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KANSAS STATE COLLEGE OF AGRICULTURE
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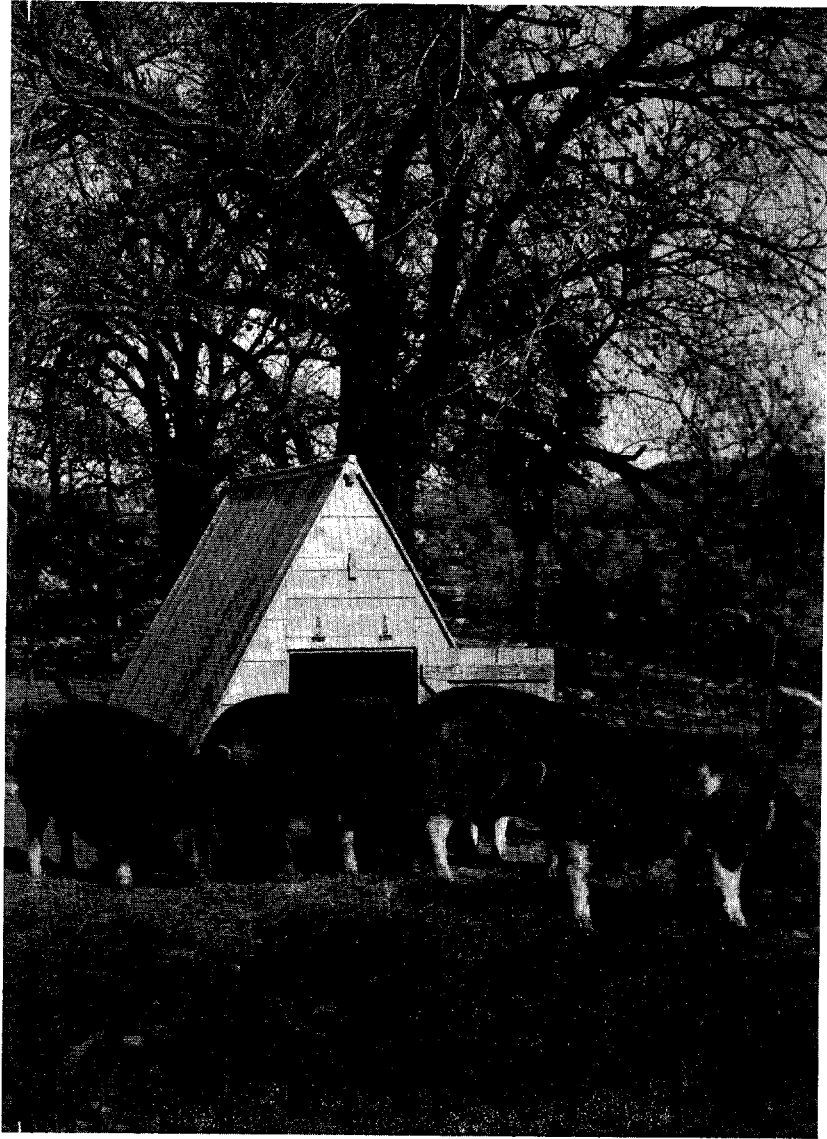
MANHATTAN, KANSAS

SWINE PRODUCTION IN KANSAS



PRINTED BY KANSAS STATE PRINTING PLANT
W. C. AUSTIN, STATE PRINTER
TOPEKA, 1943

19-7188



A GROUP OF PIGS ON THE COLLEGE FARM
They show the thrift and size resulting from proper care.

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SWINE PRODUCTION IN KANSAS¹

C. E. AUBEL

I. INTRODUCTION

In typical Corn Belt states about 40 percent of the total farm income is derived from hogs. This is due to the efficiency of the hog in converting grain crops and other feeds into food for human consumption, and to the hog's importance in farm operations.

The hog is the most efficient of all farm animals in converting grain crops into human food. Experiments show that the efficiency of hogs receiving corn and a protein supplement is about 35 percent. This is nearly twice the efficiency of cattle.

Hogs have contributed much toward profitable returns in farming. They utilize many by-products of the farm. Dairy products, undigested grain in the feed lot, wastes in fields, and vegetables of the truck grower are all efficiently used and relished by the porker.

Hogs are also a good source of income because of their prolificacy. They farrow six to ten pigs and may farrow two times a year. Furthermore, returns from investment in the hog business come quickly, for hogs may be bred and fed early in life and finished out quickly.

Kansas as a Hog State.— Figures on hog production in Kansas during the last few years, particularly those from 1935 to 1939, are not fairly indicative of the state's activity in this business because of the severe droughts and the decrease in number of hogs brought about by the corn-hog reduction program of the federal government. Prior to this time the state ranked about eighth in the United States in the number of hogs produced. According to the reports of the Kansas State Board of Agriculture, the yearly average on Kansas farms January 1 for the five years, 1930 to 1934, was 2,796,500 hogs. Since the drought years, Kansas is rapidly regaining her place as one of the principal hog-producing states. The United States Department of Agriculture reports that on January 1, 1943, Kansas had on hand 2,458,000 head of hogs.

The northeastern part of the state produces the most hogs; however, a large number are found in the area north of the Kansas river to its junction with the Solomon river in Dickinson county and north of this river in the northern tier of counties to the western boundary of the state. The eastern and southeastern counties also raise a considerable number of hogs as far west as a line through Sumner, Sedgwick, Harvey and McPherson counties.

Kansas has been called the "hog's natural habitat," and enjoys several advantages that fit it exceedingly well for the economical production of swine. First of all, the state produces in abundance many of the feeds used in the ration of the hog. Kansas ranks high

1. Contribution No. 152 from the Department of Animal Husbandry.

in the production of corn, wheat, and alfalfa which are used to advantage in the growing and fattening of hogs. Kansas ranks high also in the number of dairy cows, from which skim milk may be obtained for hog feeding.

In the east and central sections of the state the feed necessary for the raising and fattening of swine is generally grown in abundance. The western section supplies feed for growing pigs. In the event that it does not have a good grain crop the pigs raised there may be shipped for finishing to other regions that do have an abundance of grain. The western section, therefore, is excellently adapted to the raising of stocker or feeder pigs.

Hog raising fits well into the farming operations practiced in Kansas. It helps to distribute the labor, because hogs require the greatest care when the sows are farrowing which is in March and April or about September when other farm work is not so heavy. When other work is heavy the pigs are being fattened and do not need the special care that is demanded at farrowing time.

Kansas is fortunate in being close to excellent hog markets. St. Joseph, Mo., the eighth largest hog market in the number of hogs received in the United States in 1941 and 1942, is at the northeast. Kansas City, Mo., the ninth largest hog market, is at the east. The western part of the state has a good market in Denver, Colo., the southwest has Wichita, Kan., and the east central part has Topeka, Kan. At all these markets packing facilities are available. In addition many smaller packing plants are found in the state which, in the aggregate, furnish a market for a large number of hogs. The hog producer, therefore, no matter where he is located in the state, need not ship long distances to find a suitable market.

Furthermore, Kansas has perhaps one of the most suitable climates for successful hog raising. Its temperate climate without extreme cold for long periods, combined with fairly dry winter weather and an abundance of sunshine is particularly favorable for economical hog production. There are few places in the United States where sanitation can be more easily provided than in Kansas.

Pasture crops suitable for hogs is another advantage. The state is naturally a good producer of alfalfa; Sudan grass and other pasture crops also do exceedingly well. There are few farms in the state that are incapable of producing an excellent forage crop.

II. TYPES AND BREEDS OF SWINE

Types of Swine. — Present-day breeds of swine are divided into two classes on the basis of type. These classes are the lard or butcher type and the bacon type. Each type possesses a combination of characteristics which make it useful for a special purpose. The bacon type is grown to produce superior bacon. The lard type has been developed to supply more fatty meat and an excess of fat over the entire body from which lard may be manufactured.

Hogs of the lard type are most numerous in Kansas. About 90 percent of the hogs sent to market in this country are of this type. They are predominantly grown in the Corn Belt, where corn is relied upon as the principal grain for growing and fattening. Corn is used because of its high carbohydrate content. The hog readily converts carbohydrates into body fat. Six breeds of this type are common in the United States. They are the Duroc, Poland China, Spotted Poland China, Hampshire, Chester White, and Berkshire. (Figs. 1 to 6.) They are all produced in Kansas.

The bacon type is represented by the Tamworth and Yorkshire breeds. (Figs. 7 and 8.) Few herds of these breeds are found in the state. Of the two, the Tamworth is the more numerous. These breeds are more common in parts of the United States where dairying and the cereals are the principal feeds, for bacon production is unlike lard production in that feeds relatively rich in protein are required.

In former years there was a sharp distinction in the general conformation between the two types of hogs; the bacon type being long and narrow, the lard type short and thick. Now the difference is much less pronounced. The change has been gradual, and in the lard type of hog it has been brought about by the changing demands of the consuming public. Heavily fattened hogs have been discriminated against on the market. Consequently, the breeders of lard type hogs have emphasized leanness rather than excess fat. The producer has realized also that a longer legged and more upstanding hog is grown more rapidly and is a better rustler than the shorter legged, thick animal. As a result, the lard type hog today is more upstanding and stretchy. It is characterized now as being moderately thick set, with good length and depth and medium width. The shoulders are full and smooth, the hams full and wide, so that an even width is carried from front to rear. The body is evenly fleshed. The legs are of medium length, and the bone of good size and quality.

The bacon type hog differs from the lard type hog in being longer. They are somewhat narrower also, but are deep and even-sided and very smooth. These characteristics permit of an excellent side of bacon. The back is well arched. The legs are rather long and have medium sized bone. On the whole, the present type is a little thicker in the body than it was formerly. This thickness is influenced

materially by the kind of feed used in growing and fattening them. If much corn or other feed of a high carbohydrate value is used, a fatter and thicker hog will result.

Breeds of Swine.—Only a brief description of the breeds with their distinguishing characteristics is given here. It is not intended to supply much historical information.

Duroc

The Duroc, formerly the Duroc Jersey, originated in New Jersey and in the other states bordering the Atlantic ocean. The color de-



FIG. 1.—A champion Duroc sow. (All-American Senior Yearling Sow, 1942.)

sired by most breeders is a medium cherry red, although lighter and darker shades of red are accepted. The snout is of medium length and the face slightly dished, wide between the eyes and tapering well to the nose. The ears are of medium thickness, pointing forward; downward, and slightly outward. The body is upstanding, with good depth and a strong back, well arched. The sides are smooth and the shoulders and hams are meaty. Of particular note is the good quality in the feet and legs. As a breed it stands up well on its toes.

Mature boars of this breed are massive, with good length and depth. Show boars in medium show condition, 30 months old or more should weigh 800 pounds. Sows usually have good dispositions, are good mothers and good milkers. Sows 24 months old or more in medium show condition should weigh 600 to 700 pounds. Pigs

of this breed weigh 200 pounds or more at six months of age. These hogs are hardy, prolific, and possess considerable uniformity. The breed is very popular and is raised in large numbers in Kansas as well as in the United States as a whole.

Poland China

This breed originated in America and was first bred in the Miami valley in Ohio. Mature boars now have much bone and are large, with considerable depth and length. Aged show boars should weigh nearly 1,000 pounds. The sows are prolific and good sucklers. They are smooth and long with full shoulders and well-rounded hams. Mature show sows weigh 800 pounds.

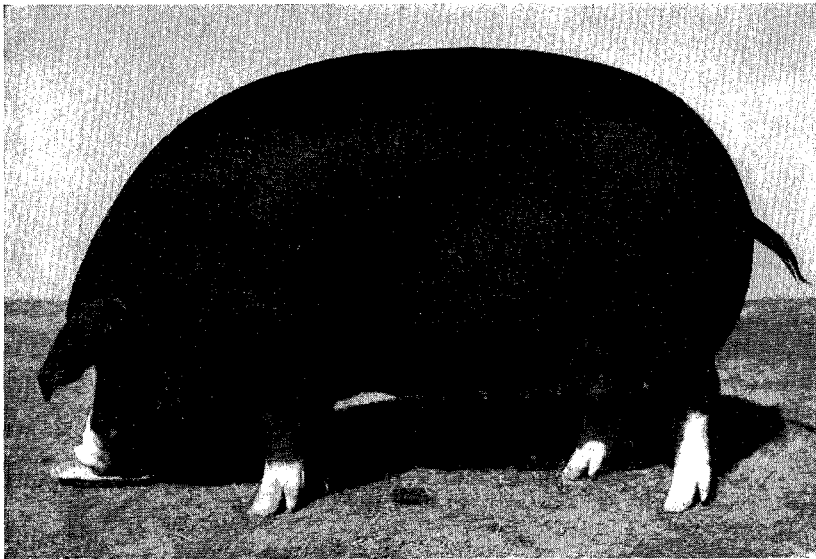


FIG. 2.—Poland China sow. (Grand Champion, Iowa State Fair, 1941.)

The color of the breed is black with white markings confined chiefly to face, legs, and tail, although some white spots on other parts of body are not particularly objectionable.

Along with its other good qualities it is an excellent feeder and matures early. The head is of medium length, wide between the eyes, which are large and prominent, and the face is slightly dished. The jowl should be neat and firm, The ears are of medium size and stand away from the head for about one-third of their length. The back is strong and well arched, with uniform width, and a length that is consistent with strength of top line. It is a very popular breed adapted to most general farm conditions and is raised in considerable numbers both in Kansas and the United States.

Spotted Poland China

The Spotted Poland China, another important breed in the state, is becoming more popular each year. In many ways this breed resembles the Poland China of which it is really a color variety. It is an American breed and has become of particular importance since 1914. It was developed mainly in the state of Indiana. At the present time it is distributed principally in the Corn Belt, especially in the states of Missouri, Indiana, Iowa, Nebraska, Kansas, and Oklahoma. It is in general adapted to all systems of farming much in the same way as its progenitor the Poland China. The color

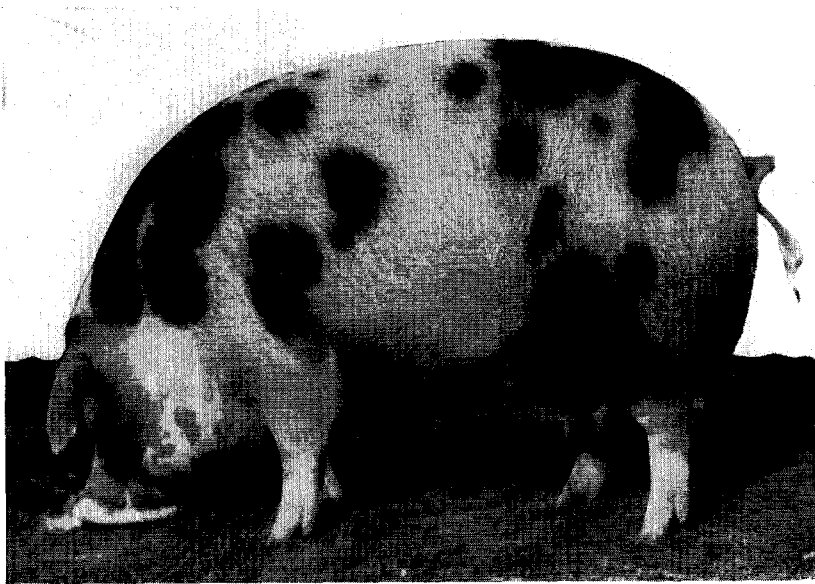


FIG. 3.—Spotted Poland China sow. (An Iowa State Fair Grand Champion.)

desired in the Spotted Poland China is spotted black and white, 50 percent of each. Eligibility for registration now requires not less than 20 percent, nor more than 80 percent of white on the body, not including head and legs.

The head is short, with slightly dished face. The ears are larger than some other breeds and, like the Poland China, break about one-half the distance from the base of the ear. The hogs of this breed are of good length and size, with fairly heavy bone of medium quality. They are early maturing, and the sows are good mothers, and fertile.

Mature show boars should weigh 800 pounds and mature sows close to 700 pounds.

Hampshire

There is some doubt as to the actual origin of this breed. Many claim it is of English origin. The English Hampshire and American Hampshire of today are quite different in form and color. Hogs of the belted color pattern were first reported in Massachusetts about 1820. Foundation stock is believed to have descended mainly from stock brought to Kentucky from Pittsburgh in 1835. The breed was first organized in Boone county, Kentucky, in 1893 under the name Thin Rind. In 1904 the name was changed to Hampshire.

The color of this breed is black with a white belt around the fore-legs and shoulders which gives it a striking appearance. The belt

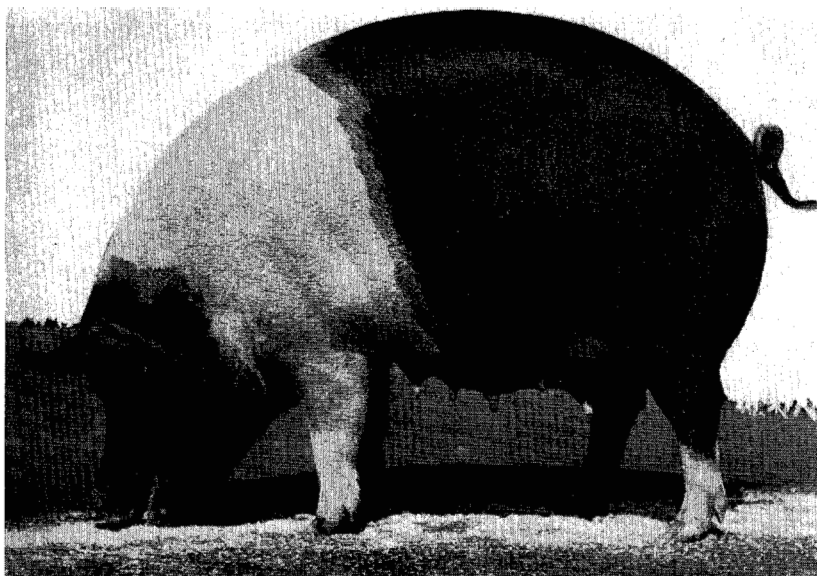


FIG. 4.—Hampshire sow. (A Grand Champion, National Swine Show.)

should completely encircle the body. Hampshires are disqualified if they are solid black or more than two-thirds white. The front legs should be white.

The head is somewhat long and narrow with a slightly dished face and pointed snout. The ears are erect. The jowls are light, the shoulders smooth and well set. From the beginning, breeders have specialized in quality and smoothness. The Hampshire cuts out a splendid carcass, as is evidenced by its success in the carload lot classes at the International Livestock Exposition. The sows are prolific and make good mothers. Individuals of the breed are recognized as being good grazers.

