

## **MSU Extension Publication Archive**

Archive copy of publication, do not use for current recommendations. Up-to-date information about many topics can be obtained from your local Extension office.

Profitable Pork Production  
Michigan State University Extension Service  
W.N. McMillen, Animal Husbandry  
Issued April 1949  
48 pages

The PDF file was provided courtesy of the Michigan State University Library

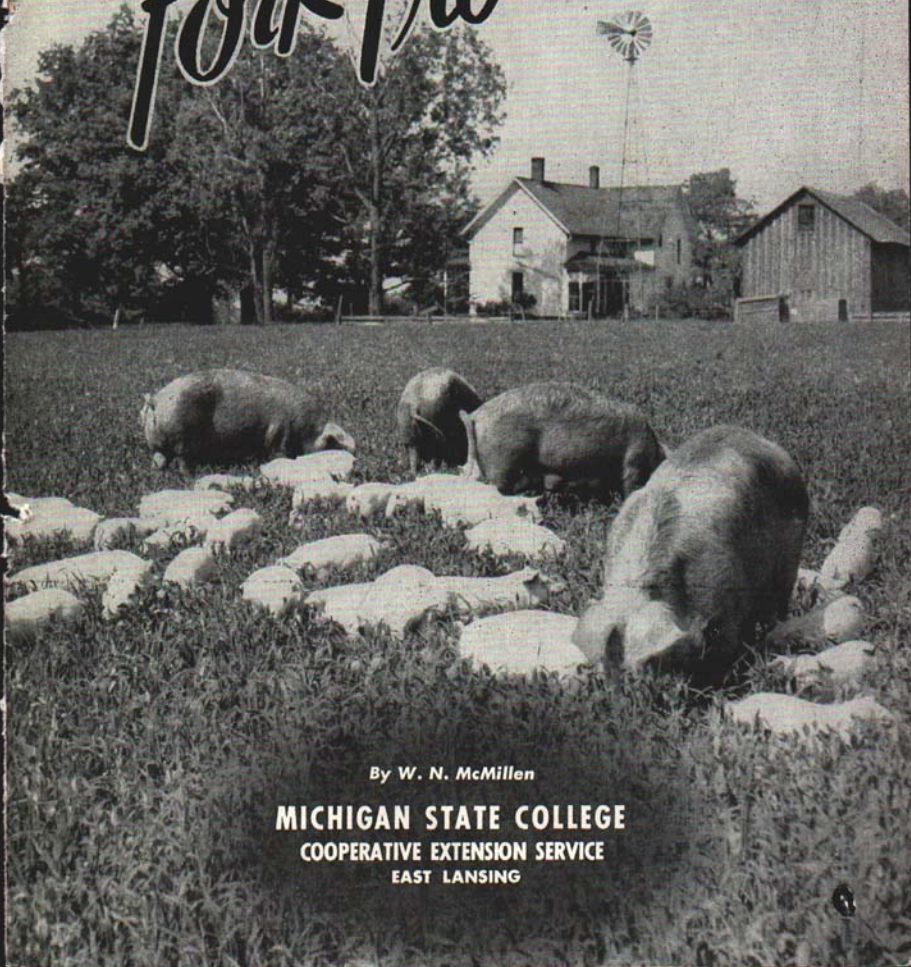
**Scroll down to view the publication.**

EXTENSION BULLETIN 299

**PROFITABLE**

FILE COPY  
DO NOT REMOVE

# Pork Production



*By W. N. McMillen*

**MICHIGAN STATE COLLEGE**  
COOPERATIVE EXTENSION SERVICE  
EAST LANSING

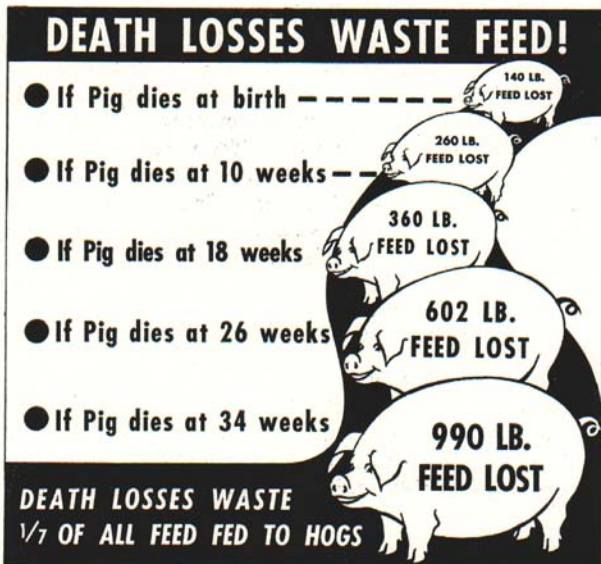
## ANSWERS TO YOUR QUESTIONS

	PAGE		PAGE
<b>BREEDING AND SELECTION</b>	4	Protein Supplements	25
Choosing a Breed	4	Minerals	26
Selecting Breeding Stock	4	Vitamin Supplements	27
Production Factors	4	Water	27
Swine Types	6	Fiber Content	27
Picking Gilts	6	Composition of Hog Feeds	29
Picking Boars	7	Gains and Requirements	29
Sow Testing	7	Free Choice Feeding	30
Ear Notching for Records	7	Feed Mixtures	30
Swine Judging	8	Value of Swine Pastures	31
Crossbreeding	10	Crops for Pasture Program	33
<b>CARE AND MANAGEMENT</b>	10	<b>PARASITES AND DISEASES</b>	33
The Breeding Herd	10	Sanitation Practices	33
When to Breed	10	Parasite Control	34
Gestation Period	11	Roundworms	34
Age to Breed Gilts	12	Lice	36
Flushing the Sow	12	Sunburn	36
Breeding Back for Early Pigs	12	Mange	36
Care of the Boar	12	Contagious Diseases	39
Number of Sows to Breed	13	Hog Cholera	39
Feeding the Sow Herd	14	Necrotic Enteritis	40
Winter Quarters and Exercise for Sows	14	Brucellosis	40
Farrowing Season	15	Tuberculosis	41
Sow and Litter	16	Erysipelas	41
Feeding the Sow	16	Diseases Due to Poor Feeding	41
Orphan pigs	16	Underfeeding	41
Anemia	17	Necrotic Enteritis	41
Creep feeding	18	Anemia	41
Castration	19	Rickets	42
Vaccination	20	Pneumonia	42
Ringing	20	Caked Udder or Mastitis	43
Weaning	21	Constipation	43
Watering	21	Hairless Pigs	43
Growing and Fattening Pigs	21	Piles	43
<b>FEEDS AND FEEDING</b>	21	Bull Nose	43
General Requirements	22	Swollen Joints	43
Essentials of a Ration	22	<b>BUILDINGS AND EQUIPMENT</b>	44
Grains or other fattening feeds	22	Location of Buildings	44
Potatoes	23	Requirements of a good shelter	44
Cull beans	23	Hog Houses	44
Garbage	23	Pig Creeps and Self-Feeders	45
Hogging down corn	24	Hog Waterers	45
		Sunshades	46
		Loading Chute	47
		Farrowing Equipment	47

# Profitable Pork Production

By W. N. McMILLEN\*

MICHIGAN has produced an average of about a million hogs yearly for the past 10 years. If one estimates that each hog fed to 225 pounds used 900 pounds of grain, the swine industry furnished an average yearly market for 450,000 tons of grain. If the rations were properly balanced with protein supplement, each pig would have received at least 80 pounds, making a total of 40,000 tons of supplement used. Pigs also utilize pasture, alfalfa or clover meal, cull beans and many otherwise waste by-products from the farm such as undigested grain



Data—U. S. Dept. of Agr.

\*The author acknowledges the assistance of G. A. Brown, Harry Moxley, H. W. Newland and Graydon Blank of the Animal Husbandry Department for suggestions in the preparation of the manuscript. Dr. Frank Thorp, Jr., of the Animal Pathology Department, assisted in the preparation of the material on parasites and diseases. Many ideas for this bulletin were taken from the Extension Bulletin 234 by V. A. Freeman.

in the feed-lot, waste in fields, vegetables, dairy by-products and garbage.

In spite of their importance and the fact that swine enterprises are generally profitable, over one-third of the pigs born in Michigan die before they reach market. In many instances, owing to poor feeding and management, stunted pigs that finally reach market are money-losers. These leaks in the swine producer's income can be reduced by more general use of improved methods.

This bulletin is written with the hope that farmers and others interested in swine production can quickly find answers to questions of current interest by using the reference table in the front of this bulletin.

## BREEDING AND SELECTION

### Choosing A Breed

Farmers who plan to start in the hog business often ask, "What breed is the best?" The answer is that there are both good and poor producers in every breed. Select breeding hogs of acceptable type out of high-producing sows. Personal preference should be considered in breed selection. It is usually a good idea to select a breed that is popular in the community. This makes possible the exchange of breeding stock. It also makes it easier to find replacements, and to sell breeding stock. Pictures of swine representing the more common breeds are reproduced in this bulletin.

## SELECTING BREEDING STOCK

A planned breeding program is the first step toward a profitable swine enterprise. The three yardsticks to use in judging a hog's breeding value are: 1) type, 2) production factors, and 3) pedigree. Pedigree records are available only on purebred swine. The parents are the most important animals to consider when judging a pedigree.

### PRODUCTION FACTORS

Select boars and gilts from herds and families that have good production records. Production factors include:

1. Large litters born. Select breeding gilts and boars from thrifty litters of 8 to 12 pigs.



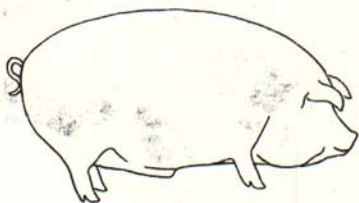
Fig. 1. Spotted Poland China Sow and her production registry litter.

2. **Mothering ability.** It is important that sows know how to take care of pigs and give them plenty of milk. The good producing, "milky" sow will get thin while nursing her litter. When pigs get plenty of milk they will weigh 30 or 40 pounds or more at weaning time. Fat, nice-looking sows when the pigs are weaned are often the poorest producers. Sow testing records for 1,198 litters on Michigan farms show that pigs from large litters are as heavy at weaning as pigs from small litters. Pigs from 143 litters with 11 or more pigs averaged 33 pounds at 56 days of age, as compared with 32.9 pounds per pig for 167 litters averaging 6 pigs or fewer. Size of litter, therefore, is the most important factor in attaining heavy litter weights.

