot 6
	Self-fed corn 85% soybeans 15% in dry lot	Self-fed corn 85% soybeans 10% C.S. meal 5% in dry lot	Corn 92% tankage grazing 8% in dry lot	Same as Lot 1 on wheat as winter grazing	Same as Lot 2 on wheat as winter grazing	Same as Lot 3 on wheat as winter grazing
Length of test (days)	67	57	50	53	48	46
Number of pigs	8	8	7	8	8	8
Average initial weight (lbs.)	95.17	100.00	101.77	95.37	97.42	96.80
Average final weight (lbs.)	204.66	198.65	197.81	190.62	188.66	187.37
Average gain (lbs.)	109.49	98.54	96.04	95.25	91.24	90.57
Average daily gain (lbs.)	1.63	1.73	1.92	1.80	1.90	1.97
Feed per 100 lbs. gain:						
Corn (bu.)	5.57	5.54	5.87	5.10	5.39	5.86
Mam. yel. soybeans (lbs.)	55.06	36.52	—	50.43	35.55	—
C. S. meal (lbs.)	—	18.26	—	—	17.78	—
Tankage (lbs.)	—	—	28.61	—	—	28.45
Mineral* (lbs.)	4.11	4.95	2.75	2.43	2.33	1.45

*Mineral mixture of 10 parts ground limestone, 10 parts bonemeal, and 2 parts salt in all lots.

Reference: Paper given by Animal Husbandry Department, Mississippi Experiment Station, Livestock Field Day, May 15, 1934.

Sudan Grass and Rape Pasture Compared to Dry Lot and to Soybean Pasture

Conducted by: Louisiana Agricultural Experiment Station.

Conducted at: Baton Rouge, Louisiana.

Period: Lots 1 and 2: May 31 to August 3, 1931.
Lot 3: August 5 to September 26, 1931.

Purpose: To compare Sudan grass and rape pasture with dry lot and soybean pasture.

Procedure and Conditions: The hogs used were principally purebred pigs with some crossbreds and grades, all belonging to the University.

All pigs had shade, plenty of water, and were fed protein supplements, free choice in self-feeders. A mineral mixture of salt, bonemeal, and ground oystershell was also available.

Results:

SUDAN GRASS, KAPE, AND SOYBEAN PASTURE FOR HOGS

	Lot 1	Lot 2	Lot 3*
	Dry lot	Sudan and rape pasture	Soybeans
Days on test	66	66	42
Pigs in lot	10	30	15
Average initial weight (lbs.)	45.15	44.4	57.6
Average final weight (lbs.)	97.7	101.7	102.9
Average gain (lbs.)	52.5	57.3	45.2
Average daily gain (lbs.)	.79	.87	1.07
Average feed eaten (lbs.)			
Corn	78.00	64.8	51.2
Rice polish	119.75	99.5	27.9
Wheat shorts	32.25	24.2	—
Tankage	11.62	8.2	—
Shrimp meal	—	—	8.8
Cottonseed meal	11.62	8.2	8.8
Feed per 100 lbs. gain (lbs.)			
Corn	148.6	113.1	114.8
Rice polish	227.7	173.7	61.6
Wheat shorts	61.4	42.2	—
Tankage	22.1	14.3	—
Cottonseed meal	22.1	14.3	19.4
Shrimp meal	—	—	19.4

*Lot 3 is not strictly comparable to the other lots, as this test was made at a later date, and some changes had to be made in the ration. It is presented here in similar form for purposes of comparison. The pigs used were of similar weight, type, and previous treatment.

Reference: Louisiana Agricultural Experiment Station Bulletin 228, "Protein Supplements and Pastures for Swine," pages 33 and 34, Baton Rouge, Louisiana, July 1932.

Permanent Pastures for Hogs

Fattening hogs in dry lot is practiced by many farmers in Mississippi; which is due in many cases to not having permanent pasture fenced for hogs, and the opinion of some that fattening hogs will do better in dry lot than on pasture.

There is considerable experimental information on the value of permanent pasture for fattening hogs. This information should be considered thoroughly before making a decision on this factor in hog feeding.

Value of Permanent Pasture for Hogs

Conducted by: Georgia State College of Agriculture.

Conducted at: Athens, Georgia.

Period: 53 days test, 1928-1929.

Purpose: To determine the value of permanent pasture for feeding hogs.

Results:

VALUE OF PERMANENT PASTURE FOR HOGS

	Shelled corn 60% tankage minerals (dry lot)	Shelled corn 60% tankage minerals (pasture)	Shelled corn 75% cottonseed meal 15% tankage 5% alfalfa 5% minerals (dry lot)	Shelled corn 75% cottonseed meal 15% tankage 5% alfalfa 5% minerals (pasture)
Average gain per pig (lbs.)	75.6	91.26	58.8	77.6
Average daily gain (lbs.)	1.44	1.72	1.11	1.46
Concentrates required per 100 lbs. gain	388.	333	442.	335.

Unpublished Data, Georgia State College of Agriculture, Athens, Georgia.

Reference: Bulletin of the University of Georgia, Volume XXI, Number 2, "Setting Up a Feeding Program for Hogs," page 52, table 58, March 1939.

The Value of Permanent Pasture for Fattening Pigs

Conducted by: North Carolina Agricultural Experiment Station.
Conducted at: Raleigh, North Carolina.
Period: 1928-1931.

Purpose: To determine if pigs grazed on a permanent pasture would consume less concentrates or make more rapid gains than those in a dry lot when both groups were full-fed the same grain mixture.

To determine if a permanent pasture would replace fifty percent of the nitrogenous feeds in the grain mixture when pigs were full-fed this mixture and allowed ample grazing in addition.

Procedure and Conditions: The two groups receiving pasture were each confined in an area that contained only one-half acre. The two pastures joined each other, were on comparable soil, and had the same general slope and elevation. Each autumn, when the pigs were removed, any bare spots were reseeded and the following spring nitrate of soda was applied at the rate of 100 pounds per acre.

An abundance of grass was available for lots 2 and 3 in 1928 and 1929 but dry seasons in 1930 and 1931 caused a scarcity of grass and it was necessary to give lot 2 an additional two-tenths of an acre of pasture on September 11, 1931. The pigs in this lot seemed to graze the grass closer than those in lot 3 and did not get sufficient grazing in the latter part of 1930.

Purebred Poland China and Duroc-Jersey pigs, together with a few crossbred pigs from two breeds, were fed in 1929, 1930, and 1931 trials, but during 1928 several Berkshire and Tamworth pigs were used in addition to pigs from the above breeds. All pigs were weaned at 8 weeks of age and were started on experiment as soon thereafter as they could be vaccinated and treated for worms.

Each group of pigs was hand-fed twice daily. The feed mixture for each group was fed dry but ample drinking water was adjacent to the feed troughs at all times. Special double feeding troughs with divisions on each side were used for all three groups, so that each individual pig had a good opportunity to get his share of the feed.

Rations: The composition of the ration was changed for each group as

the pigs increased in weight. The changes were made according to the following schedule.

Kind of pasture		Group 1 None	Group 2 Orchard grass	Group 3 Orchard grass
Feed mixture when pigs averaged 40 lbs. to 60 lbs.	Corn meal	125 lbs.	125 lbs.	125.0 lbs.
	Wheat shorts	50 lbs.	50 lbs.	25.0 lbs.
	Fish meal	25 lbs.	25 lbs.	12.5 lbs.
	Mineral	4 lbs.	4 lbs.	3.3 lbs.
	Total	204 lbs	204 lbs.	165.8 lbs.
60 lbs. to 100 lbs.	Corn meal	200 lbs.	200 lbs.	200.0 lbs.
	Wheat shorts	25 lbs.	25 lbs.	12.5 lbs.
	Fish meal	25 lbs.	25 lbs.	12.5 lbs.
	Mineral	5 lbs.	5 lbs.	4.5 lbs.
	Total	255 lbs.	255 lbs.	229.5 lbs.
100 lbs. to 150 lbs.	Corn meal	250 lbs.	250 lbs.	250.0 lbs.
	Wheat shorts	25 lbs.	25 lbs.	12.5 lbs.
	Fish meal	25 lbs.	25 lbs.	12.5 lbs.
	Mineral	6 lbs.	6 lbs.	5.5 lbs.
	Total	306 lbs.	306 lbs.	280.5 lbs.
150 lbs. to 200 lbs.	Corn meal	325 lbs.	325 lbs.	325.0 lbs.
	Fish meal	25 lbs.	25 lbs.	12.5 lbs.
	Mineral	7 lbs.	7 lbs.	6.8 lbs.
	Total	357 lbs.	357 lbs.	344.3 lbs.

