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Swine Production: A Manual for 4-H Club Members

G. A. McDonald

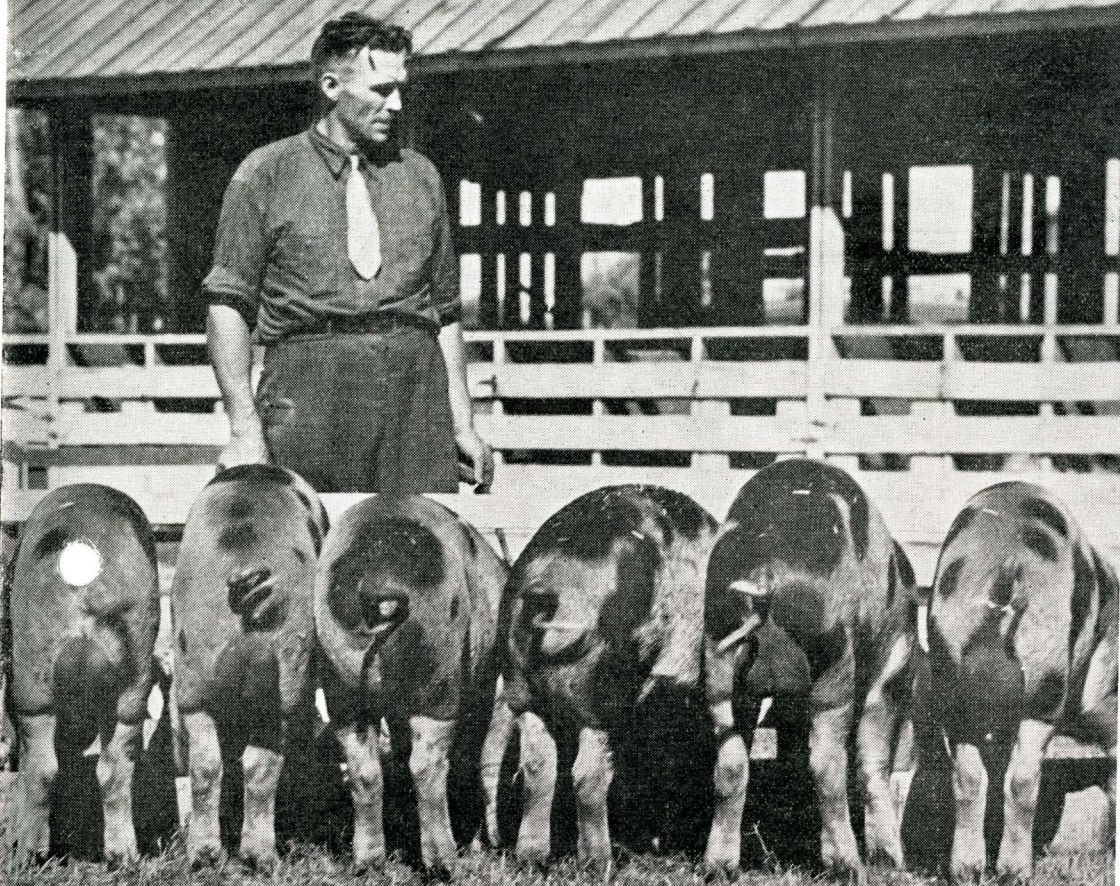
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Swine Production

A Manual for 4-H Club Members

South Dakota State College Extension Service & Brookings

FOREWORD

This circular has been prepared for the purpose of providing hog production information for South Dakota 4-H club members. Comparisons of feed and feeding results have been furnished, for the most part, by the South Dakota Experiment Station. Professor Turner Wright of the Animal Husbandry Department, South Dakota State College, is mentioned especially for his contributions in this field. Where any field of hog production was not adequately covered, work of other Stations was used.

An effort has been made to present the substance of the material of the various experiments in simple form, without tedious details. This circular is not complete in the presentation of some fields and those desiring more detailed information are urged to refer to bulletins, circulars and books listed elsewhere in this publication.

It is hoped that this circular, which has been prepared especially for 4-H club members, will create greater interest, will aid in developing initiative, and will contribute to the ultimate success of the individual member.

Table of Contents

SELECTION OF BREEDING STOCK	4
Choosing a Breed; The Lard Type; The Bacon Type; Selecting the Sow or Gilt; Selecting the Boar.	
BREEDING PRACTICES	8
Outcrossing; Crossbreeding; Inbreeding; The Age to Breed; The Boar.	
NUTRITIVE REQUIREMENTS	10
Energy; Crude Fiber; Protein; Vitamins; Mineral Mat- ter; Water (self watering); General Nutritive Factors.	
SOUTH DAKOTA HOG FEEDS	11
Corn; Barley; Oats; Proso; Sorghum Grain; Wheat; Rye.	
HIGH PROTEIN FEEDS	15
Importance of Protein Feeds; Tankage; Meat and Bone Meal; Skimmilk; Buttermilk; Semisolid Buttermilk; Linseed Meal; Cottonseed Meal; Soybean Oil Meal; Flaxseed.	
FORAGE AND PASTURE CROPS	19
Advantages of Pastures; Alfalfa; Red Clover; Sweet Clover; Rape; Fall Rye; Sudan; Oats; Barley; Soy- beans; Hogging Down Corn.	
CARE AND MANAGEMENT	22
Care and Feeding of Brood Sow; Care Before Farrowing; Care at Farrowing Time; Removing Needle Teeth; Marking the Litter; Sanitary Precautions; Castration; Orphan Pigs; Self-Feeding Sow and Litter; Creep Feed- ing; Feeding Pigs after Weaning; Feeding the Breeding Hog; Fattening Hogs.	
PREPARING FOR SHOW	32
MARKETING	34
DISEASES OF HOGS	37
MEASURING FEEDS	45
DIGESTIBLE NUTRIENTS OF SOUTH DAKOTA FEEDS	45
GESTATION TABLE	46
LIST OF AVAILABLE BULLETINS ON HOG PRODUCTION	47

Swine Production

By G. A. McDonald Extension Animal Husbandman

Introduction

The relative importance of South Dakota's hog income as related to the income from other livestock enterprises is indicated in the following analysis:

	Total No. on Farms Jan. 1, 1938	Total Value	Per cent of Total Livestock Value
All Cattle -----	1,551,000	\$51,832,000	55
Horses -----	373,000	24,408,000	27
Hogs -----	679,000	8,656,000	9
Sheep -----	1,340,000	8,413,000	9
		\$93,309,000	100

(Submitted through the courtesy of the South Dakota Livestock Reporting Service)

The maximum number of hogs were produced in 1931 when 3,000,000 were marketed with a total evaluation of \$40,200,000. A return to normal feed supplies in the state will undoubtedly increase hog numbers and pork income. The popularity of the pig is due to the fact that he is an efficient producer. He uses less feed for a certain gain than either cattle or sheep and on slaughtering, dresses out a higher percentage of meat than either of the other two types of stock.

The hog is highly adaptable to South Dakota conditions. Hogs are the most highly concentrated in the southeastern meat producing area of the state and are found in smaller numbers in the central cash-grain and livestock area. The fact that hogs can be handled in small or large units makes them particularly well adapted to these areas.

Selection of Breeding Stock

Choosing a Breed.—Livestock-growers selecting purebred hogs for the first time are often confronted with a breed problem. There is no best breed. The producer may have a personal preference. If there is no preference, it would be well to select the most popular breed in the community, such procedure would facilitate the breeder in gaining popularity; in establishing a reputation and would cause more buyers to come into the community. Each breeder may believe he has the best breed because of size, feeding qualities, higher dressing percentage or some other individual factor, but so far as satisfying the market demand is concerned, there is more difference between families, strains and individuals within the breed than there is between breeds.

Practically all of the more popular breeds of hogs were developed within the United States. Breeding stock was introduced from foreign countries during early periods of American History. These hogs were of almost every type, color and description. It was from this conglomerate mixture that our American breeds were developed, primarily a matter of selection. Some types of early hogs were coarse and large of bone, while others showed a preponderance to the fine boned, delicate fleshed, early maturing type. Two definite classes were finally established—the lard type and bacon type. The lard type is represented in this country

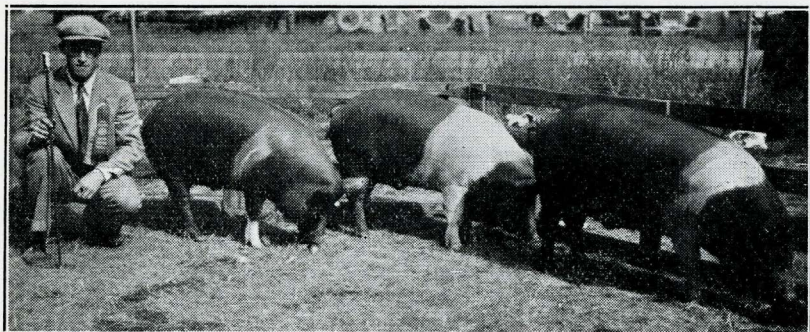
by the Duroc-Jersey, Poland China, Spotted Poland China, Chester White, Hampshire and Berkshire. The Tamworth and Yorkshire comprise the bacon type breeds.

The Lard Type.—The ideal fat barrow should exhibit typical lard type. He is uniformly deep of body, carries good width, shows strength of back and exhibits a high degree of finish. His sides and shoulders are free from wrinkles and he is clean-cut about the jowl. The shoulders are deep, neatly laid and smooth. The hams are wide, full and firm.

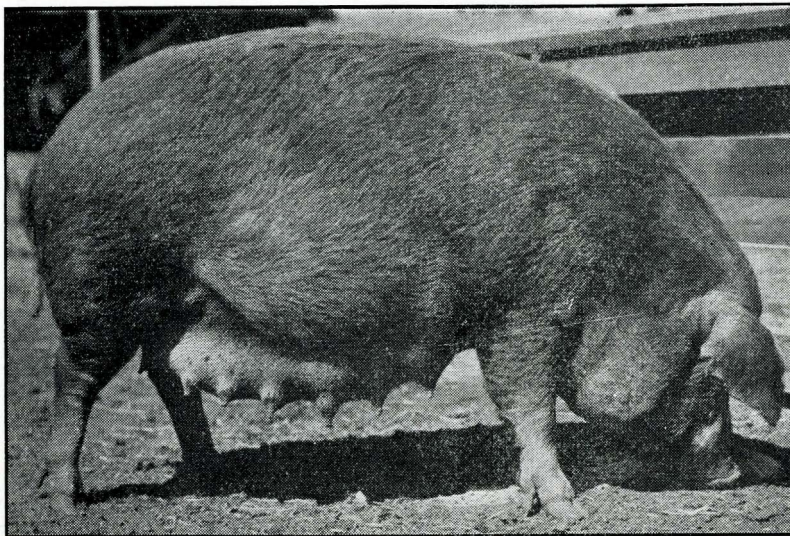
The width in a well-shaped barrow is always characterized by uniformity from front to rear. The loin is wide, thick and firm and should not show any indication of being "hollow" or flat. The flanks are deep, full and firm. The heart girth is full; the sides deep, smooth and must carry enough finish to be smooth. The middle is neat. The head is medium in length, medium in width and indicates refinement. The legs are straight and placed squarely under the body. The bone should be medium in size. The pasterns are short and well supported. High quality, firmly fleshed, sound and smooth fat barrows generally move with ease and display distinctiveness in type and style.

The Bacon Type.—The bacon type hog has a relatively larger percentage of lean meat and a smaller percentage of fat than the lard type hog. The lard type barrow is considerably more popular in South Dakota. The bacon type is leaner in general appearance and does not show the depth of finish that is so evident in the lard type. The width and depth of body and plumpness of ham are also less pronounced. The bacon type is long of body, has a short neat neck and is trim of jowl. The ideal bacon type barrow must be uniform in his depth and width, showing unmistakable signs of neatness, firmness of finish, smoothness, quality and style.

Selecting the Sow or Gilt.—The beginner selecting a sow or gilt is interested in one showing considerable type and breed—character, as in many cases this animal may be the foundation individual for the future herd. The proper type to select can be determined by studying outstanding animals of the breed at shows or possibly through the breed publications. Select a sow showing femininity as indicated by her refinement and quality of head, also smoothness of body. She should show excellent



A pen of fat barrows



This is good type Duroc Jersey brood sow

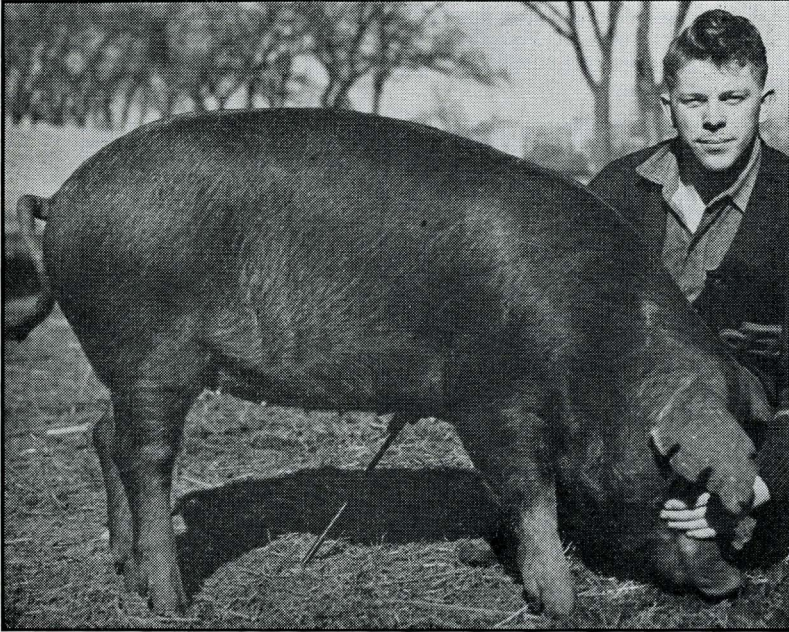
mammory development with at least 12 good teats. A good gilt or sow will exhibit a matronly quiet disposition rather than a wild nervous temperament. Size for age is important. Plenty of length and stretch of body; long, deep, smooth sides; smooth, well-laid shoulders; good width of back and loin, deep, smooth, plump, firm hams; full heart girth, wide chest floor; and straight, strong legs with short, strong pasterns. Symmetry and balance of these factors should yield a clean-cut sow with vitality and ruggedness.

A sow of ideal type and conformation may not be the most prolific producer or the one which will produce large litters. A sow producing four pigs to the litter is not the most profitable. Select a gilt or sow whose ancestors have been good producers. A sow that is an irregular breeder, poor suckler and lies on her pigs is not a profitable breeder. Pedigrees should not be overlooked in choosing a purebred gilt or sow. The producer should constantly bear in mind that fertility of a sow is governed by hereditary force and the only method of retaining a high state of prolificacy is through strict selection. This selection must be on the basis of productivity through the introduction of new strains by individuals of approved type and prolific ancestors.

Selecting the Boar.—Most livestock producers state that "The boar is half the herd." Certainly if one has selected a sow or gilt on the basis outlined above and one aims to produce pigs of desirable type, a boar, also of the right type, must be used. Hogmen who have been the most successful are those who have used a boar of strong breeding characteristics. He should be prepotent, that is, he should have the power to transmit his good points to the progeny. If possible it is advisable to select a proved sire or one that has produced litters of pigs that resemble him in conformation and type. If you are buying an untried boar, con-

sider the performance of his nearest relatives and ancestors. A boar might be a winner in the show ring but a very inferior breeder. The safest method is to select a sire from well-bred, prolific families of the correct type.

Another factor hogmen consider in selecting a boar is whether or not he will improve the apparent weakness of the sows. For example, if the sows are weak of pastern the boar should be particularly strong in this respect.