3. **Rate and economy of gain.** In general, thrifty, fast-growing pigs are profit makers.

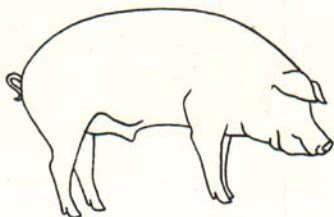
4. **Carcass excellence.** Hogs are not generally sold in this country on the basis of carcass grade. The swine industry will be on a firm footing if all producers will select meaty breeding hogs with plenty of length and quality.

## SWINE TYPES



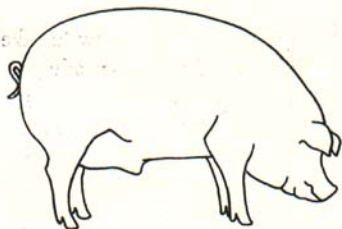
Small "chuffy" type.

Thick chuffy hogs, in general, produce small litters. Their carcasses are too fat when weighing over 150-160 pounds.



Big "leggy" type.

This type is slow-maturing. Desired finish cannot be obtained under 250 pounds.



Intermediate "meat" type.

This type hog can be a prolific and economical feeder. It produces a desirable carcass at a live weight of from 200 to 250 pounds.

## IN PICKING GILTS

## Look For

Production records  
Ample bone and strong legs  
Sound udder with 12 or more teats  
Feminity and quality  
Good dispositions  
Medium type

## Avoid

Poor producers  
Weak, crooked legs  
"Blind" teats—defective udders  
Staggy, rough sows  
Fussy, irritable sows  
Leggy or "chuffy" kinds

## IN PICKING BOARS

Look For	Avoid
Production records	Small, poor litters
Type, quality and balance	Plainness and roughness
Strong legs and bone	Weak legs, long pasterns
Activity and masculinity	Sluggish, feminine boars
Medium type-size for age	Leggy, "chuffy," runty
Well developed sex organs	Small testicles, only one testicle or rupture
Rudimentary nipples (12 or more)	Too few nipples or "blind" nipples

## Sow Testing

All of the major breed registry associations now have a production registry program. The requirements for most of the breeds are the same.

Gilts are required to raise at least eight pigs which total 275 pounds or more at 56 days of age. Sows must raise eight pigs or more weighing 320 pounds or over. Two litters must be qualified before a sow is an official PR sow. Anyone interested in production testing may get complete instructions and rules from his breed association.

All swine producers are encouraged to join the Michigan Sow Testing Program. The program involves three simple practices: 1) ear marking pigs at farrowing time, 2) weighing the pigs at weaning time, and 3) selecting replacement gilts and boars from the largest litters. A boar usually has little influence on the size of the litters he sires. He does influence, however, the size of litters of his daughters.

## Ear Notching for Records

Accurate records are essential for proper management. A record of the breeding date, date of farrowing, the number and sex of pigs farrowed, and the number and sex of pigs raised is important.

A system of identification of each litter is advisable whether the pig be a purebred or a grade. Such a system enables the producer to check carefully the productivity of each sow at weaning time, which is the most efficient means of culling the herd.

Pigs should be ear-notched when only a few hours old. A definite system should be followed. The major breed associations have recommended systems of notching.



### Swine Judging

There is a common belief that judging means "type" selection. In show-ring judging or in breeding-hog selection other things should be considered in addition to type.

Major points in judging fat hogs:

**TYPE, FORM OR CONFORMATION AND BALANCE**—A meat-type hog should be deep, straight in the underline, reasonably long, wide and even in width, slightly arched and strong in the back, have straight legs of medium length, be deep and full in the ham and have a high tail setting. All the parts should blend smoothly to give an appearance of balance or proportion. The good ones are stylish and graceful.

**QUALITY OR REFINEMENT OF HEAD, HIDE, HAIR AND BONE**—A quality hog is small and clean cut in the head, trim in the jowl, smooth in the shoulder, fine and straight in the hair coat, free from wrinkles and is of medium bone.

**CONDITION (FAT OR FINISH)**—These terms refer to the amount and firmness of the external covering. A hog in ideal finish should be just fat enough to be firm and not be soft, wasty or overdone.

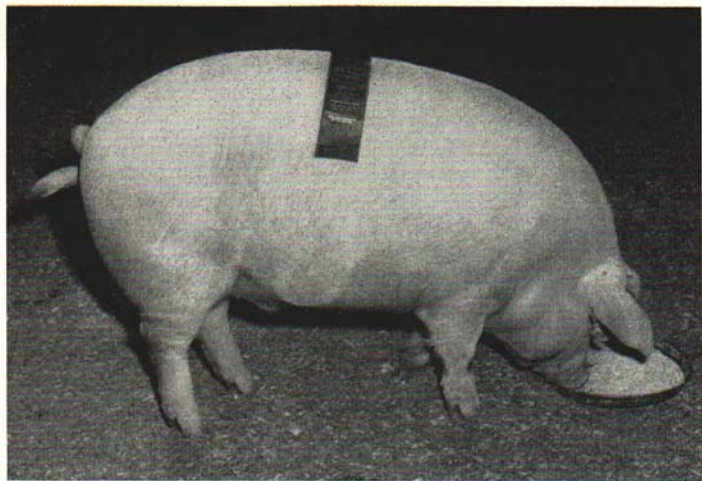


Fig. 2. A champion Chester White barrow with type, style, balance, quality and the proper degree of finish.

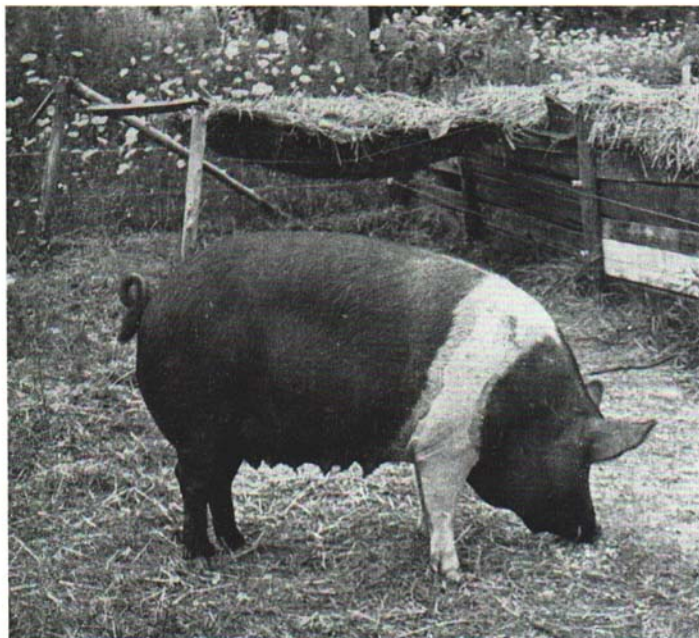


Fig. 3. A typey, high-producing Hampshire gilt, outstanding in femininity and sex character.

In breeding hogs also look for:

**BREED AND SEX CHARACTER**—Hogs of the different breeds should meet the color requirements for that breed. The ears should be lopped or erect, depending upon the ear character of the breed. A boar should have a strong masculine head. Sows should be feminine. Well developed udders with 12 or more prominent nipples are important in boars as well as in sows and gilts since this character is transmitted to the offspring.

**LEGS AND ACTION**—Breeding hogs should have strong legs and reasonably short pasterns. They should be able to walk freely and gracefully without stiffness.

**CONDITION**—Breeding hogs should not carry the high finish necessary for fat market hogs.



Fig. 4. A cross-bred litter weighing over 500 pounds at 56 days.

### Crossbreeding

Crossbreeding is the mating of a purebred boar of one breed to sows of another breed. Experiments indicate some advantages in crossbreeding for market hog production when outstanding parent stock is used.

Purebred boars of outstanding type should always be used in crossbreeding. Using boars of one of the heavy-boned, rapid-growing breeds, on high-producing sows of another breed is a popular crossbreeding plan.

The "crisscross" system of breeding is practical for the average crossbred producer. For example, cross a Berkshire boar on a Duroc sow, then breed the crossbred gilts to a Duroc boar and in turn use a Berkshire boar on the second-cross gilts. In other words, boars of the breeds used in the original cross would be alternated for each succeeding cross. When this system is used it is important that boars as well as gilts be selected for production.

## CARE AND MANAGEMENT

### The Breeding Herd

#### WHEN TO BREED

Under Michigan conditions the producer may plan to raise either one or two litters per year. With suitable equipment and housing, the

spring litters should be farrowed during March and early April. The fall litters should come in August or early September.

Late spring litters are usually farrowed by gilts that raise only one litter and are then fattened and sold. It is necessary to raise two litters each year from mature sows to keep down the maintenance cost per pig. When the two-litter system is used, it is more advisable to start with fall gilts than with spring gilts since the fall litter can then come early and the arrival of the next spring litter can be timed to suit housing conditions. Early spring and early fall pigs, when full-fed and pushed to market weight in 6 months, reach market at the most favorable average price periods of the year.

**THE GESTATION PERIOD**

Most sows will farrow 114 days after they are bred. The range is 110 to 118 days. A successful pig crop must be planned and breeding started so as to produce pigs at the desired time. With carefully kept breeding records, the producer will know the approximate farrowing date for each sow and can make arrangements accordingly. See gestation table (Table 1).

Sows usually "come in heat" 3 to 5 days after weaning their pigs. The heat period usually continues about 3 days and occurs every 20 or 21 days. Sows will accept boars only during the heat period. It is believed that larger litters result from mating late rather than early in

TABLE 1—Gestation table showing dates of breeding and farrowing for sows. (Based on 114-day period)

Date bred	Date due	Date bred	Date due	Date bred	Date due
Jan. 1	Apr. 25	May 10	Sept. 1	Sept. 10	Jan. 2
Jan. 10	May 4	May 20	Sept. 11	Sept. 20	Jan. 12
Jan. 20	May 14	May 30	Sept. 21	Sept. 30	Jan. 22
Jan. 30	May 24	June 1	Sept. 23	Oct. 1	Jan. 23
Feb. 1	May 26	June 10	Oct. 2	Oct. 10	Feb. 1
Feb. 10	June 4	June 20	Oct. 12	Oct. 20	Feb. 11
Feb. 20	June 14	June 30	Oct. 22	Oct. 30	Feb. 21
Mar. 1	June 23	July 1	Oct. 23	Nov. 1	Feb. 23
Mar. 10	July 2	July 10	Nov. 1	Nov. 10	Mar. 4
Mar. 20	July 12	July 20	Nov. 11	Nov. 20	Mar. 14
Mar. 30	July 22	July 30	Nov. 21	Nov. 30	Mar. 24
Apr. 1	July 24	Aug. 1	Nov. 23	Dec. 1	Mar. 25
Apr. 10	Aug. 2	Aug. 10	Dec. 2	Dec. 10	Apr. 3
Apr. 20	Aug. 12	Aug. 20	Dec. 12	Dec. 20	Apr. 13
Apr. 30	Aug. 22	Aug. 30	Dec. 22	Dec. 30	Apr. 23
May 1	Aug. 23	Sept. 1	Dec. 24		

the period. One service is usually as effective as several. With sires that have not been used for sometime a second service may be desirable.