The following grades of feeds were used: No. 3 white corn meal, gray wheat shorts containing 15 percent protein, Menhaden fish meal containing 55 percent protein, aud a mineral mixture consisting of 10 pounds each of finely ground limestone and superphosphate, and 2 pounds of common salt.

Results:

THE VALUE OF PERMANENT PASTURE FOR FATTENING HOGS

	Lot 1	Lot 2	Lot 3
Number pigs used	62.	65.	64.
Number days on feed	100.65	94.92	101.92
Average initial weight (lbs.)	47.23	47.37	47.38
Average final weight (lbs.)	202.00	200.95	201.94
Average gain (lbs.)	154.77	153.58	154.56
Average daily gain per pig (lbs.)	1.54	1.62	1.52
Average daily feed per pig (lbs.)	5.35	5.54	5.54
Feed consumed per pig: (lbs.)			
Corn meal (lbs.)	445.80	435.46	505.87
Wheat shorts (lbs.)	36.59	35.73	21.41
Fish meal (lbs.)	45.32	44.15	25.90
Mineral (lbs.)	10.55	10.31	11.08
Total concentrates (lbs.)	538.26	525.65	564.26
Pasture (acres)	None	.0308	.0344
Feed per cwt. gain:			
Corn meal (lbs.)	288.03	283.52	327.29
Wheat shorts (lbs.)	23.64	23.26	13.85
Fish meal (lbs.)	29.28	28.75	16.76
Mineral (lbs.)	6.82	6.71	7.17
Total concentrates (lbs.)	347.77	342.25	365.07
Pasture (acres)	None	.0200	.0222

Reference: North Carolina Agricultural Experiment Station Bulletin 286, "The Value of Permanent Pasture for Fattening Pigs," pages 3, 4, 5, and 11, table 5, Raleigh, North Carolina, June 1933.

Pasture Crops for Swine

Conducted by: Louisiana Agricultural Experiment Station.

Conducted at: Baton Rouge, Louisiana.

Period: 100 days, March 2, 1932 to June 10, 1932.

Purpose: To determine the value of various pasture crops for swine.

Procedure and Conditions: Most of the pigs used were loaned by the University and 18 grade Duroc-Jerseys purchased to complete the number required. These were divided into four lots of ten each, two lots being on pasture and two in dry lots. They were fed on ear corn, hand-fed, twice daily and self-fed a protein supplement mixture of 60 parts shrimp meal and 40 parts cottonseed meal. On April 20, this was changed to 60 parts of shrimp meal, 20 parts cottonseed meal, and 20 parts ground alfalfa hay.

One pig became sick on lot 1 (sweet clover) and was removed on the first weighing day (28 days). It later died, and was found to have the lungs adhering to the sides of the chest cavity. One pig on lot 3 (separated milk) proved to be unthrifty and was removed from the experiment on the 56th day.

In the fall of 1931, an area of one and one-half acres of upland adjacent to the experimental feeding pens was set aside for pasture experiments. One acre was seeded to white Dutch clover, to be divided later into two half-acre plots, and one-half acre was seeded to yellow sweet clover, "Melilotus Indica." This land was limed with waste lime from the sugar factory. A good stand of clover was obtained on each plot, but the sweet clover was at its best in March. The white clover was very short on March 2, and was cut down by a late frost on March 10. There was very little white clover pasture for the first month.

Results:

Ration	Lot 1 Ear corn shrimp meal C.S. meal green alfalfa sweet clover pasture	Lot 2 Ear corn shrimp meal C.S. meal green alfalfa white clover pasture	Lot 3 Ear corn shrimp meal C.S. meal green alfalfa sep. milk dry lot	Lot 4 Ear corn shrimp meal C.S. meal green alfalfa dry lot
Number pigs in lot	9	10	9	10
Av. initial weight (lbs.)	62.4	64.1	65.0	64.8
Av. final weight (lbs.)	186.3	195.3	199.6	183.4
Av. gain per head (lbs.)	123.9	131.2	134.6	118.6
Av. gain per day (lbs.)	1.24	1.31	1.346	1.18
Av. daily feed (lbs.)				
Ear corn	6.0	5.9	6.0	5.95
Estimated shelled corn 69%	(4.14)	(4.07)	(4.14)	(4.10)
Shrimp meal	.49	.38	.26	.50
Cottonseed meal	.27	.22	.17	.30
Ground alfalfa	.056	.036	.025	.036
Separated milk	.—	.—	7.4	.—
Feed per 100 lbs. gain (lbs.)				
Corn, shelled (est.)	333.8	310.8	309.6	346.3
Shrimp meal	39.5	29.0	19.7	42.2
Cottonseed meal	21.8	16.0	12.5	25.1
Ground alfalfa	4.5	2.8	1.9	3.1
Separated milk	—	—	551.6	—

Reference: Louisiana Agricultural Experiment Station Bulletin 228, "Protein Supplements and Pastures for Swine," pages 38 and 39, Baton Rouge, Louisiana, July 1923.

Feeding Spring Pigs for Market

Conducted by: Purdue University Agricultural Experiment Station.

Conducted at: Lafayette, Indiana.

Period: 1920-1925.

Purpose: To compare full feeding of spring pigs for early fall market with limited feeding for late fall or winter market on different kinds of pasture.

Procedure and Conditions: March and April pigs sired by Duroc-Jersey boars and out of Poland China sows were used in the various trials. There were 20 pigs in each trial, 10 with full feed, and 10 with limited feed of grain. The most of these pigs were raised on the Experiment Swine Farm. During the suckling period they were self-fed a mixed ration of 80 pounds corn, 20 pounds wheat shorts and 10 pounds tankage, and had access to blue grass and timothy pasture. From weaning time until the pigs were started in the experiment, shelled corn, wheat shorts, tankage, and a mineral mixture composed of 10 pounds wood ashes, 10 pounds 16 percent superphoshate and 1 pound common salt, were fed free choice in self-feeders. In most cases good clover or alfalfa pasture was used during this period. All of the pigs were weaned at eight weeks of age and were in good thrifty condition when put into the experimental lots.

Rations:

Full Feed: Shelled corn and 60 percent tankage self-fed, free choice, on pasture.

Limited Grain: Shelled corn 95 parts and tankage 5 parts by weight mixed and hand-fed twice daily in limited quantity while on pasture, and shelled corn and tankage self-fed free choice during the finishing period in dry lot.