Showing a nice type Duroc Jersey gilt

It is generally admitted by hog breeders that it is difficult to select boar pigs that stay good. They offer more problems during their development than gilts and barrows. The boar, however, should show breed character; should be growthy, rugged and exhibit considerable masculinity. The entire topline should be heavily muscled and supported in a smooth and uniform arch. The loin must show strength and smoothness, and the rump should be long and consistently wide. The shoulders should be deep and smooth, the flanks full and the underline neatly carried. The hams must be deep balanced in fullness and smooth. Jowls of moderate size are preferred; they should be sufficiently developed to contribute to the general balance and vigor of the boar, but smooth and firm. The head should be well balanced in length and width, and show vigor and neatness. The ears should be medium of texture and size and well placed.

The legs of a boar should be squarely placed and straight. The bone should be well developed, but not coarse. Quality and style are indispens-

able. They indicate, to a certain extent, his ability to stay smooth and sound. A boar lacking in quality generally develops excessive shields over the shoulders and sides. The hair should be smooth and show quality. Whorls in the hair are a serious defect and curly hair indicate coarseness.

Breeding Practices

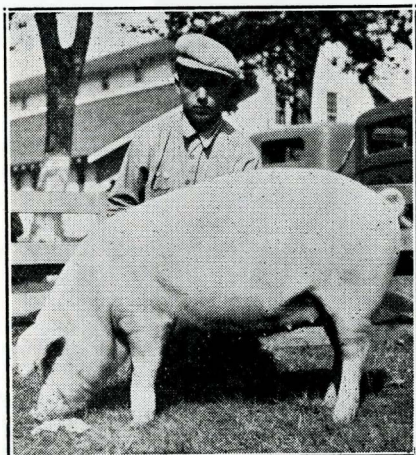
Outcrossing is the mating of animals that are not related. It is the commonly recommended practice as there is less opportunity for intensifying a certain undesirable character.

Crossbreeding involves crossing different breeds, as for example a Duroc Jersey with a Poland China. Research work conducted at the Minnesota Experiment Station indicates that cross breeding has the following advantages:

1. Crossbred sows proved superior to purebred for producing market pigs.
2. Crossbred litters average from one to two more pigs at weaning time.
3. Crossbred pigs are heavier at weaning.
4. Crossbreds reached the market weight of 220 pounds from 17 to 22 days earlier than comparable purebreds and they reached it on from 27 to 36 fewer pounds of grain.

Two methods of crossbreeding have been recognized. Both provide for the use of crossbred females and good purebred boars. One method, called criss-cross breeding, is to alternate in the use of boars belonging to two breeds. The other method is to rotate in the use of boars belonging to three breeds. Producers interested in developing outstanding fat barrows may find this system of crossbreeding to their advantage.

Inbreeding is the mating of animals which are closely related such as parent to daughter or brother to sister. Line breeding includes matings which have less than 50 per cent of the blood in common. Inbreeding should be practiced only by breeders who are experienced and have a very good knowledge of the ancestry of the breeding stock. Families which are intensely bred for several generations without very careful selection are likely to develop constitutional weakness, sterility, non-



A 4-H club boy shows a
a Chester White Gilt

resistance to disease and decline in size and fecundity. Most breeds were established through inbreedings. Character of the parents is more readily transmitted to offspring. But should there be undesirable characteristics present, either in the animals or their ancestors, there is a greater chance of the weakness appearing in the next generation. Inbreeding is generally recognized as an unsound practice in breeding for market hogs.

The Age to Breed is often an important question to the hog-raiser. It is generally agreed that breeding a young sow to farrow at eight or nine months of age stops growth for a time. If she is well fed and farrows only once yearly, she may practically recover from the early gestation, however, if she is under-nourished and bred twice yearly, her growth will be permanently retarded. Early breeding tends to establish reliable breeding habits, while late breeding frequently results in the reverse. As a general rule, earlier breeding results in a saving of feed, interest, risk and reduces the cost of pigs at birth. The gilt that is well developed may be bred safely to farrow when 12 to 14 months of age. Show gilts are not usually bred until they are a year old.

The gestation period of a sow is 112 to 114 days. This means that a sow bred on November 10 would farrow on March 1. (A breeding table will be found in the back of this circular.) Generally, early farrowing is the more favorable for the early market. However, this question will vary with the location of the farm, housing facilities, and possible individual preference. Among the advantages of early farrowing, February and March, may be mentioned the following:

1. Pigs are weaned at early enough date to enable the sows to be rebred for September pigs.
2. Sows farrow during the season when time is available for their care.
3. Necessary on farms where two-litter system is followed.
4. Early pigs can be sold on high September market.
5. Early farrowed gilts are developed sufficiently to be bred for spring farrow.
6. Pigs make the most economical gain on forage.

Having the spring pig crop farrowed in April and May may have the following advantages:

1. The amount of equipment needed is less.
2. Late farrowed pigs are less likely to suffer from disease due to close housing, limited sunshine or worm infested lots.
3. Pigs make better use of new corn.
4. Pigs have sufficient growth in October and November to make them satisfactory following cattle or hogging down corn.
5. The percentage of pigs raised is greater.
6. Cost per pig at weaning time is usually less.

The number of sows that a boar can safely breed during a given season will depend on age, natural vigor, length of breeding season, distribution of services, feeding and management. The boar is at his best from the age of 18 months up to four years. Generally speaking, hogmen allow 15 sows per boar pig and 30 to 40 sows per boar one and one half years old or older. A boar given plenty of exercise and feed preceeding the breeding season, will be more vigorous. Much depends on the judgment and experience of the herdsman. No boar can perform satisfactorily that is mistreated, whose services are not carefully regulated, that has been confined closely to a dry lot, or that is fat and lazy as the result of too much corn and too little exercise.

The boar, especially if a young one, requires plenty of protein and mineral matter in his ration. Plenty of sunshine and green feed will also be beneficial.

Nutritive Requirements

The nutritive requirements of hogs are relatively simple. They consist of energy producing materials, a supply of protein, vitamins and mineral substances.

Energy is important in the normal life processes. After these needs are taken care of an animal will store surplus energy as fat. Fats and carbohydrates are the main energy producing materials, starches and sugars are the most important. These are present in corn and the cereal grains.

Crude fibre, the coarse material of feed, is not particularly adapted to the needs of hogs as in the case of the ruminant such as cattle or sheep.

Protein materials are of great importance to proper growth and to the necessary function of the body of the hog. Protein is needed for growth of the organs, muscles and bone. It is especially necessary for the young growing animals. Protein is generally the limiting material in growing fattening rations. Many pigs have the ability to gain a pound and a half daily, but only put on three-fourths of a pound because the ration lacks protein.

Vitamins have also come to be recognized as very essential in proper growth. The exact nature of the vitamins is not readily understood. They are recognized by their effect on the animal rather than by certain properties. A lack of vitamins in the ration may result in so called "deficiency diseases."

Vitamin A is necessary for growth. It is more or less abundant in cod-liver oil, butterfat and green leaves. Yellow corn contains more vitamin than white corn and is therefore superior for growing pigs. A lack of vitamin A not only causes poor growth but may also cause defective vision.

Vitamin B has several functions. It stimulates growth and increases appetite. This vitamin is abundant in green forage, yeast and cereal grains. Vitamin C prevents scurvy in the human being. It is not particularly essential in the ration of a pig.

Vitamin D prevents rickets and next to Vitamin A is probably the most important in animal production. Rickets is a disease of young animals, causing deformities of bone and joints, stiffness and general unthriftiness. Vitamin D is present in sun-cured forage as alfalfa. Such feed is an important source of this vitamin particularly during the winter. If pigs are permitted to be out in the sun, they develop their own vitamin D. Cod-liver oil is also an excellent source of vitamin D.

Vitamin E is a more recent discovery. This vitamin is generally present in ample amounts in the regular South Dakota hog feeds.

Mineral Matter is highly important in hog feeding. Bones and teeth are composed chiefly of mineral matter. Mineral is also necessary in certain life processes and form a part of the structural material of connective tissue. Growing animals, pregnant sows, as well as those suckling litters, have a definite need for mineral matter.

Of all the farm animals, hogs probably suffer the most from a lack of mineral. Hogs are fed largely on corn and cereal grains and such are low in mineral. Bones are weak and quite often legs are broken when hogs are in transit to market. Sows quite often go down in the back after suckling a litter or perhaps a pig may become paralyzed in the hind

quarters. All of these conditions may be due to a lack of mineral matter in the ration.

Mineral elements which are most generally lacking in the hog ration are calcium, phosphorous, chlorine, sodium and iodine. Sodium and chlorine are furnished through common salt; calcium through ground limestone, phosphorous through tankage, milk, oil meal, bran, middlings, spent bone black, raw or steamed bone meal. Probably the most convenient method to feed it is to use the commercial iodized salt. Goiter and hairless pigs at the time of birth indicate a lack of iodine.

The amount of minerals needed will depend on the ration. If the pig is receiving tankage, skimmilk, and leguminous pastures, the amount needed will be small. However, where the above needs are lacking or where the feeding is done in dry lot, as much as two or three pounds may be required per day.

Good results can be obtained from the following home-made mineral mixture:

50 lbs. ground limestone.
28 lbs. steamed bone meal.
20 lbs. salt.
2 lbs. Iron Oxide.
 $\frac{1}{2}$ oz. Copper Sulphate.
1 oz. Potassium Iodide.

Water is important in proper nutrition of any hog. Water makes up more than half the weight of the body and it is said that an animal can live longer without feed than without water. Water requirements vary with the needs of the pig. More is needed in summer than winter, more on full rations than limited ones, and more on a protein rich ration than on those more carbonaceous in character. Fresh clean water should be provided at all times. Self-waterers attached to a barrel or tank, save many a step in the summer and allow the hog to make more rapid growth.

General Nutritive Factors.—In order that optimum growth, finish or other energy requirements are satisfied, the ration in general should not be too bulky. It should be palatable, mildly laxative, it should not produce soft carcasses. It should be economical and balanced. A ration implies the feeds needed for a period of 24 hours. A balanced ration is one which provides sufficient carbohydrates, proteins and fats to nourish an animal for one day without an excess of any nutrient. If such a ration, together with good water, sunshine, quiet, clean comfortable surroundings and regularity in feeding is provided the feeder may expect maximum returns and satisfaction.

South Dakota Hog Feeds

Feeds are classified into the roughages or bulky feeds and the concentrates. The digestive capacity of the hog makes it necessary to practically eliminate the roughages from consideration, with the exception of alfalfa and the forage crops. The term concentrate implies those feeds like corn, barley, oats, cottonseed meal or tankage, which are condensed in nature, low in fiber and furnish a large amount of digestible matter. Concentrates may be classified as those high in protein and those low in protein. The low protein feeds are composed chiefly of the cereal grains. The high protein feeds are largely commercial by-products. (A table giving the "Average Composition and Digestible Nutrients," of South Dakota's common feeds will be found in the back of this circular.)

Corn.—Corn is South Dakota's principal hog feed. It is one feed around which most rations are built. Corn is rich in carbohydrates and fats as well as being palatable and nutritious. Corn, however, is low in protein and requires a high protein supplement to meet the deficiency. Corn is also low in mineral, particularly calcium. There is no advantage in soaking or grinding corn. Where corn is fed in mixture with other feeds, however, it may be necessary to grind it in order obtain a more uniform mixture.

Barley.—Barley is higher in protein, and crude fiber, but lower in fat, than corn. In feeding barley it should likewise be supplemented with a high protein feed and ground mediumly fine for best results.

A summary of a series of feeding experiments at the South Dakota Experiment Station indicates that ground barley has 90 per cent the feeding value of shelled corn for fattening fall and spring pigs. The rations were both supplemented with tankage, alfalfa hay and a mineral mixture. The pigs receiving shelled corn gained 1.7 lbs. per day while the barley fed pigs gained 1.5 pounds. The summary also showed that the pigs fed shelled corn produced 100 lbs. of gain on 67.5 lbs. less grain, but required 9.3 lbs. more tankage for the same amount of grain than the pigs fed ground barley.

Barley, like many other grains, fluctuates in test weight per bushel. Plump, well-filled, heavy barley is obviously more nutritious than light weight samples. In order to determine the comparative value of light weight barley, the South Dakota Experiment Station has conducted a series of feeding trials where heavy, medium and light weight barleys were fed to fattening pigs. The test weight per bushel of these barleys were 49, 41 and 27 pounds, respectively. The average daily gain on the heavy, medium and light weight barley lots of fattening hogs was 1.65 pounds, 1.39 pounds and 1.26 pounds, respectively. In the basic corn lot, the pigs gained 1.6 pounds per day. Each lot receiving tankage and alfalfa hay as supplementary feed plus a complete mineral mixture. In these experiments, it was calculated that ground heavy weight barley had 90 per cent, ground medium weight barley 78 per cent and ground light weight barley 66 per cent the feeding value of shelled corn.

Oats.—Oats being very fibrous, is not an ideal fattening feed. It is lower in carbohydrates and fat, and higher in protein than corn. Ash and mineral content of oats is higher than other grains. A number of tests conducted at the South Dakota Experiment Station shows that in fattening rations, oats should not constitute over one-third the entire ration for best results. When fed in this manner, 100 pounds of oats has the feeding value of 75 to 85 pounds of corn.

In feeding growing pigs, rations consisting of one-fourth to one-fifth as much oats as corn gains have been as rapid and generally more economical than corn alone. When the ration is more than one-third oats, the rate of gain decreases as the proportion of oats increases.

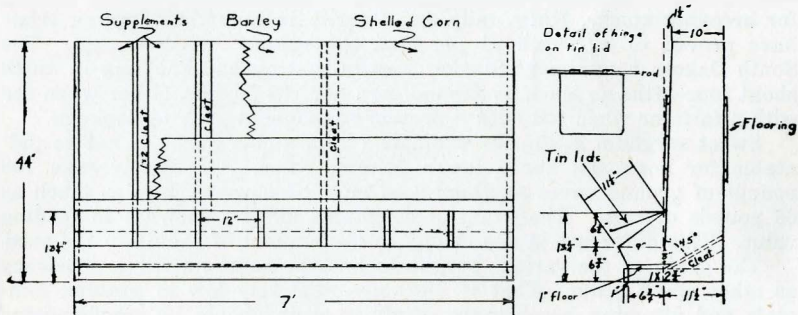
Oats can be effectively used for mature breeding animals, pregnant sows and as part of the ration for growing pigs but, generally, the less oats contained in rations for fattening hogs, the better. Oats vary considerably in feeding value, depending upon the test weight per bushel. Light "chaffy" oats are very high in fibre and are less desirable for hog feed than heavier oats.

Several stations agree that it is desirable to grind oats especially for

fattening hogs. Grinding to a medium fineness increases the value of the grain 25 per cent or more. Soaking whole oats does not increase their value appreciably.

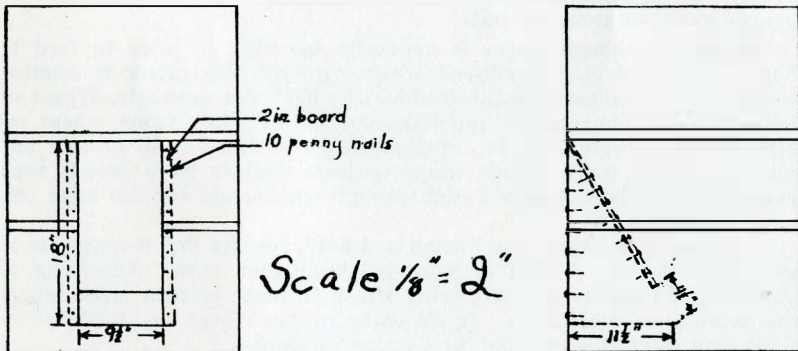
Sometimes oats are run through hulling machines which grind the grain and remove the hulls. Hulls are very fibrous and have about the same feeding value as oats straw. Only about 85 per cent of oats are recovered. Hulled oats are an excellent feed for hogs, but usually more expensive than corn or barley. Except for very young pigs, ground oats are more economical than hulled oats.

Proso or Hog Millet.—Considerable proso millet is fed each year in South Dakota. As millet is characterized by a very hard seed coat, proso should be ground fine for best results in feeding hogs.