#### **THE AGE TO BREED GILTS**

The age at which to breed gilts depends upon the development and maturity of the individual. A well-developed young sow can be bred safely at the age of 8 months. Gilts less than 5 months old may begin "coming in heat," but never should be bred before they weigh 180 pounds and are 7 months old. Breeding too young may cause small litters, weak pigs and trouble at farrowing time.

#### **FLUSHING THE SOW**

Ten days before breeding time, the daily feed allowance for dry, thin sows should be increased so as to get them into a rapidly gaining condition. Unless they are on good pasture, include  $\frac{1}{2}$  pound of protein supplement daily per sow.

A heavy, milk-producing sow is usually thin at weaning time. She should not be heavily fed for 2 or 3 days while drying up. After weaning her spring litter, it is usually best to mate for the fall pigs as early as possible, leaving no time for flushing.

#### **BREEDING BACK FOR EARLY PIGS**

Practically all sows are bred after their pigs are weaned. Where it is advisable to breed earlier the pigs can be separated from the sow overnight. A large percentage of the sows will mate successfully about the fifth day of this treatment with no ill effects on the nursing litter.

Some sows will mate and conceive 3 to 5 days after farrowing, but breeding at this time is not generally practiced.

#### **CARE OF THE BOAR**

In commercial production it is often practical to have the boar run with the sows during the breeding season. When hand breeding is practiced, it is desirable to have the boar lot located apart from the rest of the herd so that no hogs will be in adjoining lots.

Young boars sometimes refuse their feed and pace along side of the fence, lose flesh and become gaunt. Penning the ranting boar entirely separate from other hogs, especially sows, may help to keep him quiet. Feeding with a barrow or with a gilt that he has settled stimulates appetite by competition at the feed trough.



Fig. 5. The rope snubbed to a post works best for tusking and "staging" boars. A home-made holder of gas pipe and wire is convenient for holding sows and shotes for ringing.

With yearling or older boars it is advisable and much safer to remove or clip their tusks twice a year, before each breeding season. This may be done by putting a rope around the upper jaw, just back of the tusks (Fig. 5), and snubbing to a post. Use a pair of bolt cutters, hoof trimmers or a pair of large pincers.

As the breeding season approaches, the boar should be kept in moderate flesh and fed on pasture, if possible. It is often convenient to feed the boar the same ration the sows are getting.

When the breeding season is over, the mature boar need only be kept in good, thrifty condition. Young boars may be fed the feed mixtures recommended for growing pigs in the section on feeding.

#### NUMBER OF SOWS TO BREED

The boar pig should not be depended upon for breeding before he is 7 months old. The boar's vitality can be conserved by bringing the sows to a breeding pen when ready and allowing only one service for each sow. A well developed boar 8 months old may be used for two sows the same day, but should not be bred to more than five sows per

week. Older boars frequently mate three sows successfully in one day, but should not usually average more than three sows in two days. In hot weather it is best to breed the sows either in the morning or evening, before feeding the boar.

#### FEEDING THE SOW HERD

During gestation the sow should gain in weight gradually. Young gilts should carry more flesh than older sows at farrowing time. Gilts and sows in thin condition should be fed separately from fat sows so that the daily feed allowance can be so regulated in amount as to keep them gaining steadily usually about 1 pound daily during pregnancy. As a rule, brood sows should receive from 1 to 1¼ percent of their weight in feed daily, and gilts from 1½ to 2 percent of their weight. The sow should come to farrowing in a smooth condition, but not loaded with fat. Fat sows have more udder trouble, are more clumsy and lose more pigs.

It is a serious mistake to feed only corn or other grain without supplement. An adequate supply of **protein, minerals, and vitamins** should be provided for all sows. A **mineral mixture** with trace minerals should be kept available for all sows or 2- to 3-percent mineral be mixed in the feed. As soon as sows are off pasture, at **least 15-percent green, leafy legume meal** should be included in their ration. It is usually ground and mixed with their grain. Mature sows fed a limited feed of concentrates will take enough hay from a rack. Gilts bred for their first litter should receive ½ pound daily of some protein supplement if corn is the only grain and alfalfa is fed in a rack. Bred sows and gilts can be self-fed, provided 50 percent or more of the total ration consists of fibrous feeds like alfalfa and oats. Such a ration should contain at least 33-percent alfalfa meal.

#### WINTER QUARTERS AND EXERCISE FOR SOWS

Portable houses with an open door are satisfactory winter quarters for sows. Several may sleep in one house, but they should not be crowded. The house does not need to be warm if dry and **free from drafts**. Burlap may be hung over the door if desired. To prevent injury to sows heavy with pig, avoid high door sills, crowding and running with other stock.

Daily **exercise** should be required of all pregnant sows. Sleeping quarters should be located 10 to 20 rods or more from the feeding

place. A lack of exercise may be a greater factor than over-fatness in reducing the sow's ability to produce large healthy litters.

Water for sows is too frequently neglected in cold weather. Feeding a thin warm slop, or including a small amount of skim milk in the drinking water, will induce greater water consumption. If sows are self-fed, continuous access to an automatic waterer is highly desirable. Reduced water consumption may cause constipation and poor farrowing results.

### Farrowing Season

1. Before moving the sow into the farrowing house, it should be properly cleaned and repaired. Remove all bedding and filth, sweep the floors and walls and scrub the entire house or pen with boiling lye water. A mixture of 1 can of lye to about 25 gallons of water is recommended.

2. The dimensions of the house or pen should be at least 7 by 7 feet. Large sows need larger pens. Guard rails should be 8 to 10 inches above the floor and 6 to 8 inches from the wall (Fig. 6).



Fig. 6. Hover-type brooder and guard rail. Brooders, guard rails and sloping floors are means of preventing crushing little pigs.



3. After the pen is clean, dry and bedded with bright straw it is ready for the sow.

4. Move the sow to her farrowing quarters about 3 days before she is due to farrow. Before putting her in the farrowing pen, wash her thoroughly with soap and water to remove filth, mud and round-worm eggs. In severely cold weather, wash only the sides and udder.

5. Reduce the amount of feed and add light laxative feeds such as bran, ground alfalfa, middlings or oats to the mixture, avoiding abrupt changes.

6. As farrowing time approaches the sow will become nervous and milk develops in her udder. When these signs of farrowing are noticed, the coarse bedding should be replaced with a small amount of chopped straw or shavings.

7. A caretaker should be on hand as the pigs arrive. If the weather is mild or the farrowing pen comfortable, the attendant's job is one of quiet watching. In cold weather it is necessary to encourage the pigs to remain under a brooder, (Fig. 6) put them in a basket, or provide other means to prevent chilling.

8. It is advisable to clip the naval cord and dip the stub in iodine.

9. With large litters or evidence of pigs fighting for nipples, the needle teeth should be clipped with side-cutting pliers.

### The Sow and Litter

#### REGULATE THE SOW'S FEEDING

The sow should have water, but usually should not be fed for 24 hours after farrowing. A small amount of light laxative ration should be fed the second day. Increase the amount each day until the sow is returned to normal feeding in 7 to 10 days.

#### ORPHAN PIGS

If the sow becomes sick or dies, the problem arises as to how to rear the pigs. The best plan is to induce sows which have litters about the same age or younger to adopt the orphans. The same method may be used to even up large and small litters born about the same time. If the sow notices that she has different pigs, she may be taken out of the pen and the pigs sprinkled with stock dip or powder before her return. Since the sow depends upon smell to identify her own pigs, there is no difficulty from changing pigs of different colors.

If the pigs are to be raised by hand, whole, warm, sweet, cow's milk may be fed every 2 or 3 hours or 5 or 6 times a day. Frequent and regular feeding of small amounts is best for starting the pigs. One-half to one ounce at a feeding is about right to start a pig. Very young pigs can be taught to drink from a shallow dish provided their noses are pushed into the milk.

The sow's first milk or colostrum is necessary to protect the pigs against various infections. It is almost impossible to raise pigs unless they get some colostrum.

Pigs will begin to eat solid food when they are 2 to 3 weeks of age. At this age the milk need be fed only 3 times daily. Care should be taken to supply fresh water at all times.

#### ANEMIA

Anemia is an ailment of young pigs while they are receiving only their mother's milk when confined on cement or wooden floors for more than one or two weeks. Milk is low in iron and copper which are necessary for hemoglobin formation of the blood.

Anemic pigs are pale, lack vigor, become rough-haired, and the skin tends to wrinkle. A large percentage of the pigs die by the time they are 3 weeks old. The recovery for those that survive is slow, requiring 2 or 3 months (Fig. 7).

Feeding a sow minerals will not prevent anemia in young pigs.

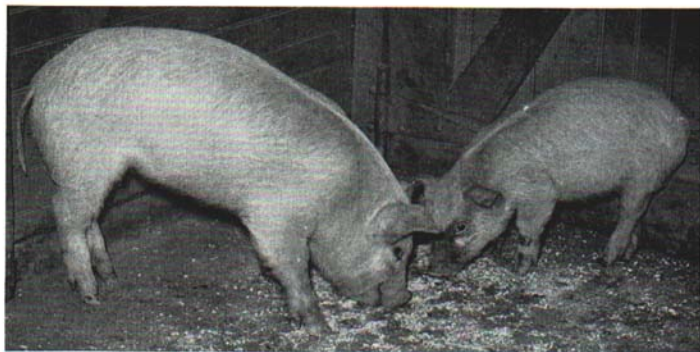


Fig. 7. After-effects of anemia. Pigs 10 weeks old. Anemic pig on right weighs only 20 pounds. Pig on left received iron and weighs 55.

