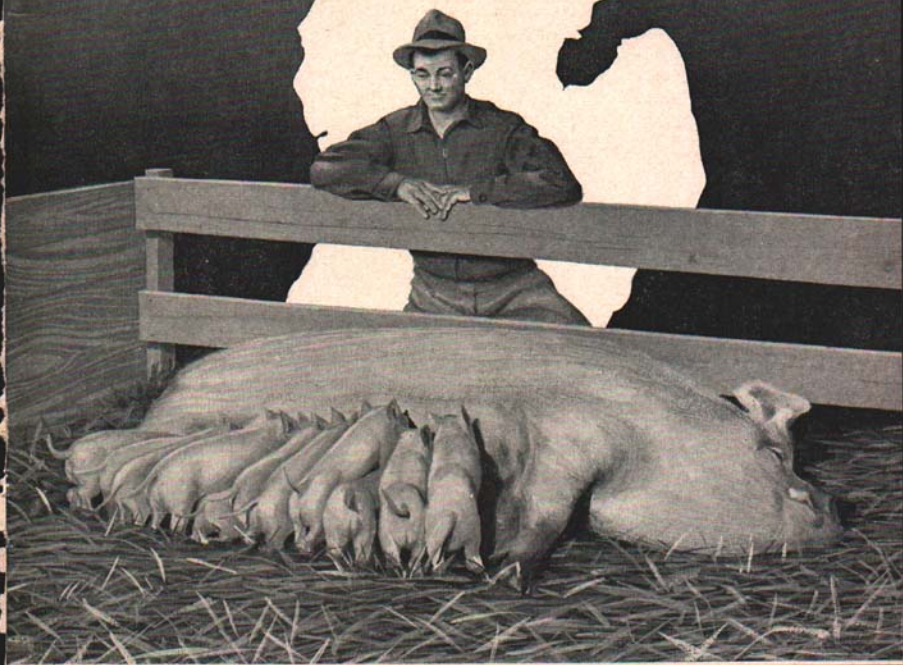


EXTENSION BULLETIN 335

Producing  
**PORK**  
in Michigan



**MICHIGAN STATE UNIVERSITY**  
OF AGRICULTURE AND APPLIED SCIENCE  
Cooperative Extension Service • East Lansing

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# Producing Pork in Michigan

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Today's consumer wants high-quality pork with a high percentage of lean and a low percentage of fat. The swine industry recognizes this and is striving to produce a product which satisfies the demands of the consumer. (Figs. 1 and 2.) From the producer's viewpoint, desirable carcass characteristics must also be associated with prolificacy, fast growth, and efficient feed utilization. Hogs must be produced as economically as possible and at a profit. It is the purpose of this bulletin to outline practices which will help the farmer lower his production costs.

## FACTORS IN SOUND MANAGEMENT

### Selecting Breeding Stock

A profitable brood sow is one that produces a large number of fast growing, good-doing pigs of a desirable type. (Fig. 3.) The

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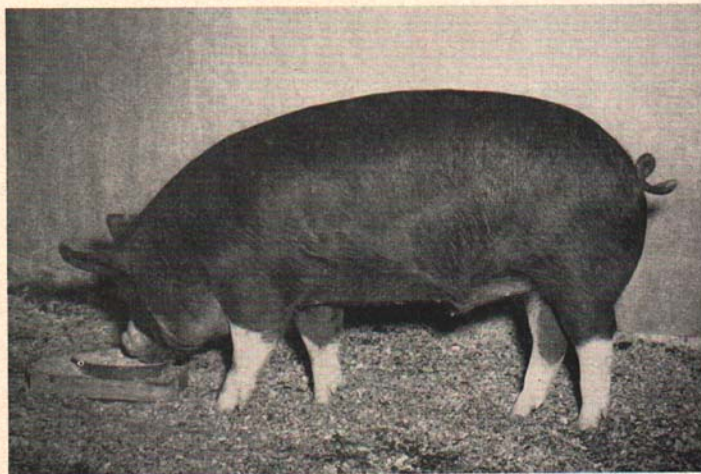


Fig. 1. A typical meat-type hog—medium in length and depth of body without excess finish. A smooth, trim, muscular-appearing hog with a good back, loins, and hams.

individuality of the animal is more important than the breed. When selecting breeding stock, look for *good individuals* from *productive families*. If possible, buy hogs where records are available. Important factors are:

*Size of litters:*

Farrowed—indicates prolificacy.