Self Feeder Scale $\frac{3}{4}" = 1'$

Plan for an easily made wooden feeder with separate compartments for various feeds.



Scale $\frac{1}{8}" = 2'$

Barrel Hog Self Feeder

This is a hog-feeder made from an old steel barrel. Two sides and bottom of the rectangle (18"x9½") are cut in side of the barrel. The nail holes are drilled before the cut is made. The cut-out rectangle is hammered in and a triangular block (18"x12") is nailed on each side of the opening to complete the feeder.

Numerous feeding trials at the South Dakota Experiment Station reveal that ground red proso gave 89 per cent the feeding value of shelled corn and practically the same feeding value as ground barley. Ground white proso gave only 86 per cent the feeding value of shelled corn. All lots of pigs were fed tankage, alfalfa hay and a mineral mixture, on dry-lot, in addition to the concentrate. The pigs fed barley or proso ate much less tankage than those fed on the shelled corn. The pigs fed corn, however, ate considerably less grain per 100 pounds gain than those fed barley and proso. Pigs on ground barley, ground red proso and ground white proso, gained 1.74 pounds, 1.43 pounds and 1.51 pounds respectively. The basic corn lot gained 1.8 pounds per day.

Sorghum Grain.—The grain sorghums make excellent substitutes for corn in hog production both for growing and fattening pigs, as well as for breeding stock. Kafir, milo and feterita in numerous feeding trials have proven to be worth 91 per cent the value of shelled corn. The South Dakota Experiment Station reports that ground kaoliang is worth about four-fifths as much as ground corn per 100 pounds, either when fed with alfalfa or when fed with a protein supplement such as tankage.

Sweet sorghum grain, for example (from amber cane) is not so palatable for hogs and has a lower feeding value. On the average 100 pounds of ground sweet sorghum seed have been worth only as much as 68 pounds of corn. The grain of sorghums differ somewhat in feeding value. This difference is due chiefly to the amount of tannin in the seed.

The grain of the various sorghums has the same nutritive deficiency as other small grain. That is, they are relatively low in protein, minerals and vitamins, accordingly sorghum grain should be supplemented with tankage, meat scraps, or other high protein feed, with bone meal or ground limestone as a source of mineral and with alfalfa or other pasture as a source of vitamin.

The grinding of sorghum grain for hogs is recommended, because when fed whole, in many instances it is not well chewed and grinding improves its palatability. There is no advantage in soaking whole or ground grain sorghum for hogs.

Wheat.—Although wheat is generally too high in price to feed to hogs, there have been conditions, when corn was high priced in relation to the price of wheat that the feeding of wheat was desirable. Wheat of low grade is frequently fed advantageously. In feeding value, wheat resembles corn, being high in carbohydrates and fat, low in protein and mineral matter. Even though wheat contains slightly more protein than corn, it should be fed with a high protein supplement for the most efficient utilization.

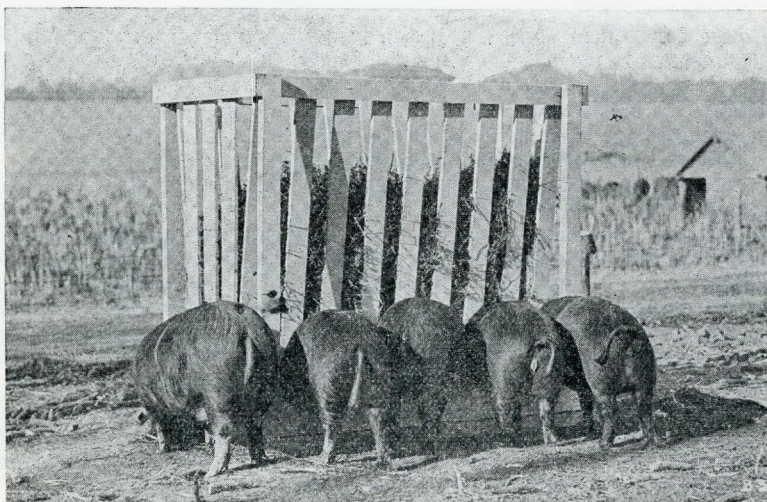
Because wheat kernels are small and hard, feeders find it advisable to grind it coarsely. Wheat is more palatable than corn. According to experimental results, pigs receiving wheat in place of corn make larger and more economical gains. In fattening rations wheat has proven to be 7 per cent more efficient than corn, pound for pound.

Rye.—As a hog feed in South Dakota rye is of less importance than either corn or barley. Rye is similar to wheat in composition. Like wheat it should be ground for best results and fed with a protein supplement.

Rye lacks palatability and should be fed with some other palatable feed. Feeding trials conducted at the South Dakota Experiment Station

show that it is a distinct advantage to mix ground rye with ground barley, half and half by weight. Less feed was required for 100 pounds gain on the ration 50-50 rye and barley as compared to shelled corn. Both lots received alfalfa hay, tankage and mineral as supplementary feeds. Pigs in the ground rye and barley lot gained 1.22 pounds daily and required 470 pounds of rye and barley for 100 pounds of gain, while pigs in the shelled corn lot gained 1.01 pounds daily and required 501 pounds of corn for 100 pounds of feed. In addition, the shelled corn pigs required 13 pounds more tankage, 6 pounds more alfalfa hay and 2.3 pounds more mineral mixture for each 100 pounds of gain.

Ergot is frequently found in rye. Rye badly affected with ergot should never be fed to pregnant sows because of the danger of causing abortion.



Feeding alfalfa hay with a self-feeder

High Protein Feeds

High protein feeds are those feeds which contain a high proportion of digestible crude protein. The term protein supplement implies that such high protein feed is fed with other feeds which are more carbonaceous in character.

Importance of Protein Feeds.—The value of protein supplements for hogs cannot be overemphasized. Rations for hogs which are the most efficient and economical are those containing sufficient digestible crude protein to meet the needs of the animal. The amount of protein to feed depends on the system. When pigs are on alfalfa, clover or rape pasture, about half as much protein supplement is needed as when fed in dry lot. The fattening hog in dry lot will need from five to 10 pounds tankage for each 100 pounds of feed.

Feeding trials conducted at the South Dakota Experiment Station comparing the feeding value of corn alone with corn and tankage with

pigs on rape pasture, indicates that the pigs on corn gained 1.17 pounds daily and required 431 pounds of feed for 100 pounds of gain, while the pigs on corn and tankage gained 1.57 pounds daily and required only 338 pounds of feed for each 100 pounds of gain. To illustrate further the importance of protein supplement, a similar experiment at the same station indicates that pigs on barley alone and rape pasture gained 1.28 pounds daily, while the barley and tankage lot of pigs on rape pasture gained 1.53 pounds daily. In addition 57 pounds more barley was required for each 100 pounds of gain in the lot where tankage was not fed. Numerous experiments show that 100 pounds of tankage will commonly save 607 pounds of corn with younger pigs and 538 pounds of corn with older ones. The folly of feeding concentrate to hogs without protein supplements is clearly demonstrated in these feeding trials.

Tankage.—Tankage is made from various products which are not suitable for human food. The meat is cooked under pressure and the excess grease removed. The meat is then dried and ground as tankage. Grades of tankage vary according to the per cent crude protein they contain. The better grades contain up to 60 per cent crude protein. Tankage enables hogs to make better use of corn and as indicated above those fed corn and tankage consume less feed than those fed corn alone.

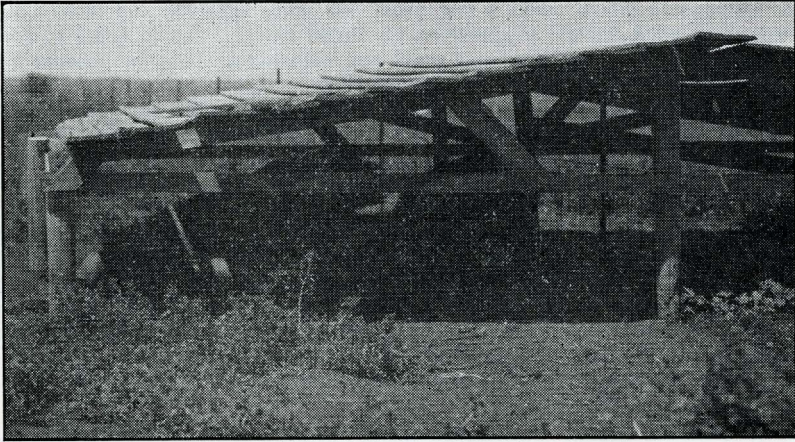
Tankage can be self fed. Pigs will generally take the proper amounts, except possibly at first they may over-eat. Over-eating will not cause any ill-effects on the pigs although the expense may be somewhat higher. Feeds like corn and tankage which are nearly equal in palatability can be self-fed to good advantage. A good rule to follow ordinarily is to self-feed the protein supplement if the grain is self-fed. A fattening hog over 100 pounds should receive one-fourth to one-half pound tankage per day. There is no advantage in feeding tankage in the form of slop or soaking it.

Meat and Bone Meal.—Meat and bone meal consists of dry rendered residues in which no "stick" or blood have been added. It differs from tankage in that tankage may contain the blood. Meat and bone meal resembles tankage very closely in feeding value.

An average of six feeding trials at Indiana and Minnesota show that pigs on corn and tankage gained 1.681 pounds daily and required 341 pounds of feed per 100 pounds of gain while pigs fed corn and meat and bone meal gained 1,680 pounds daily and required 337 pounds of feed per 100 pounds of gain. Meat and bone meal may be fed as described above for tankage.

Skim-Milk—Buttermilk.—Skim-milk or buttermilk is without question the best protein supplement produced on the farm. The protein is of very good quality. Both are also relatively high in mineral matter. This protein feed, however, is very low in vitamin A and has but traces of vitamin D. A ration made up of grains and either skim-milk or buttermilk would be deficient in vitamin D and unless the grain is yellow corn, there would be a deficiency of vitamin A. This deficiency is corrected, however, if fed to pigs on pasture and where there is exposure to ample sunlight. When skim-milk or buttermilk is fed to hogs in dry lot, the addition of alfalfa hay to the ration will help to correct the vitamin deficiency.

In feeding pigs before and after weaning skim-milk is best if fed fresh, although even for young pigs, skim-milk which has soured under sanitary conditions is satisfactory. If sour milk is to be used, it should



This type of shelter provides the necessary shade

always be fed sour. If changes are made scours may result.

Hog feeders so situated that they can obtain creamery buttermilk at a nominal price will find that it has about the same feeding value as skim-milk.

The question is often asked, "How much skim-milk should I feed?" If skim-milk is unlimited mature market hogs may be allowed all they wish, although it should be limited to pigs as they may become paunchy. Where skim-milk is limited in quantity the most efficient use can be made of it by allowing just enough to balance the protein needs of the ration. Skim-milk should always be fed with cereal grain or some carbohydrate-rich concentrate. Successful feeders find the following rule satisfactory in determining how much to feed.

Pigs weighing 50 to 100 lbs., 2.5 to 3 lbs. milk to 1 lb. corn
Pigs weighing 100 to 150 lbs., 2 to 2.5 lbs. milk to 1 lb. corn
Pigs weighing 150 to 200 lbs., 1.5 to 2 lbs. milk to 1 lb. corn
Pigs weighing over 200 lbs., 1 to 1.5 lbs. milk to 1 lb. corn

Where barley, wheat or sorghum grain are fed instead of corn, only one-half to two-thirds as much milk is needed. Pigs fed corn on pasture will need about one-half as much milk. If the above amounts of milk are available it will not be necessary to feed any other protein feed, but if not, tankage or some other high protein feed should be fed.

Semi-solid Buttermilk.—Some creameries in South Dakota prepare semi-solid buttermilk through condensation. The water is evaporated and the milk reduced to about one-seventh its original volume. The product is pasty and should be mixed with water before feeding. It contains 12 to 14 per cent crude protein. Numerous experimental results show that its feeding value is about one-third that of tankage.

Linseed Meal.—Linseed meal contains about half as much crude protein as the best grade of tankage. To supply enough protein in a corn ration it is therefore necessary to feed about twice as much linseed meal

as tankage. Linseed meal is palatable and quite laxative and makes an especially good protein supplement for brood sows, if fed in combination with tankage or meat and bone meal and with legume hay or pasture to provide the necessary vitamins and calcium.

If linseed meal is used as the only protein supplement it is much less efficient than tankage and it is particularly inefficient when fed to pigs not on pasture. However, feeding trials show that when linseed meal is mixed with tankage, $\frac{1}{3}$ linseed meal, $\frac{2}{3}$ tankage, fed as a supplement to corn, satisfactory results were obtained. An average of three feeding trials at the South Dakota Station show that when linseed meal is fed with tankage, alfalfa hay, a mineral mixture and shelled corn, that a daily gain of 1.45 pounds was obtained on 100-pound pigs while, a gain of only 1.32 pounds was obtained on tankage alone with the same feeds. The linseed meal-tankage lot also required less feed per 100 pounds gain as compared to the lot where tankage was the only protein supplement. Accordingly, satisfactory results are obtained when linseed meal is fed with another type of protein feed.

Cottonseed Meal.—Cottonseed meal has long been recognized as a questionable feed for hogs. Losses were reported in early feeding trials, due to a poisonous alkaloid, "gossypal." Recent experiments have proved beyond doubt, however, that cottonseed meal, when fed in proper combinations with other feeds, can be safely fed to hogs.

The Texas station recommends that cottonseed meal should not exceed nine per cent of the ration. Nine per cent cottonseed meal, however, will not provide sufficient protein to balance the ration so other protein supplement should be added. Feeding trials at Nebraska indicate that combinations of cottonseed meal and tankage are superior to straight cottonseed meal for a balanced corn ration.

Unless the mixture contains at least one-half tankage, a calcium supplement should be added, since cottonseed meal is low in mineral. For hogs not on pasture some legume hay should be added to provide adequate vitamins.

Soybean Oil Meal.—The feeding of soybean oil meal is not particularly common in South Dakota, although there has been some interest in feeding soybeans. Many feeding trials conducted by cornbelt stations show that soybean oil meal compares favorably with tankage.

Farmers feeding soybeans as the only protein feed in adequate amount to balance the ration, however, find that the hog carcass became soft and therefore undesirable from the market standpoint. The tendency for the carcasses to be soft is reduced, but not entirely prevented, if pigs in dry lot weigh at least 125 pounds and pigs on pasture at least 75 pounds before soybean feeding is started. If the ration, under these conditions, does not contain more than about 10 per cent soybeans, satisfactory carcasses will usually be produced. Cooking raw soybeans improves their palatability, as well as increasing the gain. In using soybeans it is interesting to note that the Illinois Experiment Station secured good results when raw soybeans were used as the only supplement to corn for brood sows during the winter, both before and after farrowing.

Flaxseed.—In years when the price of commercial protein supplements have been high in relation to the price of flax, hog producers have considered the possibility of feeding flax seed as a source of protein. The value of flaxseed supplement compared to other common protein feeds is clearly

shown in the following summary. The data submitted is an average of three feeding trials conducted at the South Dakota Experiment Station. Each lot was fed shelled corn, alfalfa hay and a mineral mixture plus the protein supplement as indicated.

No. of Pigs	No. Protein Supplement	Tankage	Tankage,		Ground Flaxseed	Linseed Oil Meal
			Linseed Oil, Meal	Ground Flaxseed		
Av. No. Days Fed	21	22	22	21	22	22
Av. Initial Wt. per Pig	163	103	94	100	124	114
Av. Final Wt. per Pig	93.1	92.1	91.6	91.6	91.6	91.3
Av. Daily Gain per Pig	206	228	228.4	229.9	225	232.3
Feed Consumed Per	.69	1.32	1.45	1.39	1.07	1.23
100 lbs. Gain						
Shelled Corn:	601.3	407.9	372.4	366.6	435.	409.4
Tankage:		26.3	27.4	26.3		
Linseed Oil Meal:			13.7			32.6
Ground Flaxseed:				13.1	34.7	
Alfalfa Hay:	12.9	6.5	3.7	4.5	6.9	7.3
Mineral Mixture:	3.8	.9	1.3	1.4	1.8	2.1

Following is a summary of these feeding trials:

1. Ground Flaxseed proved more efficient when fed with tankage than when fed as the only concentrated protein supplement.
2. Feeding a mixed protein supplement reduced the amount of corn required for 100 pounds of gain, but did not decrease the amount of tankage required.
3. Ground flaxseed tended to produce soft pork. All hogs did not yield soft carcasses, but all carcasses from hogs fed flaxseed were lacking in firmness when compared with carcasses from hogs fed tankage.
4. Under ordinary conditions it will pay to sell the flaxseed and buy other protein supplements.
5. Faster, more economical gains were made on less feed in lots receiving a protein supplement as compared to the lot receiving no protein feed.