This breed is becoming more popular each year in the state, as well as in the United States as a whole. It is adapted to Kansas

conditions. Criticism is frequently made that individuals of this breed at a certain age are not as large as those of other breeds. Table 1 shows how they compare in this respect with other breeds in the show ring.

Mature boars should weigh from 600 to 700 pounds, and the sows from 500 to 600 pounds.

Chester White

This breed originated in the southeastern part of Pennsylvania, principally in Chester county, consequently the name.

It is white in color, with a nose of moderate length and ears that drop about one-third of the distance from the base. The face is

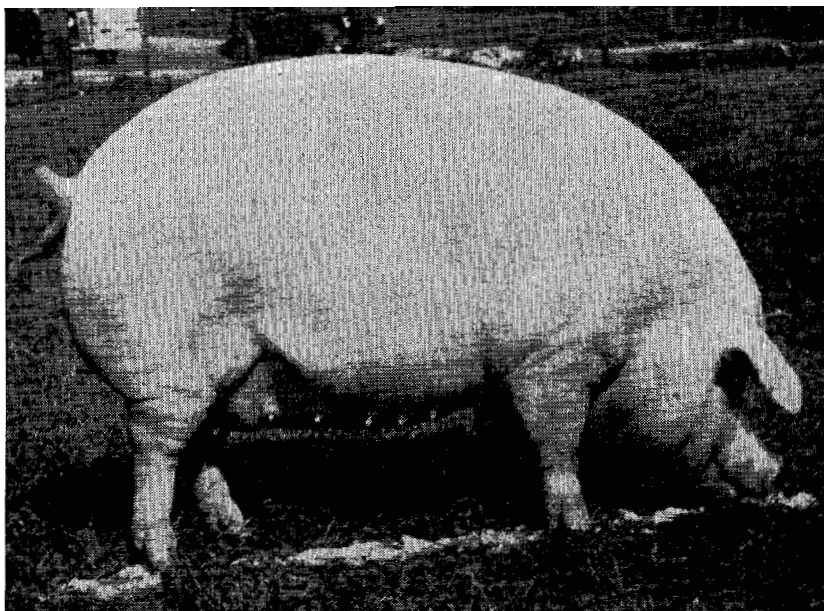


FIG. 5.—Chester White sow. (A Grand Champion Sow, 1941-'42.)

slightly dished. The body is long, of moderate width, with deep, full sides. It has good feet and legs. The disposition of the Chester White is good, and the sows are prolific. It matures early and is a good grazer and feeder. The breed has made an especially fine record in winning grand championship barrow honors at the International and other shows. Mature show boars reach a size of 800 pounds and mature aged sows nearly 700 pounds.

In late years this breed has increased in Kansas until at the present time a considerable number are being raised. The number of purebred herds, however, is not large. Some criticism has been made of this breed "sun scalding" in the summer months. Ex-

perience with barrows of this breed in the Kansas State College herd when given free access to shade, does not support this contention.

Berkshire

The Berkshire is one of the older breeds of swine. It is of English origin and was imported to this country in 1823. It is widely distributed in the United States, particularly in the east, northeast, and Corn Belt. In Kansas it has not been extensively bred.

As a breed the Berkshires are of medium size, smooth, with good length, breadth, and depth. The body is supported on legs of medium length with a good quality of bone. The face is short with a dish. However, breeders of recent years have not emphasized

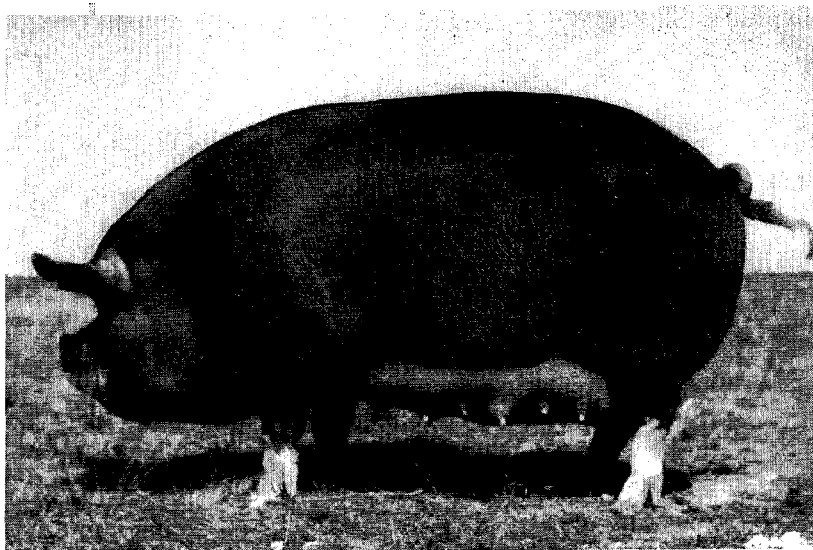


FIG. 6.—Berkshire sow. (Grand Champion, Iowa and Nebraska State Fairs, 1941.)

this and it is being eliminated. The ears are short and erect and inclined slightly forward. The neck is short and nicely blended into a broad, smooth, thickly-fleshed shoulder. The ham is full and deep. The breed is active and hardy, and the sows are careful mothers. The carcass of the Berkshire is particularly good, for the body is very thick and has much quality. The breed ranks high in carcass contests and has made an outstanding record in carcass, carload, and single barrow classes at the International. The color is black with white markings, similar to the Poland China.

Mature boars in show condition should weigh from 700 to 800 pounds, and the sows about 600 pounds.

Tamworth

This is one of the oldest breeds of hogs known. It is of English origin introduced to America in 1882. It is fairly well distributed in the United States. When fattened on corn as its principal feed it produces an acceptable lard type carcass. Few herds of this breed are in the state, although the pigs do well. This breed is golden red in color with somewhat long legs, much length and depth of body, even sides, and erect ears of medium size with no tendency to droop, but a tendency to incline forward. The backs are good, and the

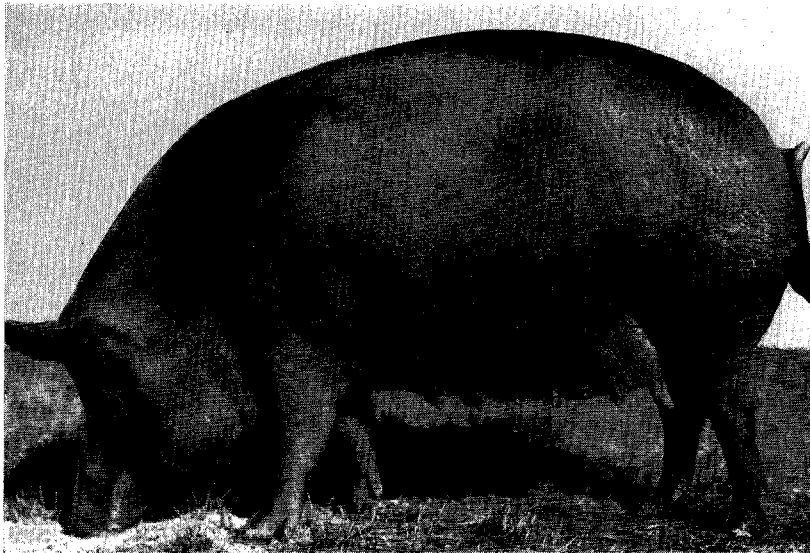


FIG. 7.—Tamworth sow. (An Indiana State Fair Grand Champion.)

head narrow, with a long snout. The jowls are light and neat. The bone is of medium size and excellent quality. The sows are prolific and good sucklers, and the pigs are unexcelled as foragers.

Yorkshire

Hogs of this breed are white in color with dish face and erect ears. The body is long like the Tamworth, with good back and supported by rather long legs with medium sized bone of good quality. The bodies are smooth and even with deep sides that cut excellent sides of bacon. This breed is a good rustler and the sows are excellent mothers. There are few, if any, hogs of this breed in Kansas.

The relative size of the different breeds is indicated in Table 1, which gives the average of the official weights of hogs of the various classes of the lard type breeds, shown at the National Swine Show from 1935 to 1939, inclusive.

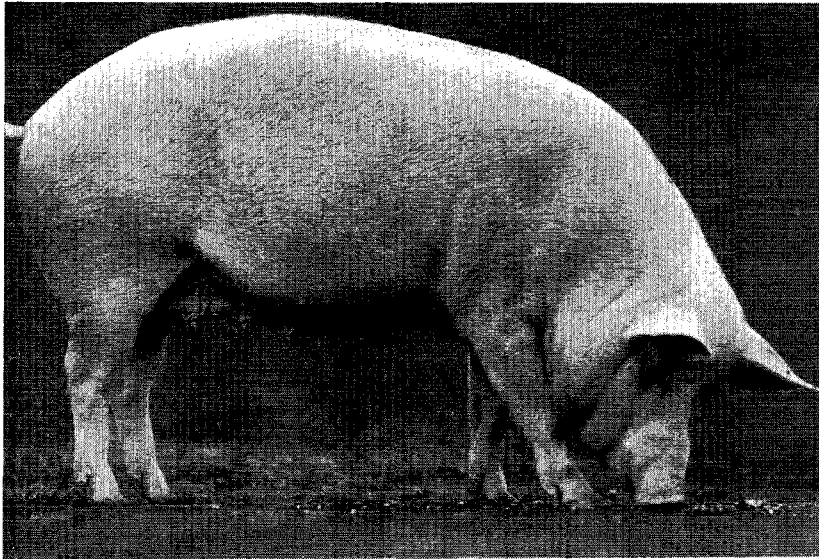


FIG. 8.—Yorkshire sow. (An Iowa State Fair Grand Champion.)

TABLE 1.—AVERAGE WEIGHTS OF WINNERS AT NATIONAL SWINE SHOW, 1935-1939

	Durocs.	Poland Chinas.	Spotted Polands.	Hampshires.	Chester Whites.	Berkshires.
Boars:						
Aged.....	976	980	932	788	822	791
Sr. yearlings.....	858	796	798	604	691	669
Jr. yearlings.....	768	725	667	529	564	565
Sr. boar pigs.....	529	463	445	401	370	415
Jr. boar pigs.....	209	194	188	165	172	177
Sows:						
Aged.....	823	813	809	703	730	791
Sr. yearlings.....	762	712	718	571	613	607
Jr. yearlings.....	673	618	635	519	541	553
Sr. sow pigs.....	508	453	473	354	391	411
Jr. sow pigs.....	201	193	183	164	172	177

Choosing a Breed. — There is no best breed of hogs for all conditions in Kansas. The choice is entirely a matter of personal preference. Generally speaking, one should select the breed one likes best, and that suits his purpose and locality. Ordinarily a breeder will succeed better with the breed he likes and which has demonstrated its adaption. Little can be said regarding the purpose for which one should select a breed except that only one idea should be in mind. This should be to produce most economically the hog that will produce the kind of carcass that will sell best. Such a carcass

is one that will cut out good hams, shoulders, loins, and sides with not too much fat in proportion to the lean, when it has acquired a live weight of about 225 pounds.

On the whole any breed herein discussed will do this. Whether one breed will do it better than another is undetermined and depends upon conditions. It is known that hogs of most breeds from

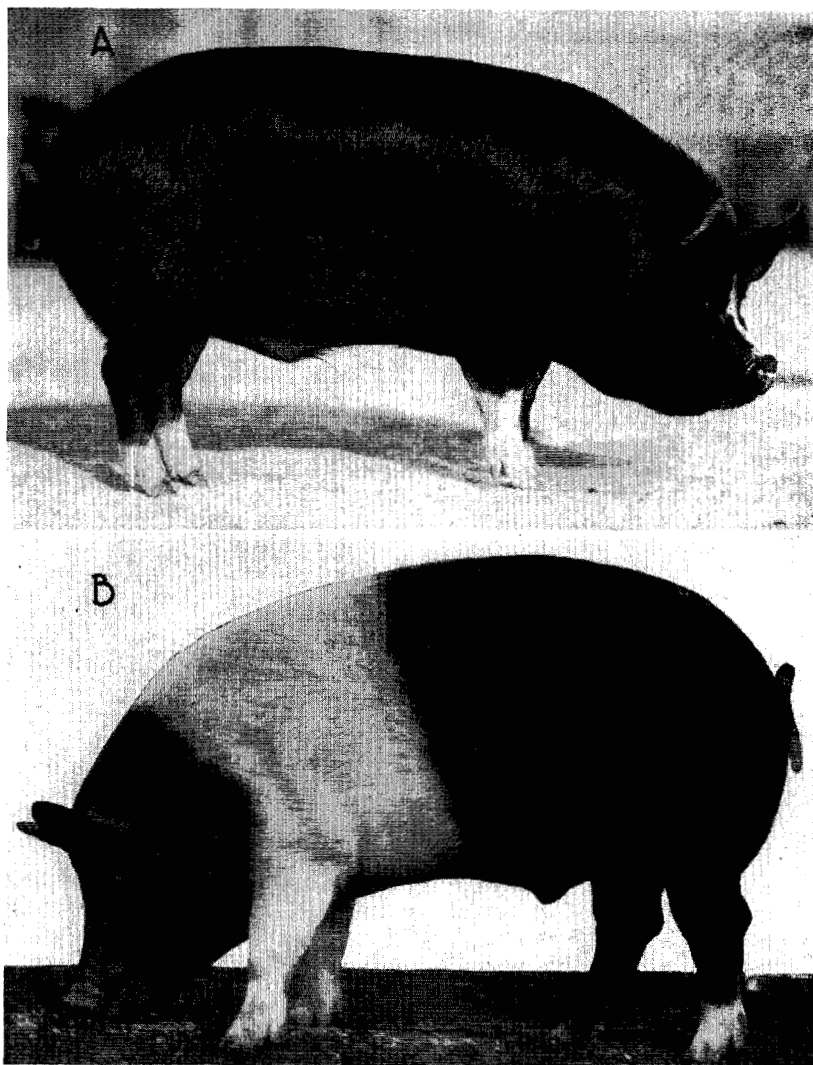


FIG. 9.—Grand Champion barrows fitted and shown by Kansas State College.
(A) Berkshire. (B) Hampshire.

time to time top the market, and win the coveted grand championships at fat barrow shows. (Figs. 9 and 10.) Differences in hogs of the same breed are due mostly to the differences in family lines or strains within the breed, and the manner in which they have been fed and managed. It is advisable to select the breed that fits in with the hogs raised in one's community, since many localities predominate in one breed or another. On the whole, the breed selected by the beginner should be the predominating one of the community because advantages of selecting breeding material from near home will often be of value. Furthermore, if one is raising breeding stock, sales will often come about simply because one happens to be raising the breed for which the community is best known.

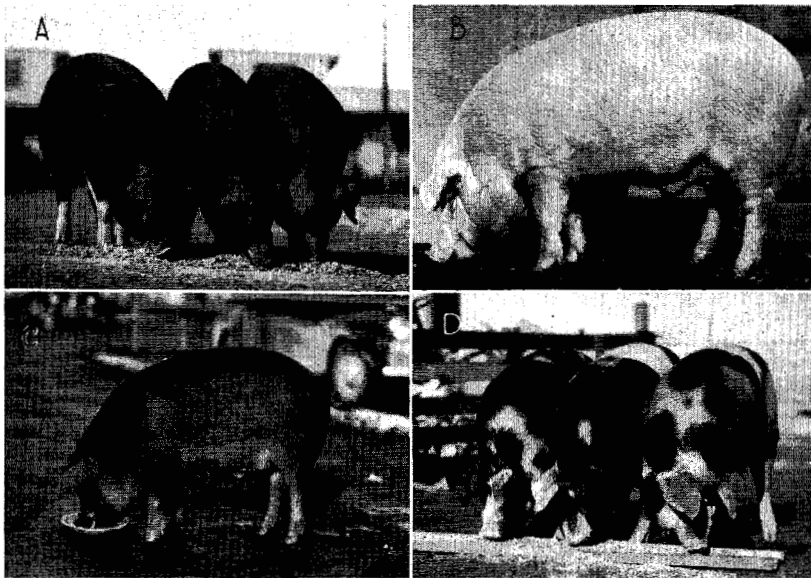


FIG. 10.—Champion barrows and pens of barrows fitted and shown by Kansas State College. (A) Poland China. (B) Chester White. (C) Duroc. (D) Spotted Poland China.

III. PRINCIPLES OF FEEDING

To produce pork at a profit it is necessary to understand the general principles of hog feeding. Hogs will make a hundred pounds of gain on less grain than other livestock, yet if they are fed improperly the advantages gained from this natural attribute will scarcely offset the losses derived from improper feeding. The easiest keeping hog ever raised will never fatten if he is not supplied with the proper kind and amount of feed. Violating fundamental principles of feeding has caused enormous losses in hog-feeding operations.

For instance, many hogs in Kansas are fed on corn alone. This violates one of the first rules of hog feeding and consequently is an expensive method. It may be cheapened materially by adding a small amount of some protein-rich supplement.

How Hogs Use Their Feed.— Animals use their feed for very definite purposes. These purposes are first maintaining the body, such as making repairs and building up worn-out tissues and producing body heat. Second for growth, third for fat production, and fourth, in the case of bred sows, for developing the unborn foetus. When sows are suckling pigs, feed is also necessary to produce milk.

The Ration.— The amount and kind of feed will depend upon what one expects of the hog. For instance, if it is desired to develop growth without much fat, plenty of the constituents for growth and a limited amount of the constituents for fat should be fed. Furthermore, if it is desired to fatten mature animals a liberal amount of fat-producing feeds and a limited amount of growth-producing feeds should be fed. This is called balancing the ration. A balanced ration, therefore, is one that provides feeds of such kind and amount as will exactly meet the needs of the particular individual for a particular purpose. In other words, a ration that will supply the materials required for the several functions of the animal. However, it is generally best to feed a little more than the requirements of the hogs demand.

Feed Constituents.— There are five feed constituents that the hog must be provided with to be thrifty, to grow, get fat, and reproduce. These are carbohydrates, fat, vitamins, proteins, and minerals.

Carbohydrates

Carbohydrates produce heat, energy, and fat. They are chiefly supplied in corn, kafir, barley, oats, and other farm grains. Most grains contain a high percent of this constituent. If the amount of carbohydrates is reduced in the hog ration, fattening does not take place so rapidly and the production of heat and energy are reduced.

Fat

Heat, energy, and fat are also produced by the fat an animal eats. Fat is supplied in small amounts through feeding corn, shorts, oats, kafir, tankage, linseed meal, cottonseed meal, etc. One pound of fat is worth about two and one-half times as much as a pound of carbohydrates in the production of heat, energy, and fat.