Weaned—indicates mothering and nursing ability.

*Weight*—evidence of vigor, growing, and doing ability; fast growth is associated with efficient feed utilization.

*Type*—medium or meat type (avoid extremes).

In gilts, look for good length, medium depth, and an evenly arched back. Twelve or more sound udder sections are necessary if large litters are to be raised. Blind nipples are hereditary and constitute a serious unsoundness. Strong bones, straight legs, smooth shoulders, trim jowls, and a fine hair coat are also important.

The boar should likewise be meaty in his type and strong and vigorous in appearance. (Fig. 4.) He will influence the type, and rate and economy of gain of all pigs he sires. He will, also, influence the size of litters of future generations if gilts from his litters are saved for replacement purposes.

### Breeding Systems

A successful breeding program is a carefully planned operation. Several breeding systems are available for the swine producer.

TABLE 1—Some acceptable performance standards

Reproduction	Number of pigs
Pigs farrowed.....	10—12
Pigs weaned.....	8—10
Weight for age	Pounds
Birth.....	3
Three weeks.....	12—15
Five weeks.....	20—25
Eight weeks.....	40—45
Four months.....	120—130
Five months.....	180—200
Six months.....	230—250

*Inbreeding* or *line-breeding* is the mating of sows with related boars. This system is recommended only for experienced breeders, and only in the best purebred herds. It must be accompanied by strict selection. A breeder should not follow this system unless he has an understanding of what it will and will not do. Mating of related individuals is not recommended for the commercial producer.

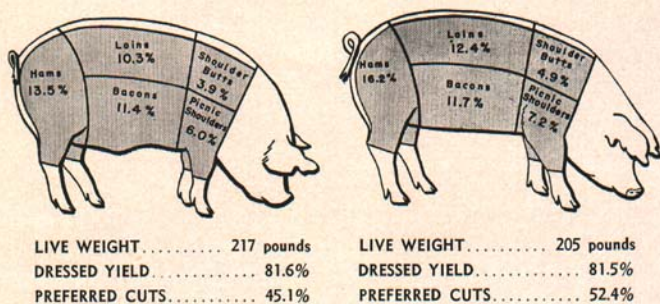


Fig. 2. Comparison of the old and new hogs. "Fat-type" hog (left) was a good specimen by old standards; but new "meat-type" (right) produces more of the preferred cuts at no sacrifice in dressing percentage.

*Outcrossing* is the mating of sows with boars (of the same breed) of different blood lines. This system is recommended for most purebred breeders and for commercial producers who do not wish to crossbreed.

*Crossbreeding* is the mating of sows with boars of different breeds. Practical experience, as well as research at various experiment stations, indicates that this system has advantages for the commercial hog producer. Crossbred pigs are usually heavier at weaning and will reach market weight in less time than non-crossbreds. Figure 5 is an example of how a crossbreeding system operates. This is only one of many crossbreeding programs that could be set up.

Research in swine breeding has resulted in the development of "hybrids" and the establishment of several new breeds. When these animals meet accepted standards of individual excellence and production, they are satisfactory for use. No breeding system will be successful unless it is accompanied by sound and careful selection.



Yorkshire sow.



Bershire sow.



Hampshire sow.

Fig. 3. Good-type prolific sows with milking capacity are the key to high production.



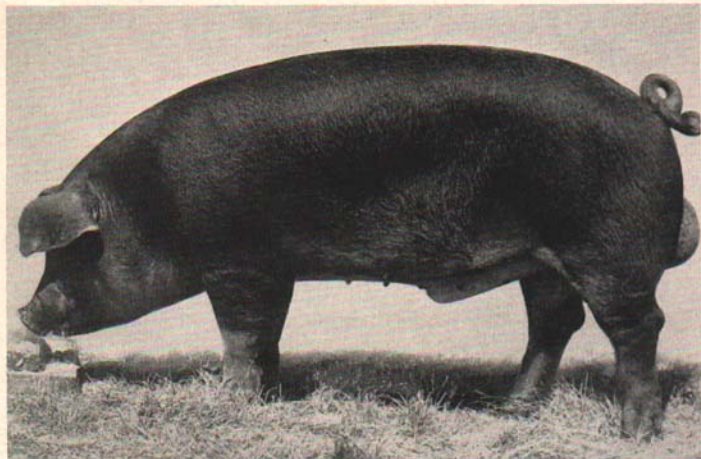


Fig. 4. The boar is half the breeding herd. Select him on the basis of individuality and record.