Forage and Pasture Crops

Advantages of Pasture

1. Reduces the amount of feed required to produce a given gain.
2. Produces a type of protein which readily supplements the protein in cereal grains.
3. Pasture keep pigs thrifty and healthy.
4. Supplies minerals and vitamins.
5. Provides needed exercise for growing pigs.
6. Saves labor.
7. Manure evenly distributed.
8. Reduces the cost of producing a marketable hog.

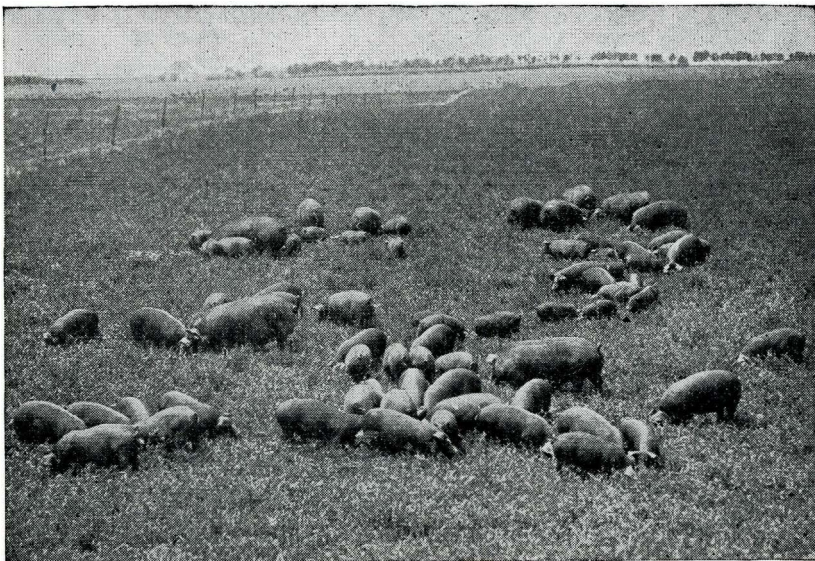
The value of pasture for growing-fattening pigs is illustrated by the following data which is a summary of 30 experiments (From Morrison's Feeds and Feeding).

Average Ration	Daily Gain	Concentrates per	
		100 lbs. gain	
Lot I—Pigs on Pasture		Corn	Tankage
Corn 4.8 lbs.		343	25
Tankage 0.36 lbs. -----	1.41		
Lot II—No Pasture			
Corn 44 lbs.			
Tankage 0.48 lbs. -----	1.16	376	42

As the table shows the pigs on pasture made a greater daily gain and saved 33 pounds of corn and 17 pounds of tankage for each 100 pounds gain. When spring pigs are carried on pasture from weaning time until they are ready to market or until the end of the pasture season each acre of good pasture will save 800 to 1000 pounds of corn and 500 pounds of tankage in comparison with dry lot feeding.

Alfalfa.—In areas where it can be grown, alfalfa is South Dakota's most outstanding hog pasture and forage crop. It provides a pasture the more continuously and for a longer season than other forage crops.

Alfalfa is high in protein, minerals and vitamin and helps to balance the concentrate ration of growing-fattening pigs. Young pigs being grown



Good pasture provides economical gains

out for future finishing will require only two and one-half pounds of grain for each 100 pounds weight. This is about half a ration for 50 to 60 pound pigs. The gain would be slower, but the greatest use is made of pasture and concentrates. Full fed pigs for greater gains should receive four to five pounds concentrates on pasture.

Although alfalfa pasture is high in protein it has been found advisable to feed a protein supplement with the concentrate feed for the quickest gains. This is especially true if the concentrate is corn. The need for a protein supplement is not so great when the pigs receive such feeds as barley, wheat, oats or rye.

Red Clover.—Red clover ranks next to alfalfa in the eastern one-third of the state as a hog pasture. Red clover is especially good because the sod is usually plowed up every two years and the clover changed to another field. This keeps the hogs on clean land which is so important in good hog management. Red clover is very similar to alfalfa in feeding value.

Sweet Clover.—Sweet clover compares favorably with red clover and alfalfa in feeding value. It is also a biennial and has an important place in a pasture rotation. Sweet clover makes an excellent pasture the first season, but during the second year may grow up rank and coarse and be less palatable. Even if the crop is cut for hay to prevent it from becoming too woody and from going to seed, the pasture will not be very good thereafter, and the plants may die after mid-summer.

Rape.—In seasons of sufficient rainfall, rape is undoubtedly the best one season pasture in the state. It is well adapted to the eastern part of the state. At the South Dakota Experiment Station it has proven comparable to alfalfa and clover. One acre of rape under favorable soil and mois-

ture conditions will carry from 10 to 20 spring pigs. Rape should not be pastured until at least six inches high and then by only small pigs. It is a rapid growing crop and enough hogs should be kept on it to prevent too rank and coarse a growth. A good plan is to plant two lots of rape, one a little later than the other. Hogs may then graze one while the other is growing. Rape sown between the corn rows at the last cultivation provides excellent fall pasture when hogging down corn.

Fall Rye.—Rye seeded in the fall will provide earlier spring pasture than any other forage. It is excellent for pasturing early spring litters but usually heads out early and becomes unpalatable so it is of little value after June 10.

Sudan Grass.—Sudan grass is an excellent hot weather crop and hog raisers have found it an excellent pasture during the drought years. It is seeded when warm weather begins; can be pastured by the latter part of June and will generally provide good forage until killing frosts in September.

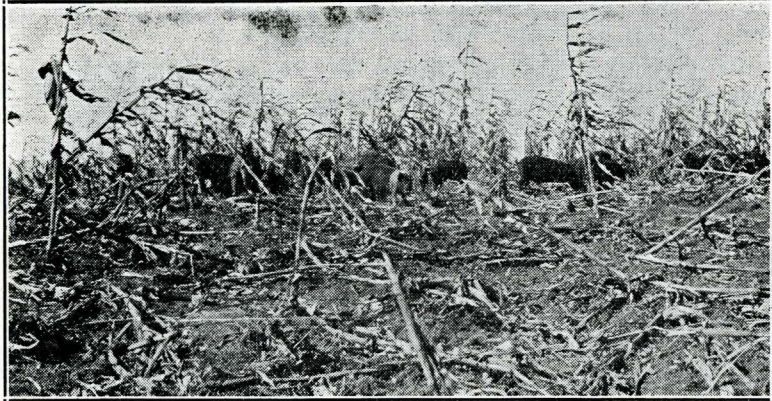
Oats and Barley.—Those hog producers who use rye for early pasture and sudan for later pasture find that there is a period during June when no forage is available. Hog lots seeded to a mixture of oats and barley in the spring will provide ample pasture for this emergency. Frequently a succession of forage crops is planned consisting of rye, oats and barley, sudan and corn for hogging down. This provides pasture throughout the season; enables the hog raiser to practice a rotation of pastures; and helps to maintain sanitary conditions for the prevention of internal parasites and disease.

Soybeans.—Soybeans as a forage for hogs is used in a limited way in eastern South Dakota counties. Since soybeans cannot be seeded in the spring until danger of frost is over, they do not furnish as early a pasture as alfalfa, clover, rye or rape. Also, when soybean plants are grazed off, the growth is not renewed, as in the case of long season pasture crops. As in the case of rape, soybean forage for hogs should be restricted to those areas of greater rainfall.

Hogging Down Corn.—The practice of hogging down corn has become common in South Dakota the past 5 years. Very little experimental work has been done in South Dakota, but if the feeding results of other northwest Experiment Stations is accepted, the practice of hogging down corn is an economical method of fattening hogs. Pigs generally make better use of the corn in the field than in dry lot, in addition, there is a considerable saving in labor.

It is a recognized fact that pigs hogging down corn are on full feed and therefore, some protein supplement is needed. Tankage, meat scraps, linseed oil meal, or other high-protein feed may be self-fed. Many hog men find it advisable to provide pigs in the corn fields with an adjoining field of alfalfa or other legume pasture as a source of protein. Rape or soybeans are often planted in the corn fields as a source of forage. Soybeans furnish an economical source of protein, but may produce soft pork. This may be corrected by feeding 0.2-0.3 pound per head daily of tankage or other high protein feed as a supplement in addition. Soybeans or rape may reduce corn yields, especially in dry years, so many feeders plant such crops in another field adjoining the corn. Minerals should also be provided for the best gains on growing-fattening pigs.

Pigs weighing over 100 pounds will do the best job in the cornfield. It is recommended that the pigs be accustomed to the cornfield by being first turned into a small patch of squaw corn, which is mature before the field corn. A field that would be cleaned up in about 12 days would result in a



Hogs will make economical gains in the corn field

considerable saving when the pigs are later turned into the field corn. Better results will also be obtained if corn field is dry.

Pigs in the corn field should be watched closely and before all of the corn has been consumed, it is recommended that they be removed from the field and full-fed corn in a dry lot with a protein supplement. Very economical gains are obtained in this way and the pigs are more desirable on the market after two weeks of such feeding. Brood sows or stock pigs can be used to clean up the corn in the field left by the fattening pigs.

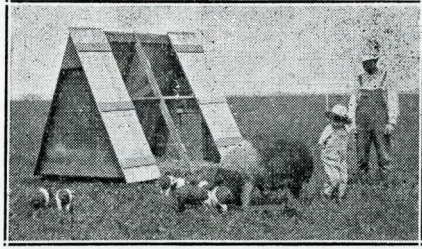
Care and Management

Care and Feeding of the Brood Sow.—Successful hog producers say the feeding and care given the brood sow during gestation period may mean profit or loss. If the sow is in proper condition at farrowing time, there will be less dead pigs at birth, there will be fewer complications and the sow will recover more promptly and be better able to nurse a litter.

The mature brood sow which has been properly fed during the gestation period should gain 75 to 100 pounds. She should be in good condition but not excessively fat. Records show that mature sows will lose an average of 45 pounds during farrowing. The body of a new-born pig consists of 70 per cent protein, 20 per cent mineral matter and 10 per cent fat. Accordingly, it is evident that the ration of the pregnant sow must be well balanced in order to produce a litter of strong, healthy pigs.

As indicated above, ample protein should be provided. Evvard, at the Iowa Station, has found that the addition of a protein supplement such as alfalfa hay or tankage to a corn ration increased the size of the litter, the average birth weight of the pigs, and also the percentage of strong pigs. Although many hog raisers still use the rack in feeding alfalfa, some find that feeding alfalfa on clean ground during the winter months

The A-type individual hog house in use

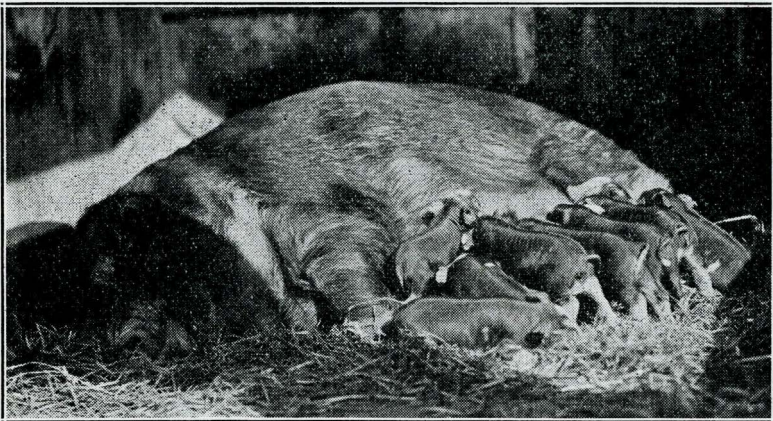


encourages more exercise, which is so important in the proper conditioning of the brood sow.

The basic ration may be made up of the standard grains or corn. Oats are excellent to feed with enough corn to keep the sows gaining. Crushed barley, wheat or grain sorghums may replace the corn in areas where such are cheaper than corn or where more readily available. The amount of these concentrates consumed will vary with the size and condition of the sow. Younger sows will generally require more than older individuals due to the fact that they are still growing. If alfalfa or clover is being fed one-third of a pound of high grade tankage should be used to supplement the grains satisfactorily. If legume hay is not available one-half pound of tankage will be needed per day. A mixture of tankage and linseed-oil meal (50-50) will generally give better results than either one alone.

Skim-milk or buttermilk fed at the rate of one gallon per day per sow along with barley and oats with alfalfa hay makes a satisfactory ration.

Care Before Farrowing.—A few days before farrowing the sow should be separated from the rest of the hogs and scrubbed with warm soap and water to remove the dust and dirt from the body. This is the first step in a sanitation program. Quite often this dirt on the sow from the old hog yards will contain thousands of worm eggs. The sow should then be placed



Sunlight on the pigs, guard rails to protect them, mean comfort and contentment

in the farrowing pen which has been scrubbed out with boiling lye water, using one pound of lye to 30 gallons of water. The pen should also be disinfected by spraying with a four per cent standard disinfectant such as coal tar dip or creosol.

As a means of preventing the sow from laying on her pigs, guard rails should be constructed around the quarters eight inches from the floor and projecting eight to 10 inches from the walls. Better still is the plan of partitioning off the corners with 2x4's at a height to give eight to 10 inches clearance. Slats are nailed from the 2x4's to the wall of the pen and covered with loose straw or alfalfa hay. Such a fixture will pay for itself many times over in pigs saved. It is also advisable to use as little straw for bedding as possible. Too much straw may prevent the pigs from nursing.

A reduction in the concentrate ration is advisable prior to farrowing. A ration consisting of whole dry oats, or a light slop of ground oats and bran is all the feed needed. Plenty of water should be provided. Immediately before farrowing all feed can be withheld. After farrowing the light ration should be continued for three or four days. Heavier feeding may be started and after 10-12 days the sow can be on full feed.

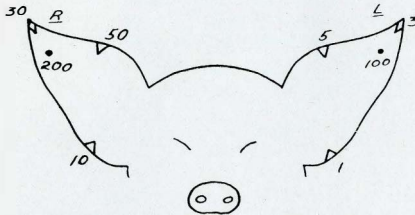
Experienced hog-raisers find it advisable to separate the sow from the rest of the herd a few days before farrowing and shut her in the farrowing pen particularly at night. The sow may be let out during the day to allow her to exercise and to help prevent constipation.

Care at Farrowing Time.—If a sow has been fed a well-balanced ration during the preceding months; has taken plenty of exercise and is in a strong, active condition; she will cause little concern at farrowing time. However, it is generally advisable to be on hand, because by so doing, the number of live pigs saved per litter may be increased. If farrowing takes place during the early spring months, some type of artificial heat should be provided. With individual houses, banking with straw is a good safeguard. If it is cold, have a basket with some warm bricks covered with a gunny sack. Dry the pigs off and put them in the basket until the sow is through farrowing. The instinct to nurse should be satisfied. The attendant should assist the weaker pigs to the teat. The first milk of the mother acts as a purgative initiating the functions of digestion and accordingly is highly important to a satisfactory beginning in life.

The afterbirth should be removed as soon as the sow has cleaned and burned or buried. If it is allowed to remain in the pen, she may eat it, which is believed by many to encourage the development of the pig-eating habit. Dead pigs should be removed for the same reason. A few hours after farrowing the pen should be cleaned thoroughly and fresh litter supplied. Air-slacked lime scattered on the floor has a cleansing, drying effect.