Vitamins

Vitamins are necessary in the ration of the hog to permit of proper growth, development, and health. A hog may receive a ration containing all the other constituents and yet not thrive if certain vitamins are absent. They will, in fact, through lack of certain vitamins develop deficiency diseases and die.

A number of vitamins have been discovered and are now recognized by workers in the field of animal nutrition. Thus far the experimental work on vitamin requirements of swine has shown a definite need for vitamins A and D. The requirement for vitamin C, if any, is very small, and need not be included in the ration of hogs for growth and reproduction, for swine seem to be able to produce this substance for themselves from ordinary feeds.² Recent work has shown that several of the factors in the vitamin B group, or complex, are needed. On the whole, however, so far as present knowledge goes, these fractions are found in satisfactory amounts in the usual hog rations and are thus quite satisfactorily taken care of in the ordinary well-balanced hog ration. The lack of vitamins A and D, however, cause concern in swine raising. Hogs fed on a



FIG. 11.—Pigs showing rickets resulting from a lack of vitamin D. Direct sunlight and cod-liver oil supply vitamin D. Rickets is characterized by faulty bone development, which makes crooked legs and interferes with a rickety animal's moving about.

ration deficient in vitamin A will usually starve to death in less time than a year. Vitamin A deficiency is manifested by such symptoms as failure to grow, unthriftiness, watering of the eyes, and unsteady gait. Yellow corn is the only common grain that contains vitamin A in any considerable amount. When it is fed in liberal amounts vitamin A need not be fed additionally. But if white corn is fed instead of yellow corn then it is best to put the hogs on some green pasture or include in the ration about 5 percent of good-quality, green, leafy alfalfa hay. Bleached or brown hay has lost much of its vitamin A, and is therefore not so satisfactory in the ration for swine. Other sources of vitamin A are whole milk and cod-liver oil.

The lack of vitamin D in the ration produces disorders of the nerve, muscle, and bone. It occurs particularly with pigs that are kept indoors for a long period of time and do not have access to direct sunlight or alfalfa hay. This disease is called rickets. (Fig. 11.) It causes crooked legs and broken down pasterns attended by lameness and finally complete immobility of the legs. Hogs that

2. The effect of vitamins A and C in the ration of swine is explained more fully in Technical Bulletin No. 23 of the Kansas Agricultural Experiment Station.

are out in the direct sunshine need no additional vitamin D, for direct sunlight produces an ample supply in the body. It may also be provided by feeding cod-liver oil, and considerable is found in legume hay cured in the bright sun. Severe cases require the administration of cod-liver oil from a few days to a week. About a tablespoonful each day to an 80-pound pig and an ounce to a 225-pound pig will usually correct rickets.

Protein

Proteins build up the body and maintain muscle, gland, nerve, skin, hair, horn and hoof tissues. They also help to develop bone tissues, and stimulate the appetite. Protein is more often lacking in the hog ration than any other food constituent because most farm grains contain comparatively little protein. This deficiency is easily corrected by adding to the ration other protein concentrate feeds.

There are many different proteins and they are very complex compounds, made up of rather simple compounds, called amino acids. There are about 22 principal amino acids which are combined in many ways to produce the different proteins in the tissues of the hog. When the hog needs protein for a specific function he uses a specific protein to meet this need. Digestion results in the splitting up of proteins into amino acids. These are sent by means of the blood to all parts of the body. There the cells have the ability to select the necessary amino acids the protein needs. If the protein in the ration does not supply enough of the specific amino acid needed to make the necessary protein, the needs of the body remain unsupplied. Ordinary grains may not supply sufficient amino acids of the proper kinds and therefore an additional amount must be supplied by proteins from other sources.

PROTEIN SUPPLEMENTS

A hog ration that does not contain the proper amounts of protein is not an economical one. Corn alone is such a ration because corn contains a relatively small amount of protein, but when corn is properly supplemented with additional protein it immediately becomes an economical and satisfactory feed.

The value of protein in the ration is shown in figure 12. These pigs were from the same litter, both were healthy, thrifty pigs when put on feed, and remained healthy throughout the feeding trial. They were fed for the same length of time in the dry lot. The small one was fed corn alone, and the large one corn and protein. The small one weighed 120 pounds, the large one 300 pounds at the end of the test. The small one made pork at a cost of \$10.50 per hundred pounds and the large one at a cost of \$6 per hundred pounds.

All hogs need protein. The young hog needs protein to build up his body. The mature hog needs protein to help maintain and build certain body tissues. The fattening hog needs it to bring about a more economical use of the corn and other grains in the ration.

It frequently appears that a protein supplement is too expensive

to feed. It must be remembered, however, that although its cost per pound is more than grain, the expense in feeding is fully justified in the increased returns.

A great variety of feeds high in protein are used to balance rations. A discussion of some follows:

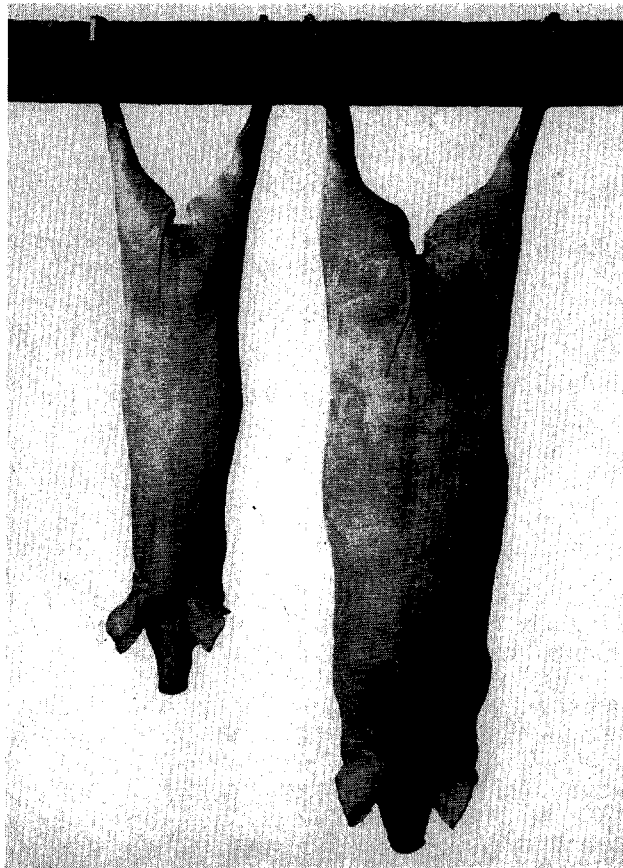


FIG. 12.—The effect of a proper protein supplement is shown in these carcasses. The smaller hog received no protein supplement; the larger hog received a proper supplement. The hogs were litter mates and were slaughtered at the same time.

1. Dairy By-products.— The proteins found in skimmilk and buttermilk are excellent for hog-feeding purposes, because they are rich in protein and mineral matter. When plenty of milk is available no other protein concentrate need be added to the grain ration. Skimmilk and buttermilk have approximately the same value in the ration for hogs. Feeding tests show that about two or three pounds of milk are required to balance one pound of corn for grow-

ing and fattening pigs not on pasture. If we pigs are on pasture it is unnecessary to feed so much. When the supply of milk is abundant and cheap a larger proportion may be profitably fed, especially when grain is scarce and high in price. About two gallons of skim-milk or buttermilk are required to equal a pound of tankage.

The following table (Table 2) suggests about the average amount of corn and the necessary skim-milk or buttermilk to balance the ration for pigs from 50 to 200 pounds in weight. The percentage of protein as given is approximately the percentage which pigs of those weights select when they are fed corn and a good protein supplement free choice.

TABLE 2.—THE PROPORTIONS OF CORN, MILK AND PERCENT OF PROTEIN NEEDED IN THE RATION OF GROWING PIGS

Weight of pig.	Pounds corn per day.	Pounds milk per day.	Percent of protein.
50	2.00	9.0	18
75	3.17	11.7	17
100	4.50	13.5	16
125	5.40	12.6	15
150	6.20	10.8	14
175	6.75	9.0	13
200	7.33	6.3	12

Other milk by-products used in swine feeding include whey, semi-solid buttermilk, dried skim-milk and dried buttermilk. Whey is becoming increasingly important as a hog feed in Kansas. In general, whey has a feeding value of about one-half that of skim-milk or buttermilk because it contains so little protein. Young pigs are unable, because of their lack of feeding capacity, to consume enough whey to properly balance a ration of corn or other grain. Consequently, some tankage or other protein supplement should be supplied when whey is fed.

Semisolid buttermilk is regular creamery buttermilk condensed to about one-third its volume by the removal of a portion of the water by evaporation. It is an excellent feed, palatable, and may be used as the protein supplement for the grain in swine rations. It contains considerable lactic acid which has value in controlling the kind of organisms which inhabit the digestive tract, so has particular value in the feeding of young pigs. Its price, however, is generally out of line when its productive value is compared with other protein supplements, and therefore should be used mostly as an appetizer and conditioner, relying upon some cheaper source of protein to supply the major portion of this part of the ration.

Dried skim-milk and dried buttermilk also have received considerable attention among hog feeders in recent years. The price has

usually been high because only limited amounts have been available to hog feeders. One pound of dried skimmilk or buttermilk is equivalent in feeding value to ten pounds of fluid skimmilk or buttermilk.

2. Tankage. — This is a by-product of the packing industry. It is a good source of protein and makes an excellent supplement for grains for growing and fattening hogs. It is extremely rich in protein and mineral matter, but contains little carbohydrate, so is especially valuable as a supplement to corn and other grains. A 60-pound pig fed on corn alone will require on the average approximately 600 pounds of corn to make 100 pounds of gain, whereas he will require only 400 pounds or less of corn when he receives 1 part of tankage to 9 parts of corn.

Pigs fed corn and tankage will gain about 50 percent faster than those fed corn alone. Hogs allowed to help themselves from a self-feeder filled with corn and tankage in separate compartments will eat about 85 percent corn, and 15 percent tankage when they weigh from 60 to 100 pounds; about 90 percent corn and 10 percent tankage at from 100 to 175 pounds in weight; and about 95 percent corn and 5 percent tankage at from 175 to 250 pounds. Tankage often appears to be high priced, but tests show that, 1 pound properly used will save 5 or 6 pounds of corn. In other words, 100 pounds of tankage is worth in round numbers about as much as 9 bushels of corn. It should never be self-fed, however, unless the grain is self-fed.

3. Meat and Bone Scraps. — A new protein supplement has become available for swine feeding. This is produced through a change in the method of processing meat and bone residue in packing houses. The change is from the old steam tank rendering method which produced the digester tankage to a new dry rendering process. The latter method requires less expensive machinery and is more economical to operate for the packer; consequently, more meat scraps will likely be on the market as time goes on.

Meat and bone scraps is lighter in color and has less odor than digester tankage. The protein content varies in the feeding material produced by the two methods. The meat scraps usually contains from 50 to 52 percent protein, while the steam rendered tankage contains about 60 percent. They usually sell for about the same price. In some experimental work at the Kansas Agricultural Experiment Station meat scraps was found to be as efficient as digester tankage for full-fed swine in both dry lot and pasture.

4. Wheat Shorts. — Feeding experiments have shown that grain by-products such as shorts are not adapted to serve as the only supplement to grain because they supply the same character of protein that is furnished by the grains. One pound of tankage contains about as much protein as four pounds of shorts. Too much bulk would have to be consumed to secure enough protein from shorts to make a satisfactory substitute for tankage in growing and

fattening young pigs for market. Furthermore, tankage is a better source because it supplies the character of protein required to supplement the grain. Shorts will improve a corn and tankage ration, but not enough to justify the additional expense. It must be purchased as cheaply as corn to justify its use as a fattening feed, and at one-fourth the cost of tankage to justify its use as a protein feed.

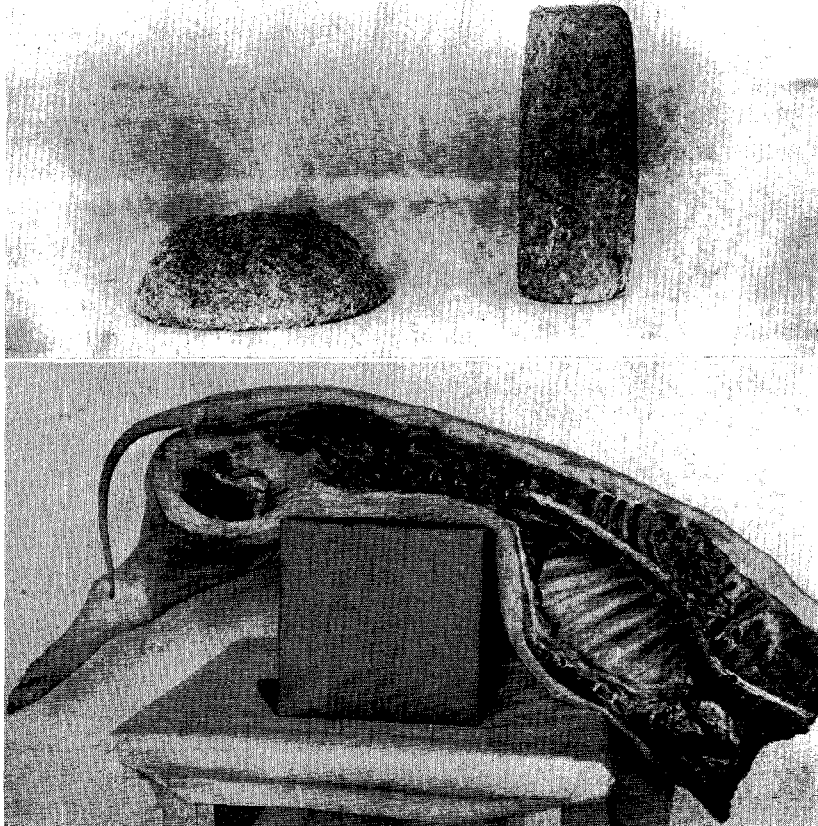


FIG. 13.—Pork from carcasses affected by softening rations. The sausage on the left was made from the carcass of a hog that had been fed excessively on soybeans. The sausage on the right is firm; it was from a hog fed corn and tankage. The carcass shown in the lower half of the picture is from a hog fed soybeans.

5. Linseed Meal.—Linseed meal is another high protein content supplement which contains about half as much protein as tankage. It is not suited for feeding as the only supplement to corn and other grains, especially in the dry lot. A little better results are secured

when fed to hogs on pasture. However, linseed meal is worth only about one-third as much as tankage in feeding value.

6. Cottonseed Meal.—Cottonseed meal is much the same as linseed meal in protein content and feeding value when fed alone with grain. In addition, it sometimes contains a toxic element, gossypol, which may prove poisonous to hogs when using it as the entire source of the protein supplement. It is inadvisable to feed cottonseed meal, therefore, as the only protein supplement. If it does not make up more than 9 percent of the entire hog ration, it can be fed satisfactorily to all classes of swine. Its greatest value as a feed for hogs lies in its use in protein mixtures. It may cheapen the cost of such a mixture.

7. Soybeans.—Soybeans which are adapted in eastern Kansas are a source of home-grown protein that may be used to a limited extent. The protein content of the seed is about 36 percent. They are low in minerals, containing about 5 percent; but high in oil, averaging about 17 percent. The protein in the raw bean is not of the right quality to supplement the common grain ration. The beans are not palatable to pigs, and if fed in amounts of over 14 percent of the grain ration for fattening hogs the oil of the beans produces a large proportion of soft, oily, or limp, unattractive carcasses known as "soft pork" (Fig. 13) on which the packer must cut the price. The lower market price reacts unfavorably on the price of live hogs suspected of having been fed on soybeans.

Soybeans may be fed to brood sows. About three-fourths of a pound a day for each sow in gestation will provide the supplement necessary to her grain ration.

Since soybeans are low in minerals these should be supplied in a mixture of 2 parts steamed bone meal, 2 parts ground limestone, 1 part salt. Grinding beans is unnecessary, as pigs prefer the whole bean. Grinding exposes the oil to the air, and in hot weather bacterial action makes them rancid and unpalatable. There has been some attempt to improve the use of the whole bean by cooking or roasting. This makes the bean more palatable, but it does not prevent the softening effect on the carcass, and consequently does not change the amount that can be fed safely.

8. Soybean Oil Meal.—The residue remaining from the removal of the oil from soybeans is known as soybean oil meal. It is a better hog feed than the original beans, because the objectionable "soft pork" producing oil has been removed and the protein therein is of much better quality than found in the raw bean and supplies one of the best protein supplements of plant origin. Two kinds of meal are produced depending upon the process employed in extracting the oil. These are the expeller and the solvent. Both are excellent protein supplements. The meal contains about 42 percent protein, but like the bean is low in minerals and consequently a mineral mixture should be fed with it. Approximately 8 percent should be added if the meal is fed alone without any other supplements being used.

9. Pastures. — A ration of corn and tankage has for many years been considered the standard for growing hogs. It is a good one, and justifies its use even on pastures. Pasture crops, especially alfalfa, clover, rape, cowpeas, and soybeans furnish some protein, but not enough for most economical and most satisfactory gains. The need of additional protein, even on alfalfa pasture in carrying pigs from weaning to marketing, is shown by a test covering a period of 90 days. The pigs getting corn alone on alfalfa pasture weighed 159 pounds at the close of the test, while those receiving corn plus tankage on alfalfa pasture weighed 222 pounds. One pound of tankage or its equivalent should be fed with each 19 pounds of corn on alfalfa pasture. If no pasture is available 1 pound of tankage or its equivalent should be fed with each 9 pounds of corn. A better practice is to allow the pig to help himself to corn and tankage from a self-feeder as he sees fit. He will balance his ration satisfactorily and economically.

10. *Alfalfa Hay and Meal.* — In the winter the supplying of pasture for additional protein in addition to tankage is impossible. However, good, bright, leafy, green alfalfa hay which contains the essential elements of a pasture, except its succulence, may be provided in a rack. Such a practice is a profitable one. In a test with fattening hogs at the Kansas Agricultural Experiment Station it was found that pigs receiving corn, tankage, and alfalfa hay gained nearly one-fourth pound more per head per day, and required 10 percent less corn to make 100 pounds gain than the pigs receiving corn and tankage without alfalfa hay. Because of its bulk, alfalfa cannot be recommended as the sole source of protein in the hog ration. It cannot be too strongly emphasized that breeding hogs as well as fattening hogs should have access to good, green, leafy alfalfa hay at all times when good pasture is not available.