Results: FEEDING SPRING PIGS FOR MARKET

Trial number	1	2	3	4	5	6	7	8	9	Average
Date begun	July 4, 1920		July 2, 1921		June 28, 1922		June 27, 1923	June 26, 1924	June 25, 1925	June 30
Kind of pasture	Clover	Rape	Clover	Alfalfa	Clover	Alfalfa	Alfalfa	Alfalfa	Clover	
Av. initial weight (lbs.)	74	74	62	62	68	68	76	74	63	69
Av. final weight (lbs.)	219	219	220	220	208	208	221	220	219	217
Av. daily gain										
Full feed (lbs.)	1.80	1.74	1.82	1.90	1.53	1.62	1.77	1.66	1.88	1.64
Limited grain* (lbs.)	1.27	1.21	1.27	1.29	1.12	1.15	1.19	1.17	1.20	1.21
Date finished for market										
Full feed (lbs.)	Sept. 22	Sept. 25	Sept. 27	Sept. 24	Sept. 28	Sept. 22	Sept. 17	Sept. 22	Sept. 16	Sept. 23
Limited grain (lbs.)	Oct. 27	Nov. 2	Nov. 3	Nov. 2	Oct. 31	Oct. 28	Oct. 30	Nov. 1	Nov. 2	Oct. 31
Feed required 100 lbs. gain										
Full feed (lbs.)										
Corn	322.6	334.6	336.0	327.6	336.1	335.0	324.6	334.0	316.7	329.6
Tankage	21.2	23.8	29.8	24.8	30.6	26.6	20.5	25.5	23.4	25.1
Limited gain* (lbs.)										
Corn	314.4	313.6	320.8	317.4	325.0	314.0	366.3	332.5	326.4	325.9
Tankage	13.3	17.3	17.5	17.3	18.4	19.8	16.8	14.7	12.8	16.4
Pasture required for 10 hogs										
Full feed (acres)	.5	1.0**	.5	.5	.5	.5	.5	.5	.5	.5
Limited feed (acres)	1.5	3.0**	1.5	1.0	1.5	1.5	1.5	1.5	1.5	1.44
Gain and Feed Requirements of the Pigs Fed by Limited Grain Method										
Av. daily gain growing on pasture (lbs.)	.77	.68	.68	.73	.72	.71	.74	.67	.76	.72
Weight at close of pasture season (lbs.)	136.0	128.0	120.0	124.0	133.0	132.0	141.0	138.0	131.0	131.0
Av. daily gain fattening in dry lot (lbs.)	2.39	2.22	2.63	2.60	2.18	2.41	2.21	2.56	2.21	2.38
Feed consumed per 100 lbs. gain										
Growing period (lbs.)										
Corn	248.4	270.3	239.9	222.6	270.5	262.9	278.4	299.2	243.4	259.5
Tankage	13.8	15.5	13.6	13.2	16.2	17.2	14.7	15.8	12.8	14.8
Fattening period (lbs.)										
Corn	363.2	338.7	368.6	379.5	372.4	356.5	432.3	355.8	390.1	373.0
Tankage	13.0	18.4	19.7	20.0	20.3	22.1	18.5	14.0	12.7	17.6

*Based on entire feeding period.

**In 1920 the rape was rated as one-half a normal crop. This crop is not included in the average.

Reference: Purdue University Agricultural Experiment Station Bulletin 279 (revised), "Feeding Spring Pigs for Market," pages 4, 5, 7, and 10, tables 1, 2, and 4, Lafayette, Indiana, July 1928.

Tankage for Fattening Spring Pigs on Legume Pasture

Conducted by: Indiana Agricultural Experiment Station.

Conducted at: Lafayette, Indiana.

Period: Six years, 1920-1925.

Purpose: To determine the value of tankage when fed with corn and legume pasture to spring pigs.

Procedure and Conditions: Twenty pigs were in each trial, 10 with shelled corn and pasture and 10 with shelled corn, tankage and pasture.

Both groups were fed to the same market weight.

Rations were self-fed free choice.

Half-acre units of pasture were used for the experimental lots. Each group of ten pigs was started with one-half acre of pasture. The pigs were removed to a new half acre in case of shortage of pasture. They were returned to the original lot when the pasture had made sufficient growth to meet their needs.

Yellow corn was used in all of the feeding trials. Tankage containing 60 percent protein was used in all trials. The alfalfa pasture was of good quality and one-half acre furnished a surplus of pasture for the pigs receiving tankage and adequate pasture for those without tankage. The clover pasture varied from year to year due to weather influences. In 1920 and 1921 the clover continued growing and furnished plenty of pasture throughout the grazing period but did not seem to have the good grazing qualities of the clover grown in the drier years. In 1922 and 1925 the clover became very dry. In 1922 the pigs were practically without pasture for a ten day period in August.

Automatic water fountains supplied fresh water to the pigs in all trials. Salt was supplied to the pigs in all lots. In the earlier trials flake salt was used, and in the latter pressed block salt.

Results:

TANKAGE FOR FATTENING SPRING PIGS ON LEGUME PASTURE

	1 1920	2* 1921	3 1922	4 1923	5 1924	6 1925	Av. 1920-25
Kind of pasture	Clover	Clover	Clover	Alfalfa	Alfalfa	Clover	
Date began	July 4	July 2	June 28	June 27	June 26	June 25	
Average initial weight (lbs.)	74	62	68	76	74	63	71
Average final weight (lbs.)	219	220	208	221	220	219	217
Average daily gain							
With tankage (lbs.)	1.80	1.82	1.53	1.77	1.66	1.88	1.72
Without tankage	1.31	.98	1.28	1.46	1.34	1.50	1.38
Date finished for market							
With tankage	Sept. 22	Sept. 27	Sept. 28	Sept. 17	Sept. 22	Sept. 16	Sept. 21
Without tankage	Oct. 23	Dec. 10	Oct. 15	Oct. 5	Oct. 13	Oct. 7	Oct. 13
Extra time required by pigs without tankage (days)	31	74	17	18	21	21	22
Feed requirements							
With tankage							
Shelled corn (lbs.)	322.6	336.0	336.1	324.6	334.0	316.7	326.6
Tankage (lbs.)	21.2	29.8	30.6	20.5	25.5	23.4	24.2
Without tankage							
Shelled corn (lbs.)*	381.6	489.8	378.2	371.1	390.8	356.9	375.5
Pasture required for 10 pigs							
With tankage (acres)	.5	.5	.5	.5[1]	.5[1]	.5	.5
Without tankage (acres)	1.0	1.0	1.0	.5	.5	.75	.75

[1] Although ½ acre lots were used there was a surplus of alfalfa pasture.

*Trial 2 is not included in the average figure as the group of pigs without tankage in this trial represents a very extreme case.

Reference: Indiana Agricultural Experiment Station Bulletin 300, "Tankage, for Spring Pigs on Legume Pasture," pages 3, 5, and 6, tables 1 and 2, Lafayette, Indiana, March 1938.

Feeding System for Spring and Fall Litters at Tifton, Georgia

Conducted by: Georgia Coastal Plains Experiment Station.

Conducted at: Tifton, Georgia.

Period: 1935-1937.

Purpose: To compare different feeds for pork production.

Procedure and Conditions: The 1935 spring litter feeding periods were as follows:

Lot 1—April 23 to July 15.
Lot 2—July 16 to August 7.
Lot 3—August 8 to August 31.
Lot 4—September 1 to September 24.
Lot 5—September 25 to November 15.
Lot 6—November 16 to December 10.

The feeding periods for the 1936 spring litters were as follows:

Lot 1—May 5 to July 14.
Lot 2—July 15 to August 14.
Lot 3—August 15 to September 29.
Lot 4—September 30 to October 26.
Lot 5—October 27 to November 9.

Results:

CONTINUOUS FEED PROGRAM FOR HOGS AT TIFTON—SPRING LITTERS, 1935

	Lot 1	Lot 2	Lot 3	Lot 4	Lot 5	Lot 6
Number pigs to lot	38	38	41	41	41	30
Feeding period, days	84	23	24	24	52	24
Grazing crops (acres)						
Mature oats	5.4					
∫Otootan soybeans (no beans						
\set) green grazing		2.2				
∫Grohoma sorghum (mature)						
\and Otn. soyb. (no beans set)			3.4			
∫Grohoma sorghum (mature)						
\& Spanish peanuts (mature)				4.1		
∫Corn (mature) and Hay-						
\seed soybeans (mature)					8.3	
Dry lot on corn and tankage						—
Supplement						
Corn (lbs.)	3958	592				5544
Tankage (lbs.)	345	31	47	177	215	155
Cottonseed meal (lbs.)	235	21	32	118	142	104
Total gain (lbs.)	1642	556	598	1324	3046	1490
Total gain per acre (lbs.)	304	253	176	323	367	—
Gain per day per pig (lbs.)	.52	.65	.61	1.35	1.63	2.07
Acres per pig for the period grazed	.142	.057	.082	.100	.202	—

CONTINUOUS FEEDING PROGRAM FOR HOGS AT TIFTON, GEORGIA, SPRING LITTERS 1936

	Lot 1	Lot 2	Lot 3	Lot 4	Lot 5
Number pigs to lot	56	52	52	39	9
Feeding period (days)	71	31	46	27	14
Grazing crop (acres)					
Mature oats	3.9				
Early White Dent corn (Hastings'					
Early) White Dent		6.			
Grohoma sorghum and Spanish peanuts			5.45		
Corn and Hayseed soybeans				8.45	
Dry lot on corn and protein supplement					
Supplements					
Corn (lbs.)	6719				832
Tankage (lbs.)	907	871	1048	467	63
Cottonseed meal (lbs.)	604	580	698	312	42
Total gain (lbs.)	3141	3210	2229	1054	137
Total gain per acre (lbs.)	805	535	409	128	—
Gain per day per pig (lbs.)	.79	1.98	.98	1.00	1.17
Acres per pig for period grazed	.069	.115	.104	.217	—

Note: A mineral mixture was self-fed.