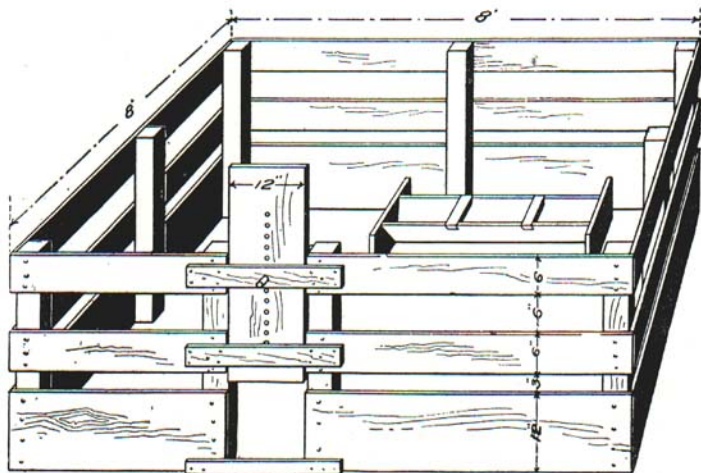


Fig. 8. Feeding pen for small pigs.

It is necessary to get the iron and copper directly to the pigs as early after birth as possible. Anemia can be prevented by: 1) placing the pigs out in worm-free pasture, 2) placing worm-free sod in the pen or 3) swabbing or spraying the sow's udder daily with a solution of  $\frac{1}{2}$  pound of copperas (ferrous sulfate) in 1 quart of water. The addition of about 2 ounces of molasses is desirable so that the mixture will adhere to the nipples.

#### CREEP FEEDING OR SELF-FEEDING

Pigs should be offered some feed before they are 3 weeks old. They can be self-fed with their dams or fed from a separate trough or self-feeder placed in a creep (Fig. 8).

Cracked corn, coarsely ground wheat or barley, and middlings are good feeds for starting pigs in the creep. Protein supplement should be included in their mixture as they approach weaning time. Unless the sows and pigs are on good, succulent pasture, protein supplement should be added to the creep mixture early. The mixtures listed on page 30 for weaning pigs are good mixtures for creep feeding.

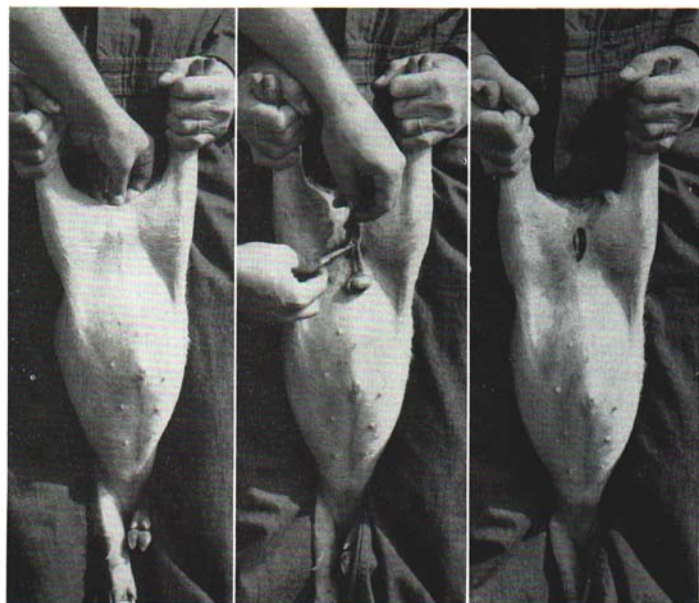
Many producers prefer to self feed the pigs with their mothers. Then mixtures containing approximately 16-percent protein as recom-

mended for growing pigs on page 31 are desirable. Both sows and pigs can be fed free choice, with grain or a mixture of grains in one compartment of the self-feeder and the protein supplement in another.

#### CASTRATION

The advantages of a low, belly incision are 1) desirable drainage and quick closing of the wound, 2) the wound and scar are not visible, 3) the chances for infection and large growths are greatly reduced.

The best time to castrate pigs is at the age of 4 to 8 weeks because they will shrink less and recover from the operation more quickly than at an older age. Warm, bright weather is beneficial. Pigs and quarters



A

B

C

Fig. 9. Castration.

(a) Pig in position for castration.

(b) Incision has been made. Cords are pulled out as far as possible before cutting them off.

(c) Castration is complete. The incision is low and will heal promptly. The operator has not touched any part of the wound.

free from dust or mud will help to prevent infection and complication from the operation.

All that is needed for a successful operation are clean hands, a sharp knife, a brush or sponge and some good disinfectant. Usually a coal-tar dip is satisfactory. Wash the scrotum and area surrounding it thoroughly with the disinfectant before beginning the operation (Fig. 9).

Pigs may be held by the rear legs, gripping the pigs with the knees. With the index and second fingers or thumb crowd the testicles forward (see Fig. 9). With a sharp knife or single edge razor blade make an incision directly between the testicles and pull the cord as far out as possible (Fig. 9). Then cut the cord off. Some healing oil may or may not be applied, but no disinfectant should be poured into the wound.

Ridglings and ruptured pigs can be castrated only by a skillful operator. It is usually desirable to call a veterinarian or sell such pigs for roasting.

#### HOG CHOLERA VACCINATION (See Section on Diseases)

The only permanent safeguard against cholera is vaccination with serum and virus. Pigs may be vaccinated at lower cost when 6 to 10 weeks of age. Since virus can be sold only veterinarians, it is well to consult with the veterinarian when making plans to vaccinate. It is usually desirable to have about 2 weeks elapse between castration and vaccination.

Some swine men are using crystal violet or B.T.V. vaccine to get away from the set-back that sometimes follows double treatment. These vaccines are not effective for 3 weeks after administration and the immunity lasts only a few months.

#### RINGING

After pigs are weaned they should be ringed if they are doing damage to the pasture by rooting. Sows and older hogs often do more damage than weaning pigs. Many breeders prefer to use a ring that is placed through the partition of the nose. If rings are placed in the snout, care should be taken to place the ring just back of the cartilage and not against the bone. A twitch (Fig. 5) or a breeding crate may be used as a means of restraint while ringing.

## WEANING

Pigs are weaned from 5 to 12 weeks of age. The usual weaning age is 8 weeks. If only one litter is raised each year, it is often profitable to leave the pigs with the sows until they are 9 to 12 weeks old. The sows should be removed from the pigs rather than removing the pigs from their familiar feeding grounds.

To prevent swollen or caked udders, feed for the sows should be reduced or eliminated for about 3 days before removing them from the pigs. If the udders become caked and hard, the sows can be put with the pigs for a few minutes to prevent severe udder injury. Trouble often results if one attempts to wean a few pigs at a time because the milk flow continues and the unused udder sections may become caked and hard.

## WATERING

The importance of a constant supply of clean drinking water cannot be overestimated for swine especially for sows and pigs. Milk is over 80 percent water, and the small pig's body is about two-thirds water.

Self-watering devices will furnish a constant supply and are better than depending upon a trough. The most satisfactory watering arrangement is an automatic waterer connected to the pressure system.

## Growing and Fattening Pigs

After the pigs are weaned, they may be hand-fed or self-fed as discussed in the section on feeding. In addition to a constant supply of water, shade and cool quarters are necessary for summer. A tree furnishes the best shade. In case shade trees are not available, an inexpensive artificial shade (Fig. 19) can be provided. Comfortable, roomy quarters free from drafts should be provided in winter. It is often necessary to treat growing pigs against parasites.

## FEEDS AND FEEDING

Hogs, properly fed, excell other meat-producing animals in efficient utilization of feed and very closely approximate the dairy cow in the amount of human food produced from a given amount of feed.

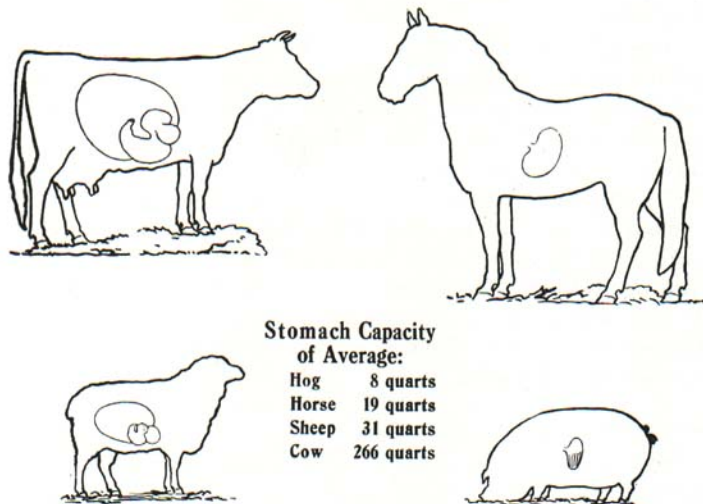


Fig. 10. Comparative stomach capacity of hogs and other livestock.

The rapidity of growth and the small digestive tract of the pig require that he receive a highly concentrated ration. This, plus the fact that swine are frequently raised under confinement, necessitates care in meeting their requirements. Swine are natural grazers, but the green foliage must be succulent, high in protein and vitamins and low in fiber.

The six essentials of a complete ration are:

1. Farm grains or other feeds to furnish heat and energy.
2. Protein supplements to furnish tissue-building material.
3. Mineral supplements to build and maintain bones and teeth.
4. Vitamin supplements to keep the animal healthy.
5. A constant supply of clean water.
6. A relatively low fiber content.

### Grains and Other Fattening Feeds

#### FARM GRAINS

Grains make up the largest part of feed mixtures for swine. The grains most commonly used, in order of importance, are corn (8 to 9 percent protein), oats (12 percent), barley (11.5 percent), and wheat

(13 percent). The grains as a class are rich in energy, but are low in protein, minerals and vitamins. Yellow corn is usually a fair source of vitamin A, and barley is rich in niacin and some other B vitamins. Most swine feed mixtures then consist of a large percentage of grains supplemented with feeds rich in protein, minerals and vitamins.

#### POTATOES

Cooked potatoes give good results when used as a partial substitute for grain. Potatoes are high in energy, but must be supplemented with protein, minerals and vitamins.

It takes about 3½ to 4 pounds of potatoes to equal 1 pound of grain. For best results the proportion of potatoes should not be greater than 4 pounds of potatoes to each pound of concentrates.

Potatoes should be thoroughly cooked since raw potatoes produce poor results.