### Important Records

1. Breeding dates
2. Farrowing dates
3. Number of pigs farrowed and weaned
4. Weights where possible

To keep accurate records, some means of identification is necessary. This may be done by notching the ears in the manner shown in Fig. 6.

### Production Systems

The TWO-LITTER SYSTEM in which sows farrow two litters a year (spring and fall), makes efficient use of the sows. It is usually followed by both the commercial and the purebred producer. When properly conducted, this system puts hogs on the market at the time of seasonal high prices. The two-litter system puts a premium on managerial skill and feeding ability. Where these fail, the two-litter system breaks down.

The spring litter should be farrowed no later than March; the fall litter no later than early September. The early fall litters may be farrowed in portable houses on pasture. Somewhat more elaborate housing is necessary for the early spring litters. Housing costs may

be lowered by grouping portable houses and then using heat lamps as pig brooders.

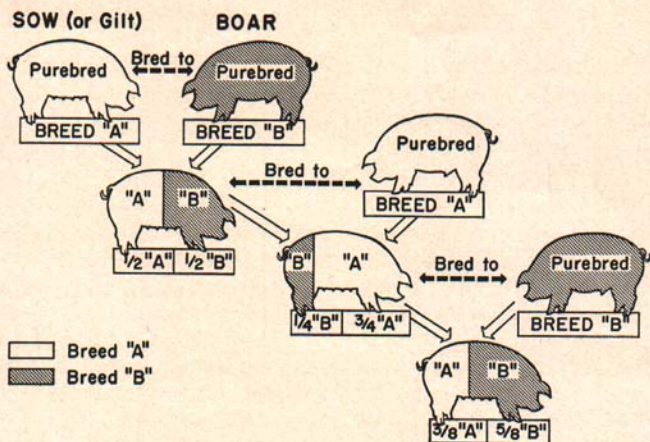


Fig. 5. How cross-breeding works.

As replacements for mature sows in the two-litter program, fall-farrowed gilts have the following advantages over spring-farrowed gilts:

1. Conditions are more favorable when the first litter is farrowed.
2. Costs are lower.
3. Proven sows are made available for spring farrowing.

In the **ONE-LITTER SYSTEM**, gilts are bred to produce a litter during late spring or early summer. Although these pigs are generally marketed at a lower price level, production costs are also lower. This system requires little housing, makes maximum use of pasture, provides for easier parasite and disease control, and makes pigs available to use new corn or to follow cattle in the feed lot. After the pigs are weaned, the gilts are fattened and sold, and a new set of gilts saved or purchased for replacement purposes.

The **MULTIPLE-LITTER SYSTEM**. Those who are in the business of producing feeder pigs or who wish to market at different periods of the year, may follow a practice of having sows farrow throughout the

year. Pigs are weaned early and the sows rebred as soon as possible. Since this system involves many problems in care and housing as well as in feeding, it is generally not recommended for the average producer. Under Michigan conditions, winter pigs are a definite problem.

Some producers use a combination of the ONE- and TWO-LITTER SYSTEMS to insure the most efficient use of their equipment and to spread out their marketing time. Generally, sows are bred to farrow in spring and fall, with gilts farrowing in summer.

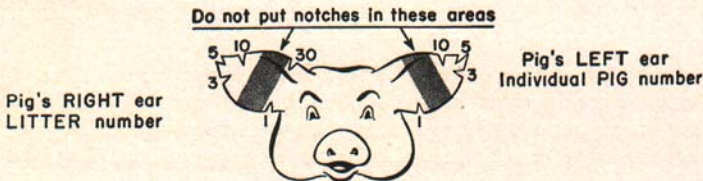
## MANAGEMENT OF THE BREEDING HERD

### Age to Breed

Growthy gilts may be bred at 8 months of age. The boar should be well developed for his age and at least 7 months old when he is put into service. Development means size and scale, not fat. Overfinished animals are poor breeding risks.