References: Georgia Coastal Plain Experiment Station Sixteenth Annual Report 1935-1936, page 59, Tifton, Georgia, September 1936.

Georgia Coastal Plain Experiment Station Eighteenth Annual Report 1937-1938, pages 72 and 73, Tifton, Georgia, July 1938.

CONTINUOUS FEEDING PROGRAM FOR HOGS AT TIFTON, GEORGIA, FALL LITTERS 1935-36

	Lot 1	Lot 2	Lot 3
Number pigs per lot	44	44	44
Period	Oct. 22 to Jan. 10	Jan. 11 to Mar. 6	Mar. 7 to Mar. 26
Feeding period (days)	81	56	20
Grazing crop (acres)			
Corn and runner peanuts	7.9		
Runner peanuts		9.	
Dry lot on corn and tankage			—
Supplements			
Corn (lbs.)			4.49
Tankage (lbs.)	.2	.28	.45
Daily gain per pig (lbs.)	.98	1.37	1.44
Gain per acre (lbs.)	408.	374.	—
Average weight per pig on Mar. 26	207.	207.	207.

References: As on page 116.

FEED PREPARATION AND METHODS OF FEEDING

Grinding Corn for Swine

Conducted by: Pennsylvania Agricultural Experiment Station.

Conducted at: State College, Pennsylvania.

Period: 1931 through 1933.

Purpose: To determine the relative value of different degrees of fineness of ground corn when compared to whole corn, as measured by gain in body weight of growing and fattening pigs.

Procedure and Conditions: This report is an average of four tests conducted using ground corn, fine, medium and coarse, compared to whole corn. The degrees of fineness were obtained by grinding corn through 3/36, 3/16 and ½ inch screens in a hammer type mill.

A ration of 1,000 pounds of corn, 200 pounds of wheat middlings, 66⅔ pounds of 60 percent tankage, 33½ pounds of old process linseed meal and 13 pounds of mineral (ground limestone 40, steamed bonemeal 40, salt 20) was fed to all lots in each test.

These tests were conducted in 1931 through 1933 using purebred Chester White, Duroc-Jersey, Poland China, and Berkshire pigs. They were evenly distributed according to breed, weight, and size through each lot. All lots in two tests were fed in dry lot, lots ¼ acre in size and all lots in two tests were fed on ¼ acre pastures of Dwarf Essex rape. All animals were fed a daily ration equivalent to 3 percent of the liveweight.

	Lot 1	Lot 2	Lot 3	Lot 4
	Fine	Medium	Coarse	Whole
Fineness modulus	2.12	2.54	3.28	9.5
Pigs fed	9.5	10.	10.	10.
Days fed	80.	79.	81.	86.
Average initial weight per pig (lbs.)	78.1	78.0	77.3	77.5
Average final weight per pig (lbs.)	190.5	192.6	188.3	180.9
Average daily feed per pig (lbs.)	4.61	4.69	4.65	4.63
Average daily gain per pig (lbs.)	1.40	1.45	1.37	1.19
Average feed per 100 lbs. gain (lbs.)	333.6	327.2	343.6	393.4

Reference: Pennsylvania Agricultural Experiment Station Bulletin 326, "Grinding Corn for Swine," pages 3, 4, 5, 6, and 7, tables 1, 2, 3, and 5, State College, Pennsylvania, March 1936.

Self-Feeding Compared with Hand-Feeding from Weaning Through Fattening Period

Conducted by: U. S. Experiment Farm.
Conducted at: Beltsville, Maryland.
Period: 1921 and 1922.

Purpose: To compare self-feeding with hand-feeding from weaning through fattening period.

Procedure and Conditions: The following breeds were used in the experiment: Duroc-Jersey, Poland China, Chester White, Hampshire, Tamworth, and Berkshire. In addition to these some grade sows and litters were on test. In most of the tests, pastures of various kinds were used. Pastures were usually rye, but a mixture of oats and some native grasses were used.

In the self-fed lots, certain feeds were constantly accessible in self-feeders to the sows and pigs during the entire period. The sows and pigs in the hand-fed lots were given twice daily all they would readily eat of identically the same feeds used in the self-fed lots. In the hand-fed lots, the young pigs had access to self-feeders placed in creeps providing supplementary feed after they had reached three weeks of age. Corn alone was provided in the self-feeders for the young pigs for the first two or three weeks. After this time the protein feeds were added.

The above conditions have to do with the feeding of pigs through suckling period up to weaning. At this time it was decided to continue this test through the fattening period.

Results:

SELF-FEEDING COMPARED WITH HAND-FEEDING FROM WEANING THROUGH FATTENING PERIOD

	Self-fed	Hand-fed
Number of pigs in tests	253	101
Average weight when farrowed (lbs.)	2.38	2.36
Average weight when weaned (lbs.)	35.71	32.61
Average gain from farrowing to weaning (lbs.)	33.33	30.25
Average age at weaning (days)	71.02	76.24
Average daily gain from farrowing to weaning	.47	.40
Average gain, weaning to beginning of test	70.96	67.15
Average number of days, weaning to beginning of test	119.54	120.49
Average daily gain, weaning to beginning of test (lbs.)	.59	.56
Average weight, beginning of test (lbs.)	106.66	99.76
Average weight, close of test (lbs.)	197.74	188.18
Average gain on test (lbs.)	91.08	88.42
Average age, beginning of test (days)	190.56	196.73
Average age, close of test (days)	266.36	289.89
Average days on test (days)	75.80	93.16
Average daily gain on test (lbs.)	1.20	.95
Average daily gain, farrowing to close of test (lbs.)	.73	.64

Reference: Farmers' Bulletin 1504, "Self-Feeding versus Hand-Feeding Sows and Litters," pages 2, 3, and 6, table 2, August 1926.

Self-Feeding Ground Corn and Soybeans and the Feeding of Same with Different Protein Supplements

Conducted by: Mississippi Agricultural Experiment Station.
Conducted at: State College, Mississippi.
Period: 1929.

Purpose: To determine the value of self-feeding ground corn and soybeans and the feeding of same with different protein supplements.

Procedure and Conditions: All pigs were bred and raised on the Experiment Station farm and in each trial they had had the same care and feeding until the various trials were started. The practice was to worm and move the pigs on clean grazing lots as soon after weaning as possible. They were smooth, thrifty, and considered as good-to-choice feeder pigs. The breeding consisted of purebred Poland China, Duroc-Jersey, and Hampshire, with some crossbreds of these breeds. At the beginning of the experiment, the pigs were divided into lots as nearly equal as possible in age, breeding, type, sex and quality, condition, and weight.

In soft pork studies large variations have occurred in carcasses of hogs from the same lot; therefore, it was deemed necessary to know the exact proportion of corn to beans each individual pig consumed in order to try to determine the cause of variation in firmness of carcasses, and the only way to obtain such information necessitated the grinding and thorough mixing of the feeds in known proportions. Hence, the work was carried out on that basis.

This work consisted of the addition of a protein supplement to the corn and soybean ration in order to see if some was profitable and if so, what source of protein supplement would give the most economical gains. All feeds were ground and mixed thoroughly in definite proportions. Each group of pigs was self-fed in dry lots and had free access to the following mineral mixture:

10 parts bonemeal.
10 parts ground limestone.
2 parts salt.

Results:

SELF-FEEDING GROUND CORN AND SOYBEANS AND THE FEEDING OF SAME WITH DIFFERENT PROTEIN SUPPLEMENTS

Ration—(Self-fed in dry lot)	Lot 1 Corn 6 parts Mammoth Yellow beans 1 part	Lot 2 Corn 6 parts Virginia beans 1 part	Lot 3 Corn 6 parts Mammoth Yellow beans 1 part M.P.F. 0.3 part	Lot 4 Corn 6 parts Mammoth Yellow beans 1 part D.B.M. 0.4 part	Lot 5 Corn 6 parts Mammoth Yellow beans 1 part C.S.M. 0.341 part
Number of hogs	10	10	10	10	10
Length of feeding trial (days)	63	63	56	56	56
Average initial weight (lbs.)	96.8	96.5	99.	99.1	98.7
Average final weight (lbs.)	190.3	196.2	207.1	224.1	202.2
Average daily gain per hog (lbs.)	1.48	1.58	1.93	2.23	1.84
Feed consumed per 100 lbs. gain					
Corn (lbs.)	325.72	322.00	282.24	269.42	292.10
Beans (lbs.)	54.28	46.00	47.03	44.90	48.68
Protein supplement (lbs.)	—	—	14.10	17.96	16.63
Mineral mixture (lbs.)	7.59	5.71	2.40	1.36	2.41

M.P.F.—Marine protein feed; D.B.M.—Dried buttermilk; C.S.M.—Cottonseed meal.