#### CULL BEANS

Cull beans are often a cheap feed for fattening hogs. They are rich in protein but are not very palatable to swine and must be cooked to give good results. They should not compose more than one-third of the grain ration (on the basis of their dry weight before cooking) for growing shotes weighing up to 100 pounds. They may profitably be increased later to one-half the ration, and when very cheap, may constitute the main part of the hog's feed. Too many beans reduce the feed consumed daily, produce slower gains, and give a poor finish. Pigs fed beans should receive minerals and leafy hay or pasture.

#### GARBAGE

Garbage varies in value, but a ton of municipal garbage produces about 40 pounds of gain. Pigs weighing over 75 pounds do much better on garbage than younger pigs. Feeder pigs should be vaccinated against cholera and treated for parasites before starting on garbage. Avoid overfeeding of garbage at first. A good supply of water is essential.

Concrete feeding floors sloping ½ inch per foot are desirable for sanitation. Supplementing garbage with grain feeding will make for faster gains and improve the carcasses. This may not be economical if grain is high.



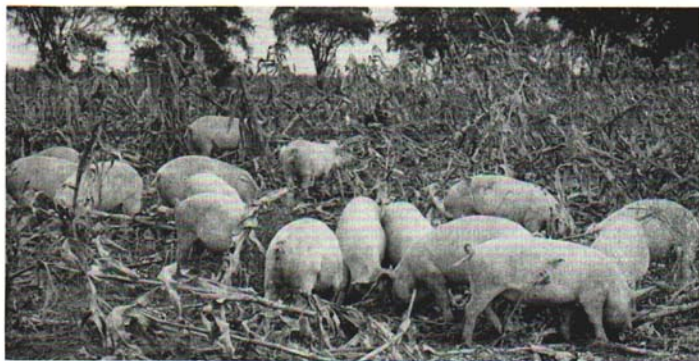


Fig. 11. Hogging-down corn is an economical and labor-saving method of fattening pigs.

#### HOGGING-DOWN CORN

Hogging-down corn is an economical and labor-saving method of fattening pigs. Pigs usually make more efficient use of corn in the field than if the same corn were husked and fed.

Success of hogging-down corn depends upon weight of pigs used, season, character of the soil and other factors. Well grown pigs in average flesh weighing about 100 to 125 pounds seem to be best adapted to hogging down corn. Fleishy pigs should never be turned in the corn field.

The practice is generally more successful during seasons when the weather is reasonably dry. Rainy weather and muddy corn fields reduce returns through loss of grain and may cause pneumonia.

Pigs should be accustomed to corn-field conditions by being turned first into a small patch. A considerable saving of feed is generally effected by then turning the pigs into such a portion of the field as they are likely to clean up in 10 to 14 days.

Pigs in the corn field should be observed closely. The last few bushels of corn disappear fast. Pigs should not be forced to clean up the corn field too closely. Brood sows or stock pigs can clean up any grain left by the fattening pigs.

Pigs on a full feed of corn need some protein supplement. This need may be sharply reduced, however, if the pigs can be given access to a green pasture while they are in the corn.

It is good practice to full-feed the hogs in dry-lot for a week or two after removing them from the corn field. Very economical gains are generally made when a good ration is fed for a short time.

Hogging-down of small grain is regarded as an unsatisfactory practice unless it becomes a matter of salvaging a crop damaged by hail or wind, or when grain is very cheap.

**PROTEIN SUPPLEMENTS**

Protein feeds used for swine may be classified into three groups:

1. Animal by-products—meat scraps (usually 50 percent total crude protein), tankage (55 to 60 percent), fish meal (50 to over 63 percent), meat and bone scraps (50 percent) and skimmilk (dried basis 35 percent).

2. Oil meals—soybean oil meal (41 to 44 percent crude protein), linseed meal (37 percent), and cottonseed meal (41 to 43 percent). Linseed meal and cottonseed meal should be used as only a part of the protein supplement.

3. Milling by-products—wheat middlings or shorts (17 percent crude protein), wheat bran (16 percent), corn gluten meal (24 to over 27 percent), and distiller's dried solubles (25 percent).

A sufficient amount of good quality protein supplement to feed with farm grown grains adds to the profit from swine feeding. Feeding too little or a poor quality of protein means wasted grain and slow gains.

TABLE 2—Protein supplemental mixtures for swine

Mixture	Dry lot			Pasture			
	1	2	3	4	5	6	7
Meat scraps, tankage or fish meal . . .	25	42	12	20	—	48	100
Soybean oil meal* . . . . .	45	32	57	74	90	48	—
Distiller's dried solubles . . . . .	10	—	—	—	—	—	—
Ground leafy alfalfa hay . . . . .	15	25	25	—	—	—	—
Ground limestone . . . . .	2	—	3	4	6	2	—
Steamed bonemeal . . . . .	1	—	1	—	2	—	—
Iodized salt or Trace mineral salt . . . . .	2	1	2	2	2	2	—
Irradiated yeast (per ton) . . . . .	¼	¼	¼	—	—	—	—
Total pounds . . . . .	100	100	100	100	100	100	100
Approximate percentage of protein . . .	40%	40%	35%	40%	40%	46%	50%

\*Up to 25 percent each of linseed, cottonseed or peanut oil meal may be used in place of part of the soybean oil meal.

**Quality Protein**—Some high quality animal protein is desirable for all swine and is practically necessary for drylot-fed pigs up to 60 or 75 pounds. If animal protein supplements are available in limited amounts, they should be used first for weanling pigs and secondarily for breeding stock, particularly for nursing sows. Oil meals and mill feeds are satisfactory protein supplements for fattening hogs over 75 pounds on pasture or when 10-percent legume meal is included in the dry-lot ration.

### MINERALS

The ration for all hogs should include at least 0.4 percent calcium and at least 0.3 phosphorous. Hogs should have about 0.5 percent salt or mineralized salt added to their feed mixtures.

In Michigan where hairless pigs are occasionally born, stabilized iodized salt, mineralized salt or mineralized calcium containing stabilized iodine is necessary in the ration of the pregnant sow, and is desirable in all winter swine rations.

When well-balanced swine rations are fed, in which a part of the protein supplement consists of animal by-products, or when the pigs are on pasture, the simple mineral mixture No. 1 is recommended.

When vegetable protein supplements, such as soybean oil meal or linseed oil meal, are used as the sole or principal source of protein, mineral mixture No. 2 is recommended.

If the swine feeder feels that his pigs need additional minerals, a trace mineral is suggested. Many swine feeders now consider the use of trace mineral mixtures good insurance, especially for winter feeding.

It is suggested that one of the mineral mixtures be included in winter and dry-lot swine rations to the extent of 2 to 3 percent of the entire ration. One percent is sufficient for pigs on pasture if some animal by-products are included in the protein concentrate.

TABLE 3—Suggested mineral mixtures

Ingredients	1	2	3
Calcium carbonate (ground limestone, high calcium marl or oyster shell) (pounds).....	67	33½	33
Salt or stabilized iodized salt (pounds).....	33	33½	33
Steamed bonemeal or defluorinated rock phosphate (pounds).....	—	33½	31 to 33
Trace minerals (may be in salt or calcium carrier) (pounds).....	—	—	1 to 3

Hogs are capable of balancing their rations reasonably well from a mineral standpoint if given free access to the mixtures given in Table 3. Minerals should be protected from the weather and dirt and should be kept before the animals at all times if they are not included in the grain mixture.

#### VITAMIN SUPPLEMENTS

The richest source of vitamins for pigs is growing, succulent pasture. Pasture is rich in vitamin A, members of the vitamin B complex and other important vitamin-like substances yet unclassified. Pigs on pasture also receive an abundance of vitamin D from sunshine. Swine should have access to pasture during as much of the year as possible.

When pigs are not on pasture it is important that they receive an ample supply of pasture substitutes in the form of alfalfa or clover meal (15-percent protein) or a leaf meal (18-20-percent protein). Growing pigs should have 5- to 7-percent high quality legume meal in their feed mixtures when not on pasture. Larger amounts are recommended for older breeding swine.

Fish liver oil and other vitamin carriers are used in swine rations for winter feeding to furnish vitamins A and D. Irradiated yeast is cheap and should be used in winter rations, at the rate of  $\frac{1}{4}$  pound per ton of feed. Some feed companies are including niacin, pantothenic acid, and other members of the B-complex group in feed mixtures.

#### WATER

Water is cheap and abundant. In spite of this fact, the greatest deficiency in swine feeding is a lack of water. The only entirely satisfactory way to furnish water is to have an automatic waterer attached to the pressure system. The waterer should be in the shade during the summer and equipped with some method to keep the chill off in the winter. A constant supply of fresh water of proper temperature on many farms would do much to increase efficiency of gain.

#### FIBER CONTENT

We now know that pigs can handle more fiber than was once thought desirable. Alfalfa meal has been used to the extent of 10 to 15 percent of the total mixture, with good results for thrifty pigs over 60 pounds in weight. This does not mean that pigs thrive on corn and

TABLE 4—Composition of a few widely used hog feeds<sup>1</sup>

	Energy and protein per lb. feedstuff		Inorganic nutrients per lb. feedstuffs				Vitamins per lb. feedstuffs						
	Total digestible nutrients		Calcium	Phosphorus	Sodium	Carotene	Vitamin D <sup>2</sup>	Thiamin	Riboflavin	Niacin	Pantothenic acid		
	Lb.	Lb.	Gm.	Gm.	Gm.	Mg.	I. U.	Mg.	Mg.	Mg.	Mg.	Mg.	
<b>Grain</b>													
Barley	0.72	0.13	0.32	1.45	0.26	0.19	.....	2.71	0.55	30.44	2.84	.....	.....
Yellow corn	0.80	0.09	0.05	1.18	0.13	2.20	.....	2.06	0.60	6.40	3.36	.....	.....
Oats	0.74	0.13	0.45	1.77	0.77	0.05	.....	3.43	0.58	6.50	4.50	.....	.....
Wheat	0.74	0.12	0.23	1.68	0.14	1.15	.....	2.10	0.51	26.74	5.62	.....	.....
<b>Mill concentrates</b>													
Wheat bran	0.58	0.16	0.45	5.20	0.18	1.18	.....	3.24	1.34	139.97	11.33	.....	.....
Wheat middlings	0.59	0.17	0.41	4.04	0.45	1.39	.....	7.00	0.74	52.80	7.10	.....	.....
<b>Protein supplements (plant)</b>													
Linseed meal	0.72	0.35	1.63	3.81	0.45	0.12	.....	5.84	2.75	22.25	3.20	.....	.....
Soybean meal (38-43%)	0.77	0.42	1.32	3.04	0.77	0.10	.....	2.62	1.87	17.60	6.27	.....	.....
<b>Protein supplement (animal)</b>													
Meat scraps (55%)	0.80	0.55	36.15	17.52	2.00	.....	.....	0.55	2.78	.....	3.54	.....	.....
Tankage (60%)	0.70	0.62	32.05	16.89	7.54	.....	.....	.....	0.80	30.40	1.00	.....	.....
Skim milk (fluid)	0.08	0.03	0.59	0.41	0.23	.....	.....	0.21	0.85	0.47	1.63	.....	.....
Fish meal (all analyses)	0.73	0.64	19.00	12.00	.....	.....	.....	0.30	3.40	24.90	3.80	.....	.....
Fish solubles (condensed)	0.42	0.29	.....	.....	.....	.....	.....	2.00	9.80	165.50	18.90	.....	.....
<b>Miscellaneous</b>													
Alfalfa hay (ground) (leafy sun-cured)	0.39	0.15	6.86	0.95	0.41	19.40	750	1.35	5.36	17.70	12.05	.....	.....
Distiller's dried solubles	0.77	0.27	0.30	1.41	.....	.....	.....	2.70	5.20	54.30	8.90	.....	.....