Remove the Needle Teeth.—As a rule, experienced hog raisers recommend the removal of the needle or wolf teeth of all pigs in the litter. This is primarily to prevent laceration of the lips and gums of the pigs. These cuts or abrasions may become infected and a sore mouth may result. Two of these teeth will be found in each corner of the mouth, making eight in all. The teeth are removed at birth with a pair of side-cutting forceps made for that purpose. The effort should be made to get a clean break without leaving any jagged splinters.

Mark all Pigs.—It is necessary that pigs in all litters be marked if one is to keep a record of the breeding and wishes to maintain a pure-bred herd. Even if registered stock is not maintained it is advisable to mark the pigs and keep a record of them as only through such method can one select desirable gilts from the larger and more efficient litters.



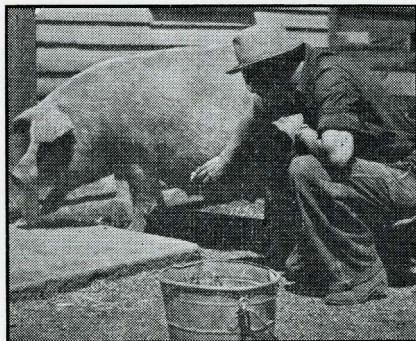
The ear notches are numbered as indicated and the numbers added to get the number of the pig. Number 2 is obtained by making two notches on the lower left ear. To obtain No. 4 combine (3 and 1); for 6, combine (5 and 1); for 8, combine (5 and 3); for 9, (5 and 3 and 1); for 11, (10 and 1); for 13, (10 and 3). On the right ear arrange similar combinations of 10, 30, 50 to obtain 20, 40, 60, 70, 80 or 90. The number 158 could be indicated by a hole in the left ear, a notch in the tip of the

right ear, a notch in the tip of the left ear and a notch on the top of the left ear.

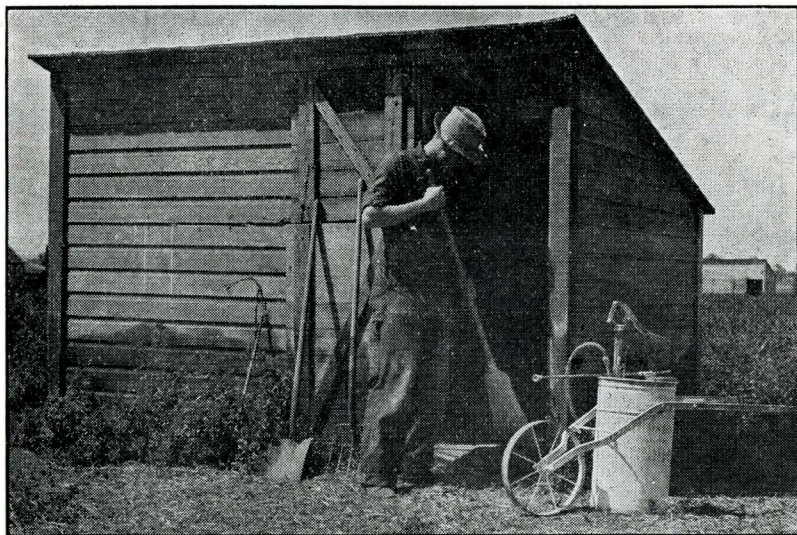
A practical method of ear-marking pigs

Marking generally consists of notching the ears with a special tool or by using a large size leather punch. Although numerous systems of marking hogs are used, producers quite generally throughout South Dakota find the method illustrated simple, easy to remember and adapted to marking a large number of hogs.

Sanitary Precautions.—It was previously mentioned that the initial steps in hog sanitation were the washing of the pregnant sow and placing her in a farrowing pen which had been cleaned, scrubbed with boiling lye water and disinfected. The farrowing pen should be kept clean and well-bedded at all times. Pigs or hogs kept in damp, dusty over-crowded conditions are likely to develop colds, rheumatism or pneumonia. After the pigs are eight to 10 days old they are ready to be moved out on clean ground and pasture. To avoid reinfesting the sow and initially infecting the pigs with worms from contaminated ground, the sow and litter should be hauled and not driven to the pasture. If possible the pasture should be one upon which hogs have not been pastured for two or more years. Once the sow and litter are on clean pasture many of the problems of management are solved.



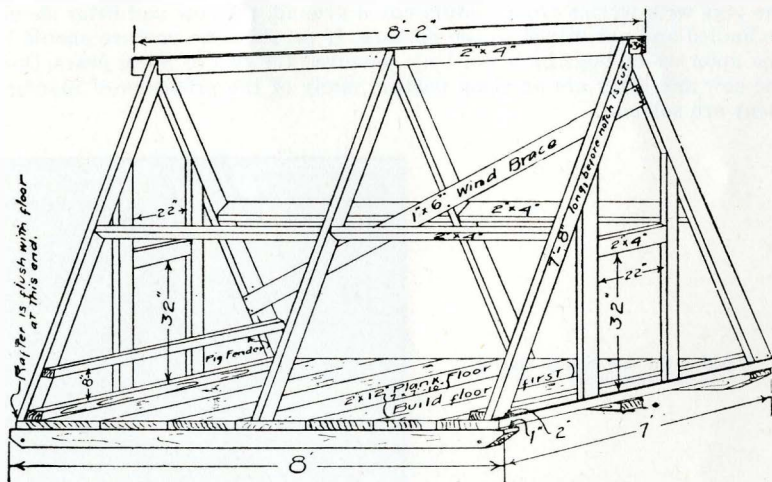
Washing the sow before placing
in the farrowing house



Preparing the farrowing house by scrubbing and disinfecting

Housing.—The small individual A-type hog house is probably the most economical for the sow and litter. Such a house can be readily moved to clean ground and offers adequate protection from the weather.

The central type of house is adapted to large herds; is excellent for early spring farrowing and facilitates chores during cold weather. The central big house, however, complicates the parasite and disease problem unless special attention is given to the cleanliness of the pens and freshness of the surrounding lots.



The framework for an A-type individual hog house



1 pc. 4x4 in. fir, 16 ft. long
8 pcs. 2x4 in. fir, 16 ft. long
11 pcs. 10 in. fir shiplap, 16 ft. S. 1 S
5 pcs. 10 in. shiplap, 16 ft. S. 2 S.
2 pcs. 1x6 in. No. 2, 16 ft. long
4 pcs. 1x4 in. 10 ft. long
4 pcs. 2x12 in. 14 ft., for floor
3 lbs. 16d nails
5 lbs. 8d box nails
½ gal. barn paint



Detail of A-type hog house (front view)

Castration.—Pigs should be castrated during the suckling period, preferably between four and five weeks of age. At this early period the pig experiences very little setback and there is less danger of infection. The operation is not complicated. It is advisable to use some precautions such as having the pigs as empty as possible of feed; avoid warming them up when penning them; use some standard disinfectant following the operation, as four per cent coal-tar dip solution; be clean about your person and place the pigs on a clean pasture afterward. Avoid a dusty dry lot containing convenient wallows.

Orphan Pigs.—Practically every hog-raiser, sooner or later, is confronted with the problem of raising orphan pigs, which have been left through the death of the sow or the failure of the sow to produce enough milk. Quite often the problem can be effectively handled by switching the pigs to a sow with a smaller litter. If this is possible, it is generally much more satisfactory than hand-feeding.

The Iowa Experiment Station, which has conducted extensive trials in raising orphan pigs, offers the following suggestions.

1. If possible allow the pigs to secure some of the first or colostrum milk of the sow.
2. Dispense with the bottle and nipple and teach the pigs to drink out of a flat pan, which can be easily kept clean.
3. Feed the pigs each two or three hours the first few days. The second week the number of feedings can be reduced to five or six per day; the third week to three or four daily and later to three feedings per day.
4. The orphans should not be over-crowded.
5. A quart of whole milk per pig each day is the most satisfactory. Where whole milk is not available, skim-milk or buttermilk may be used. Modification of whole milk by adding cream or sugar proved undesirable. There was also no advantage in adding casein, blood meal or linseed oil meal to the milk to increase the protein content.
6. Shelled yellow corn, tankage and a salt mixture should be provided free choice. One raw egg to each pig daily proved beneficial.

Feeding the Sow and Litter.—After farrowing it is unnecessary to feed the sow for at least a period of 24 hours, although an abundance of drinking water should be provided. On the second day a light feed of bran or shorts may be fed. Following, a light ration of half corn and half oats can be gradually increased until after a period of 10 days the sow is on full feed. The amount of milk produced in the sow is influenced by the amount of feed given. The object is to feed so that the milk flow of the sow is gradually increased as the pigs become older. Too rapid a stimulation of milk may cause scours in the pigs. A good plan is to feed all the sow will consume without scouring the pigs. An appearance of scours should be accompanied by a reduction in the feed of the sow. Feeding a few handfuls of bloodmeal to the sow has been found effective in stopping scours in the litter. Thoroughly cleaning the pens is also a good control measure. Care should also be taken at this time not to feed sour, moldy or fermented feeds, as such may cause further digestive disturbances in the pigs.

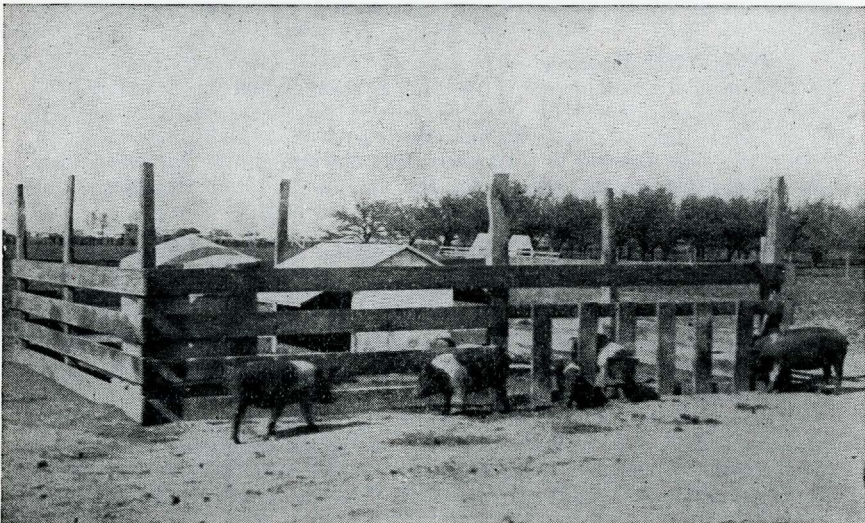
The best ration for a nursing sow is the one which is the cheapest and most productive of a large milk flow. At the same time the ration should contain protein to grow normal bodied pigs. Skim-milk, buttermilk and tankage are probably the most satisfactory protein supplements to corn, barley or oats for feeding the nursing sow. The following combination of feeds represent rations containing all the food constituents necessary for the sow nursing a litter of pigs:

Ration 1	Ration 2	Ration 3
60% Ground corn	30 % Ground barley	60% Ground sorgum grain
30% Ground oats	30% Ground oats	40% Ground oats
10% Tankage	30% Wheat Middlings	2 gallon skim milk or
Legume forage or pasture	10% Tankage	buttermilk per day
	Legume forage or pasture	Good pasture Salt

The following general plan is used in making up the above rations:— A concentrate plus an animal protein supplement (or a combination of an animal protein and vegetable protein plus green forage (or good quality legume hay).

Self Feeding.—Self feeding the sow and litter proved preferable to hand feeding in experiments by the United States Department of Agriculture. The self-fed sows gained an average of 12.8 pounds and their pigs an average of 20.4 pounds during 41 days, while hand-fed sows lost an average of 11.6 pounds and their pigs gained an average of 17 pounds during 44 days. In addition, the self-fed sows required 162 pounds less feed for each 100 pounds of gain as compared to the hand-fed lot. The self-fed pigs also showed the more rapid gains after weaning. Also, when the sows were bred before their pigs were weaned, 81 per cent of the self-fed sows settled at the first service and only 47 per cent of those that were hand-fed.

Creep-feeding Pigs.—Where the sow and litter are not to be self-fed, additional feed should be provided for the pigs. The most satisfactory method of giving the extra feed is by means of the “creep.” The creep is merely a small pen containing feed into which the pigs can go, but the sows cannot. In making the creep, have the slats opening in a



This is a good type of creep for pigs. They do not have to stoop in entering vertical direction instead of horizontal and close enough together to allow the pigs and not the sow to get into the creep. Requiring the pigs to drag themselves down under a board every time they want feed is likely

to cause low backs in later life. This is especially important to the individual producing purebred hogs.

The pigs will begin eating at about two weeks of age and shelled corn will probably be the first feed they will take. Corn and barley with 5 per cent tankage will make a good feed for the creep after the pigs begin eating. A common feed trough can be used in the creep, however, many hog raisers find the self-feeder the most advantageous.

Weaning.—Although most pigs are weaned at from eight to 10 weeks the exact time will depend on several factors. First, the pigs should have reached a weight of 35 to 40 pounds before weaning and if they have been set back by bad weather, scours or thumps, it may be advisable to let them remain with the sow somewhat longer. Second, if the owner is to raise two litters a year, the pigs should be weaned at the age of eight weeks or less. This is generally necessary unless self-feeding has been practiced in order to get the sow back into condition for re-breeding. Third, it has been found that pigs weaned later, 10 to 12 weeks, generally "do better."

At weaning time it is generally advisable to reduce the feed of the sow in order to reduce her milk flow. The South Dakota Experiment Station find that it is a good practice to place the sow on a straight corn ration at the time her feed is reduced. If the sows have been running to self-feeders, a hurdle built around them to exclude the sows, but permit the pigs, will be found effective. It is generally a better plan to move the sows from the pigs than to move the pigs to strange quarters. Occasionally it is necessary to return the sow to her pigs after a day in order to relieve the udder. If this is not done, particularly with heavy milkers, the udder may "cake" and a part of it may become injured.

Feeding After Weaning.—The plan of feeding after weaning will depend upon feed available, cost, pasture, equipment and market. The producer, who has planned for early farrowing, as discussed under section "The Age to Breed," and who has adequate feed available may wish to fatten the pigs quickly for an early fall market. Later farrowed pigs are quite often grown out during the summer on limited rations and fattened in the fall and winter on grain or new corn.

Full Feeding or Limited Feeding.—Prices for hogs usually average higher in the early fall than in the winter months. Accordingly, if pigs are farrowed early, they should be pushed for this higher market, otherwise the advantage of this early farrowing will be lost. Full feeding or pushing for the early market has the further advantage of a quick turnover and permits one to dispose of the spring pig crop in time to make space available for fall pigs.

Where pigs are full fed, they cannot utilize pasture or forage as efficiently as when fed limited amounts. In limited feeding pigs will eat more green forage and in addition will be fattened on new crop feeds which are generally lower priced than feeds held over from the previous year. This may or may not affect the lower selling price.

Where the full feeding method is to be practiced it is evident that liberal rations must be allowed. The rations should be well balanced and highly palatable. Shelled corn or ground barley may constitute the basis of the ration. A high-protein supplement will be absolutely necessary for quick gains. Skim milk or tankage may be the most readily available.

Following are suggested rations:

- I Growing fattening pigs (30 to 100 pounds)
1. Shelled corn 85 to 90 pounds, tankage 10 to 15 pounds.
 2. Ground grain sorghum 85 to 90 pounds, tankage 10 to 15 pounds.
 3. Ground barley or wheat, self-fed. Skimmilk or buttermilk 3 to 4 pounds per head daily, or 6 to 8 pounds tankage per 100 pounds of grain.
- II Shoats (100 to 175 pounds).
1. Shelled corn 90 to 92 pounds, tankage 8 to 10 pounds.
 2. Shelled corn 75 to 80 pounds, middlings 15 to 20 pounds, tankage 5 to 8 pounds.
 3. Shelled corn 50 pounds, ground barley 42 pounds, tankage 8 pounds.
 4. Grain sorghum 75 pounds, wheat middlings 15 pounds, tankage 10 pounds.