Reference: Mississippi Agricultural Experiment Station Bulletin 283, "Grazing and Feeding Trials with Corn and Soybeans for Pork Production," pages 3, 7, and 8, table 5, State College, Mississippi, July 1930.

Self-Feeding Shelled Corn and Soybeans Free Choice and Hogging Down Corn and Soybeans

Conducted by: Mississippi Agricultural Experiment Station.

Conducted at: State College, Mississippi.

Period: 59 days, September 30 to November 27, 1928.

Purpose: To determine the value of self-feeding shelled corn and soybeans free choice and hogging down corn and soybeans.

Procedure and Conditions: All pigs used in the following experiments were bred and raised on the Experiment Station farm and in each trial they had the same care and feeding until the various trials were started. The practice was to worm and move the pigs on clean grazing lots as soon after weaning as possible. They were smooth, thrifty, and considered good-to-choice feeder pigs. The breeding consisted of purebred Poland China, Duroc-Jersey, and Hampshire, with some crossbreds of these breeds. At the beginning of each experiment, the pigs were divided into lots as nearly equal as possible in age, breeding, type, sex and quality, conditions and weight.

Results:

SELF-FEEDING SHELLED CORN AND SOYBEANS, FREE CHOICE, AND HOGGING DOWN

	1 Dry lot	2 Dry lot	3 Dry lot	4 Dry lot	5 Dry lot	6 Hog.	7 Hogged
	Corn and tankage	Corn and M. Yellow beans	Corn and Laredo beans	Corn and Manchu beans	Corn and M. Yellow beans	Corn and M. Yellow beans	Corn and Laredo beans
Number of hogs	8	8	8	7	7	12	12
Average initial weight (lbs.)	101.87	101.25	101.75	101.14	102.57	101.75	96.41
Average final weight (lbs.)	217.62	187.25	186.37	175.00	177.57	206.75	175.60
Average daily gain (lbs.)	1.96	1.45	1.43	1.25	1.27	1.77	1.34
Feed consumed per 100 lbs. gain:							
Corn (lbs.)	311.77	229.65	271.93	315.08	277.33	—	—
Tankage (lbs.)	37.68	—	—	—	—	—	—
Mammoth Yellow beans (lbs.)	—	112.50	—	—	104.57	—	—
Laredo Yellow beans (lbs.)	—	—	87.00	—	0.0*	—	—
Manchu Yellow beans (lbs.)	—	—	—	52.22	—	—	—
Proportion of corn to tankage	8.26:1	—	—	—	—	—	—
Proportion of corn to soybeans	—	2.04:1	3.12:1	6.03:1	2.74:1	—	—

*Only one pound of Laredo soybeans was consumed during the feeding test.

Reference: Mississippi Agricultural Experiment Station Bulletin 283, "Grazing and Feeding Trials with Corn and Soybeans for Pork Production," pages 3, 6, and 7, table 4, State College, Mississippi, July 1930.

PART VI

Killing, Curing and Storing Pork

Fresh pork is a highly perishable product. Without proper handling, preparation, refrigeration, curing and storage, a wholesome product cannot be had. By careful elimination of waste and spoilage the advantage of proper handling of hogs on the farm can be realized. Success in preparing meat depends on strict attention to the methods used.

There are many different ways in which to prepare pork products. The most desirable one for each farmer is that which best suits his family or locality. However, certain general rules for cutting and curing should be observed by all.

Equipment: Certain tools are essential in butchering hogs, illustrated in figure 35.

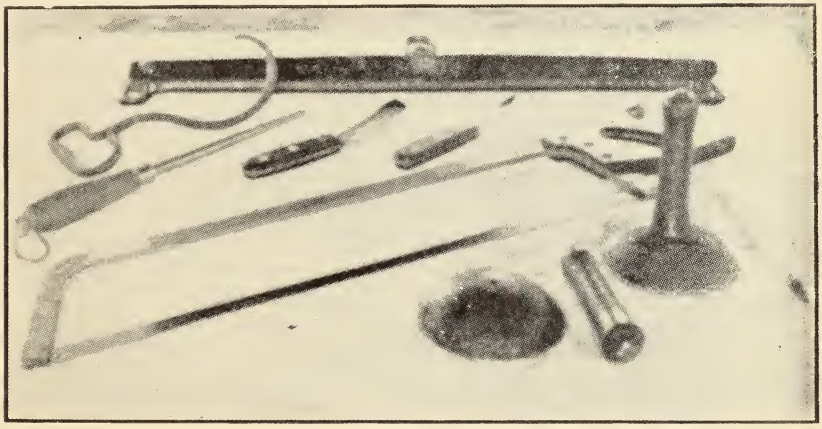

Figure 35. Equipment for use in slaughtering and dressing hogs; gambrel (single-tree), hook, smooth steel, skinning knife, boning knife, saw, bell-shaped hog scrapers and thermometer.

In addition to these tools, scalding barrel and scraping table are essential.

Care of hogs before slaughtering: The care of an animal just before slaughtering has much to do with getting a good "stick." This is important because meat from a well bled hog keeps better than from a hog which has not been bled properly. A hog bleeds more thoroughly and dresses more easily after a 24-hour fast, but it should be given all the water it will drink. Running the animal or wrestling with it often causes an abnormal temporary temperature. Animals should not be killed in this condition as the meat is likely to be bloody, sometimes referred to as "firey." Such meat looks bad and spoils easily.

Sticking: Killing the hog should be done as humanely as possible and in a way that will insure a thorough drainage of the blood. Stunning may be done by striking it one sharp blow with an ax or other heavy blunt instrument or by shooting directly at a point in the forehead, midway between the eyes and slightly above. If possible the stunning should be made effective with the first trial.

Some stick the animal without stunning and it is highly recommended and will give a more complete drainage of blood when stuck. In sticking, place the hog squarely on its back, take a position squarely in front of the hog and open the skin for a distance of about 3 inches in front of the breastbone, then insert the knife, edge downward, straight in toward the breastbone, not downward as is often done. When the breastbone is reached, follow downward with the point of the knife until the knife slips under the breastbone, then push the knife in about 1 inch and direct the cut first downward toward the backbone, then forward toward the heart as illustrated in figure 36.

It is unwise to stick the heart, because it should be allowed to pump out the blood as long as possible.

Scalding: On the farm where it is difficult to reheat the water promptly, the temperatures of 155° to 165° F. often must be used at the beginning so that the water will not become too cold before the hog is completely cleaned. In using water as hot as this, care must be taken to keep the hog in motion while in the water and to pull from the barrel and give it frequent chances to cool to lessen the danger of setting the hair. Test and remove from water as soon as hair and scurf slips easily.