In recent years the chopping of alfalfa hay and even fine grinding to produce a meal has become quite common among hog feeders. The use of chopped hay or meal permits mixing with the grain or other protein supplement and is recognized as a good practice. A meal made of only the leaves of the plant is likewise available and supplies an excellent swine feed. It is higher in protein than the whole hay product but the higher price asked for this produce does not usually justify its use.

PROTEIN MIXTURES

Protein-rich feeds in the form of mixtures have been devised to supply the protein for hogs. One such combination that has been received with considerable favor is composed of 50 percent tankage, 25 percent chopped alfalfa hay or meal, and 25 percent linseed oil meal. This mixture when fed with corn in the dry lot has given excellent results. It has the advantage of supplying sufficient protein and at the same time a variety of proteins that supply the amino acids lacking in the protein of a straight corn ration. It also provides the protein in an economical form. When hogs are fed on

pasture the alfalfa meal should be omitted from the mixture. Allowing pigs in the dry lot to help themselves to good quality hay in a rack may well replace the meal in such a mixture. The pigs will consume the amount they require.

Other feeds, such as cottonseed meal, soybean oil meal, peanut meal, gluten meal, etc., might be included in mixtures if their cost is low enough to justify their use. Generally, protein mixtures should be made up of not more than four or five feeds and should contain about 40 percent of the animal proteins as tankage, fishmeal or meatscraps, and about 40 percent of the plant proteins, made up entirely of soybean oil meal, with some linseed or cottonseed meal and about 15 percent of alfalfa or alfalfa leaf meal. Usually mixtures containing a larger number of feeds do not justify the expense of mixing them. Under Kansas conditions pigs being fattened on shelled corn, with a protein supplement of tankage and alfalfa hay, self-fed, with perhaps some linseed meal or cottonseed meal replacing a part of the tankage, have gained as economically as pigs receiving any other protein supplement.

Minerals

In recent years the feeding of minerals to hogs has received considerable attention. Some of the claims made regarding the importance of minerals to hogs are well founded; on the other hand, many statements are unwarranted. A sufficient supply of the various minerals is necessary to aid in the development of bone and for normal digestion and nerve and heart action.

Minerals are the chief constituents of bone. Ninety percent of the mineral matter of the skeleton consists of calcium and phosphorus, and 3 percent other minerals. This shows the importance of supplying plenty of calcium and phosphorus in the ration, especially for growing animals. Common feeding stuffs contain in small amounts many mineral salts, but the mineral content of different feeds varies. The grains are nearly always deficient in common salt and lime, though they usually contain a fair amount of phosphorus. It is probable that other minerals such as magnesium, iron, copper, silicon, zinc, iodine, etc., which are needed in very small amounts, are usually supplied in sufficient amounts in the common feeds, although they may be deficient in grains grown on soils that are deficient in these minerals.

When hogs are fed rations which include skim milk, buttermilk, tankage, and either good pasture or good leafy alfalfa hay in the proper proportions to balance the grain, there is usually no need of supplying any other mineral supplement except common salt. This is because these feeds usually contain fairly large amounts of calcium and phosphorus. On the other hand, when hogs are fed on grain or grain by-products alone, or on grain with such a supplement as linseed meal, soybeans, or soybean oil meal, it will be best to add a mineral supplement because these feeds are lacking in the essential minerals.

The lack of iodine in the ration may cause goiter. Its deficiency is sometimes manifested by hairlessness in new-born pigs, (fig. 14) often accompanied by a big neck. Only in districts where there is an apparent lack of iodine in the soil is this trouble experienced. There is some evidence that iodine may be somewhat deficient in north-east Kansas. By adding a trace of iodine to the ration of brood sows such losses may be avoided. Only one-half pound of potassium iodide need be added to an entire ton of mineral mixture. Or it may be supplied by feeding iodized salt. In sections of the state where no hairless pigs are farrowed, additional iodine is unnecessary.

Additional iron to avoid anemia is frequently thought to be necessary in the ration. Although experimental results are conflicting, it is probable that hogs receive enough in their ordinary ration.

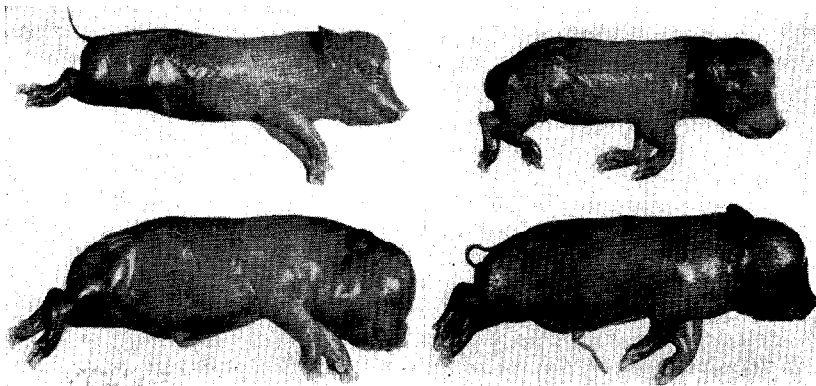


FIG. 14.—Pigs showing goiterous characteristics. Pigs with goiter have thickened necks and are hairless. Goiter is caused from the lack of a sufficient amount of iodine in the ration. This mineral deficiency in a ration may be corrected by adding to the diet iodized salt or potassium iodide.

Many other mineral compounds such as sulphur, Epsom salts, Glaubers salts, etc., are often included in mineral mixtures. There is no evidence that these are commonly beneficial.

The Indiana Agricultural Experiment Station, after a series of feeding trials, recommends a mineral mixture of 5 pounds finely-ground limestone, 5 pounds steamed bone meal, and 1 pound of common salt for hogs being fed in the dry lot.

Substitutes For Corn.—Corn is the grain most commonly fed to hogs. It is exceedingly palatable and has the fat-producing qualities necessary for economical pork production.

Although corn is an excellent fat producer it has certain limitations as a hog feed. It will produce fat because of its high content of carbohydrates, but it lacks proteins and minerals which are necessary for the development of bone and muscle. The little protein it contains is inferior. As a result, hogs do not thrive well where a

ration of corn alone is fed. The addition of a protein supplement such as skimmilk or tankage will help correct the deficiencies and increase the rate of gain, thereby saving time in getting a hog ready for market.

When white and yellow corn were fed in a dry lot at the Kansas Agricultural Experiment Station only a slight difference in the relative efficiency was found between the two based on the amount of grain required for 100 pounds gain. However, the yellow corn was more palatable. The pigs receiving yellow corn appeared to be more vigorous at the close of the test than those receiving white corn. This difference was indicated by the smoother coats and somewhat better general appearance of the yellow-corn lot. Yellow corn is relatively high in vitamin A, while white corn is deficient. Green feeds, such as alfalfa, are high in vitamin A. For that reason pigs fed white corn on pasture remain as thrifty and gain as well as those fed yellow corn.

Tests show that the addition of green, leafy alfalfa hay to a white corn ration will help correct a vitamin A deficiency when pigs are fed in a dry lot.

Grinding or soaking corn usually does not make it enough better to pay for the extra trouble although the rate of gain is sometimes increased. There is nothing to be gained by grinding ear corn into corn and cob meal. In fact, pigs will make faster and more economical gains on ear corn than on corn and cob meal.

Oats

Oats contain too much fiber and are too bulky to make a satisfactory fattening feed. They are somewhat higher in protein than corn and hence are a better feed for growing pigs. However, oats are not a balanced ration and need to be supplemented with skim milk, tankage, or other satisfactory protein supplement feeds for maximum results.

In a test at the Oklahoma station, pigs fed oats and tankage gained 1.34 pounds per pig daily and required 633 pounds of oats for 100 pounds gain, while pigs fed corn and tankage made an average daily gain of 1.82 pounds, and only two-thirds as much corn as oats were required for 100 pounds gain. It will seldom pay to feed oats to fattening hogs unless they can be bought at about one-half the price of corn per bushel.

The advisability of feeding ground and hulled oats has been the basis of feeding trials at the Minnesota and Illinois Agricultural Experiment Stations. At the Minnesota station where hulled oats were fed in comparison with ground oats and whole oats, the hulled oats were more concentrated than the other forms and produced more rapid gains at a higher cost. At the Illinois station where whole, finely-ground and hulled oats were fed in different proportions with corn it was concluded that whole finely-ground oats were less valuable than corn, and that whole hulled oats were more valu-

able pound for pound than corn. The value was not enough greater, however, to cover the cost and the loss involved in hulling them.

Because of their protein content, oats are most valuable when fed to brood sows and growing pigs. To give the greatest return oats must be ground or crushed. Ground oats with the hulls sifted out or rolled oats such as are used for human consumption are good feeds to use in growing young pigs for show, but are usually too high priced to feed to any others.

Wheat

Ordinarily wheat is too high in price compared to corn for hog-feeding purposes. However, low-grade wheat is sometimes available at a comparatively low cost per bushel. Only when corn and wheat are nearly the same price per pound is it practical to substitute wheat for corn. Low-grade wheat versus corn for feeding pigs was the basis of a test at this station. It proved to be superior to corn whether fed with or without tankage.

Pigs fed ground wheat will make slightly more rapid gains than when fed corn, but on the average less corn will be required for 100 pounds gain. Wheat should be ground, since in that condition it is about 10 percent more efficient than the whole grain in producing a given gain. Soaked whole wheat is not as efficient as ground wheat. There is very little to be gained by soaking ground wheat. Although wheat is richer than corn in protein it requires the addition of a supplement to produce rapid and satisfactory gains for pigs in the dry lot.

Barley

Barley is used for hog feeding to some extent in Kansas. Pigs self-fed barley and tankage will sometimes overeat on tankage making it advisable to hand feed this supplement. Ground barley is ordinarily worth about 90 percent as much as corn, although light, chaffy barley frequently is not worth over 80 percent. Barley should be ground for hog feeding. In some tests grinding increased the feeding value about 20 percent. Soaking whole barley has been found to be a poor substitute for grinding. Barley is richer in protein than corn, consequently less tankage or other protein supplement need be fed with it, but it should not be fed without a protein supplement of some kind.

Rye

The use of rye for hog feeding is rather limited in Kansas. It is somewhat unpalatable. In a test at this station, pigs fed rye and tankage were more restless, their appetites were not so well satisfied, and the somewhat harsh appearance of their coats indicated that they were less thrifty than pigs fed corn and tankage. The test indicated that a mixture of ground rye with some more palatable feed will result in more rapid gains than rye alone with a protein supplement. Rye should be ground to get best results.

Grain Sorghums

In most sections of Kansas grain sorghum is a surer crop than corn. Large quantities of milo, kafir, and feterita are produced in western Kansas. Grain sorghum seeds are hard and comparatively small and not easily masticated. They should all be ground for hogs.

Kafir

Kafir is the most common of the grain sorghums. It is fairly palatable to hogs of all ages. Tests at the Kansas Station indicate that it comes more nearly being equal to corn when fed to older pigs than when fed to younger pigs. Ground kafir has been found to be worth 90 percent as much as corn.

The value of grinding kafir was demonstrated in a test at this station when pigs fed ground kafir, shorts, tankage, and alfalfa hay made an average daily gain of 1.4 pounds, and required 534 pounds of concentrates for 100 pounds gain. On the other hand, when kafir heads were fed the pigs made slightly smaller gains than on ground kafir, but the gains were as cheap as on the ground kafir grain. Kafir heads gave better results than threshed kafir because in picking the grain from the heads it was masticated more thoroughly than was the threshed grain. A protein supplement should be fed with kafir.

Milo

Milo has a slightly higher feeding value than kafir, being worth about 95 percent as much as corn. Milo grain is palatable and a protein supplement should be fed with it for best results.

Feterita

Feterita has given fully as good results as corn when fed to hogs. Feeding tests show that when properly supplemented with protein, feterita is superior to both milo and kafir.

The following conclusions appear to be justified regarding feeding sorghum grain to hogs:

1. The sorghum grains, especially milo and feterita, are nearly as good as corn for growing pigs and may possibly excel corn for fattening purposes.
2. Feterita is more efficient than milo, and milo more efficient than kafir for fattening hogs when each is supplemented with tankage.
3. More tankage is needed with sorghum grains than with corn.
4. Often money spent for grains to be fed to hogs will give greater returns if it buys sorghums.

Cane Seed

The seed from sweet brown seeded sorghums is not as palatable to hogs as the grain sorghums—milo, feterita, and kafir. However, cane seed, if ground, is a satisfactory grain for fattening hogs, but

more cane seed than corn is required to produce satisfactory gains and a market finish. Like corn, cane seed should be fed with a protein supplement. Pigs fed a mixture of cane seed and corn will make more rapid gains, but the relative value of the cane seed will remain the same.

IV. MANAGEMENT OF THE BREEDING HERD

Care of the Boar.—In order to get sows with pig the boar must be kept active, and in good health, and in the proper condition of flesh. This may be accomplished through management and feeding. In summer he should have the run of a small pasture and in winter at least the freedom of a small yard. (Fig. 15.) His shelter should be a house that is dry. It should be cleaned out regularly and kept free of dust. The boar should be kept free of lice and mange by



FIG. 15.—Boar lots at the college hog farm. Note the length of these lots and the shelter at far end. The boar is fed at the end in the foreground. Plenty of room to exercise is essential to the good health and well doing of the herd sire.

frequent applications of used crank case oil. It is advisable to remove his tusks (Fig. 16) occasionally to facilitate handling him.

During the breeding season the boar's feed should be abundant and of good quality. The mature boar should be kept somewhat thin in flesh until two weeks before breeding when he should be fed all he will clean up twice daily. Corn alone is not a good feed for the boar. A variety of grains combined with protein supplying feeds in addition to some pasture is the best ration. Generally the ration should be somewhat laxative and bulky with plenty of mineral and protein. Corn, in addition to a thick slop of shorts to which has been added some tankage or linseed meal, makes a good ration.

If pasture is not provided, some good quality alfalfa hay or meal should be given him. Young boars will need enough feed to keep them growing, but not fat.

If a boar becomes restless or "ranty," a young pig may be put in the lot with him. If he goes off feed in the breeding season a young boar pig in the lot will often induce him to eat.

One service to a sow is sufficient, and this should be given the second day after the first appearance of heat. A young boar about ten months old should serve preferably not more than 15 to 20 sows a season and should not be allowed more than one sow each day.



FIG. 16.—Clipping the tusks from a boar with a bolt clipper. It can be done by tying him to a post. Boars, when a year old, should have them removed.

The aged boar may serve more than twice as many sows as the young boar, but it is best to allow him only one each day. Two sows a day may be allowed a vigorous boar if one service is given early in the morning and the other in the evening.

Care of the Sow and Gilt.—On the sows and young gilts depend the size and number of pigs farrowed, together with their strength and activity. Consequently they must be vigorous and healthy for best results. This thriftiness is largely controlled by the nature of the ration fed them. Rations suitable to bring this about vary. Open sows need little grain in the summer if on a good pasture (Fig. 17), but it is advisable to feed enough to keep them in good condition. At any rate they should be fed grain two or three weeks before breeding time. On alfalfa pasture the grain should be corn, oats, barley, or wheat and some protein-rich supplement.

Mature sows are in the best condition for breeding when a little thin in flesh but gaining in weight. They should be in excellent

condition if they have been on alfalfa pasture and have received in addition a little concentrated feed. One-half to two-thirds of a full grain ration for thin sows is generally sufficient. About two weeks before breeding they should have their feed increased so they will be gaining from one-half to one pound per day. This assists the sow to come into heat and insures the maximum number of pigs to be farrowed.

Gilts kept for breeding purposes should have a liberal feed, but not a full feed. They will forage and exercise more if not fed too liberally. Gilts should receive a little more protein supplement than sows, otherwise the feed and management is the same.

Sows and gilts should be handled in groups that are divided on the basis of age, size, and condition. This insures the thin sow getting the feed she requires and keeps the fat sow from getting too much.



FIG. 17.—Poland China sows on an alfalfa pasture. A good legume helps to supply protein and minerals in a ration and reduces the amount of grain necessary to keep the brood sow in the proper condition.

Care of the Sow During Pregarancy.—The feed and care the bred sow or gilt receives during the gestation period will determine to a large extent the thrift and vigor of the litter she will farrow. During this time the bred sow must not only maintain her own body, but must also provide the nutrients necessary to develop the unborn litter. For that reason it is essential that the ration of the bred sow provide first, for the maintenance of the sow; second, for the proper development of the pigs in embryo; and third, for the growth and development of the sow herself.

Body maintenance requires carbohydrates for heat and energy, and protein to repair worn-out tissues. The growth and development of the sow and unborn litter calls for protein of good quality and for the minerals, particularly calcium and phosphorus.

Corn alone is not a desirable feed for pregnant sows, because it does not contain enough of the materials for the development of bone and muscle. Sows that have been fed corn alone are nervous and feverish at farrowing and frequently so much so that the entire litter is overlaid. Even though they do not overlay the newborn pigs, the litter is usually weak and undersized, with some dead pigs. Sows that have been fed an insufficient amount of protein prior to farrowing sometimes may eat their pigs.

This does not mean that the sow should not be fed corn. In fact, corn or other grain may well be the basis of the ration which, if properly supplemented with protein, will provide a satisfactory feed for pregnant sows.

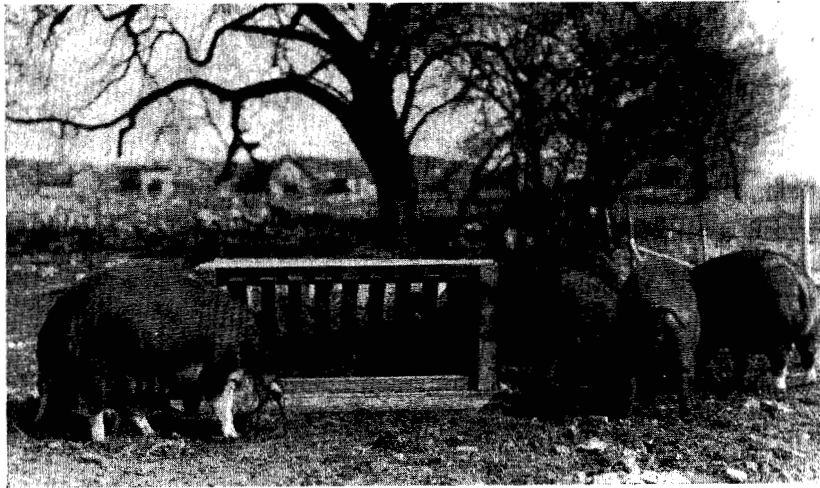


FIG. 18.—Pregnant sows eating alfalfa hay from a rack in the winter. This is one of the most satisfactory ways to feed legume hay to brood sows when not on pasture.