These rations are to be supplemented preferably with good legume pasture. If pasture is not available, as may be the case for fall pigs, alfalfa meal or alfalfa hay in racks should be added. These rations are only suggestive and may be modified to meet the specific individual needs. The pig should also have access to a self-feeder containing a good mineral mixture. The method of preparing the mixture is discussed under, "Minerals."

Feeding Breeding Stock.—Pigs selected for breeding stock should be fed so they develop good size and strong bone, but should not be allowed to become as fat as fat-barrows or other hogs being finished for the market. In the full-feeding method it is generally advisable to separate the pigs selected for breeding stock from those to be fattened for market soon after weaning. If the spring pigs, however, are being limited fed an allowance of concentrates on pasture, it may not be necessary to separate the pigs to be used for breeding purposes from the market pig until they reach a weight of 175 to 200 pounds.

Special care should be taken to see that the ration of pigs being raised for breeding stock contains sufficient protein and that there is an adequate supply of calcium, phosphorous, vitamin A and D. Good pastures is an excellent assurance against a lack of vitamins.

Breeding stock can be raised with good success on barley or corn as the only concentrate, providing such is properly supplemented and the amount limited to prevent the pigs from getting too fat. Most breeders, however, prefer to have the concentrate mixtures contain a reasonable portion of bulky feeds as, ground oats or bran. If possible, some protein rich feed of animal origin should be included in the ration. The following rations are suggested for breeding stock:

- | | |
|--------------------------|------------|
| 1. Corn or grain sorghum | 40 pounds. |
| Ground oats | 30 pounds. |
| Standard middlings | 20 pounds. |
| Linseed Oil Meal | 5 pounds. |
| Tankage | 5 pounds. |
| 2. Barley or wheat | 95 pounds. |
| Tankage | 5 pounds. |

If pasture cannot be provided to supplement these rations, legume hay should be fed. In preparing the most desirable ration for breeding stock one must consider availability, costs, pasture, equipment and various other individual requirements, most of which vary with the feeder and the farm. The ration which is balanced to the needs of the developing gilt or boar and which meets these specific individual needs is the ration which is the most satisfactory.

Fattening Hogs.—In fattening hogs, corn is again the principal feed. However, if price conditions are more favorable, corn may be replaced with ground barley or wheat. Ground grain sorghums can also be used

efficiently if other concentrates are not available. Feeding under dry lot conditions makes protein supplements absolutely essential, although the amount needed, to balance the corn, barley or other concentrate, is somewhat less than for the growing-fattening pig. In fattening, the self-feeder is of paramount importance. Following are suggestive fattening rations on dry-lot:

1. Corn or grain sorghum 92 to 96 pounds, tankage 4-8 pounds.
2. Corn 60 pounds, ground barley 35 pounds, tankage 5 pounds.
3. Ground barley or wheat 95 pounds, tankage 5 pounds.

Preparing for Show and Showing

Selection of the Animal is the first factor to consider in preparing to show. The animal chosen should show characteristic breed type, style, smooth and uniform throughout, strong arch of back, deep side and plenty of quality. The individual should stand squarely on all four legs, well up on the toes with adequate size and substance of bone. In selecting a pig, select one that is large and growthy for age. Avoid a pig for show, that is coarse or open in the shoulders, rough sided, heavy jawed, weak of pastern or off type. Fat hogs should show excellent finish. Breeding hogs should be just well conditioned. Pigs should be kept in strong, healthy, smooth flesh. Mature animals should be kept in full smooth flesh with good appetites.

Washing the animal should be done two or three times before showing. Older animals will require more frequent washings than younger animals. Soft water and a good cleansing soap, such as tar or cocoanut-oil soap, which lathers well, should be used. Add a small amount of dip in the water. This will free the pig from any lice. It is a good plan to wet down the hair a while before the soap is applied. This will soften the dirt.

The soap should be thoroughly rinsed out of the hair after washing. Brushing off the water in the direction of the hair slope will shorten the time for drying and help train the hair. The last washing, when practical, should be done not later than one day before the show. Plenty of straw will help keep them clean.

Oiling the hog has the effect of softening the skin and hair and giving the necessary "bloom" to the coat. Use oil sparingly. It is not the quantity of oil, but rather the method of application that counts. The oil application may be prepared late in the day preceding the show. Sprinkle oil on a brush and distribute it over the pig by brushing carefully in the direction of the hair. After the oil has remained on the pig over night, it has dried enough so that the hair will take an excellent polish, when the pig is groomed with a brush and woolen cloth before going to the ring. When the pig goes to the ring there should be no excess oil on the hair. A heavy coat of oil during hot weather is undesirable because the pig overheats more easily. Oil interferes with normal evaporation. In warm weather, some showmen use no oil but sprinkle water on the pigs before entering the ring.

For the red breeds a colorless oil should be used. Such can also be used for black breeds. Some herdsmen add a little lamp black for the black breeds. Lamp black is not recommended. The use of oil only is preferred. The vegetable oils are probably the easiest and safest. One-fourth of a pint should be enough for a 200 pound hog, and one oiling is adequate for each show. The edible vegetable oils can be applied satisfac-



Before showing, it may be necessary to trim the toes

torily without gasoline, kerosene or alcohol. The following preparations are also used for red and black hogs:

1. One pint cottonseed oil, four ounces wood alcohol.
2. Two-thirds linseed oil, one-third gasoline.
3. Two pints light colored mineral oil, thinned with a pint of kerosene, can be used for pigs of any color.

For dressing white breeds it is customary to apply a dusting powder such as powdered soapstone to which has been added a very small amount of marine blue. The blue counteracts the tendency of the powder to show yellow. This powder is usually dusted on with a sifter-top can just before the pig enters the showing.

Clipping the hair off the inside and outside of the ears will improve the appearance of the head. The clipped parts should blend smoothly into the unclipped parts. In trimming the tail, leave a good brush at the end and a smooth connection at the base. Occasional long hair about the head and jowl should also be trimmed off.

Trimming the feet is an important detail in fitting hogs for show. In trimming the feet most emphasis is placed on the toes. However, the dew claws should also be cut back and dressed down neatly. Short dew claws make the pasterns appear short and straight. When the toes are too long it has the effect of increasing the slope of pastern, and making them appear weak. Cut back the toes almost even with the sole of the foot.

When the excess growth of the horny part of the toe is cut away with a knife, the cutting should begin at the rear. A pair of small nippers can be used and an eight-inch rasp is convenient for use in shaping up the foot afterward. If a large number of hogs are to be trimmed a lifting-crate will be found useful. A common shipping crate can also be used. A pig could also be laid on his side and his feet tied before trimming. Care

should be exercised in trimming the feet, for if they are cut too short lameness may develop. The last trimming should be done not later than two weeks before the show. If the feet and foot pads seem dry and hard apply neat's-foot oil or wool fat occasionally. This will soften the pads and tend to relieve soreness.

Removing the tusks gives the male pig or hog a more desirable showing appearance. A noose, made out of a rope or several strands of smooth baling wire, can be placed around the upper jaw. The boar is tied to a post and the tusks clipped out with a bolt cutter or with a pair of nippers.

Training the pig to show takes time, but is essential for exhibiting to the greatest advantage. A number of methods of showing are used. Some herdsmen use a whip. Others prefer the stockman's cane. A small hurdle can be used with a cane for training the pig. It is sometimes used while showing. The use of a hurdle while showing, however, is usually a confession of inadequate training of the pig. Hurdles are most in use when showing boars. Training and showing with a cane is probably the most commonly recognized method.

It is probably necessary to begin training the pig in a pen. Observe how the animal shows to the best advantages and train it to show that way. Do not make a pet of a show pig as it is generally a disappointment in the show ring. A pig that is very gentle relaxes too much to show with adequate style. However, the pig should be sufficiently gentle so that it will not continually insist on running away. He should be taught to stop when the cane is laid gently across his face. A slight tapping of the cane should be sufficient to cause him to move. It is as important that the pig be trained to walk freely straight ahead, as it is to train him to stand properly. The judge usually requires a demonstration of both. Little courtesies to remember about showing hogs are:

1. Be able to answer questions concerning age promptly.
2. Keep the pig between you and the judge.
3. Do not over work your animal.
4. Refrain from talking to the judge and don't argue if not satisfied with the placing.
5. Be on time in getting your exhibit to the ring.
6. Be a good sportsman at all times. It will make many friends and give you favorable contacts.

Marketing

The successful hog producer makes a study of market conditions as well as problems of production. The producer has felt for entirely too long a period that his interest ceased with the production of hogs to a marketable weight. The ultimate success of the enterprise will depend on marketing methods. By a little study of the major phases of marketing the producer can adjust his production and marketing technic to meet some of the problems which seem to detract from the profits of his business.

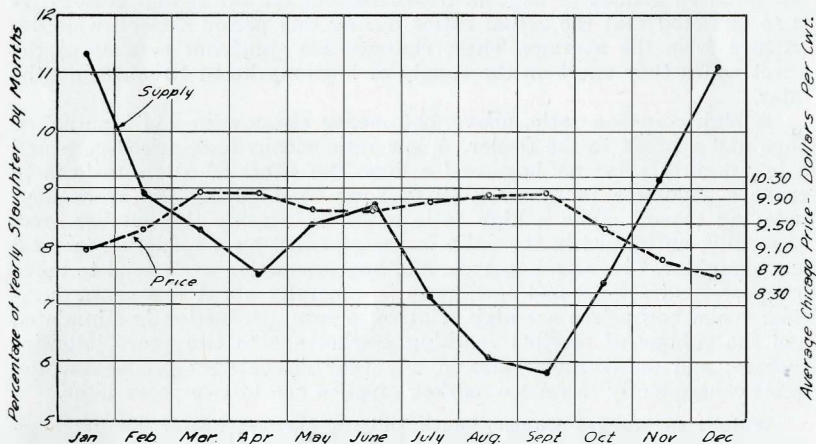
Methods of Marketing.—During the period of agricultural expansion, marketing methods have changed profoundly. The early pioneer period saw considerable livestock slaughtered and consumed locally. As transportation facilities improved, stock was shipped long distances and terminal markets sprang up. With this development came the local stock buyer and commission companies. The local buyer in the country bought, assembled and sold the stock through commission companies on the central markets. Even at present considerable livestock is marketed through similar channels.

Cooperative marketing is used in some communities of the state. In this plan of marketing, there is a paid manager who assembles, weighs and grades the stock of the individual consignor and then ships it to the most advantageous market. The consignor receives the actual selling price of his animals, less necessary overhead charges. This plan is merited in that practically all speculation is eliminated, the small producer has equal advantage with the larger stock raiser since stock is sold on the basis of quality and grade.

In recent years, the local livestock auction has developed as an additional means of selling livestock. The manager yards the stock and sells it to the highest bidder at auction. Sales commission, yardage and feed fees are deducted from the selling price of the stock. At these auctions, which are usually held weekly at certain centralized towns, both breeding and market stock is offered for sale.

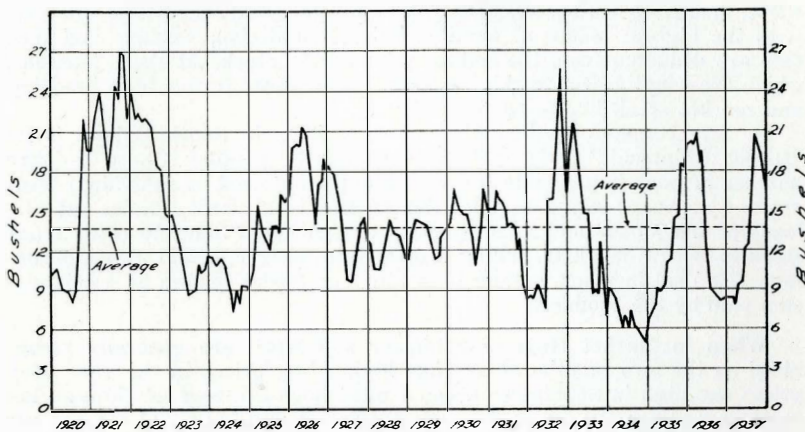
A very common method of marketing hogs in South Dakota is by "Direct Shipment." This system is especially popular where a large number of hogs is available for sale. The plan is used by individual feeders or by a buyer who assembles the stock in local yards, grades out carloads or truckloads and sells direct to the packer. Producers often truck stock to central markets, selling it directly to packer buyers. Commission men also deal in stock, selling it to killer or feeder buyers at a commission paid by the producer.

When to Market Hogs.—September and April are generally recognized as the two months of average higher hog prices in the year. Hog prices are high in September because most hogs are grassed through the summer and are fed off on the new grain and corn crop and are not yet ready for market. Accordingly, there is a shortage in hogs on the September market, with a resulting higher price. April prices are high because most hogs have been sold earlier in the year, and fall farrowings, wintered on limited rations, are not ready for market. It should be understood that these conditions are average and do not always apply to specific years.



Percentage distribution of federal inspected slaughter of hogs by months and the average Chicago prices of hogs by months from 1910 to 1934

The most important influence affecting the farmer's decision as to the number of sows to breed or the number of hogs which can be profitably marketed seems to be the relation between feed prices, especially of corn and the prices of live hogs during the months immediately preceding the breeding season. This relationship is known as the "corn-hog ratio," and means the number of bushels of corn required to equal in value one hundred pounds of live market hogs. A corn-hog ratio of 12, for example, means that the prices are such that 12 bushels of corn is equal in value



South Dakota Corn-Hog Ratio 1920-1937
(Courtesy S. D. Crop Reporting Service)

to one hundred pounds of hogs. In the accompanying table, the dotted line represents the average number of bushels required to equal in value one hundred pounds of hogs in South Dakota for the period 1920-37. It is to be noted that the actual ratios during this period showed wide departure from the average. These changes are significant because of the effect which they exert on the supply of hogs marketed 12 or 18 months later.

A high corn-hog ratio, above 12.6 means cheap corn and high-priced hogs and a profit to the feeder. A low ratio means high-priced corn and a low market price for hogs and a loss. The effect of a low ratio is to cause a reduction in the number of sows bred during the subsequent breeding season, while a high ratio tends to increase the number bred. Generally, an upturn in the ratio is accompanied by a reduction in total hog slaughter. The corn-hog cycle and hog-production cycle tend to move in opposite directions and each cycle is generally about five years duration. When hog prices are high relative to corn, production is stimulated and the volume of receipts reaching market one to two years later increases; and unfavorable ratio in any year discourages production and tends consequently to reduce market supplies one to two years later.

Weight to Market Hogs.—South Dakota packers prefer market hogs ranging in weight from 180 to 240 pounds. A hog weighing about 225 pounds is probably the most desirable. Hogs marketed at weights less

than 200 pounds have, in most cases, cost more per pound of gain, because of higher priced feeds necessary for early growth. Costs per pound of gain will also tend to increase at weights much over 200 pounds. As the hog gets larger, and especially as he matures, it requires more feed to put on each additional pound of gain. Produce what the market wants and little difficulty will be experienced in finding a good market.

Diseases

Scours.—Scours or diarrhea in little pigs is a common ailment and causes an extensive loss. It is generally caused by irregularities in feeding or unsanitary conditions. It is common in this part of the country for the reason that weather conditions in the spring of the year are none too favorable for the little pigs.

The direct cause in most cases is due to an irregularity in the feeding of the sow. If a sow has not been accustomed to milk before farrowing and is given milk after the pigs are born it is likely to scour the pigs. If the sow is fed too soon after farrowing it is likely to cause trouble. Over-feeding will produce the same condition. Any sudden change of feed for the sow may be responsible. If the pigs are not kept dry and warm the condition may appear.

The chief symptom of scours is a profuse diarrhea. The discharge from the bowels is thin and white. At first the pig may nurse as if he were normal but later he will stop eating or nursing. The coat becomes rough and the skin is wrinkled. The pig will lie around indifferently to surroundings and if picked up or handled will squeal from pain. In a few days he will probably die. Some of the older pigs may recover but most of the little pigs die.