<sup>1</sup>The data in this table are taken largely from publications of the National Research Council and Morrison's "Feeds and Feeding", 21st edition.

<sup>2</sup>Requirements may be largely met by sunshine.

cob meal, fodder, and other fillers and roughages. It is possible to get excessive fiber in rations when including large percentages of oats, bran, alfalfa meal, and the like. The fiber content of inadequate rations should be checked as a possibility of one cause of trouble.

### Composition of Hog Feeds

The composition of a few widely used hog feeds is given in Table 4. No attempt has been made to indicate a range of values which is found in different samples of feeds. The values must be used with knowledge that climate, soil, variety, storage and other factors affect the composition of the feeds.

The grains are deficient in protein, minerals (particularly calcium) and usually in vitamins. Exceptions are that yellow corn contains a fair amount of vitamin A, and barley and wheat are rich in niacin.

The mill concentrates are high in phosphorous and are good sources of some members of the vitamin B complex. The plant protein supplements are reasonably high in phosphorous and low in calcium. Alfalfa hay is included in the table to show its usefulness in supplying calcium, vitamin D, niacin and pantothenic acid. It is almost impossible to produce satisfactory gains in young pigs up to 60 to 75 pounds without some high quality protein and pasture or a substitute in the form of alfalfa or other feeds rich in the same nutrients.

### Gains and Requirements

The normal gain expected of hogs at different weights and the average amount of concentrates required per pound of gain are shown in the following table:

TABLE 5—Performance of hogs under good management and recommended levels of protein

	Weight, lb.	Age, (days)	Average daily gain, lb.	Feed require- ments per lb. gain	Recom- mended percent protein
Suckling pig.....	Up to 35	1 to 56	0.5—0.6	.....	.....
Weanling pig.....	55 to 75	57 to 96	0.9—1.1	2.75—3.25	18—20*
Growing pig.....	75 to 125	97 to 126	1.5—1.7	3.25—3.75	16—18*
Fattening pig.....	125 to Mkt.	127 to 176	2.0—up	3.75—5.00	13—15*
Breeding swine.....	.....	.....	0.75 (Min.)	.....	14—15
Lactating sows.....	.....	.....	.....	.....	15—16

\*When pigs are on pasture the protein can be reduced 2%.

### Free Choice Feeding

Pigs have the ability to balance their own diets when farm grains and protein supplements are fed in different compartments of the self-feeder. With a highly palatable protein supplement, pigs sometimes eat more protein than they need. With an unpalatable supplement they may not eat enough. Shelled corn or ear corn can be fed with the supplement. Oats, barley, and rye should be finely ground. Wheat may be fed whole or ground. A good supplement for swine feeding should contain 35 percent or more protein. A combination of grains is usually more desirable than single grains. Bred sows and gilts can be self-fed if 50 percent or more of the ration consists of alfalfa meal and oats. At least 33 percent of the mixture should be legume meal.

### Feed Mixtures

Mixtures in the tables below emphasize the importance of high-protein rations for small pigs. These mixtures also give the feeder a choice of several feeds. Raising pigs on pasture saves up to 15 percent of the grain and 50 percent of the protein supplement needed in dry lot feeding.

A part of all the corn in the mixtures may be replaced by ground wheat or barley. Ground rye may be used up to 20 percent of the mixture. When small grains are substituted for a part of the corn, a little less protein supplement is needed.

#### Mixtures for Pasture Feeding Hogs of Different Weights

For pigs weighing .....	30 to 75 lb.	75 to 125 lb. or lactating sows & nursing pigs	125 lb. up or breeding stock
Ground corn or other grain.....	58½	71½	90½
Ground oats or middlings.....	20	15	—
Tankage, meat scraps or fish meal	10	6	4
Soybean meal, or other oil meals	10	6	4
Mineral .....	1½	1½	1½
	100	100	100

### Dry Lot Mixtures for Hogs of Different Weights

For pigs weighing .....	30 to 75 lb.	75 to 125 lb. or lactating sows	125 lb. up or breeding stock*
Ground corn or other grain.....	59½	62½	78½
Ground oats or middlings.....	10	10	—
Tankage, meat scraps, fish meal....	12	8	5
Soybean meal or other oil meals....	12	8	5
Ground alfalfa .....	5	10	10
Mineral .....	1½	1½	1½
	100	100	100

\*For bred sows and gilts increase the alfalfa to 15-25% or more.

### Good Management Necessary

Pigs will not make the most profitable use of their feed unless they are free from disease and parasites. In addition, they must have comfortable quarters in winter and shade in summer. Pigs should have a constant supply of water at all times. Water is cheap and even more essential than feed.

### Value of Swine Pastures

Well managed swine pasture is often the most profitable acreage on farms where hogs are raised. Advantages of pasture include:

**Feed saved**—By the use of succulent green pasture, pork can be produced with 10 to 15 percent less concentrates and up to 50 percent less protein supplement.

**Sanitation, parasite and disease control**—Swine sanitation is more easily practiced with pasture feeding than with dry-lot or barn yard feeding. There are usually fewer than 2 percent runts in pasture-fed lots. It is common to find 10 to 20 percent unthrifty pigs in dry-lot or on concrete floor. A well planned pasture program insures against worm infestation and many swine diseases.

**Soil conservation—increasing soil fertility**—It is well recognized that crops used for pasture form one of the most effective means of controlling soil erosion. Experimental evidence indicates that a fat-





Fig. 12. Well developed gilts on alfalfa pasture. Alfalfa is the leading swine pasture crop because of its drought resistance, palatability and long growing season.

tening pig will scatter at least \$1 worth of manure on the pasture. A sow may return \$4 worth or more in a year. A large percentage of the manure from dry-lot feeding is wasted.

**Labor and equipment saved**—Properly used pastures reduce both labor and financial requirements compared with those needed in dry-lot feeding.



Fig. 13. Healthy fall pigs on lush rye pasture in November.

Grazing Crops for Michigan

Pasture crop	Rate of seeding	When seeded	When Available For Pasture													
			Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.		
Rye	6-8 pks.	Late summer or early fall														
Bluegrass	2-5 lb.	Early spring														
Alfalfa or clover	6-10 lb.	Spring or summer														
Alfalfa and Brome grass	6-8 lb. 1-3 lb.	Spring or summer														
Rape and oats	3-6 lb. 1 bu.	Early spring														
Sudan grass	15-25 lb.	Late spring														

**Faster gains and high market**—Pasture-fed pigs gain about 17 percent faster than pigs in dry-lot or on concrete floor. This faster rate of gain means that pasture fed pigs reach market weight 2 or 3 weeks earlier and normally bring 25 to 75 cents more per 100 pounds.

**The Pasture Program**

A good swine pasture program is any combination of pasture crops that supply fresh growing feed from early spring until late fall and includes crops that do not fail in dry hot weather. Clipping is often necessary to keep the pasture crop green and growing. Rye sown in August is gaining in popularity as a crop to extend the length of the pasture season.

**PARASITES AND DISEASES**

**Sanitation Practices**

1. Avoid small, crowded filthy quarters.
2. Provide well drained hog lots.
3. Change pasture each year or use a new ground to control worms.
4. Keep pens clean. Remove manure, corn cobs and dirty litter often.
5. Avoid muddy hog wallows.

6. Use worm-free pasture to the fullest extent.
7. Locate doors and windows so that the sun will shine over as much of the floor as possible.
8. Isolate replacement hogs and feeder pigs brought onto the farm.

### Parasite Control

#### ROUNDWORMS

The most widespread and detrimental internal parasite in Michigan is the roundworm. The practices recommended at farrowing time and for the sow and litter if followed will go a long way toward controlling this parasite. The McLean County System of worm control is generally recommended. It consists of three practices.

1. Washing the sow with soap and water before she is put in the farrowing pen.
2. Having the farrowing pen scrubbed with boiling hot lye water, and
3. Moving the pigs to worm-free pasture as early as possible after farrowing.

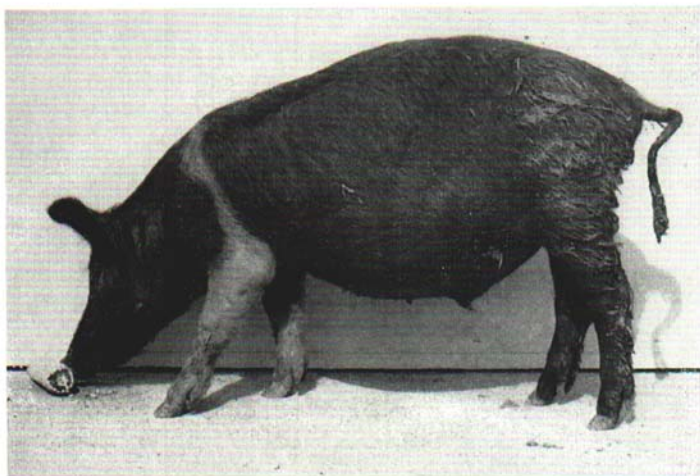


Fig. 14. Pigs raised in dirty barn yards often become loaded with roundworms.

While it is better to prevent infestation, it is sometimes necessary to treat pigs for worms. Older treatments involve drenching with oil of chenopodium or the use of commercial capsules. The latest recommended treatment for roundworms is the use of sodium fluoride.