Scraping: When the hog has been completely scalded one man should

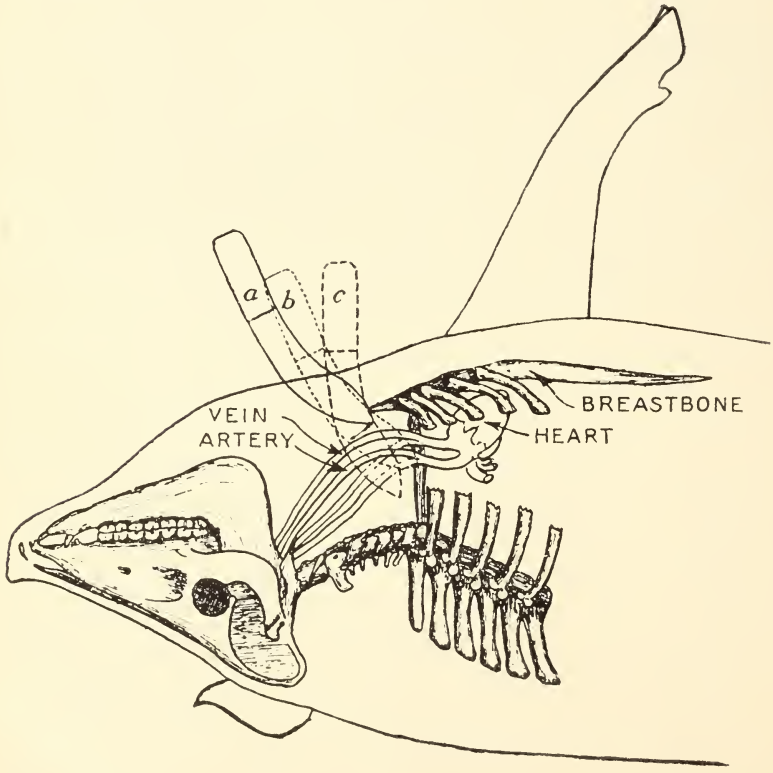

Figure 36. The three positions of the knife in sticking a hog: (a) the knife inserted in the fat; (b) the second position placed the knife above the artery; (c) the final position after the downward thrust has been made and the artery severed.

grip the hind legs with both hands and twist off the hair and then pull off the dew claws and toes. At the same time another man should scrape the forelegs and head. From these points scrape the entire body. Scraping should be done as quickly as possible. After the hair has been removed the carcass should be cleaned by rinsing with warm water and re-scraping, being careful not to cut the skin. Sometimes a blow torch and wire brush will be very useful in singeing and in scraping the head and feet. After this is done the carcass should be rinsed with cool water and shaved.

Removal of Internal Organs: Opening the hog carcass and removing the internal organs are really simple operations, particularly if the animal has been kept off feed for 24 hours before slaughtering. There are many different methods, but the following steps should be understood by the beginner:

(1) Insert the skinning knife, edge side into the sticking place and cut up through the full length of the breastbone as illustrated in figure 37, A.

(2) Begin at the other end of carcass and cut down between the hams, being sure to keep the knife in the center. As the hams open the white membrane which marks the exact middle can be seen. Follow this if possible to the pelvic bone. Sometimes it is necessary to use a saw to divide the pelvic bone. While dividing the pelvic bone care should be taken to avoid puncturing the urinary bladder which lies just below. Insert handle of the knife in opening made in splitting the hams, with the point of the knife pointing outward. Guard the heel of the blade with the forefinger and thumb of the right hand and cut down the medium line of the belly until this cut joins the split breastbone as illusrated in figure 37, B.

(3) Allow intestines to roll out and hang by the natural attachments. Raise the bung by slipping the knife into the pelvic cavity and loosen the bung from the fat on both sides and at the back. Pull it down and toward the kidneys, being careful to cut it free from the kidney fat as illustrated in figure 38, A.

(4) At this point the operation is almost completed and no difficulty need be anticipated. With the left hand, grasp the intestines firmly just below the kidneys at the point where they appear to be attached to the backbone. Push down slowly until they loosen from the back. Free the liver by running the finger of the right hand behind it and pulling it away from the back. Still holding the intestines in the left hand, cut through the diaphragm to the backbone as illustrated in figure 38, B.

Extend the cut around the white fibrous portion of the diaphragm which is parallel to the ribs, to the breastbone and down the breastbone to the throat. This last cut loosens the heart and lungs in the chest cavity. It may sometimes be necessary to cut the back artery from the backbone, thus permitting the left hand to pull the entire offal out of the carcass. The gullet is still attached to the throat, but one cut of the knife will free it.

(5) Rinse the body cavity with cold water. Split the carcass down the center of the backbone with a saw, remove the leaf fat by loosening it where it is attached to the diaphragm at the last rib and strip it up and out as illustrated in figure 39.

Chilling the Carcass: The tissues of many freshly slaughtered hog carcasses contain bacteria that are capable of spoiling the meat unless their growth is promptly checked. This problem can practically be solved by chilling the fresh

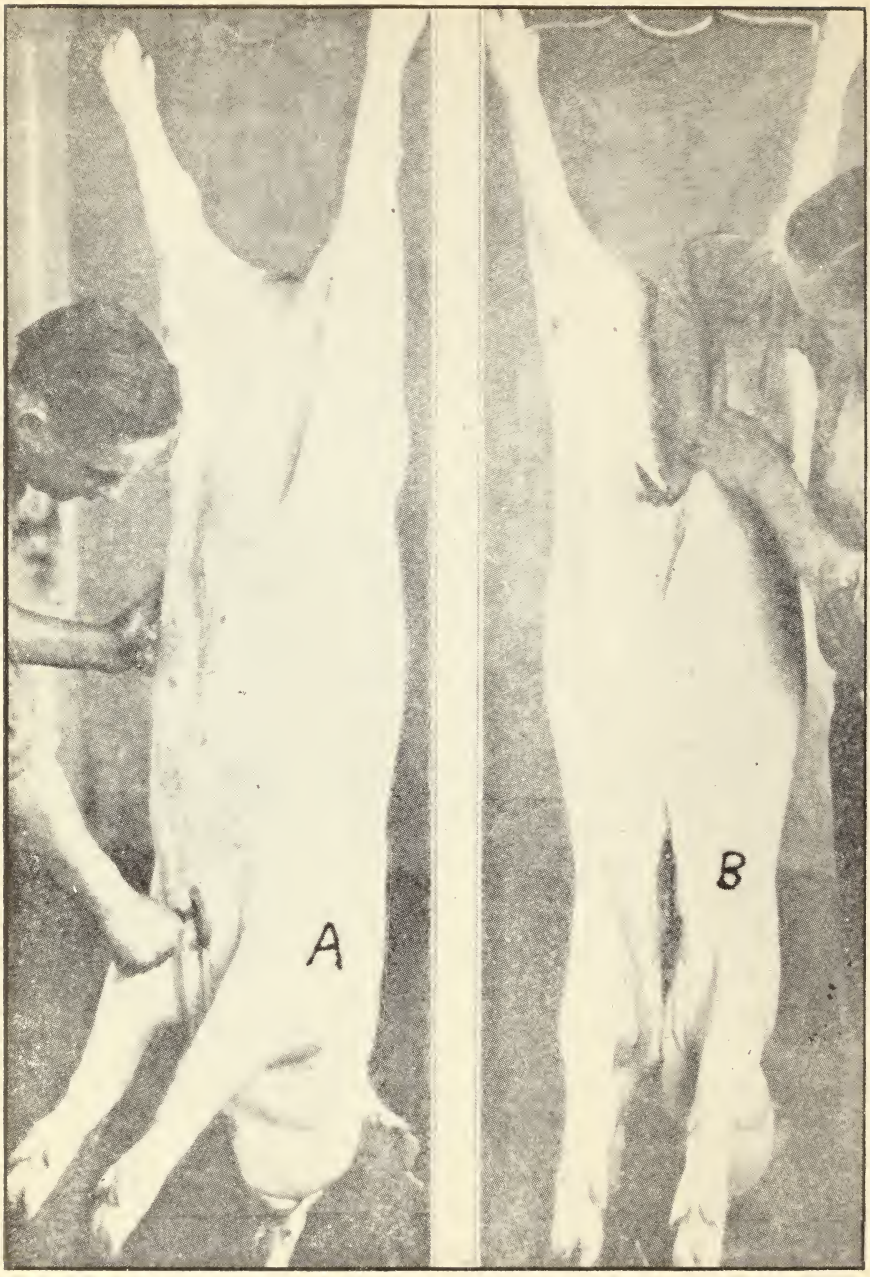

Figure 37, A. In splitting the breastbone, if the handle of the knife is slanting up with the point down there is little danger of cutting up too far and opening the stomach.