Treatment is largely preventive and consists mainly in correcting the feeding of the sow and keeping the pigs warm and dry. The sow should be brought up to full feed very gradually after farrowing. She should not be fed anything for 24 hours after farrowing. Lukewarm water may be given at any time. Milk should not be given the sow for several days after farrowing. The common statement among hogmen "Keep the pigs warm and dry" cannot be over-emphasized. The sick pigs may be given a dose of Epsom salts as a physic to remove the irritating substance in the bowels. Castor oil may be better as a physic—one teaspoonful to each sick pig. Even a teaspoonful of raw linseed oil may be given if no other treatment is available.

Thumps.—Thumps in pigs is a condition produced by sudden contractions on the diaphragm. It is not an ailment of the lungs and heart. It is common in pigs that are over-fat and under-exercised. Thumps is the same thing as hiccoughs in a person. It is a spasmodic contraction of the diaphragm. The diaphragm separates the lungs and heart from the stomach, liver and intestines.

Any irritation to the nerve that controls the diaphragm may cause a sudden contraction. This irritation may be produced by overfeeding. Pigs that are over fat and lack exercise are fit subjects. If the stomach of the pig is inflamed or the intestines are inflamed the pig may thump. Many other conditions or diseases might produce thumps but the most important are over-feeding and lack of exercise.

The condition is easily recognized by sudden jerking of the pig. The sides of the pig will suddenly contract and the lung cavity will expand.

There is a continued series of these jerking spasms. The condition is often accompanied by constipation and loss of appetite. The spasms may be so violent and frequent as to cause death. In case the pig lives there will be considerable of a set-back in growth.

If the pigs are noticed in the early stages of thumps, it is probable that they can be brought out of the condition without serious difficulty. By all means the amount of feed given should be cut down either by taking the pigs away from the sows for several hours during the day or lessening the grain fed. Get the pigs in the sunlight. See that they have exercise even to the extent of running them up and down the alleyway. Give each sick pig a teaspoonful of castor oil.

Round Worms.—Internal parasites, of which the round worm is the most common, cause considerable disturbance in the digestive system of pigs. The infestation may be so severe as to cause death. At least the badly infested pig is given a set-back from which he may never fully recover. The loss to the hog raiser is very great when the pigs become badly infested with the common round worms.

In order to prevent round worms the hog raiser should have some knowledge of the life history of the worm. The female worm will lay eggs in the intestines of the hog. These eggs are passed out of the body in the manure. The eggs are so small that they cannot be seen without the aid of a microscope. The eggs lie in the dirt and manure in the hog lots for some time—generally over winter. After the little pigs are born in the spring the eggs are in the right stage for hatching. The little pigs pick up these eggs in the hog lots when they nose around in the dirt or they may get them in the dirt on the sow while nursing. The eggs are swallowed and absorbed into the blood stream the same as the food. After passing thru the liver and heart the eggs lodge in the lungs where they hatch out into little worms about one-sixteenth of an inch long. After getting into the air spaces of the lungs the little worms are coughed up into the mouth and are again swallowed. This is the second time they have been in the intestines and they are now ready to grow. After they are full grown the males and females mate and then the female starts to lay eggs. One female may lay as high as eight million eggs.

The symptoms of worms are unthriftiness, stunted growth, weakness, "pot bellies," digestive disturbances and emaciation. Frequently worms are passed out in bowel discharges. While the worms are hatching out in the lungs they cause considerable coughing and in some cases pneumonia. Some of the worms may crawl up the bile duct into the gall bladder and shut off the action of the liver. It is not likely that all of the pigs will show these symptoms—only those that are badly infested. This condition need not be confused with hog cholera for worms are not a problem in old hogs while hog cholera affects hogs of any age.

The prevention of worms in pigs is entirely along sanitary lines. Any drug that is given to a hog by way of the mouth goes into the stomach and intestines and does not prevent worms from hatching in the lungs. It is useless to spend money for any medicine to prevent worms. The only way to prevent worms is to break the life cycle or the life history of the worm and the best way to do that is to prevent the pigs from getting the worm eggs. A system of management that will provide a clean farrowing pen, a clean sow and a clean pasture for the sow and pigs will go far toward preventing worms.

After a pig becomes wormy it is then necessary to give him a dose of medicine to get rid of the worms. Oil of chenopodium (wormseed oil) is the most efficient specific for worms. It is ordinarily given in a dose of 15 or 16 drops to a pig weighing 30 to 50 pounds. In order to get the worms out of a pig the chenopodium is combined with a physic and castor oil serves this purpose as well as anything. The dose for one pig is 16 drops of oil of chenopodium (1 c.c.) and 1 ounce of castor oil. A larger dose of castor oil is sometimes given. The pig is kept off feed for 24 hours before the treatment. The dose is given with a syringe—commonly called a dose syringe. The syringe usually holds two ounces which is enough for two pigs. The pig is held up on his hind legs by one man while another inserts the nozzle of the syringe in the mouth of the pig and gives the medicine. The pig is held a minute or so until he swallows. The pig should not be fed for 4 or 5 hours after treatment and should be confined to a small place in order to observe results.

Rickets or Rachitis.—Bone forming elements are necessary for pigs at all times and especially when they are growing rapidly. These elements are mainly phosphorous and calcium. While the pigs are nursing they secure these elements in the milk but the ordinary feeds do not contain a sufficient amount and after weaning the pigs become paralyzed or weak in the back or hind-legs as a result.

The direct cause of rickets is a lack of bone building material in the feed. The common grains are high in flesh building material but low in bone building elements. When sufficient bone forming salts are not supplied the bones become soft, enlarged and easily broken.

The symptoms of rickets are manifested in several different ways. Shortly after weaning when the pigs are growing fast they may become lame, weak in the hind parts and even paralyzed. Some of the pigs may develop enlarged joints and their legs may become more or less stiff. When the affected pigs are moved they squeal from pain. The muscles seem to be sore. Probably most of the pigs will get well if given proper treatment. They seem to eat and drink considerable even though they do not move around.

Another form of rickets which might be of interest to some hog raisers occurs in sows. If a pregnant sow has been brought through the winter on pretty much of a straight corn diet and little exercise she is a fit subject. When a bred sow is purchased this point should be considered. Young sows that have big litters and are good milkers are especially susceptible. It is one of the laws of nature that the bone building elements must be supplied by the mother in the milk for the pigs. If none is being fed to the sow, nature takes these elements from the bones of the sow and puts them into the milk. This can only last a short time and then the sow will break. She will become lame, paralyzed, and possibly die.

If the pigs are fed a reasonably balanced ration and are supplied with sufficient lime, phosphorus, and salt there should be little difficulty with rickets. However, it does occur once in awhile in fast growing pigs receiving the best of feed. If the feeding directions as given in this bulletin are properly carried out very few cases of rickets will develop. The mineral mixture given will help prevent rickets. Alfalfa pasture will help prevent it. Exercise and sunlight have a share in the prevention.

Pigs that are sick with rickets should be given plenty of milk. Lime water may be provided by putting a little air-slacked lime in the drinking water. Cod liver oil is effective and can be bought in the form of powder.

The liquid cod liver oil can be mixed with the grain feed at the rate of 1 pound or 1 pint of cod liver to 100 pounds of feed. Put the sick pigs or sow in a comfortable place and give a light diet with little or no corn. If the sow is affected the pigs should be weaned.

Mange (Scabies).—Mange is a contagious skin disease causing the pigs to become unthrifty and lose flesh. The disease is very wide spread in South Dakota and is responsible for a great loss to the hog industry. There are two kinds of mange caused by two different mites but since the control is the same for both it will not be necessary to consider them separately.

Scabies or mange is caused by a mite. This mite spends its entire life on the hog. The mange mite is very small and can be seen after it has been magnified. A new generation develops every 10 or 12 days. One female may lay ten thousand eggs. The mite digs holes into the skin and covers itself with a crust.

A hog that is mangy may spend a large part of his time scratching. The mites set up an irritation to the skin. The condition is generally first noticed on the legs and then spreads to the sides and finally all over the hog. The skin develops little pimples about the size of a pin-head. Later the skin becomes thick and rough. Frequently the skin will crack open. The skin of the hog may look like the hide of an elephant and the disease is sometimes known as "elephant hide."

Mange is spread only by contact—that is one hog rubbing against another or rubbing against the same post. These mites do not crawl any distance. If the mite is kept off the hog he will die in a short time. Therefore, if the hogs were kept out of a hog house for thirty days the house would again be safe as far as mange is concerned. The best way to kill a mange mite is to smother him. A mite breathes through his bad pores so if he is covered with oil he will soon die. The ideal method of controlling mange is the application of some heavy oil all over the hog at one time. It is necessary to repeat the application in ten days in order to kill the mites that have hatched out in the meantime as the oil does not destroy the eggs. The best oil to use is genuine crude oil—just as it comes from the oil well without any refining. Sometimes this is hard to obtain. Some results may be gotten by using crank case oil. Crank case oil may be improved by adding one pint of kerosene to each gallon but crank case oil cannot be expected to give the results of crude oil. Lime-sulphur dip is effective and generally easily obtained at any drugstore. The liquid lime-sulphur should be mixed according to directions on the container. If dry lime-sulphur is used it may be mixed at the rate of 32 pounds to 100 gallons of water or 1 pound to 3 gallons of water.

The application of either oil or lime-sulphur is considerable of a problem. If only a few pigs are to be treated the application may be made by hand. Catch the pig and hold him down while the oil is rubbed in with a brush. Be sure to cover the entire hog including the inside of the ears. If 15 or 20 pigs are to be treated, a few at a time may be put into a small pen and the treatment applied with a sprinkling can. The pen should be well bedded and the pigs held in the pen for two hours. Make a swab by wrapping a rag on the end of a stick and soak the swab in the oil, then lift up the ears and swab the inside. If a large number is to be treated a dipping tank will be the best. Partly fill the tank with water and then pour eight inches of oil on top of the water. If lime-sulphur dip is used

the extra water should not be added and the straight solution of 32 pounds of dry lime-sulphur to 100 gallons of water is used. A hog oiler will help to control mange if it is properly cared for. The worst thing to be said about a hog oiler is that it so seldom contains oil. Probably the roller type of hog oiler has some advantages over the shake down type. Whatever treatment is used it should be repeated in 10 days and at further intervals of 10 days if necessary.

Lice.—Lice occur frequently on hogs and cause considerable irritation. They obtain their food by puncturing holes in the skin. Such an irritation to the skin causes the animal to rub and scratch. When a hog is rubbing and scratching most of the time he is not taking on weight.

A hog louse is a blood-sucking parasite. The entire life of a louse is passed on the hog. The female glues the eggs to the hairs and the eggs hatch in 12 to 14 days. The average female will lay about 90 eggs. A favorite location for lice is inside the ears.

Hog lice is spread in the same way as mange—by one hog rubbing against another or sleeping in the same nest. The control measures given in connection with mange are effective against lice. If lice only and not mange are to be controlled any ordinary coal tar dip such as Kreso will be effective. The solution is made according to directions on the container and the solution applied. This is repeated in 12 to 14 days. It is also advisable to soak the walls and floor of the hog house with this disinfectant to kill any stray lice. Do not expect a coal tar dip to control mange.

Necrotic Stomatitis. (Sore Mouths)—The sore mouths that occur in little pigs shortly after they are born is a form of “necro.” The inflammation in the mouth interferes with nursing and the pig loses weight. The disease is especially common in unsanitary hog lots and where a large number of pigs are running together.

Little pigs have very sharp teeth and when they fight one another they bite openings in the lips and on the nose. These openings give the “necro” germ a chance to enter and set up an inflammation. The “necro” organism will kill the tissue and cause an abscess or an ulcer on the lips and in some cases on the tongue. Frequently the gums are affected. The ulcers are characterized by a yellowish, cheesy scab.

By cutting off the sharp teeth (not pulling) the number of openings for the infection to enter is greatly lessened. Avoiding too many pigs running together will help prevent fighting. Any pig so affected may be treated by painting the sores or ulcers with iodine. This may be applied with an old tooth brush.

Necrotic Rhinitis. (Bull nose or Sniffles)—“Bull nose” is a disease causing a lump or swelling to develop somewhere about the head of the pig, usually on top of the nose. It produces a distorted or enlarged nose, hence the term “bull nose.” The same organism that causes sore mouths is responsible—in fact the disease is the same but of a different form. The germs enter through the skin or possibly through the nostrils and cause an abscess which in turn cause the swelling. Frequently an abscess will break and then leave a hole in the top of the nose. All abscesses do not occur on the nose but may be on the lower or other parts of the head.

After a pig becomes so affected treatment is of little avail. Bad cases should be destroyed. In some cases the abscess may be opened to let the cheesy material out and then treated with tincture of iodine. This might

be followed by frequent dipping of the pig in some good coal tar dipping solution.

Necrotic Enteritis.—Necrotic enteritis is an inflammation of the lining of the intestines which causes the lining membrane to die and slough off. Under such conditions the pig cannot digest his food and will waste away and usually die. No other disease causes a greater loss in pigs. Compared with other diseases necrotic enteritis is new but it has spread very rapidly and become a very important problem to the hog raiser.

While there is some difference of opinion among authorities as to the primary cause of necrotic enteritis we cannot lose sight of the fact that the same old organism (*necrophorus bacillus*) is a factor. This germ is normally present in most hog lots that have been used for a number of years. It is an easy matter for pigs to pick up this infection coupled with other germs and inflammation of the intestines is started which ends in ulceration of the intestinal lining.

Pigs weighing from 40 to 60 pounds are especially susceptible to necrotic enteritis. After a pig weighs around 80 pounds he seems to have considerable immunity. The disease goes through the herd slowly and probably not all of the pigs will be affected. Some of the larger, more thrifty pigs never take the disease. The pigs affected seem to drink and eat considerable. Since the food is not digested or assimilated the disease is manifested by a profuse diarrhea. Sick pigs may live for several weeks and get well or die, depending on the severity of the disease. Old hogs are not usually affected.

More research work must be done before any specific treatment can be devised. Under present information about the only thing to offer is the use of internal antiseptics and some authorities claim that these are worthless. At least no harm is done by internal antiseptics in treating necrotic enteritis even though the value is questioned. Many good hogmen report that a weak solution of copper sulphate (bluestone) is helpful. Most veterinarians use some kind of an internal antiseptic in treating necrotic enteritis. In connection with the control of necrotic enteritis it is advisable to call a veterinarian because he can give much better treatment than any homemade treatment. The copper sulphate solution is made by dissolving one-fourth of a pound of copper sulphate in three gallons of water. This is a one per cent solution. A dose for one pig is a teaspoonful. If fifty pigs are to be treated a pint of the solution may be put in the slop or drinking water once a day. All sick pigs should be removed from the well pigs.

Flu.—Hog flu is nothing more than an infectious bronchitis and flu is not a good name for the disease. It is a herd disease and when it occurs it generally affects most of the herd. It is common in the fall of the year and is common on fair grounds. The direct cause is unknown but the lowering of the resistance of a hog by shipping or sudden changes in the weather is a factor.

Hog flu produces an extremely bad cough, a high fever, difficult breathing, loss of appetite and constipation. The disease may be complicated with pneumonia. The sick hog will lie around continuously and lose flesh rapidly. Most of the sick hogs will get well if properly cared for.

Treatment consists of putting the hogs in a warm comfortable place. Bed the hog house down with lots of straw. See that no drafts are present. Give some internal antiseptic like one per cent copper sulphate

solution in the drinking water. A very light slop or no feed at all for the first 24 hours and then only a light diet is advised. If the hogs are constipated a physic such as Epsom salts may be given. Under such treatment 90 per cent of the hogs will get well.

Hog Cholera.—Of all the diseases among hogs, cholera is the most important. It causes a greater loss than any other disease. Millions of dollars are lost every year as a result of hog cholera. It is a contagious disease caused by a germ and is characterized by a loss of appetite, fever, emaciation and death.