#### How to Give Sodium Fluoride to Swine

The recommended treatment with this material is to feed the pigs for 1 day on a mixture containing 1 part by weight of sodium fluoride thoroughly mixed with 99 parts by weight of dry ground feed. Smaller amounts can be mixed by using 1 ounce of sodium fluoride with each 6 pounds of dry ground feed. The commercial grade of sodium fluoride is satisfactory and is the cheapest to buy.

The hogs to be treated should not be fed the morning they are given the medicated feed. On the day the animals are treated, they should be given as much of the mixture as they will normally eat in one day. On the day following the treatment the animals are returned to their regular feed. If a small quantity of the medicated feed is left, it may be mixed with a larger quantity of the regular feed. Animals unaccustomed to dry feed should be fed their feed dry several days before the sodium fluoride mixture is fed.

Pigs to be treated should be penned according to size and given sufficient feeding space so that each one will have a chance to eat the medicated feed.

Pigs that are subjected to risks of heavy roundworm infestation may receive considerable benefit from two treatments. Give one treatment soon after weaning and the other when they are 4 to 5 months old. It is not considered advisable to worm bred sows, especially during the last half of the pregnancy period.

#### Precautions

1. Always weigh the feed and the sodium fluoride. Do not guess.
2. Use dry ground feed. Mix thoroughly.
3. Feed medicated feed for one day only.
4. Sodium fluoride is poisonous. Containers should be plainly labeled and stored out of reach of children, household pets and individuals who might misuse it.
5. Prevent worms by following a strict sanitation program and by using clean pastures.

## LICE

The louse is an external parasite which lives by sucking the blood or lymph from the hog. Lice can be seen crawling over the hog's body, especially on the flanks, and back of the ears. Numerous eggs may also be seen, as they are attached to the hairs, very close to the body. Because the louse is a sucking insect, a contact insecticide is needed rather than a stomach poison.

One of the most widespread and economical means of control is the use of crude oil or used crankcase oil. Where a sanitary wallow is provided a small amount of oil on the surface of the water will control lice and help prevent mange. The problem is to get the pig completely covered. Crowd the hogs into a small pen in a corner; then, pour the oil over their backs, using either a sprinkling can or an old broom. The hogs will jump upon each other until the oil has entirely covered them. Freshly oiled pigs are susceptible to overheating and sunburn and should not be driven far in hot weather or placed on pasture without plenty of shade. One-fourth pound of dry lime-sulfur to 3 gallons of waste crankcase oil may be used. This mixture will aid in curing mild cases of mange as well as ridding the hogs of lice.

## SUNBURN

Pigs often sunburn on forage, owing to the moisture in the plants or because their skins become more sensitive to the sun when on forage. White pigs and pigs with white belts or other white areas are more susceptible than pigs with colored hair.

Prevention of sunburn includes: 1) keeping pastures clipped short, 2) providing plenty of shade, 3) keeping the skin healthy by treatment for mange and frequent oiling and 4) by feeding a balanced ration.

Unhealthy skin due to mange or poor feeding may cause pigs to sunburn and makes for slow recovery, so mange control, proper feeding and prevention or treatment of sunburn are related problems. Placing sunburned pigs in a cool barn hastens recovery.

## MANGE

Common mange of hogs is caused by white or yellow round-bodied mites, microscopic in size, that live and propagate in the skin.

In early stages the mites cause small pimples on the belly and sides. Mangy animals are restless and spend much of the time rubbing their sides and scratching their bellies with their hind feet.

In advanced stages the skin becomes dry and thick. Frequent rubbing and scraping leaves bare spots on much of the body. Mange lowers the vitality of the pig, makes for slow, expensive gains and unprofitable production.

#### When to Spray for Mange

Mange is common in Michigan during the entire year. It is very noticeable during the late winter and early spring. If sows are mangy when they farrow the mites will infest the pigs. A control program should include:

1. Checking and treating the sows for lice and mange at least 4 weeks before farrowing to prevent the spread of parasites to the pigs.
2. If the pigs become mangy they should be treated at once. Swine mange quickly causes great injury to small pigs.
3. All hogs should be treated for lice and mange before going into winter quarters.
4. Spraying to prevent mange—prevention is better than cure.

#### Lime-Sulfur Treatment

Mange is difficult to control. Liquid lime-sulfur, 1 part to 18 parts water, as a dip or spray, is commonly used. Repeated treatments at 12- to 14-day intervals are necessary when using lime-sulfur.

#### Directions for Using Benzene Hexachloride for Mange

Benzene hexachloride is very effective as a mange treatment and cures mange in one application. It may be applied as a spray, dip or wash. The hogs should be sprayed in a small pen or enclosure where it is possible to get **good coverage**. The milling movement of the pigs will aid in the penetration and spreading of the spray material.

#### Mix as Follows

1 pound of 10-percent gamma wettable powder in 5 gallons of water—OR

1 pound of 6-percent gamma wettable powder in 3 gallons of water—OR

1 pound of 5-percent gamma wettable powder in 2½ gallons of water.

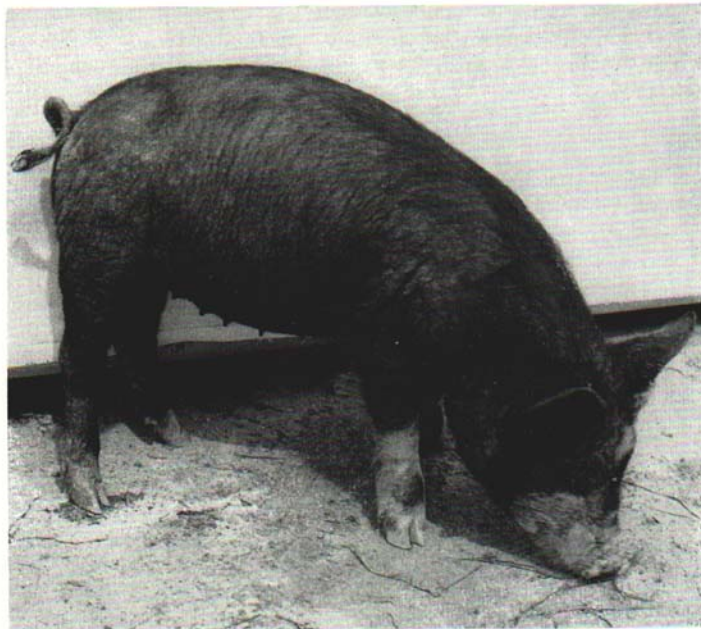


Fig 15. A mangy pig 4 months old, weighing only 30 pounds. Note wrinkled skin and elephant-like hide. Nearly all hogs in Michigan are subject to this disease. Of all swine diseases, it is the most costly to producers.

(The percent gamma isomer in benzene hexachloride is the determining factor in the amount of spray each pound of wetttable powder will make. If a commercial product is used, follow the manufacturer's directions.)

#### Caution

1. Pregnant sows or gilts should not be treated within 30 days of farrowing.
2. It is not recommended to treat hogs within 60 days of slaughter.
3. Complete coverage is necessary even around the head and ears of the hogs.

4. Care must be exercised by the operator not to breathe the powder or mists.
5. Dusts are not recommended.
6. Continuous mixing of the benzene hexachloride in water is necessary for best results unless the wettable form is used.
7. If lumps are present in the material, screening will be necessary.

Benzene hexachloride may be purchased from local drug stores, farm supply stores and elevators under numerous trade names. If you have trouble getting the material consult your county agricultural agent.

### Contagious Diseases

#### HOG CHOLERA

Cholera is still the most destructive disease among swine. This is because swine owners often take a chance if no outbreaks have occurred recently in their community. Cholera is highly contagious. Good feeding and management will not prevent it. Usually, however, well fed pigs do not show as severe reaction to vaccination as sometimes is seen in pigs vaccinated when sick or poorly nourished. Pigs may be vaccinated successfully at a small cost when about 6 to 10 weeks of age. To treat them later is more expensive as they increase in weight. If the herd is to be kept immune from cholera, the pigs should be vaccinated about a week before or soon after weaning.

The single treatment or serum alone is used when only part of the herd is to be vaccinated, or when only temporary immunity is desired. Three weeks is as long a period as one can be reasonably sure of safety after the single treatment.

The double treatment for pigs 6 weeks old or older produces immunity for life. It is cheap insurance against severe loss. Both serum and virus are injected into different parts of the pig's body. A small dose of virus is required and costs but little. The serum dose is proportional to the weight of the hog and so much more of it is required that the cost of double and single treatment is about the same. The double treatment should not be used unless all hogs on the farm are treated or have been previously treated for cholera.

It is necessary to employ a veterinarian to vaccinate hogs in Michigan because by law hog cholera virus is sold only to veterinarians.





Fig. 16. "Nutritional necro." Pigs often show symptoms of necrotic enteritis when on diets largely of corn, low in protein, and have no pasture or pasture substitutes.

#### NECROTIC ENTERITIS

It is now recognized that there are two types of "necro". One form of the disease is not caused by a living organism but by a dietary deficiency. This type of disease is associated with diets largely of corn that are low in protein and diets low in some members of the vitamin B-complex. Feeding mixtures of grains to replace corn, increasing the amount of protein and adding B-vitamin supplements have proved helpful in curing the nutritional type.

The other type is caused by bacteria. Symptoms of this type of enteritis are high fever, lack of appetite, severe diarrhea and in advanced stages bloody diarrhea. "Necro" is more common in weanling pigs from 2 to 4 months of age than in older pigs. In treating necrotic enteritis attention should be given to correcting the diet. If the pigs have a temperature, sulfa drugs prove helpful in overcoming the infection. In many cases the use of drugs is likely to give only a temporary cure unless the diet is corrected.

#### BRUCELLOSIS OF SWINE

Bang's disease is due to a bacterium that causes sows to lose their pigs and produces undulant fever in man.

The disease can be largely prevented by testing three or four times a year and removing all positive reactors. Only breeding animals

from negative herds should be purchased. A good plan to eliminate the trouble in serious outbreaks is to market all animals of breeding age as soon as the pig crop is weaned. Then raise the replacements away from animals that may be spreaders. The replacement boars and gilts should be blood-tested before the breeding season.

#### **TUBERCULOSIS**

Swine are susceptible to the avian or chicken type of tuberculosis and should be kept away from chickens.