Barley or wheat may replace wholly or in part the corn in the sow's ration. The amount used could vary at the discretion of the feeder. Oats may be used as one of the grains also. Many feeders like to use a shorts slop. It may replace part of the grain in the ration when it can be purchased pound for pound as cheaply as corn.

During the first part of the gestation period mature sows should be fed a supplement with the grain, which may be good alfalfa hay in a rack or alfalfa pasture, and a little tankage in addition. (Fig. 18.) During the last of the pregnant period her protein should be increased. At this time the sow should receive in addition to alfalfa hay or pasture about one-third pound of tankage. A 300-pound gilt should receive about one-half pound. A gallon of skimmilk or buttermilk may replace the tankage. Another good supplement

may be made up of tankage 50 percent, linseed meal 25 percent, and alfalfa meal 25 percent. A good sized bred gilt should receive about three-fourths pound per day of this mixture.

Gestation Table

The following table (Table 3) is based on a 113-day gestation period. If, for instance, a sow is bred January 1, she is due to farrow April 23.

If she is bred April 21 she is due to farrow August 11.

TABLE 3.—GESTATION TABLE FOR SWINE

DATE OF SERVICE.	Due to farrow.	DATE OF SERVICE.	Due to farrow.
Jan. 1	Apr. 23	July 5	Oct. 25
6	28	10	30
11	May 3	15	Nov. 4
16	8	20	9
21	13	25	14
26	18	30	19
31	23	Aug. 4	24
Feb. 5	28	9	29
10	June 2	14	Dec. 4
15	7	19	9
20	12	24	14
25	17	29	19
Mar. 2	22	Sept. 3	24
7	27	8	29
12	July 2	13	Jan. 3
17	7	18	8
22	12	23	13
27	17	28	18
April 1	22	Oct. 3	23
6	27	8	28
11	Aug. 1	13	Feb. 2
16	6	18	7
21	11	23	12
26	16	28	17
May 1	21	Nov. 2	22
6	26	7	27
11	31	12	Mar. 4
16	Sept. 5	17	9
21	10	22	14
26	15	27	19
31	20	Dec. 2	24
June 5	25	7	29
10	30	12	April 3
15	Oct. 5	17	8
20	10	22	13
25	15	27	18
30	20	31	22

No definite rule can be given as to the amount of grain to feed the brood sow. This will depend upon her age and condition. Young sows must be fed more liberally than mature sows, and thin sows require more feed than those in good flesh. A good rule (Fig. 19) is to have the sow increase about 75 pounds in weight during the gestation period. She should not be fed so that she is excessively fat at farrowing time. Mature sows will usually require about one pound of grain per 100 pounds live weight daily. Gilts should be fed more liberally — about one and one-half pounds per 100 pounds live weight daily.

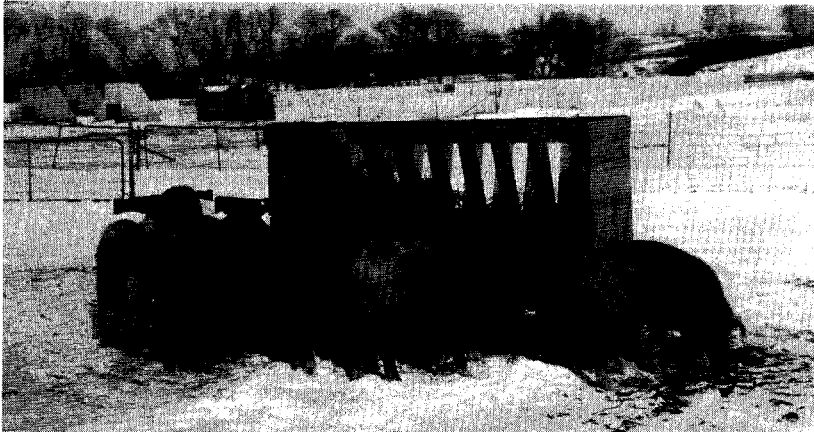


FIG. 19.—Young pregnant gilts eating alfalfa hay from a rack. A good, green, leafy legume hay should be provided pregnant sows when pasture is not available.



FIG. 20.—Cleaning out the farrowing pen. After the litter is removed the pen is scrubbed with hot water and lye to kill disease organisms and worm eggs.

It is also desirable that brood sows take plenty of exercise. Exercise determines to a considerable extent the thrift of the pigs at farrowing time. Feeding the sows some distance from the sleeping quarters will make them exercise. If this is impossible, then it may be advisable to drive the sows each day.

Care of the Sow at Farrowing Time.—Farrowing time is the most critical time in hog raising. The breeding dates of the sows should be recorded so that the day of farrowing may be more closely foretold and preparations made for the arrival of the little pigs. (See Gestation Table 3.) Before the sow is due to farrow the far-



FIG. 21.—Washing the sow's udder before placing her in a clean farrowing pen. Little pigs should have a clean place to nurse. Sore mouths, bull nose, worms, and scours in young pigs are caused by nursing at filthy teats and udders.

rowing pen should be put in order, the floors put in good shape, all pig rails repaired, and the pens thoroughly scrubbed. (Fig. 20.)

About three or four days before the end of the gestation period the sow should be put in the pen so she will become accustomed to her new quarters. (Fig. 21.) This should tend to quiet her and make her better satisfied. An effective way to quiet a nervous sow is to brush her daily.

It is advisable that the sow be as quiet as possible at this time so that in the event assistance in farrowing is necessary, she may be more easily approached. The place where the sow is to farrow may be a stall or pen in the central hog house. The chief requirements

of such a pen are that it be quiet, dry, clean, sanitary, well ventilated, warm in winter, and cool in summer.

When the sow has been removed to the farrowing pen she should be allowed to exercise and not be confined in too small a pen. (Fig. 22.) Confinement may tend to constipate her and also make her quarters insanitary. If a lot for each sow is not available she should be turned out in a large open place and allowed to work over some good legume hay. When the sow is moved to her farrowing quarters her ration should be decreased to about one-half the former feed. A little bran with some shorts and a little linseed meal mixed into a thick slop and fed twice a day will constitute an excellent ration,



FIG. 22.—Bedding a sow for farrowing. Only a little bedding in the farrowing pen is necessary. Too much will tangle up the pigs. The bedding should be clean and not dusty.

or she may be fed about a quart of bran to one-half her former grain ration. This will tend to put her in proper condition.

When a sow is about to farrow there are certain indications that foretell the probable time. The usual signs of approaching farrow are a filling of the udder and teats and a mild spirit of unrest. When she begins carrying straw or arranging her bedding for a nest she may be expected to farrow within 12 hours. At this time the sow must be watched carefully. (Fig. 23.) If she has taken plenty of exercise during the preceding months and has been properly fed and is in a strong condition, she should cause little concern, but nevertheless close observation should be maintained.

Old sows seldom need help at farrowing, but many gilts do. It is important that the ones that need help should get it at the right time. If a pig lodges at the pelvic bones it usually dies in from 30 to 60 minutes unless delivered; if it remains there two or three hours the next pig following it will be dead; and if it lodges 24 hours the remainder of the litter will have perished. If a sow goes much longer her life is endangered. As soon as it is evident that continued labor is of no avail, help should be given. A small hand and arm thoroughly cleansed and smeared with vaseline is the best help. The unskilled use of pig extractors is usually unsuccessful and often causes injury to the organs. In cold weather it is sometimes desirable to remove the pigs as they are born to a half barrel or basket lined with straw or rags. (Fig. 24.) This should be accomplished with-



FIG. 23.—Watchful waiting on a sow close to farrow will pay dividends. Why feed a sow for four months to get pigs and then lose them in an hour or two because the owner has not watched and helped the sow?

out disturbing the sow. If the weather is very cold a jug of warm water may be placed in the basket and the pigs taken to a warm room until dry (Fig 25.) When the sow has finished farrowing they should be returned to her for nourishment. If the sow is nervous and irritable it may be desirable to keep the pigs away from her for several days, allowing them to nurse every two or three hours. (Fig. 26.)

When a newly born pig does not of itself start breathing and life is still present as evidenced by the throb of the heart an effort should be made to start respiration. First, see that the mouth and nostrils are free of mucous membrane or slime; then blow into the mouth and nostrils and while blowing rub or press the chest in imitation



FIG. 24.—Newly farrowed pigs in a basket, ready to be carried to a warm room.



FIG. 25.—Newly born pigs protected against chilling in cold weather. The jug contains hot water.

of the ordinary muscular contraction and expansion of breathing. One may also work the fore and hind legs back and forth at regular intervals. Sometimes a shake or gentle slap on the side of the head will start respiration. It pays to work over a pig in this condition so long as the heart continues to beat, but the effort usually will be of no avail if the pig does not start breathing within a few minutes.



FIG. 26.—Taking little pigs to a warm room in cold weather. Here they should be kept until thoroughly dry and able to walk around. Many little pigs can be saved in cold weather by keeping them in a box in a warm room and letting them suck every hour or two until they are strong enough to take care of themselves.

It should be observed that each little pig sucks when given the opportunity. (Fig. 27.) They should not be allowed to become chilled. Pigs farrowed in cold weather should be rubbed dry with a gunny sack and kept warm. A chilled pig is in a dangerous condition. Unless immediate efforts to revive him are made he may die. To revive a chilled pig he should be rubbed well with a cloth to dry him and stimulate circulation. He should then be wrapped in a warm, woolen cloth and placed by the fire.

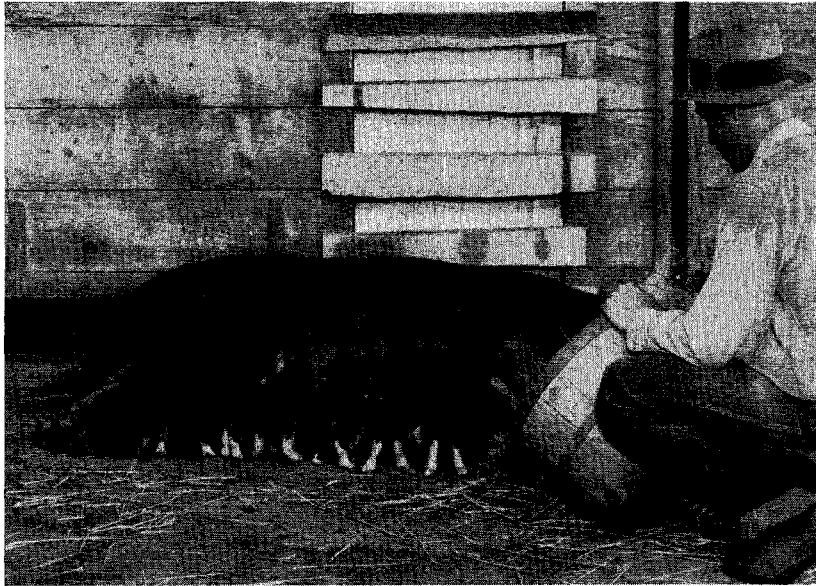


FIG. 27.—An attendant seeing that each little pig gets its share of the milk when put with its mother after being dried in a warm room.

Marking Pigs

Purebred pigs that are to be registered must be marked in order to identify them. Even where grade hogs are produced, some identification should be made so that gilts may be selected from the most efficient sows. Marking usually consists of notching the ears with a special tool or with a knife. (Fig. 28.) It should be done within a day or two after they have been farrowed, before the litters have had a chance to intermingle. A simple method of marking is to give all pigs in one litter the same number. Some breeders prefer to give each pig in the litter an individual number. In Figure 29 will be found a satisfactory system of numbering the notches in the ear.

At this time, also, it is well to be on the alert for several little annoyances that affect little pigs, including needle teeth and bull nose.

Needle Teeth

At birth, pigs have temporary tusks which are long and sharp. They are of no benefit to them. They may, however, cut the udder of the sow and lacerate the noses of the other pigs as they tussle among themselves for a place to nurse. Such wounds bring on badly infected noses, which may prove fatal if not cared for. It is a good practice to remove these teeth close to the gums with small nippers being careful to leave no ragged edges. (Figs. 30 and 31.) Care also should be taken so as not to injure the gums, for infection may set in and badly infected mouths result.

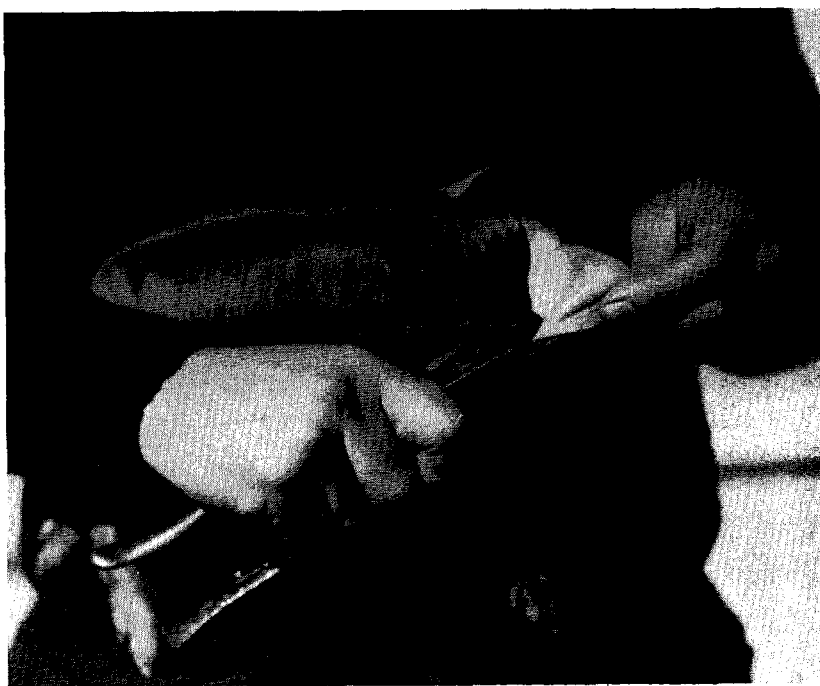


FIG. 28.—Ear notching a suckling pig.

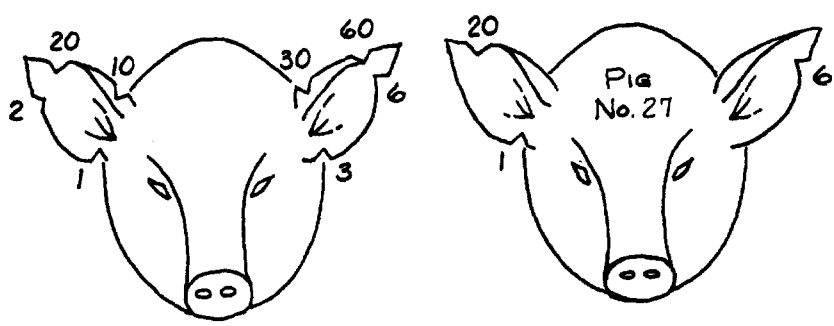


FIG. 29.—(Left) Value of notches in ears. (Right) Ears notched to indicate No. 27.

Bull Nose

This is an enlarged sore nose, caused by a filth-borne organism. It can be eliminated by cleaning up the quarters and sow's belly. Treatment consists of cleaning the nose thoroughly and painting it with iodine. When the swelling softens it may be lanced and washed out with a disinfectant.

Care of the Sow While Nursing.— After farrowing the sow is usually in a feverish condition. She should receive no feed, but plenty of water on the first day. On the second day a light feed of bran or shorts, about one double handful to a feed, may be fed. This



FIG. 30.—Removing the needle teeth from a suckling pig. If this is done before nursing it will prevent injuries to the other young pigs in the litter.

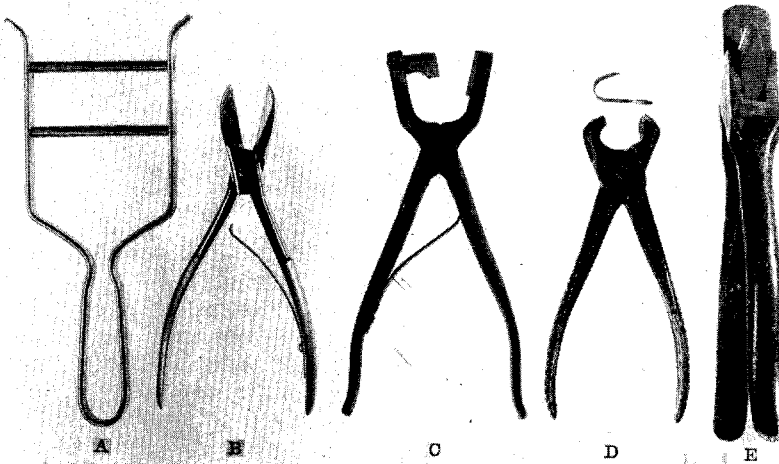


FIG. 31.—Useful instruments for the hog-raiser. (A) Spreader to hold the pig's mouth open while administering medicines. (B) Nippers for removing needle teeth. (C) and (E) Tools for ear-notching. (D) Nose-ringing tool.

may be continued the next day, increasing the amount to two double handfuls to the feed. Gradually the amount and quality of the feeds may be increased daily by adding grain and tankage so that in about ten days or two weeks the sow will be on full feed. The milk flow is influenced by the amount of feed consumed, and it should be stimulated by increasing the feed as rapidly as the pigs can handle the milk without scouring.

A good ration at this time is equal parts corn, oats, and shorts with about one-half pound of a protein supplement of tankage 50



FIG. 32.—Sows and little pigs enjoying sunshine and pasture. This permits them to grow faster, and disease contamination is less probable.

percent, linseed meal 25 percent, and alfalfa meal 25 percent. Gradually the ration may be changed so that the bulk of it is corn or a mixture of grains with about 10 percent of tankage.

The sow should be fed liberally with feeds that will stimulate milk production. The best feeds for this purpose are corn, shorts, and tankage or other protein supplements, with some linseed meal to promote a laxative condition and a certain amount of green feeds to provide bulk and vitamins. A high percent of protein is necessary in the ration because the milk contains a high percent of this element which is used by the little pigs to develop bone and muscle. Other rations will give good results. One commonly used is corn 50 percent by weight, shorts 40 percent, tankage 5 percent, and linseed

meal 5 percent. Another good ration is corn 10 parts, ground oats 5 parts, shorts 5 parts, and tankage 1 part, by weight; or equal parts by weight of corn, ground oats, and shorts. If white corn is used in the above ration care should be taken to see that sufficient green feed, either fresh or dry, is supplied.