### The Breeding Season

For best results, a sow should be in a rapidly gaining condition. Begin "flushing" the sow with a growing ration about ten days before breeding. A sow with nursing pigs may be brought into heat by separating her from the pigs overnight for 3 to 4 consecutive nights. In this way, the sow may be rebred for an earlier litter. It is not a recommended practice to breed sows within 2 weeks after farrowing.



### KEY TO EAR NOTCHING PIGS



Litter No. 4, Pig 6



Litter No. 25, Pig 13

Fig. 6. Ear-notching system for identification of pigs.

A young boar should be limited to light service—not more than 5 sows per week and not more than two in any one day. The vigorous mature boar may breed 2 sows a day. If the boar is allowed to run with the herd, he cannot service as many sows as with the hand-breeding method. An overworked boar may result in small litters and sows not settled.

To conserve the boar's vitality, it is best to bring the sows to a breeding pen and allow only one service per day for each sow. In hot weather, it is best to breed the sows either in the morning or evening and before feeding the boar.

When yearling or older boars are used, it is advisable to remove or clip their tusks twice a year as a safety measure.

Between breeding seasons the boar should be kept relatively thin. As the breeding season approaches, he should be fed so that he is in a vigorous and active condition at the time of service.

Where heavy mature boars are used on gilts, it is necessary to put the gilt in a breeding crate.

Sows usually come into heat 3 to 5 days after pigs are weaned. The heat period continues 1 to 3 days, and occurs about every 18 to 22 days. Sows will accept the boar only during the heat period. To check the sow, drive her along the boar lot fence. Her actions and those of the boar will indicate whether she is in heat.

One service per day is as good as several. However, two services on successive days during a heat period are better than only one.

### **The Gestation Period (See Back Cover)**

Sows farrow from 112 to 115 days after breeding. Accurate breeding dates are important so that the breeder will know when his sows are due to farrow and can plan accordingly. During gestation, provide dry, draft-free shelter. Locate the sleeping quarters 10 to 12 rods from the feeding area to encourage exercise. Plenty of fresh, clean water should be available at all times.

### **The Farrowing Season**

Scrub the farrowing quarters with a mixture of 1 can of lye in about 25 gallons of boiling water or clean with a steam cleaner. Bed the pen with clean litter (chopped straw, shavings, ground corn cobs, and the like). Do not use excess bedding.

Approximately 50 square feet of floor space should be provided for each mature sow. Guard rails should be put about 8 to 10 inches from the floor and wall.

Move the sow to 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 parasite eggs. Pay particular attention to the underline and legs. In cold weather, keep her in a warm place until she is thoroughly dry.

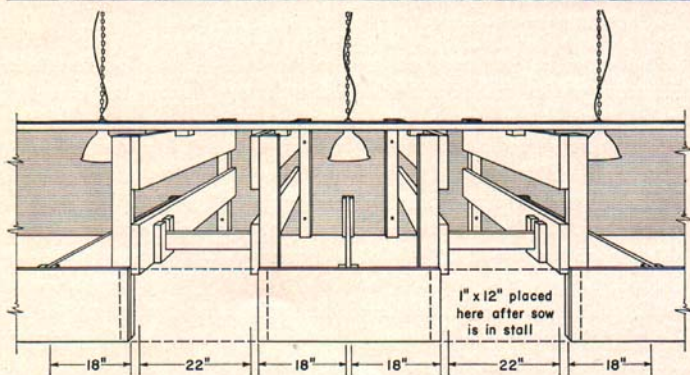


Fig. 7. This type of farrowing pen is practical to construct and makes efficient use of available space. As the working drawing indicates, however, the pen in the photograph has a serious error—for safety reasons, a heat lamp should never be suspended by its electric cord; a separate fastening should bear the weight.



Fig. 8. Clipping needle teeth. This prevents the pig from injuring the sow's udder, or other pigs of the litter.

As farrowing time approaches, the sow will become nervous and milk accumulates in her udder. When these signs are noticed, the sow will usually farrow within 24 hours.

Sows rarely need assistance at farrowing, but it is a good plan to be on hand. Pigs may be saved from being laid upon or smothered, may be assisted in nursing, and placed under a heat lamp to prevent chilling (Fig. 7). The first 24 hours in a pig's life are the most critical.