B. Under this method of opening the carcass there is no danger of cutting the intestines or stomach.

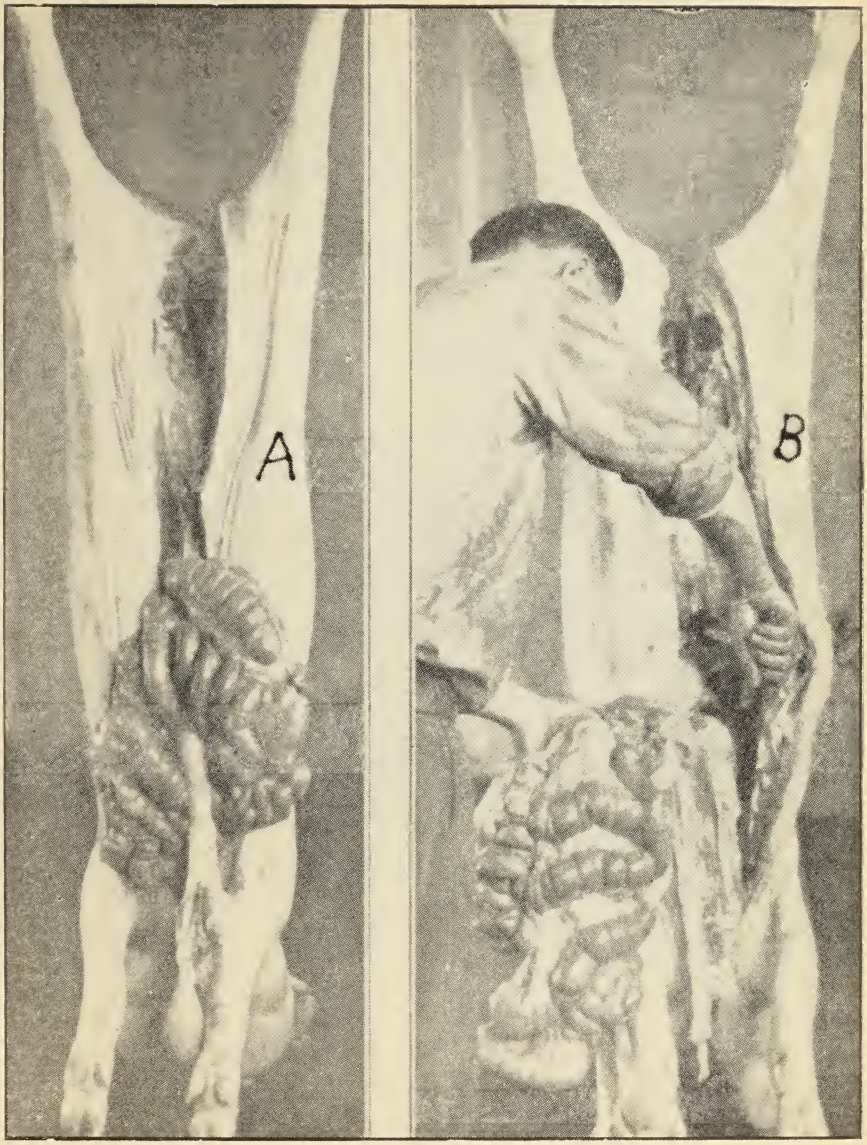

Figure 38, A. The internal organs will not fall unless the animal was fed shortly before slaughter.

B. In removing the intestines, grasp them carefully and firmly so they will not tear and fall.

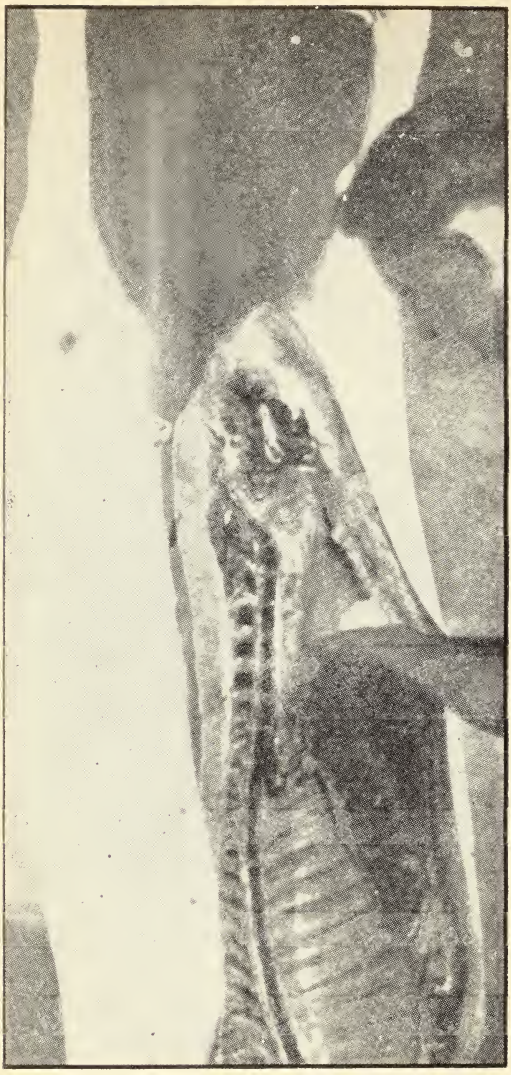

Figure 39. The warm leaf fat is pulled out by loosening it at the rib end and fisting it up and out

warm carcass to a temperature of 34° to 36° F. as soon as possible after slaughtering, preferably within 12 to 18 hours, and by holding the meat at 36° to 40° F. while it is curing. Care should be exercised to prevent the carcass from freezing. Chilling greatly facilitates cutting and trimming the carcass, and is necessary to cure properly.

Cutting the Carcass. Figure 40 shows the standard division of cuts in a pork carcass.

There is not one best method of cutting the pork carcass. The choice depends on how the pork is to be used. If it is to be sold locally the cuts should conform to local preferences.

Trimming Pork Cuts: All meat to be cured should be trimmed smoothly and evenly. Care should be exercised to remove all blood spots, to be looked for especially in the shoulder. The brisket and ragged neck pieces should be cut from the shoulder, tail and flank from the ham, and the uneven edges from the bacon strip. The excess fat on the hams and shoulder may be removed, though the pieces are stored more satisfactorily in summer if not skinned. The bacon strip should be flattened out with the hands or with the sides of a cleaver, and square on all 4 sides. The jowls and fat back, if these cuts are to be cured, should be treated in the same way. Figure 41 shows poorly trimmed and well trimmed cuts

Curing

Curing Pork: Curing is a race between the multiplication of spoilage bacteria in the curing pork and the penetration of the preserving salt. It takes weeks for the salt to reach sufficient concentration to protect the center

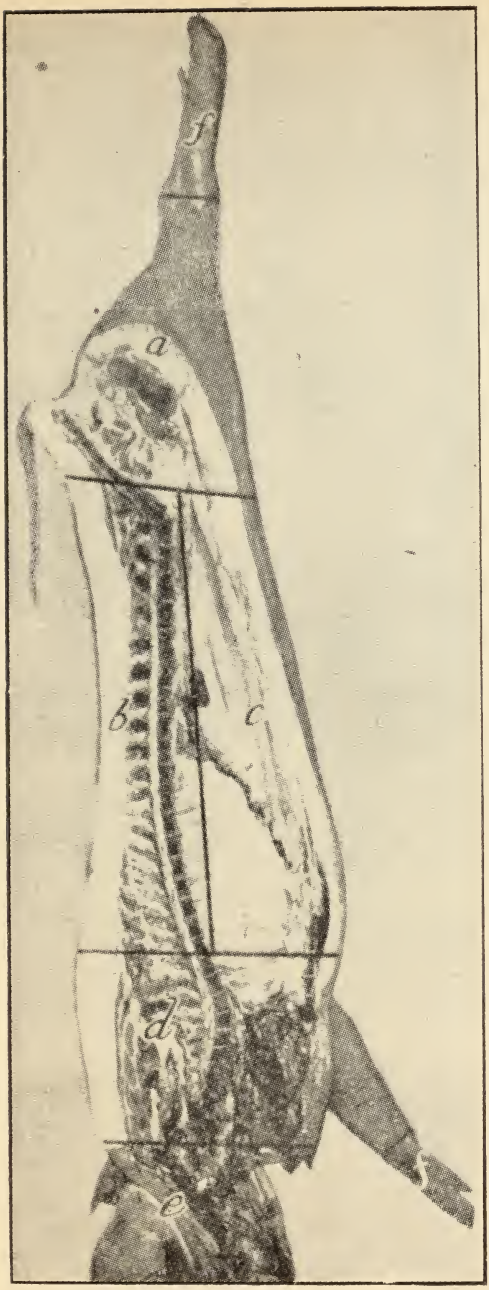

Figure 40. Cuts of pork: (a) ham; (b) loin; (c) bacon strip; (d) shoulder; (e) head; (f) feet.

of hams and shoulders. Low temperatures are the best means known today to prevent the growth of spoilage organisms in meat until the salt has completed the task assigned to it. Temperatures ranging from 36° to 38° F. have been found most satisfactory for curing. At the same time, much meat is cured on the farm at temperatures above 40° and even up to 50°, although much meat may be lost at these high levels.