The amount of feed a sow should get at this time cannot be determined and much will depend on the judgment of the feeder. The average sow will lose weight during this period even though she is given all the feed she will eat. The heaviest milking sows are generally the biggest eaters and heaviest losers. So the amount of feed should be regulated by the appetite and condition of the sow. If a sow has a small litter of two or three pigs she should have less feed than one with a large litter. The sow with the small litter, if fed like the sow with the large litter, will use the excess feed for fattening, and may be very fat at weaning time.

Care of the Pigs to Weaning Time.—The sow and the litter should be put out on pasture as soon as possible. (Fig. 32.) This will help supplement the feed and give sunlight and exercise. Sows farrowing in a central house may be removed to a pasture that contains an individual house. Do not allow the pigs to be in the house all the time. If they will not go out of their own accord they should be put out. It is best to keep each sow and her litter in a lot by themselves. If this is impossible two or three sows that are congenial with pigs of the same age may occupy the same lot and be fed together.

Young pigs at this time often acquire a sore tail, which if not taken care of will dry up and break off, thus producing a bob-tailed pig. A good plan is to apply vaseline each day or a good soothing salve to the scabby sore. This will soften the injury and allow the circulation to continue and the tail may be saved.

When pigs are two or three weeks old they will begin to eat their mother's feed. A creep (Fig. 33) then should be provided wherein they may be fed separately from the sows and receive additional feed. This may be set up in a corner of the lot or part of the barn where the sows cannot get at it. At first shelled corn is relished by the little pigs and is all that is necessary. Later they may receive mixtures in any combination of shelled corn, oats, shorts, barley, and wheat. In addition they should receive a protein supplement. Skimmilk is excellent. It should be sweet, and the troughs in which it is fed should be kept clean or scours may result. If milk is not available, then shorts, tankage, or linseed meal should be provided. A good mixture at this time for little pigs in a creep is corn 50 pounds, shorts 35 pounds, tankage 10 pounds, and linseed meal 5 pounds. For young pigs ground hulled oats are good, but their price probably will not justify feeding them to any pigs except those intended for show. If pigs are fed in a creep in this manner they should grow rapidly and by the time they are ready to wean should

be getting most of their feed independently of the sow. Pigs should be weaned when eight to ten weeks of age. The best plan is to take the sow from the pigs, leaving the pigs in their accustomed quarters. The sow's ration should be reduced four or five days before weaning and in most cases she will dry up at once. It is well to keep her off pasture a short time immediately after weaning to assist in this.

Caked udders seldom occur at weaning time when the sow is handled this way. If the udder becomes too full, the sow may be returned to the pigs to nurse, but she should be removed as soon as the pigs have finished. Returning the sow to the pigs more than once is seldom necessary.



Fig. 33.—A creep for young pigs in one corner of the pasture. Pigs may be self-fed or hand-fed in creeps.

After the pigs have been weaned their ration should not be changed. They should be kept on pasture if possible, and if any changes in feed are made, the substitutions should be made gradually.

After the pigs are weaned is a good time to cull out the unprofitable brood sows. Those that raised small litters and with poor udders should be fattened for market. The sows to be retained in the herd, if thin, should be run on pasture with a good feed of grain and protein supplement to build them up in flesh again.

A week or two before the pigs are weaned they should be vaccinated for hog cholera. (Fig. 34.) This may be done in two ways, the single treatment or the double. The former produces a temporary immunity from six to ten weeks. Hogs receive this treatment by having injected into them anti-hog-cholera serum alone. The double treatment gives immunity for life in most cases. It is a simultaneous injection of the virus of the disease with the serum.

This produces a mild form of the disease in the hog, from which he quickly recovers and is thereafter immune. Since this virus is a culture of the living germ from the cholera-sick hog, it should be handled by competent persons. It is desirable to vaccinate before weaning so that the pigs will be nursing while recovering from the treatment.

Castration

Another operation which should be looked after before weaning is castration. Castration of all boars not intended for breeding may be performed any time from a few weeks of age up to a few months. It is best done a short time before weaning, for the pigs will be less



FIG. 34.—Students assisting the veterinarian to vaccinate for hog cholera.

concerned by the operation while with their mothers, and at this time the testes are large enough to facilitate the operation. It should not be done at the same time the pigs are weaned or vaccinated, for the two operations may produce a severe setback. Pigs are frequently castrated after weaning. There is no serious objection to this except that they will recover from the use of the knife quicker at a younger age and while nursing their dams.

Before castration, pigs should be kept off feed 10 to 12 hours. Plenty of disinfectant should be used both on the knife and on the wound. Usually a disinfectant of coal tar dip is satisfactory. The pig is held securely and the skin is cut entirely through to the testicle. This is pulled out and the cord jerked off. The opposite testicle is then removed in the same manner, and plenty of drainage cut to the opening and a good disinfectant applied.

Feeding Orphan Pigs.—Orphan pigs should be put on another sow if possible. As a general rule little pigs may be easily trans-

ferred if the change is made before they are three days old. They may be best transferred a few hours after birth. Pigs should be changed to other sows that have pigs about the same age, or that have farrowed within a day or two. If the little pigs cannot be put on another sow, then the orphans must be hand-fed. A nipple and bottle with clean, fresh, whole cows' milk is all right, but this may be dispensed with even at the start. Generally a shallow dish with a little fresh, whole cows' milk which is still warm or has been heated to about 100 degrees F. is just as good. It is unnecessary to dilute the milk as the sow produces richer milk than the cow. Put just enough milk in the shallow pan so that it will come over the pig's mouth when his nose is in the bottom of the vessel. Then push his nose into the milk and allow it to stay under a moment or two. This bathes his tongue and he acquires some milk in spite of himself. A lesson or two of this sort is generally all that is necessary and soon the pig will drink of his own accord.

The orphan pig should be fed every three or four hours for the first few weeks. Although good results have been obtained from feeding the pig three times per day from the beginning, he will do better if fed more often at first.

In about three weeks the whole milk may be changed to skim milk or buttermilk. The change might be made gradually and the amount given may be increased as fast as the pig gets used to the feed. As soon as the pig will eat grain, rolled oats and shelled corn may be provided. A young pig likes to chew on shelled corn. This may be kept available in a self-feeder or it may be supplied twice daily. Tankage may be added later and wheat shorts may be substituted for the oats.

Worming Pigs.—Hogs are infested with a number of worms, the most common of which is the round worm. It is very injurious for it causes digestive trouble, retards growth and development, and affects the general thrift of the pigs. It is most harmful to pigs up to 50 pounds in weight. If a pig can be kept free from worms until it weighs 100 pounds or more, injurious effects are not likely to occur.

The pig suffering from a bad infestation of worms has some fever, digestive disturbances followed by scours, and in general is hard looking, with stiff hair and drawn up flanks. The infestation is caused by swallowing the eggs of the parasite. Eggs pass off in the manure of mature animals which are infested and incubate in the soil several weeks. Dirty, muddy lots with manure piles and dirty hog wallows are ideal places for the development of the eggs. The eggs (Fig. 35) are swallowed by young pigs when they suckle sows whose teats are covered with infested mud. The eggs, but one four-hundredth of an inch long after being swallowed, hatch in the small intestines of the pigs. In their search for a home young worms enter the blood stream from the intestines and are carried to the liver, heart, and lungs. It is while in the lungs that the young worms, now one-sixteenth of an inch in length, do the most damage. The pass-

ing of free young worms through the lungs causes congestion, hard breathing, and pneumonia. A severe infestation of young worms in the lungs retards growth. Many runts are caused in this manner. The young worms in the lungs work their way into the windpipe, are coughed up, and then swallowed and pass into the small intestine where they mature in two and a half months. They produce millions of eggs which are passed off in the manure.

This troublesome condition may be handled by a preventive method or a curative method. The former is most recommended. It is known as the McLean County System. (See page 73.) The

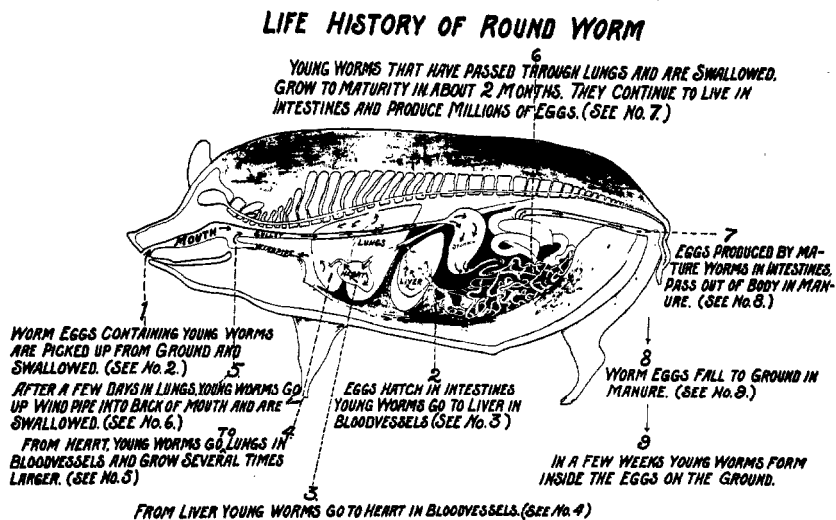


FIG. 35.—The round worm's journey through the pig. (Adapted from the United States Department of Agriculture.)

curative treatment consists in sweeping the worms from the intestines by the use of a vermifuge.

Three methods are commonly used in giving the curative worm treatment. These methods are, the "slop," "drenching," and "pill." All require that the hog to be treated should be fasted for 24 hours, so as to free the intestine from food, in order that the medicine may have its full effect on the worms. No matter which method of worming is employed a thorough understanding of the principles is necessary.

The slop method is a satisfactory one and consists of incorporating in a thin slop for each 50 pounds of live weight of pig, 4 grains of santonin and 2½ grains of calomel. The pigs to be treated should be separated into conveniently small bunches of not more than 20 head so that each pig will receive its proper share of the dose. This is easy for the average person to administer, but has the disadvantage in that the sick pig which needs the treatment often will not

take its share of feed and medicine. For such pigs, one of the individual dosing methods may have to be used.

The drenching method involves giving the dose orally by means of a syringe. A satisfactory dose consists of two cubic centimeters of oil of chenopodium (oil of wormseed) to one ounce of castor oil for each 50 pounds of pig.

The third method is the pill method. There are many brands of worm capsules and tablets on the market. Some are good, others are not. When administering capsules or pills the throat may be injured or the capsule may stick in a pouch in the neck. Also pills may not always contain a full dosage.

Mange and Lice.—About weaning time young pigs frequently scratch and rub themselves, especially if their dams are scratching and rubbing. A close examination will disclose the presence of lice or mange.

Lice are external parasites commonly found on swine. They live by sucking the blood and lymph from the hog and are usually found on the tender parts, which are the backs of the ears and between the legs. Lice are easily controlled by the application of used crank-case oil which has been thinned by adding a little kerosene. It may be poured over large hogs from a sprinkling can and then spread over all parts with a broom or mop. Little pigs may be crowded into a corner and the oil poured on them. Jostling and crowding over and under each other usually spreads the oil thoroughly over them.

Mange is a contagious skin disease caused by a small mite that burrows into the skin and produces intense irritation. (Fig 36.) The condition spreads rapidly because the mites reproduce in 12 to 14 days. The discomfort causes the pigs to rub and scratch, which tends to spread the mite and to infect all of the hogs that are yarded together.

To treat mange, it is best to first separate the infected hogs from those that are not infected. The lime sulphur treatment is the best, especially for severe cases. A dry form of lime sulphur is convenient and may be secured commercially. It is considered less effective, however, than the liquid form. One pound of dry lime sulphur to 20 gallons of water is the amount usually recommended for dipping. The liquid form or lime sulphur solution is the same as is used by orchardmen. For hog dipping it is used in the proportions of about 1 gallon of the solution to 25 gallons of water. The water should be about 105° F. and the hog may be dipped in this hot solution in a dipping tank or a barrel or may be sprayed or scrubbed with a brush. The effectiveness depends upon the thoroughness of the job. Severe cases require repetitions of the treatment two weeks apart. Waste crank-case oil has some value in treating for mange. Mild cases usually respond to several oilings. One percent of liquid cresol compound mixed with the waste oil adds to its efficiency for treatment of mange.

Managing the Pigs from Weaning to Marketing.— All pigs, whether they are to be fed for market or kept for breeding purposes, should be given plenty of feed and good care immediately after weaning. Either of two methods of feeding may be followed in getting spring pigs ready for market. Immediately after weaning they may be full-fed by self-feeding on alfalfa or other suitable pasture, or they may be grown on pasture with a light feed of grain, and later fattened with new corn.

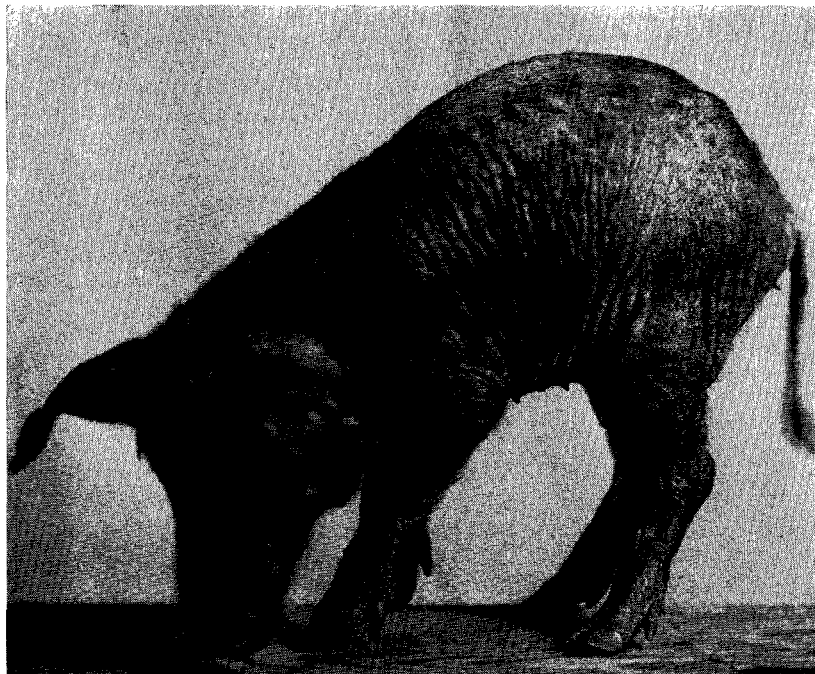


FIG. 36.—A pig suffering from mange. This pig is seven months old and weighs only 30 pounds.

The first method has the advantage of getting the pigs off to market sooner and benefiting from the better market price usually paid in the early fall. This method, however, uses much high-priced old corn, and does not utilize the pasture to its fullest extent.

The method of growing them out on pasture with little or no grain for varying lengths of time has the advantage of lower production costs because the new crop of corn which usually is cheaper may be fed. Another advantage is that much of the gain put on by the pigs will be from an extensive use of pasture. However, if grain feeding is delayed too long, the declining market price for hogs may offset the cheapness of the gains.

Results of an experiment at the Kansas Agricultural Experiment Station in which one group of pigs was full-fed corn on alfalfa pasture with tankage hand-fed at the rate of one-fourth pound per head daily, was compared with another group which received only one pound of corn per head per day with the same amount of tankage hand-fed daily showed that the full-fed pigs made the most rapid gains and were ready for market the last of September, while the pigs on the limited grain ration required 60 days longer to attain the same finish. The full-fed pigs sold for \$1.35 more per hundred pounds than the limited fed pigs. The latter required only slightly less feed for one hundred pounds gain than those full-fed corn from the beginning. Consequently, over a period of years it will probably pay to full-feed spring pigs from the start, providing they can be marketed in September. This means that the pigs must be farrowed early in the spring. Even then, they must receive the very best care in order to be ready for the September market. Feeding for the early market also has the advantage in taking the spring pigs out of the way and making room then for the fall farrowing sows. The full-feeding system is the best practice for the farmer who raises most of his own corn, has the necessary equipment, and can make his early pigs weigh 200 pounds by September.

A deferred full-feeding system may be advisable in sections of this state where corn is not a fairly sure crop. However, if the corn crop is a failure the pigs may be marketed as feeder pigs. Also where only one litter is raised each year in the late spring they are finished out later and do not eat so much of the high-priced old corn generally used by earlier farrowed pigs.

Usually fall pigs are immediately full-fed in the dry lot. It is most desirable to have fall pigs farrowed early, generally by the middle of September, so they will have good size and be vigorous enough to withstand the more severe weather of winter. Late pigs are often rough coated and humpbacked, unthrifty, and do not make an efficient use of their feed.

Full-fed fall pigs will make excellent gains if they receive good grain rations supplemented with plenty of protein and minerals. Self-feeding is generally to be recommended. Corn in most cases should form the major portion of the ration, although ground wheat, barley, or the grain sorghums may be used. Bulky feeds such as oats should be used sparingly. The use of high-grade protein supplement is necessary to the rapid gains that are essential for early marketing. The tankages, buttermilk, or skim milk, or a mixture of high-protein feeds may be expected to make good returns. In Kansas excellent results have been received in dry-lot feeding by self-feeding corn, tankage, and alfalfa hay in self-feeders, and good thrifty pigs when so fed may be expected to gain about one and one-half pounds per day.

Feeding on Pasture

It is generally conceded that hogs fed in a dry lot are not as profitable as those on pasture. Hogs full-fed on pasture in the summer compared with those full-fed in the dry lot make better daily gains and require less feed for a hundred pounds of gain. So when rapid gains and an early market are sought by the feeder in the spring, it behooves him to make use of alfalfa pasture. An acre of pasture will replace about 40 bushels of corn in fattening hogs.



FIG. 37.—Pigs being self-fed on pasture. This is an easy and economical method of fattening pigs.

Self-feeding Pigs

Pigs being grown and fattened after weaning either in dry lot or on pasture, when full-fed, may be fed by means of the self-feeder. (Fig. 37.) The average results from the use of the self-feeder show that self-fed pigs will gain about 10 percent faster than those that are hand-fed. In most cases there is very little difference in the amount of feed required for 100 pounds gain. Spring pigs which are being pushed for the early market will eat more grain when self-fed, than when hand-fed, and as a result will gain more rapidly. The use of the self-feeder, therefore, in finishing pigs for market after weaning is a good practice. It is economical in that it saves feed and labor, but when self-feeders are used care must be taken to see that they feed freely and do not clog.