#### **ERYSIPELAS**

Erysipelas is a serious disease through much of the corn belt. Fortunately only a few cases have been reported in Michigan. This disease is similar to cholera but is caused by a different organism. The organisms multiply in the soil and in the body of the hog so that it is difficult to get rid of the disease. The symptoms of erysipelas are similar to those of cholera. It may be very acute and kill the pigs in 2 to 4 days, or chronic and long drawn out. In the chronic type few pigs die but they often make poor gains. Other symptoms of chronic erysipelas are sloughing of small diamond-shaped areas of the skin and swollen joints.

Erysipelas responds to treatment with erysipelas serum. Young pigs often respond to erysipelas serum with good results. If the disease becomes firmly established on a farm, it is usually best to move the hogs to clean ground and usually to buy clean breeding stock.

### **Diseases Due to Poor Feeding**

#### **UNDERFEEDING**

Probably the biggest loss to the swine industry in this country is slow unprofitable gains due to feeding too little feed or to a lack of protein, vitamin and mineral supplements.

#### **NECROTIC ENTERITIS**

Necrotic enteritis has been discussed under contagious diseases, but it is now believed that the diet is very important in helping prevent an important type of this disease.

#### **ANEMIA**

The importance of supplying iron to young pigs not having access to the soil to prevent anemia has been discussed under the management of the sow and litter.



Fig. 17. Good feeding and management will prevent most parasite and disease damage. The champion on the right weighs over 250 pounds at 6 months. The runt on the left due to a diet of corn only and a dirty barn yard weighs only 30 pounds at the same age.

#### RICKETS

This disease is caused by too little sunshine or by a lack of vitamin D or mineral in the diet. Recommendations for preventing rickets are discussed in the section on feeding. These recommendations include the use of sun-cured hay and irradiated yeast in winter rations.

#### Miscellaneous Troubles

##### PNEUMONIA

Pneumonia is a secondary disease usually caused by reduced vitality due to dust, damp poorly ventilated quarters or other types of exposure.

Pneumonia is found in about one-third of the pigs that have died and have been brought to the College for autopsy. Providing proper rations and comfortable quarters will go a long way towards reducing these losses.

### CAKED UDDER OR MASTITIS

Swollen, warm, painful udders are usually caused by bruises, cold, damp quarters, overfeeding or attempting to dry up sows without reducing their feed.

Treatment consists of repeated applications of hot water and massage. In severe cases the veterinarian should be consulted.

### CONSTIPATION

Dry hard feces is frequently due to highly concentrated feeds lacking bulk, or to a lack of exercise. Exercise and adding bulky feeds such as alfalfa meal, bran, and oats to the diet may help overcome the trouble.

More trouble is experienced with pregnant sows than with other kinds of hogs. When bulky feeds fail to relieve constipation, give sows a dose of epsom salts, 1 tablespoonful for each 100 pounds of weight.

### HAIRLESS PIGS

When pigs are born without hair, it is usually due to a lack of iodine in the sow's feed mixture. Trace minerals containing stabilized iodine should be used in the rations of swine, especially for pregnant sows.

### PILES

Excessive amounts of fibrous feeds like oats, alfalfa and bran may cause piles in pigs. Unusual strain may also be the cause. Mild cases may be relieved by overcoming constipation and by cleaning the protruded portion with warm salt water and pressing it back into place. Advanced cases require surgical operation.

### BULL NOSE (RHINITIS)

This is a bacterial disease causing sore mouth and nose and deformities or swelling of the nose. There is no good treatment for bull nose, but removing the necrotic tissue from the sores and swabbing the wound with tincture of iodine may help.

### SWOLLEN JOINTS

Swollen joints are likely caused by:

1. Rickets due to a lack of mineral or vitamin D.
2. Navel infection picked up at birth.
3. Swine erysipelas.

## BUILDINGS AND EQUIPMENT

Equipment for swine raising need not be elaborate nor expensive, but it should be practical and efficient. The hogs will do better, and there will be a big saving in time and labor if handy equipment is used. The swine grower should try to have facilities that will best suit his own needs and which are adapted to conditions in that locality.

### Location

The buildings and equipment should be located on ground having good natural drainage. A building on a southern slope with a natural windbreak behind it and a sunny exposure throughout the day is the most satisfactory. All equipment should be far enough away so that odors will not reach the house. The hog lots should be as near the pasture as possible. Many swine men are building inexpensive central houses with pastures on all four sides. Then the building can be used for hogs of all ages.

### Requirements of a Good Shelter

Regardless of the type of hog house constructed, several things should be considered. Hogs do not have the ability to withstand adverse weather conditions as well as do many other farm animals. Warmth is of primary importance at farrowing time. Good ventilation and sunlight aid to maintain the health and vigor of the hog. Dry quarters are essential, for dampness promotes disease. The house should be as convenient for the herdsman and as comfortable and safe for the sow and litter as possible.

It is only good economy to obtain the equipment at as low a cost as possible. However, it should be neat and attractive in appearance and substantially constructed so as to be serviceable for many years.

### Hog Houses

If the hog enterprise is of sufficient size to justify the construction, a large central hog house will be found very convenient for the herdsman. Lights, heat and storage for feed and equipment are more easily provided in it. A central house is usually more expensive than movable cots in caring for the same number of sows. Portable cots are very practical and may furnish all the housing for small swine enterprises of about six sows and litters. A central house is sufficient if large

enough for half of the brood sows, with provision for moving the sows and litters to portable cots on pasture when about a week old. Even fall pigs make as rapid gains and do as well when housed during the winter in portable cots as they do in a central house.

Portable equipment has the advantages that it can be moved for rotation of pasture on exercise lots, costs less per animal housed, can be added one unit at a time as the swine enterprise grows, and spreads the sows so that disturbance in one pen does not annoy the other sows.

### Pig Creeps and Self-Feeders

Little pigs should have all the grain they want at any time. Unless the sows are self-fed so that the pigs can use the feeder also, the pig creep (Fig. 8) should be used after the pigs are 3 weeks old. The pigs may be continued on self-feeders to market weight. Self-fed hogs are likely to gain faster than hand-fed hogs. The feeder should be built to reduce waste to the minimum by protecting the feed from getting wet or rooted out or blown out of the feeder.

When labor and material costs are high the purchase of good self-feeders from a reliable company may be more economical than to build them.

### Hog Waterers

A good hog waterer rivals a self-feeder in saving labor. Producers have observed much better results from self-feeders when there is also a continuous supply of drinking water. There are many good watering devices on the market.

The best plan is to have the waterer attached to the pressure water system. Several types of waterers may be used. One may purchase a commercial waterer or make one with a float to control the water level.

A home-made hog waterer (Fig. 18) made from a barrel and a few planks is very convenient and economical to construct.

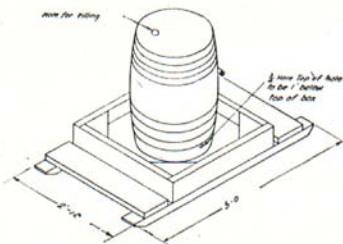


Fig. 18. Home-made barrel hog waterer.

The planks are fitted together so as to form a box in which the barrel is placed. The box should be made so that there will be a 5-inch drinking space between the barrel and the side of the box. The barrel must be air-tight. A hole which is bored in the barrel about 3 inches from the bottom forms an outlet from the water supply in the barrel to the drinking trough. This hole is left open at all times except when the barrel is being filled, when it would be tightly stopped. Fill the barrel to overflowing through the hole in the top; then stopper tightly and open the hole near the bottom. Water will then run out automatically so as to keep the water level just above the hole as long as there is water in the barrel.

### Sunshades

All hogs need protection from the heat during hot weather, for they cannot withstand the heat. If shade trees are not present, sunshades (Fig. 19) should be built. The shade should be about 4 or 5 feet above the ground to permit air circulation. Although sawed lumber makes a neater appearing shelter, brush, poles and straw or

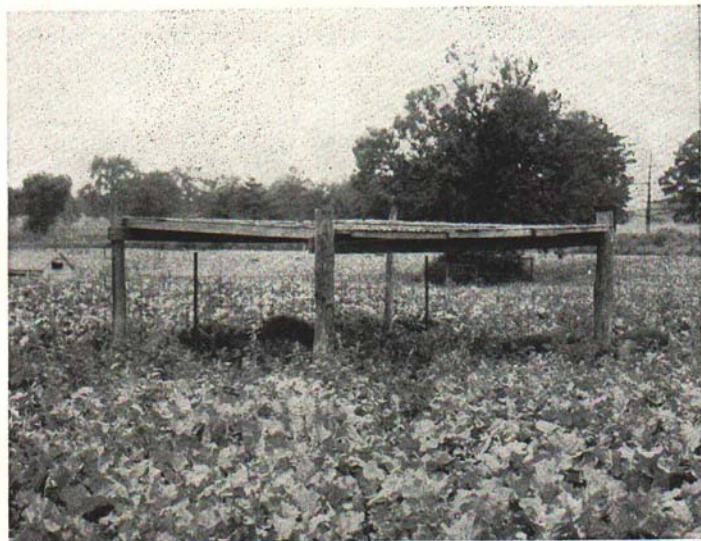


Fig. 19. Shade for pigs. Plenty of shade helps to prevent serious sunburn on rape pasture.



Fig. 20. Loading chute. It is easier to drive hogs through a 20-foot, gradual incline than through a short, steep one.

corn stover may be used with just as good results. Adequate shade does away with the need for hog wallows and is much more sanitary if moved to new ground each year.

#### Loading Chute

A portable chute may be mounted on a pair of old implement wheels (Fig. 20) and set in any convenient place with hurdles or gates for the catch pen. In either case the bottom should have no cracks that pigs can step through, be cleated to prevent slipping, and be narrow enough that market hogs cannot turn around. Twenty to 24 inches is wide enough. The sides should be substantially braced and 30 inches high.

With a little work, it is often possible to make a sod bank into a loading place. When there is other livestock to load on the farm a permanent loading chute with stationary catch pens is desirable.

#### Farrowing Time Equipment

Guard rails and pig brooders (Fig. 6) should be provided as pig savers. Many swine producers are now using the sloping floor in the farrowing pen.



Broom, shovel and a supply of lye come in handy for cleaning the farrowing pen.

A clean tub or basket is handy for such jobs as handling the litter during farrowing, marking, clipping needle teeth.

A brush and soap are needed for washing the sow.

Ear notchers, needle-teeth nippers and a record book are necessary items.

A paint brush or cloth swab on a stick are handy for painting the sow's udder to prevent anemia.