Ingredients used in curing meat are (1) Salt, which dries and preserves the meat and checks the development of putrefactive bacteria. A good grade of clean, common dairy or table salt is desirable. (2) Sugar is used mainly to lessen the harshness of the straight salt cure and to improve the flavor and taste of the meat. Brown or cane sugar may be used. (3) Nitrates: Saltpeter (nitrate of potash) preserves and dries the meat, but is used almost entirely because it effectively fixes the bright red color of the meat. Nitrate of soda (Chile saltpeter) is a little stronger and 1.7 ounces of nitrate of soda will replace 2 ounces of saltpeter. It is undesirable and unwise to use more of either saltpeter or nitrate of soda than is recommended. (4) Pepper is sometimes dusted on the cured meat to add flavor.

There are two recommended methods of curing:

(1) **Brine Method.** The standard curing mixture for each 100 pounds of meat is 8 pounds of salt, 2 pounds of sugar, 2 ounces of saltpeter, and 4½

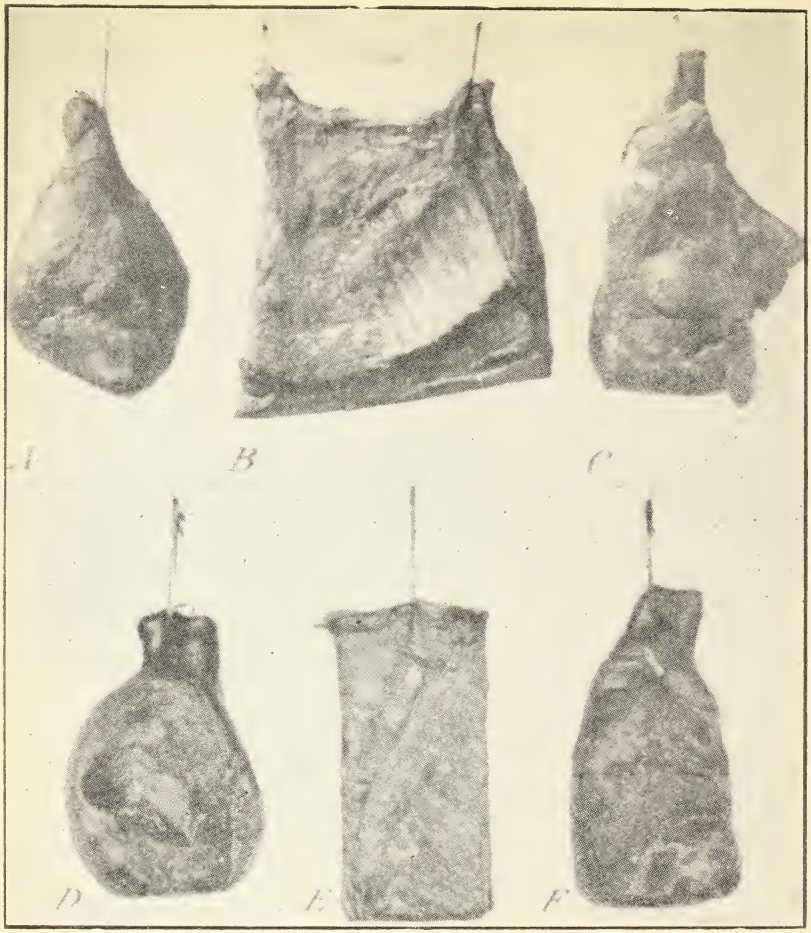

Figure 41. Poorly trimmed ham (a), bacon (b), and shoulder (c). Similar cuts well trimmed: d. e. f.

to 6 gallons of water. Weigh the meat and mix the required amount of curing ingredients.

The standard curing mixture dissolved in 4½ gallons of water will make a brine that tests 75° on the salinometer. This is excellent for curing hams and shoulders. When 5½ gallons of water is used, the weaker brine, testing 65°, will produce a desirable mild bacon.

Pack hams and shoulders closely together, skin side down in a crock or barrel. Pour in the cold 75° brine until the pack begins to shift or float a little, then add a clean weight, just heavy enough to keep the meat below the surface of the brine.

On the fifth, fifteenth, and thirtieth days after being put down, the hams and shoulders should be removed and placed in another barrel and re-covered with the same brine or they and the brine may be removed and replaced in the

same barrel. This remixes the brine and insures its coming in contact with all parts of each cut.

The bacon strips are usually packed, skin side down; each piece should be crosswise of the piece below it. Jowls and shoulder butts may be used to fill any unoccupied space. The milder 65° brine is frequently used for bacon. Removing this meat and remixing the brine on the third and tenth day is usually sufficient.

Hams and shoulders are usually held in brine 4 days per pound; that is, a 15 pound ham will not be removed from cure until the 60th day and it is probably better to allow the 4- to 6-pound picnics 25 to 30 days in cure. Bacon can be cured in 1½ to 2 days per pound.

If the brine should become ropy it should be changed. Remove the meat and scrub thoroughly with a brush and warm water and repack in a clean and scalded barrel. The new brine made after the original recipe should be diluted to as near the same saltiness of the old brine as possible. If the hams and shoulders have been in cure a week, use 70° brine instead of 75°; if more than two weeks use 65° brine. Maintain the original curing schedule. This process may not save the meat, but it is the only course available.

(2) **Dry Method.** The following curing mixture is recommended: For each 100 pounds of trimmed pork use 6 to 8 pounds of salt, 1½ to 2 pounds of sugar and 2 ounces of saltpeter. This is the well-known 8-2-2 recipe.

Mix the ingredients thoroughly and divide into two equal parts by weight. Use one part for the first rubbing, ½ of the remainder on the third day and the other ½ on the tenth day.

The First Rubbing: Sprinkle a little of the mixture in the bottom of a barrel and put each ham and shoulder into the pan of curing mixture and rub it thoroughly. Force some salt into the hock and along the cut face of the butt. Cover the face of the butt with the mixture and lay the pieces carefully in place. Repeat this process on each successive rubbing. The pieces on top of the original pack should be at the bottom when the meat is re-salted.

The same curing mixture with the salt reduced to five pounds will dry-cure 100 pounds of bacon. Re-salting on the third day will be sufficient.

Two days per pound is the standard time for the dry method; however, it is usually sufficient to keep 8 to 10 pound hams in the curing mixture for 25 to 30 days.

Smoking Cured Meat: Cured pork is smoked primarily to give the meat its familiar color and flavor and to evaporate some of the moisture from it. Smoking tends to seal the surface and helps delay the development of rancidity in the fat. Relatively high smoke-house temperatures (100° F. or above) with a light smoke will speed up the drying. Lower temperatures (80° to 110° F.) with a dense fog or smoke will intensify the smoke flavor in the meat. When meat is taken from the curing container it should be washed in warm water to remove the excess salt and allowed to drain and dry over night before smoking is started.

Green hickory wood and sawdust are the standard fuels for smoking meat. Other hardwood such as oak, apple, maple or ash will be satisfactory.

A distance of 10 feet between meat and fire is sufficient. If the distance is only 5 or 6 feet an inverted tube or metal shield should be placed above

the fire to deflect the direct heat. Smoking should be continued until the meat has the desired color.

Storing

Storage is possibly the most important problem faced in handling pork in Mississippi. Cured pork is sometimes stored in rooms with low temperatures. It has been found by experimental work conducted at Maryland Experiment Station, also at Mississippi Experiment Station, that meat stored in rooms with low temperatures prevents the desired aging and development of the proper flavor and in some cases the meat becomes undesirable for consumption after a long storage period. It has been found that meat ages better at a temperature of around 108° F., requiring about a 10-week period. It has been found that a temperature ranging from 90° to 120° F. is the most desirable temperature for aging cured hams. The average farm smokehouse, which may be improved by the use of screen wire to prevent insects from entering, has been found to be a very satisfactory place to store meat. Protection from insects may be afforded by wrapping the meat with brown paper and sacking.