Hogging Down Corn

By this method the hogs are full-fed on corn, but it requires the hog to rustle about the field of standing corn to get it. (Fig. 38.) The hogs are run into a corn field, fed a protein supplement, and

allowed to eat the grain as they will. The practice of hogging down corn is followed very little in Kansas. In a test conducted at this station it was found that less corn and tankage were required to produce 100 pounds gain in dry lot feeding than where corn was hogged down. These results are not in keeping with those secured at some other stations where pigs have done as well or a little better when they harvested their own corn as when it was fed to them the usual way. It is believed this method of feeding may not be so well adapted to Kansas conditions where the fall seasons are often wet. During the progress of the experiment in Kansas much rainfall oc-

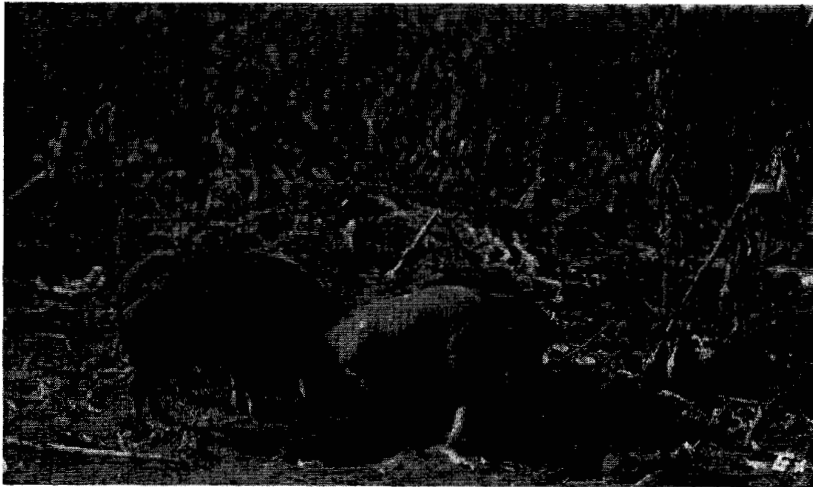


FIG. 38.—Hogging down corn. These pigs have stopped harvesting the corn and are eating their necessary supplements.

curred with little or no freezing. This brought about considerable waste of grain in the field.

To get the best results in hogging down corn a nitrogenous supplement must be provided either in the form of commercial concentrates or a forage crop. Crops grown with corn for this purpose are soybeans, cowpeas, alfalfa, clover, and rape. The number of hogs to the acre varies with the yield of corn; 40 bushel corn will carry 14 or 15 hogs for 30 days.

Fields to be hogged down must of course be fenced hog tight. The hogs to be turned in should gradually be accustomed to the new corn, especially if they have been on old corn. The corn should be well dented before the hogs are turned on. Spring shoats, weighing at least 100 pounds, are best for this. This method follows the deferred feeding method previously discussed, for the pigs must be carried through the summer until the corn is mature enough to turn the hogs on.

Hogs Following Cattle

Full-fed cattle waste feed from their bunks as well as through their digestive tract. It is economical to use hogs to salvage these wastes. The pigs should be thrifty, growthy and about 115 to 120 pounds in weight. Protein supplements should be provided in the same manner as for hogs on full feed. When too many hogs are permitted to run behind cattle additional corn should be fed. For every bushel of corn fed to steers, hogs following them should produce an average of from one to two pounds of pork. If the feed is ground for the cattle, the gain should be about one-fourth to one-half pound of pork per bushel of corn.

Slopping Hogs

The inadvisability of feeding slop to hogs was shown in a feeding test at this station. Two lots of pigs were self-fed corn and alfalfa hay in dry lot. One lot received tankage in addition, free choice, and the other lot received one pound of shorts and four-tenths of a pound of tankage per head daily in the form of slop made with water. The slop-fed pigs gained 1.94 pounds per head daily whereas pigs receiving no slop gained 2.14 pounds and made 100 pounds of gain at less cost.

V. PASTURES FOR HOGS

The Importance of Pastures. — Pastures are essential to the economical production of swine. They provide proteins of the kind and quality that will supplement the home-grown grains and provide the body-building materials needed by young pigs. Pastures supply minerals in the form of lime and phosphorus that are necessary for bone development. They also are rich in the vitamins that help keep the pig thrifty and vigorous and help him to utilize his feed more efficiently.

The value of pasture for hogs is not solely in the nutrients that it contains; it also causes the hogs to exercise. The succulent laxative green feed and the exposure to sunshine tend to keep them in better health than if confined to small cramped quarters. Also, pigs on pasture scatter evenly the manure they produce.

An average of three experiments at the Kansas Agricultural Experiment Station showed that alfalfa pasture for pigs on full feed produced about 10 percent greater daily gains, and a saving of about 15 percent in the amount of feed required for 100 pounds gain, when compared with dry-lot fed pigs on balanced rations. If corn alone is fed in both dry lot and on pasture, a saving of at least 40 percent will be made in the feed required for a given gain.

Pigs fed on pasture during the summer will do better when fed in a dry lot in the fall than those that have never had green feed. Most spring pigs, especially those farrowed in May or June, are not ready for market when the pasture season closes and are there-

fore in condition to respond more readily to grain feeding in the dry lot than pigs that were not pastured.

Pigs may be carried through the summer months on pasture with very little grain, which is advisable when corn is high in price. Tests at this station indicate that pigs fed only 1 pound of corn and 0.2 pound of tankage per pig daily will remain thrifty on alfalfa pasture. They grow but do not fatten and, therefore, make excellent feeder pigs at the end of the pasture season. The production of thrifty 100 to 125-pound feeder pigs is dependent upon a good pasture crop.

Feeding Corn and a Supplement on Pasture. — The fact that most pastures are rich in protein causes many hog men to question the advisability of feeding tankage or other protein rich supplement to hogs on pasture. Tests at this Station show that the daily gain of pigs receiving one-fourth pound of tankage per head per day in addition to corn and alfalfa pasture was 60 percent greater than the daily gain in the lots receiving no tankage in addition to corn and alfalfa pasture. The cost of gains was 9 percent, less in the tankage fed lots. Pigs fed tankage in addition to corn on alfalfa pasture will be more thrifty, eat more feed, and make more rapid and economical gains. Only enough tankage should be fed to balance the corn, which is about one-half as much as when pigs are in the dry lot. When pigs on pasture are full fed on corn they will not eat enough of the bulky green forage to balance their ration entirely, so they will gain more rapidly if some protein-rich feed is added to help balance it.

Pasture Considerations. — There are several requirements to keep in mind when selecting a pasture crop for hogs. The pasture crop selected should be adapted to local soil and climatic conditions. The ideal forage for hogs should be able to withstand tramping. It should be able to furnish pasture for a long period and also withstand drought and hot weather. It is an advantage to have permanent pastures, but it should be remembered that annual crops lend themselves better to methods of sanitation.

It is not always advisable to have all the pastures fenced into small areas. However, if some are small much benefit will be derived by more thorough grazing. Proper rotation is easier if the pasture lots are small. Also sanitation may be improved. It is frequently desirable to pasture individual sows and their litters in separate areas. When this is done small pastures are more efficiently utilized than large ones.

Pasture Crops for Kansas. — The crops from which a selection may be made vary in their desirabilities and growing habits. No one crop is applicable over the entire state as there is much variation in rainfall, soil, and growing conditions. Consequently, it is important to choose the crop on the basis of adaptation to local conditions.

Alfalfa

Where it can be grown, alfalfa is no doubt the most valuable forage crop for hogs in Kansas. (Fig. 39.) It may be grown in most sections of the state, although in the extreme western part a good stand is generally only obtainable in river and creek bottom lands or under irrigation.

Alfalfa is a valuable forage because of its heavy yields, long grazing season, good feed value, palatability, and its high protein, mineral, and vitamin content. It supplies succulent forage in late summer when many other pasture crops have dried up or lost their palatability.

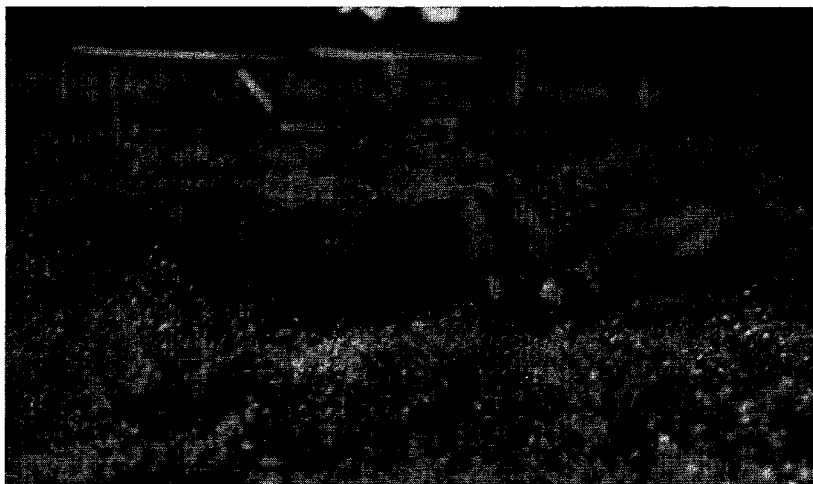


FIG. 39.—Market pigs on alfalfa pasture. Good pastures are the foundation of profitable pork production. Alfalfa is the ideal pasture.

Alfalfa is the best forage addition to grains because of its high protein and mineral content. In fact, mature hogs may be maintained on good alfalfa pasture without loss of weight. Young pigs should, however, receive some concentrated feed on alfalfa pasture. For brood sows, a corn-alfalfa forage ration is quite satisfactory during the summer.

Alfalfa should not be pastured too heavily with hogs if the stand is to be safeguarded. The number of pigs an acre of alfalfa will carry cannot be definitely stated because of the differences in stand and in feeding and management. Generally speaking, about 15 to 18 fattening pigs should be the average permitted on an acre of this forage. If the crop is not pastured the first year after seeding, its ability to withstand tramping will be increased. The number of hogs allowed to graze should be limited so that one or perhaps two cuttings of hay may be secured in addition to the forage. Fencing

a field into smaller areas and grazing them uniformly and in rotation will increase the permanency of the stand.

Rooting by hogs on alfalfa is detrimental. The inclination to root may be caused by a poorly balanced ration. If pigs persist in rooting when fed a balanced ration they should have rings put in their noses. (See Figs. 40 and 31.)

Clover

The use of medium and mammoth red clover for hog forage is perhaps limited to the eastern and the northeastern parts of the state. In general they are adapted to cool, moist climates. No ex-



FIG. 40.—Ringing a young gilt. The tool for this is illustrated in Figure 31. A breeding crate is used to secure the gilt. A rope around the upper jaw snubbed to a post will serve just as well. An un-rung sow can tear up lots of sod. Don't put the rings in too deep. Just behind the nose cartilage.

periments have been conducted under Kansas conditions to compare these clovers with alfalfa for pasture. The two species are much alike and may be used interchangeably. Some swine growers interchange them with alfalfa because they are similar in the feed constituents they supply. However, since alfalfa furnishes such a uniform supply of forage and is more drought resistant, it has a distinct advantage over the clover. Medium or mammoth red clovers are biennials and fit in well with crop rotations, and although good forage crops, they do not make a uniform growth throughout the summer and tend to become woody and hard early in the season.

For best results the clovers should not be pastured until they have made a growth of 8 or 10 inches, nor should they be pastured too close, especially in the late fall, since this increases the danger of winterkilling.

Sweet Clover

Two varieties of biennial sweet clover, namely the white and the yellow blossom, may be grown in about the same regions as alfalfa. The white blossomed variety is best for hog forage. (Fig. 41.) It is moderately drought resistant, but lacks palatability and often grows somewhat rank. It may be sown, broadcast, or drilled in late March or early April at the rate of 15 to 18 pounds of scarified seed to the acre. It may also be sown with oats and pastured after the oats are cut.

The first year's growth should not be pastured until the plants have reached a height of eight inches. Sweet clover for pasture.



FIG. 41.—Young pigs on sweet clover pasture.

should not grow too rank nor should it be grazed too close. The first year's growth may be pastured until late in the fall. The second year's growth comes early and is very abundant for six or eight weeks. It goes to seed about midsummer and only little pasture is received the remainder of the year.

Several tests have been conducted with first-year sweet clover at the Kansas station. In one test just as large and as economical gains were secured as with alfalfa pasture. In this test 90-pound pigs receiving corn and tankage self-fed were divided into two groups. One group was pasured on sweet clover, the other on alfalfa. The average daily gain for the sweet clover pastured group was 1.42 pounds, and for the alfalfa pastured group, 1.34 pounds. The feed required to produce 100 pounds of gain was practically the same in each lot. Another year a similar test with 60-pound pigs resulted in daily gains per pig of 1.51 pounds on alfalfa and 1.13 pounds on sweet clover. The feed required per 100 pounds gain was

about the same, but the average amount of corn consumed daily per pig was greater in the alfalfa lot than in the sweet clover lot. The sweet clover pasture in the test first referred to was of very fine growth, due to an unusually dry season, whereas the sweet clover in the second test was very rank, due to a wet season. The pigs probably ate more sweet clover than alfalfa, which explains why those on sweet clover ate less corn than those on alfalfa pasture.

Sudan Grass

Sudan grass, which is adapted to all sections of Kansas, is one of the most satisfactory annual pasture crops. (Fig. 42.) It should not be seeded until warm weather, generally about the middle of May, at the rate of 18 to 20 pounds to the acre. It grows rapidly

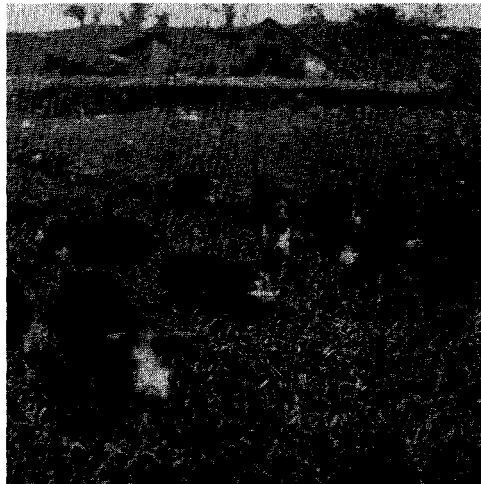


FIG. 42.—Young pigs on Sudan grass pasture.

and is ready for grazing at Manhattan by late June. It should be pastured steadily so that a rank growth will not develop. It furnishes pasture until the latter part of September or until a killing frost, and when once established has great carrying capacity if moisture conditions are favorable. If it grows too rank, clipping will improve the grazing, since this stimulates the growth of new shoots with tender leaves. Chinch bugs relish Sudan grass, and if grown near wheat or oats when chinch bugs are a menace, it soon becomes seriously infested.

In a feeding test conducted at the Kansas station it has been shown that for all practical purposes Sudan grass is as efficient a pasture as alfalfa for fattening pigs during the summer and fall months. The 72-pound pigs pastured on Sudan grass gained 1.19 pounds per day while those on alfalfa gained 1.23 pounds, when the corn was full-fed by hand, and a quarter of a pound of tankage

per day was fed each pig. Tests have also demonstrated that it is necessary to feed a protein supplement to full-fed pigs on Sudan grass pasture.

Rape

Rape is an excellent forage crop for hogs, especially in the eastern part of the state. In other sections it usually does not do well, as hot, dry weather retards the growth. Rape should be sown early at the rate of six or eight pounds to the acre either with the drill or broadcast. Rape grows luxuriantly if moisture and other climatic conditions are satisfactory. If pastured carefully throughout the summer it will persist late into the fall until heavy frosts occur. It should not be pastured until it is 8 to 10 inches high. The Dwarf Essex is the most generally grown variety for hog pasture.

Kentucky Bluegrass

In the eastern part of the state Kentucky bluegrass may be grown quite successfully, but in the middle and western parts it cannot be relied upon. Where available, it furnishes an excellent early spring pasture. It often dries up and makes a poor pasture during midsummer. When this occurs, hogs must have their grain ration increased, or other forages must be supplied. No experimental work has been carried on at the Kansas Station, but work at other stations indicates bluegrass is not as good as alfalfa.

Its chief drawback, as with all permanent pastures, is the tendency for it to become infested with round worm and other infectious diseases. Hogs enjoy rooting bluegrass to find grub worms.

Sorghums

Cane and grain sorghums make satisfactory pastures in western Kansas where some of the other crops will not grow, but their use is limited, because more supplementary feeds are necessary than with the other crops.

Rye

Rye makes excellent late fall, winter, and early spring pasture. It is the earliest pasture crop in the spring and is of special use for suckling sows and litters. Rye for pastures should be drilled as near the first of September as possible at the rate of about one and one-half bushels to the acre. The spring pasture season is relatively short. It may be followed by Sudan grass and this will furnish pasture until frost.

Cowpeas and Soybeans

Strictly speaking, cowpeas and soybeans are not considered pasture crops for hogs, because the plants are easily destroyed by pasturing. They are most valuable when planted with corn and used as a protein supplement when the corn is hogged down. These crops are perhaps best adapted to the eastern and southeastern sections of the state. Other sections frequently become too dry and hot.

Cowpeas do not stand grazing so well as soybeans and should not be grazed until the seed has fully developed.

Pasture Rotations. — For best results with pastures a rotation should be followed, for pastures used year after year soon become infested with worms and other diseases. Pigs are more easily raised if kept on clean ground. Bringing clean ground to the surface at frequent intervals helps avoid trouble from round worm and various infectious diseases. Rotating crops for pastures provides a variety of forages for pigs and will help combat various diseases.

Since alfalfa is the best pasture for hogs in Kansas, and is easily grown in most parts of the state it usually should be the crop on which the rotation is founded. A suitable substitute can be supplied by annual or biennial pastures in a rotation of three or four years. The pastures used for this may be Sudan grass, oats, rape, or sweet clover. A four-year rotation, using substitutes for alfalfa or where alfalfa is not adapted, is illustrated in Table 4.

TABLE 4.—A FOUR-YEAR CROP ROTATION FOR PASTURING HOGS

YEAR.	Field No. 1.	Field No. 2.	Field No. 3.
First	First year sweet clover . . .	Second year sweet clover. Rye sowed in Sept.	Rye in early spring. Sudan grass sowed in May.
Second	Second year sweet clover. Rye sowed in Sept.	Rye in early spring. Sudan grass sowed in May.	First year sweet clover.
Third	Rye in early spring. Sudan grass sowed in May.	First year sweet clover.	Second year sweet clover. Rye sowed in Sept.
Fourth	First year sweet clover.	Second year sweet clover. Rye sowed in Sept.	Rye in early spring. Sudan grass sowed in May.

In some sections perhaps rape might be substituted for the Sudan grass, or wheat for rye.