The direct cause of hog cholera is a very small organism called a virus. This virus has certain characteristics. It is easily killed by sunlight. If kept away from sunlight in a cold, damp place it will live a year or more. It can be killed by disinfectants and by heat or fire. Therefore, it is important in connection with the control of hog cholera to let in plenty of sunlight, clean out the dark corners, use a lot of disinfectant solution and burn all dead hogs.

Anything that lowers the resistance of a hog makes him more susceptible to hog cholera. Young pigs are more susceptible than old hogs. The disease is more prevalent in summer than in winter. Improper feeding is a factor. If hogs are not properly housed they may lose their resistance. Pigs that are full of worms or covered with lice or mange lose their resistance to hog cholera. Proper feeding, care and management help to prevent hog cholera.

The symptoms of hog cholera are sometimes confusing because the disease does not always act the same. There are really three types of this disease. The first or very severe type kills the hog quickly. He has a high fever, refuses to eat, gets down within a few hours, probably has a few spasms and dies within 10 or 12 hours. This type is not common and is known as acute hog cholera. The hog comes up slowly behind the rest of the herd. He refuses to eat, drinks more water than usual and has a high fever. In a few days he gets thin and weak and has a wobbly gait. At first he is constipated and later has a diarrhea. He will probably live a week and then die. The third or chronic type is the mildest form of hog cholera. The symptoms are not much different than the second type except they are milder. Chronic hog cholera is common in the old hogs. An old sow may be sick a month, lose all her hair, a chunk of hide and then finally recover.

Treatment of hog cholera is entirely preventive. No cure exists. Hog cholera can be controlled by care and management, sanitation, quarantine and vaccination. The proper feeding of hogs to keep up their resistance is important. A hog should be fed clean feed and should not be expected to be a scavenger. A good comfortable house is necessary—one that is properly ventilated and drained. Plenty of clean drinking water should be supplied. All wallow holes should be eliminated. The hog houses should be cleaned and disinfected frequently. Under no circumstances should hogs be fed dead animals. A herd that is sick with cholera should be quarantined. There should be no contact between the neighboring farms. All dogs should be tied. No more exchange of labor should take place than is absolutely necessary. Vaccination, if properly carried out, will prevent hog cholera. The operation should be performed by a veterinarian. The hogs must be well at the time of vaccination. After vaccination the hogs should be put on a light diet. The best time to vaccinate is when

the pigs weigh around 40 pounds. They are large enough so that a permanent immunity may be produced, and they are small enough to be easily handled and in case a pig is lost the loss is not great. It does not cost as much to vaccinate a small pig as it does an older or larger hog. Vaccination should be considered a part of the cost of producing hogs and wherever there is any danger whatever of hog cholera the pigs should be vaccinated.



Vaccination to prevent cholera is a good business practice.

Measuring Feeds.—The average feeder relies upon measurements rather than weight in estimating rations. For this reason, the following table giving weights per quart of various feeds will prove helpful:

Feed

Alfalfa meal -----	0.6	Oats, ground -----	0.7
Barley, whole -----	1.5	Skimmilk -----	2.0
Barley, ground -----	1.1	Tankage -----	1.6
Corn, shelled -----	1.7	Wheat, whole -----	1.9
Corn, ground -----	1.5	Wheat, ground -----	1.7
Cottonseed meal -----	1.5	Wheat bran -----	0.5
Linseed meal -----	1.1	Wheat shorts -----	0.8
Oats, whole -----	1.0		

The following table is reproduced from "Feeds and Feeding" by Henry and Morrison.

Digestible Nutrients in Feeding Stuffs

Feeding Stuff	Total dry matter in 100 pounds	Digestible nutrients in 100 pounds				Nutritive ratio
		Crude protein	Carbo- hydrates	Fat	Total	
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	1 :
Alfalfa leaves -----	93.4	17.3	35.9	3.0	60.0	2.5
Alfalfa meal -----	91.2	10.2	38.7	0.8	50.7	4.0
Barley, common -----	90.7	9.0	66.8	1.6	79.4	7.8
Buttermilk -----	9.4	3.4	4.9	0.1	8.4	1.5
Corn, dent, well cured -----	89.5	7.5	67.8	4.6	85.7	10.4
Corn germ meal -----	91.1	16.5	42.6	10.4	82.5	4.0
Corn gluten feed -----	91.3	21.5	51.9	3.2	80.7	2.7
Corn gluten meal -----	90.9	30.2	43.9	4.4	84.0	1.8
Cottonseed meal, choice -----	92.5	37.0	21.8	8.6	78.2	1.1
Cow's milk -----	13.6	3.3	4.8	3.6	16.2	3.9
Dried blood -----	90.3	69.1	--	0.9	71.1	0.03
Emmer (spelt) -----	91.3	9.5	63.2	1.7	76.5	7.1
Feterita grain -----	88.9	10.1	65.4	2.4	80.9	7.0
Fish meal -----	89.5	40.1	--	8.3	58.8	0.5
Flax seed -----	90.8	20.6	17.0	29.0	102.8	4.0
Hominy feed -----	89.9	7.0	61.2	7.3	84.6	11.1
Kaffir grain -----	88.2	9.0	65.8	2.3	80.0	7.9
Kaoliang grain -----	90.1	8.5	67.0	3.3	82.9	8.8
Linseed meal, old process -----	90.9	30.2	32.6	6.7	77.9	1.6
Milo grain -----	89.3	8.7	66.2	2.2	79.9	8.2
Millet seed, hog -----	90.9	8.4	63.7	2.4	77.5	8.2
Molasses, cane, or blackstrap -----	74.3	1.0	58.5	--	59.5	58.5
Oat meal (rolled oats) -----	92.1	12.8	56.9	6.0	83.2	5.5
Oats -----	90.8	9.7	52.1	3.8	70.4	6.3
Rye -----	90.6	9.9	68.4	1.2	81.0	7.2
Skimmilk, centrifugal -----	9.9	3.6	5.1	0.2	9.1	1.5
Soybean oil meal -----	89.5	39.7	34.7	4.5	84.5	1.1
Soybean seed -----	90.1	33.2	24.7	16.1	94.1	1.8
Tankage, guaranteed 60 per cent protein -----	92.1	56.2	--	7.2	72.4	0.3
Wheat, Minn., N. D., S. D., Nebr., Kans. -----	89.6	10.0	66.3	1.5	79.7	7.0
Wheat bran, winter -----	89.4	12.2	40.9	2.9	59.6	3.9
Wheat middlings, flour -----	89.3	15.7	52.8	4.3	78.2	4.0
Wheat middlings, standard (shorts) -----	89.5	13.4	46.2	4.3	69.3	4.2
Whey -----	6.6	0.8	4.7	0.3	6.2	6.8

Gestation Table

Date Bred	Due to Farrow	Date Bred	Due to Farrow	Date Bred	Due to Farrow	Date Bred	Due to Farrow	Date Bred	Due to Farrow
Jan. 1	Apr. 22	Mch. 5	July 4	May 27	Sept. 15	Aug. 8	Nov. 27	Oct. 20	Feb. 8
" 2	" 23	" 16	" 5	" 28	" 16	" 9	" 28	" 21	" 9
" 3	" 24	" 17	" 6	" 29	" 17	" 10	" 29	" 22	" 10
" 4	" 25	" 18	" 7	" 30	" 18	" 11	" 30	" 23	" 11
" 5	" 26	" 19	" 8	" 31	" 19	" 12	Dec. 1	" 24	" 12
" 6	" 27	" 20	" 9	June 1	" 20	" 13	" 2	" 25	" 13
" 7	" 28	" 21	" 10	" 2	" 21	" 14	" 3	" 26	" 14
" 8	" 29	" 22	" 11	" 3	" 22	" 15	" 4	" 27	" 15
" 9	" 30	" 23	" 12	" 4	" 23	" 16	" 5	" 28	" 16
" 10—May	1	" 24	" 13	" 5	" 24	" 17	" 6	" 29	" 17
" 11	" 2	" 25	" 14	" 6	" 25	" 18	" 7	" 30	" 18
" 12	" 3	" 26	" 15	" 7	" 26	" 19	" 8	" 31	" 19
" 13	" 4	" 27	" 16	" 8	" 27	" 20	" 9	Nov. 1	" 20
" 14	" 5	" 28	" 17	" 9	" 28	" 21	" 10	" 2	" 21
" 15	" 6	" 29	" 18	" 10	" 29	" 22	" 11	" 3	" 22
" 16	" 7	" 30	" 19	" 11	" 30	" 23	" 12	" 4	" 23
" 17	" 8	" 31	" 20	" 12	Oct. 1	" 24	" 13	" 5	" 24
" 18	" 9	Apr. 1	" 21	" 13	" 2	" 25	" 14	" 6	" 25
" 19	" 10	" 2	" 22	" 14	" 3	" 26	" 15	" 7	" 26
" 20	" 11	" 3	" 23	" 15	" 4	" 27	" 16	" 8	" 27
" 21	" 12	" 4	" 24	" 16	" 5	" 28	" 17	" 9	" 28
" 22	" 13	" 5	" 25	" 17	" 6	" 29	" 18	10—Mch.	1
" 23	" 14	" 6	" 26	" 18	" 7	" 30	" 19	" 11	" 2
" 24	" 15	" 7	" 27	" 19	" 8	" 31	" 20	" 12	" 3
" 25	" 16	" 8	" 28	" 20	" 9	Sept. 1	" 21	" 13	" 4
" 26	" 17	" 9	" 29	" 21	" 10	" 2	" 22	" 14	" 5
" 27	" 18	" 10	" 30	" 22	" 11	" 3	" 23	" 15	" 6
" 28	" 19	" 11	" 31	" 23	" 12	" 4	" 24	" 16	" 7
" 29	" 20	" 12—Aug.	1	" 24	" 13	" 5	" 25	" 17	" 8
" 30	" 21	" 13	" 2	" 25	" 14	" 6	" 26	" 18	" 9
" 31—Feb.	" 22	" 14	" 3	" 26	" 15	" 7	" 27	" 19	" 10
" 1	" 23	" 15	" 4	" 27	" 16	" 8	" 28	" 20	" 11
" 2	" 24	" 16	" 5	" 28	" 17	" 9	" 29	" 21	" 12
" 3	" 25	" 17	" 6	" 29	" 18	" 10	" 30	" 22	" 13
" 4	" 26	" 18	" 7	" 30	" 19	" 11	" 31	" 23	" 14
" 5	" 27	" 19	" 8	July 1	" 20	" 12—Jan.	1	" 24	" 15
" 6	" 28	" 20	" 9	" 2	" 21	" 13	" 2	" 25	" 16
" 7	" 29	" 21	" 10	" 3	" 22	" 14	" 3	" 26	" 17
" 8	" 30	" 22	" 11	" 4	" 23	" 15	" 4	" 27	" 18
" 9	" 31	" 23	" 12	" 5	" 24	" 16	" 5	" 28	" 19
" 10—June	1	" 24	" 13	" 6	" 25	" 17	" 6	" 29	" 20
" 11	" 2	" 25	" 14	" 7	" 26	" 18	" 7	" 30	" 21
" 12	" 3	" 26	" 15	" 8	" 27	" 19	" 8	Dec. 1	" 22
" 13	" 4	" 27	" 16	" 9	" 28	" 20	" 9	" 2	" 23
" 14	" 5	" 28	" 17	" 10	" 29	" 21	" 10	" 3	" 24
" 15	" 6	" 29	" 18	" 11	" 30	" 22	" 11	" 4	" 25
" 16	" 7	" 30	" 19	" 12	" 31	" 23	" 12	" 5	" 26
" 17	" 8	May 1	" 20	" 13—Nov.	1	" 24	" 13	" 6	" 27
" 18	" 9	" 2	" 21	" 14	" 2	" 25	" 14	" 7	" 28
" 19	" 10	" 3	" 22	" 15	" 3	" 26	" 15	" 8	" 29
" 20	" 11	" 4	" 23	" 16	" 4	" 27	" 16	" 9	" 30
" 21	" 12	" 5	" 24	" 17	" 5	" 28	" 17	" 10	" 31
" 22	" 13	" 6	" 25	" 18	" 6	" 29	" 18	" 11—Apr.	1
" 23	" 14	" 7	" 26	" 19	" 7	" 30	" 19	" 12	" 2
" 24	" 15	" 8	" 27	" 20	" 8	Oct. 1	" 20	" 13	" 3
" 25	" 16	" 9	" 28	" 21	" 9	" 2	" 21	" 14	" 4
" 26	" 17	" 10	" 29	" 22	" 10	" 3	" 22	" 15	" 5
" 27	" 18	" 11	" 30	" 23	" 11	" 4	" 23	" 16	" 6
" 28	" 19	" 12	" 31	" 24	" 12	" 5	" 24	" 17	" 7
Mch. 1	" 20	" 13—Sept.	1	" 25	" 13	" 6	" 25	" 18	" 8
" 2	" 21	" 14	" 2	" 26	" 14	" 7	" 26	" 19	" 9
" 3	" 22	" 15	" 3	" 27	" 15	" 8	" 27	" 20	" 10
" 4	" 23	" 16	" 4	" 28	" 16	" 9	" 28	" 21	" 11
" 5	" 24	" 17	" 5	" 29	" 17	" 10	" 29	" 22	" 12
" 6	" 25	" 18	" 6	" 30	" 18	" 11	" 30	" 23	" 13
" 7	" 26	" 19	" 7	" 31	" 19	" 12	" 31	" 24	" 14
" 8	" 27	" 20	" 8	Aug. 1	" 20	" 13—Feb.	1	" 25	" 15
" 9	" 28	" 21	" 9	" 2	" 21	" 14	" 2	" 26	" 16
" 10	" 29	" 22	" 10	" 3	" 22	" 15	" 3	" 27	" 17
" 11	" 30	" 23	" 11	" 4	" 23	" 16	" 4	" 28	" 18
" 12—July	1	" 24	" 12	" 5	" 24	" 17	" 5	" 29	" 19
" 13	" 2	" 25	" 13	" 6	" 25	" 18	" 6	" 30	" 20
" 14	" 3	" 26	" 14	" 7	" 26	" 19	" 7	" 31	" 21

Hog Record Associations and Secretaries:

American Berkshire Association. C. W. Mitchell, Springfield, Ill.
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 Tamworth Swine Association. W. T. Barr, Ames, Iowa.
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South Dakota Experiment Station Bulletins on Hogs:

(These bulletins may be obtained free by writing South Dakota Experiment Station, Brookings, S. D.)

- 209 Potatoes as a Feed for Fattening Pigs.
- 216 Improving Winter Rations for Pigs.
- 252 Value of Grinding Grains and Roughages for Livestock.
- 262 Barley as a Fattening Feed for Cattle and Swine in South Dakota.
- 271 Rye as a Fattening Feed for Cattle and Swine in South Dakota.
- 283 Oil of Chenopodium and Chenopodium Plants for the Eradication of Round Worms in Swine.
- 285 Sorghums for Forage and Grain in South Dakota.
- 316 Proso as a Fattening Feed for Swine.

South Dakota Extension Service Circulars:

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- 259 Alfalfa for Livestock.
- Ext. Leaflet 6—A Movable Hog House Plan.
- Leaflet—Pork on the Farm.
- Mimeographed Circular 178—Sorghum Utilization in South Dakota.
- Extension Circular 365—Meat Identification and Judging.

Farmers' Bulletins.—United States Department of Agriculture:

(These bulletins may be obtained by writing the Division of Publications, U. S. Department of Agriculture, Washington, D. C.)

- 1085 Hog Lice and Hog Mange—Methods of Control and Eradication.
- 1186 Pork on the Farm: Killing, Curing, Canning.
- 1244 Diseases, Ailments and Abnormal Conditions of Swine.
- 1263 Breeds of Swine.
- 1357 Castration of Hogs.
- 1437 Swine Production.
- 1455 Fitting, Showing and Judging Hogs.
- 1487 Practical Hog Houses.
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- 1504 Self-feeding Versus Hand-feeding Sows and Litters.

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