VI. SHELTER AND EQUIPMENT³ FOR SWINE

Shelter Requirements. — It is essential that hogs have shelter. They have too long been under domestication and artificial conditions to withstand, unprotected, the rigors of Kansas winters and summers. They are susceptible to extremes of temperature, dampness, and drafts.

It should not be concluded that any shelter is good enough for hogs. Of course, expensive and elaborate housing can be provided, but a cheap structure that includes the essential principles of protection will be just as efficient. Many old buildings may be made 100 percent efficient for hog raising by simply remodeling along suitable lines.

The Site. — The hog house should be situated at a high place on rolling ground. Such a site provides drainage that insures against

3. Buildings useful in swine production are discussed more fully in Bulletin No. 286 of the Kansas Agricultural Experiment Station.

dampness. If the soil selected for the site is sandy, so much the better, for heavy clay soils hold the water, and filthy puddles result. The location should also be convenient to other buildings and to pastures and shade. A sunny exposure with a southern slope is preferable, for these help to provide warmth and dryness.

Construction.— The hog house should be warm and dry, with good ventilation. Sweaty walls or damp floors are objectionable and pig losses are often traceable to such conditions. Direct sunlight at some time of the day should be allowed to strike every part of the interior of the house. Sunlight destroys germs and tends to promote warmth and dryness, besides invigorating the pigs. Feed bins, water supply, sewer drainage, suitable troughs, and other equipment and interior arrangements that lessen the amount of work in caring for the hogs should be provided.



FIG. 43.—The central hog house on the college animal husbandry farm.

Types of Hog Houses.— There are two general types of hog houses—the central or community, and the individual or portable. The central house is stationary, ordinarily large and of durable construction. It contains a number of farrowing pens under the same roof.

The individual house is movable, and constructed to provide shelter for only one sow and her litter. It is small and light in weight.

The Central House

Central houses are usually warmer and dryer because direct sunlight is more easily admitted and good ventilation maintained in houses with larger dimensions and better arrangement of areas. The central house has a further advantage in that the herdsman may care for a number of sows with less time and labor. (Fig. 43.)

The pens in the central house may be separated by movable partitions. This arrangement generally calls for two rows of pens separated by an alleyway in the middle. These pens should be at least 6 by 8 feet, and contain pig rails to protect the little pigs. These may be constructed by using 2 by 4 rails around the pen supported by brackets about 8 inches from the floor and extending 8 inches from the walls and partitions.

The floors of the central house should be permanent. Satisfactory floors may be made by laying building tile on a gravel base and covering them with 1½ inches of concrete. This will insulate against cold and dampness and the floor will be warm and comfortable. Dirt floors harbor germs and are easily rooted up and thus become dusty and insanitary. Wood floors become insanitary and filthy and are not durable.

The doors should be 30 inches wide by 36 inches high and have low sills with a good approach. Heavy sows may stumble over a high sill. If the doors are not wide, injury may result through crowding.

There should be one square foot of glass area to each 12 to 15 square feet of floor space, so placed as to permit direct sunlight to every part of the house at least once a day.



FIG. 44.—The Kansas A type individual hog house. Houses of this type may be used for farrowing or for other groups of hogs and are easily moved to clean fields or where permanent houses are not needed.

The Individual House

The chief advantage of individual houses are that they are less expensive to build and are portable. Being movable permits changing them to clean ground, which assists in sanitation measures. The individual house provides excellent shelter for the nervous sow about to farrow. A renter may satisfactorily house his swine in this type of shelter when other buildings are not provided and then take the shelter with him when he moves. There are many types of portable houses in which the roof, shape and size vary. The house should be strongly made, using plank floors, and by all means should have pig fenders if sows and little pigs are to inhabit the house.

Kansas A Type Individual House.—The Kansas A type house is cheap and durable and has all the desirable features of a good, portable hog house. (Figs. 44 and 45.) It is of sufficient size for one sow and litter. It is built on substantial skids, with a plank floor, large suitable door and ventilator, and has pig rails. A group of these houses is often arranged in a row.

Combination Individual House.—The combination house when closed provides suitable winter quarters, and in addition, by opening the outside walls, supplies shade and coolness in the summer. A woven wire fencing prohibits the hogs from using any but the main entrance to get in and out.

The Two-sow House.—(See Fig. 50.) The two-sow house which is meeting with considerable favor among swine raisers is essentially two small portable houses built together with a partition. The roof



FIG. 45.—A group of A type hog houses with back end to the north, and banked with straw for early spring farrowing.

is generally a gable or two-thirds gable type with roof windows. It has the advantage of providing space for two sows and their litters when it is desirable to keep two together.

Feeding Equipment.—Satisfactory feeding equipment will not only reduce production costs by decreasing labor, but also it makes the handling of hogs much easier.

Self-feeders

Labor and feed are saved by the use of self-feeders. Experiments show that self-fed hogs usually eat more and gain faster than do hand-fed hogs and that they make as much gain from a given amount of feed. For these reasons self-feeders should be on every farm where hogs are fattened for market. A properly designed self-feeder should keep a supply of feed before the hogs at all times. It should limit waste to the lowest possible amount, and protect the

feed from inclement weather. It should have several compartments, at least one for corn or other grains, and another for the protein supplement. Such a feeder is shown in Figure 37. It does not clog because of the straight, vertical drop of the feed in the six-inch throat of the feeder and it wastes little, because the feed opening is near the floor.

Hay Feeding Rack

Experiments in feeding hogs in recent years have shown the desirability of permitting all sizes of hogs free access to good alfalfa hay in a self-feeding rack if pasture is not available. A rack that eliminates much of the waste that ordinarily occurs when feeding hay to hogs is shown in Figure 19. It is constructed on skids on which it may be moved from lot to lot.



FIG. 46.—Poland China pigs on a concrete feeding floor. Such floors save grain in muddy lots. Observe automatic barrel waterer at left of picture.

Pig Creeps

Good swine management calls for some method by which little pigs may be fed away from their dams. Little pigs will quickly respond to such treatment, but the sows must be kept out of the feeding place. The best way to accomplish this is to provide a creep which may be made cheaply and easily by nailing narrow pieces of wood vertically on horizontal two-by-fours across the corner of the house or lot in which the pigs are fed. Creeps may also be provided by portable panels that can be fastened together to form a pen in which the feed may be placed in a self-feeder or shallow trough. Such an arrangement is illustrated in Figure 33.

Feeding Floors

Where the feed lot seldom gets muddy feeding floors scarcely justify the expense. However, where hogs must feed on the same area during all kinds of weather the failure to construct a floor may waste much grain. When constructed it should be made of concrete and built on well-drained soil. (Fig. 46.) A slight slope should be provided and a four-inch curb about the sides is desirable.

Sun Shades

Shades are necessary to protect swine during the hot summer months, for hogs suffer greatly from heat. (Fig. 47.) If natural shade from trees is not available then some sort of shelter should be erected. A simple shelter of limbs thrown over a roughly constructed rack and covered with straw will answer the purpose. One made of scrap lumber will also do.

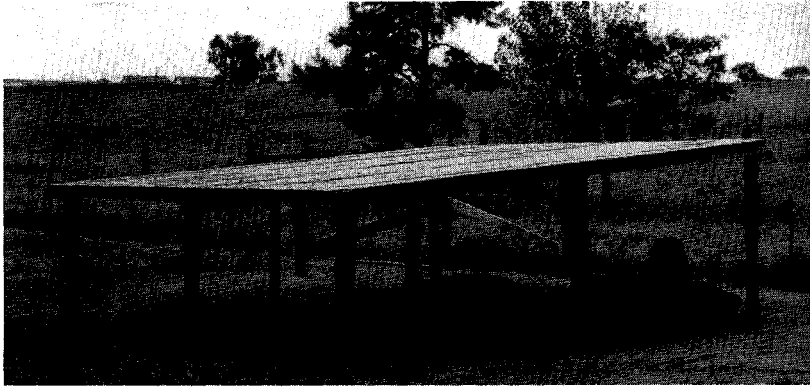


FIG. 47.—Fattening pigs enjoying a sunshade in hot weather. Although this shade is built of sawed lumber, brush shelters roughly constructed will do just as well.

VII. SANITATION

Not many years ago hog production was considered a risky business because disease was responsible for many deaths. Today these hazards have been greatly reduced through scientific investigation, but considerable caution must still be exercised. Investigation has disclosed that many hog diseases are caused by germs that thrive in filthy, dirty lots. Research has also determined that the health of hogs is largely a matter of sanitation.

The death rate in hogs is higher than in other farm animals, and consequently the hog raiser must always be on the alert. Those who allow their vigilance to relax frequently find that they must abandon production for a time and begin anew. The hog is naturally a difficult animal to treat for disease. Therefore, "an ounce of prevention is worth a pound of cure," and he who has learned to prevent insanitary conditions or who will remedy those conditions as soon as they are observed has learned the first rule of successful hog raising.

Sanitation in hog production is the adoption of those methods that prevent disease and conserve the health of the animals. This, and herd management go hand and hand, but must be combined with the use of vaccines and other remedies to produce clean herds.

There are a number of places about the hog farm where sanitation may be overlooked and because of which unhealthy pigs result. For instance, hogs are frequently permitted, and in many cases forced, to live in crowded quarters. (Fig. 48.) As a rule such places are dark and filthy and most favorable for harboring disease germs. When hogs crowd into these places and against one another any disease they may carry is easily spread. Not all diseases originate in filth, but under such conditions all spread rapidly. Furthermore, close quarters and confinement soon lower the resistance of pigs to disease.

The proper arrangement of buildings and feed lots and their location is commonly neglected. Hogs should not be compelled to inhabit old straw sheds and poorly drained quarters.

Dirt floors are undesirable, for dust is a spreader of disease. Pigs



FIG. 48.—This filthy, trashy yard, and damp, dark hog shed will harbor disease and carry it from one year to another. Hogs kept under such conditions cannot be expected to thrive.

piled up in straw stacks soon bring trouble of some sort. Pigs should have clean, dry straw and good floors of wood or concrete on which to lie. Buildings should always be placed in well-drained locations. Lots surrounding them should be plowed frequently and sowed to some forage crop. Manure piles, corn cobs, and similar materials should be burned or removed and not allowed to accumulate. Lime might well be sprinkled around the premises and buildings and the pens should be disinfected before farrowing takes place.

Hogs should not be allowed to wallow in or drink from small streams which often are contaminated from other feed lots further up the stream. Pigs should be watered from clean troughs or drinking fountains. Muddy hog wallows are unnecessary and should be

filled up, since they harbor germs. (Fig. 49.) Wallows, when used, should be concrete, and fitted with a drain to facilitate cleaning and disinfecting.

Since the discovery of the relation of ultra violet light to health, more attention every year is being given to direct sunlight for hogs. Modern hog house construction should permit plenty of light to reach the inside. It should sweep all parts of the floor each day to destroy the disease breeding organisms and give vigor and vitality to the young pigs. Individual houses should have large doors in the roofs and these should be opened each day to permit sunshine to enter, for this adds warmth, gives light, and destroys germs.



FIG. 49.—Hogs living in filthy insanitary conditions. Filthy hog lots carry swine diseases and parasites. Young pigs especially should be kept out of old hog lots.

The rotation of crops in the pastures is one of the best ways to help rid the place of worms and other infections. Small pigs should always be put on clean ground. Where it is impossible to provide new ground each year then plowing at least twice a year should be resorted to. This helps keep the infection down, but will not be so effective as new ground.

The McLean County System of Sanitation. — This is one of the most popular methods of eradicating disease. It is especially designed to combat and prevent round worms, enteritis, thumps, bullnose, “necro” infections, and other filth-borne infections of hogs. It was worked out by the Bureau of Animal Industry in cooperation with the hog raisers of McLean county, Ill. It is outlined as follows:

1. Clean the farrowing quarters and scrub them with 1 pound of lye to 30 gallons of boiling hot water, then spray them with 1 pint of compound cresol solution to 4 gallons of water. (Figs. 50, 51;

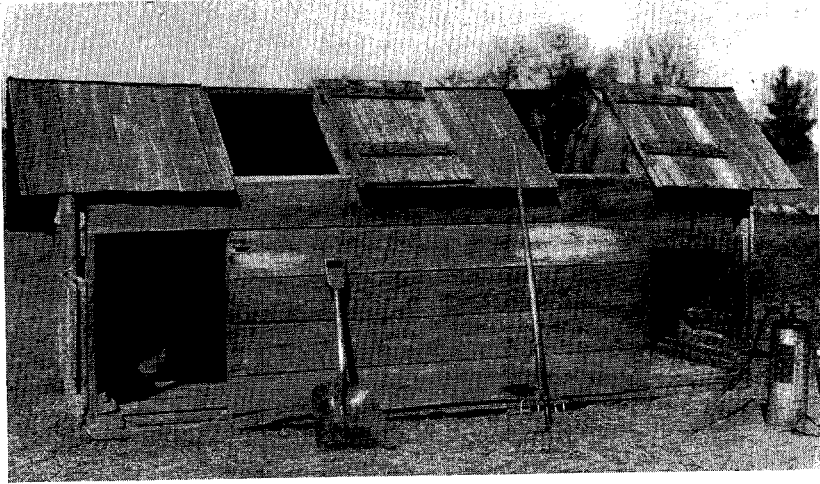


FIG. 50.—Cleaning a two-sow farrowing house before moving in a sow and her litter.

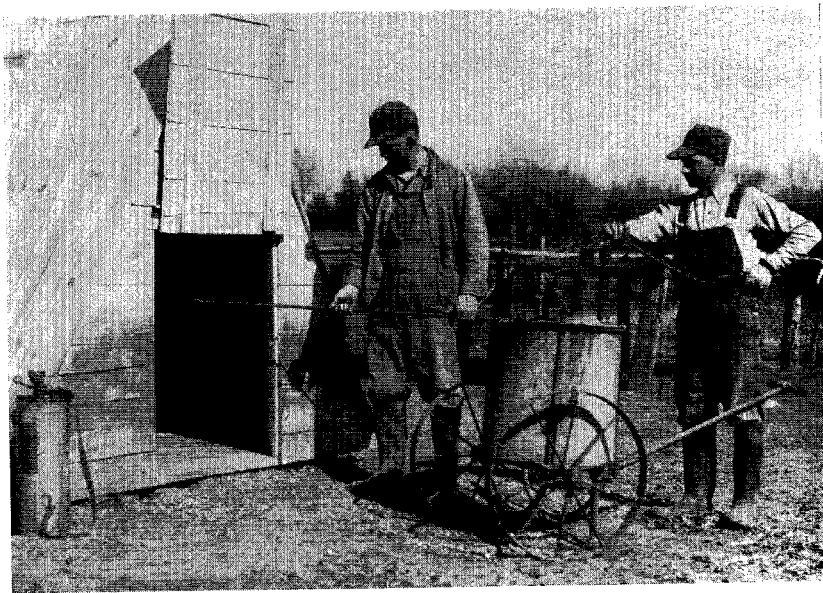


FIG. 51.—The farrowing house should be disinfected thoroughly before placing the sow in her quarters.

also, see Fig. 20.) The hot water kills the worm eggs, the lye loosens the dirt, and the disinfectant destroys the germs of infectious diseases.

2. Wash the sow's udder and sides with soap and water before putting her in the farrowing pen. (See Fig. 21.) This removes the worm eggs so that the little pigs cannot get them when they suck.

3. Keep the pigs confined to the farrowing pen, if it is in the vicinity of old hog lots, until the sow and pigs are moved to a clean pasture.

4. Haul the sow and pigs to a clean pasture where no hogs have run for at least two years. Preferably this pasture should be a field which has been cultivated since last used by hogs. This avoids contamination from filthy hog lots.

5. Confine the pigs to the clean pasture until they are at least four months old.

6. Prevent the development of polluted areas near feeding equipment by removing such equipment occasionally.

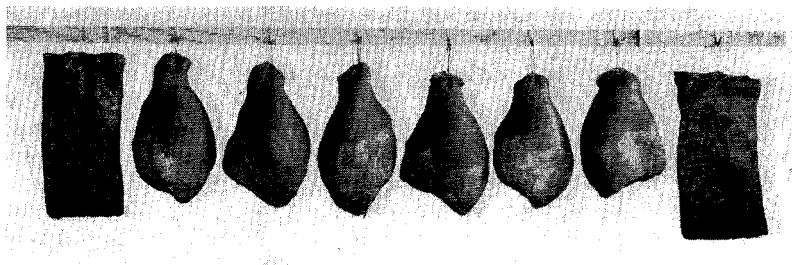
Importance of Hog-lot Sanitation.— The foregoing rules for hog-lot sanitation were so successful in raising hogs in McLean county, Illinois, that the following data from the University of Illinois Circular No. 306 are here presented in order that hog raisers may be fully aware of the importance of sanitation in swine production. These data are based on records of 13,478 pigs raised from 1,977 sows on 154 farms in Illinois by the use of the sanitary system, and are compared with a large number of pigs raised in permanent hog lots on the same farms.

By using the sanitary method 98.2 percent of the pigs farrowed were raised. An average of 1.6 to 2.7 more pigs per litter were raised. The size of the litters was increased more on farms formerly having the greatest trouble in having small litters. The same number of pigs were produced by 28 percent fewer sows. The number of runts was reduced from 18 out of every 100 to 1 out of every 100, and finally, pigs raised by the sanitary system weighed an average of 27 pounds more at four months of age than those raised by the permanent hog-lot system. The sanitary-system pigs reached marketable size seven weeks earlier and weighed 28 pounds more than the permanent hog-lot, pigs.

General Disinfection.— Disinfectants should be used freely and regularly, especially about those places that receive little sunlight and are naturally damp. Before applying the disinfectant all bedding and manure should be cleaned out, and dust and dirt removed from the walls and floors. If the hogs are on a dirt floor it is best to remove several inches from the surface once in awhile and refill with clean dirt. An efficient and reliable disinfectant is a 3 to 5 percent water solution of a coal-tar dip. Generally liquid cresol is used. It can best be applied by spraying, which drives the disinfectant into cracks and crevices that often cannot be reached by any other method.

If disease of an infectious nature has been present all bedding and manure should be removed and burned. The loose dirt should be scraped off and all places thoroughly disinfected. A thorough and occasional systematic disinfecting should be a part of the hog management system.

Disinfection of hog lots and pastures can best be accomplished by plowing them at least once each year and then sowing a forage crop thereon. Covering parts of such places with quick lime and keeping hogs off for awhile will also help. All lots and pastures should be laid out to permit this sort of treatment.



A row of these will come in fine during harvest time.