As an aid in preventing infection, some hog raisers like to clip and tie the naval cord and dip the stub in iodine. Clip the needle or "wolf" teeth to prevent irritation of the sow's udder and injury to the little pigs when they fight among themselves. A side-cutting nipper is an excellent tool for this purpose (Fig. 8).

#### Orphan Pigs

Orphan pigs are a problem to raise. The best plan is to induce sows which have litters about the same age to adopt the orphans. This method may be used to even up large and small litters. If the

pigs are to be raised by hand, commercial sows'-milk replacers are helpful. Follow the manufacturers' instructions. Good sanitation is extremely important. It is almost impossible to raise orphan pigs unless they get some of the sow's first milk (colostrum).

Pigs will begin to eat a fortified pre-starter about 1 to 2 weeks of age. They may be completely weaned from milk at 2 to 3 weeks. Care should be taken to provide fresh water at all times.

### Preventing Anemia

Anemia is a common ailment of suckling pigs when they are confined on cement or wooden floors. It is caused by a deficiency of iron and copper. These two minerals are deficient in sow's milk. Feeding a sow minerals will not prevent anemia in young pigs. It is necessary to give iron and copper directly to the pigs soon after birth. Anemia can be prevented by:

1. Placing the pigs in a worm-free pasture within 7 to 10 days after birth.
2. Keeping worm-free sod in the pen.
3. Swabbing the udder daily with a solution made up of  $\frac{1}{2}$  pound of copperas (ferrous sulfate) in 1 quart of water. The addition of about 2 ounces of molasses makes the mixture adhere better to the nipples. Some hog men like to sprinkle the sod in the pen with this solution.
4. Giving iron tablets to the pig according to instructions.

### Creep-Feeding Pigs

For heavy litters at weaning time, creep-feeding is a must. Creep-feeding stimulates more rapid growth and faster gains. It also aids in preventing setbacks at weaning time. Recommendations for creep rations may be found in the section on feeding.

## FROM WEANING TO MARKET

### When to Wean

Pigs are usually weaned at 8 weeks. If a good creep ration has been used, well-grown pigs may be weaned at an earlier age. Under certain conditions, using the most modern fortified pig starters, the pigs may be taken from the sow at 1 to 2 weeks. This type of program involves the use of special rations. Early weaning has a number of advantages when a two-litter system is followed.

### **Castration**

There is usually very little shock or setback when pigs are castrated at 3 to 5 weeks. Pigs and quarters should be cleaned to prevent infection. During hot weather, place the pigs in a cool, well-shaded area. If insects are particularly numerous, use a fly-repellent.

Castration is a simple operation. All that is needed are clean hands, a sharp knife or razor blade, and some disinfectant. A coal tar-dip or pine oil is satisfactory. Wash the scrotum and area surrounding it with disinfectant before beginning the operation.

The belly incision is popular for castrating pigs. In this method, hold the pigs by the rear legs as shown in Fig. 9. Crowd the testicles forward with the index and second finger and make an incision directly above each of the testicles. Pull the cord out as far as possible and scrape in two with the knife. Some healing oil may be applied. No disinfectant is needed on the open wound. The advantages of a low-belly incision are:

1. Desirable drainage and quick closing of the wound.
2. The scar is not visible.
3. Chances for infection are decreased.

### **Vaccinating for Cholera**

The only real safeguard against cholera is vaccination. Vaccination is easier and costs less when the pigs are light in weight. It is usually desirable to have about 2 weeks elapse between castration and vaccination. Vaccination must be done by a veterinarian. (See section on diseases.)

### **Ringling**

Ring pigs that are to be placed on pasture. Ringling helps stop rooting. This not only prevents damage to pasture, but reduces the chances for picking up parasites. Care should be taken to place the ring just back of the cartilage and not against the bone. Some prefer to use a ring that is placed through the partition of the nose, since it will not interfere as much with the operation of a self-feeder.

## **FEEDING**

The biggest single item in the cost of swine production is feed. Reliable estimates indicate that feed accounts for about 80 percent of the total cost. A well-balanced, properly fortified ration saves feed.





Area is disinfected before starting. Operator uses sharp knife or razor blade. Helper holds pig by hind feet, gripping the head between his knees.

Pig's testicles are crowded forward and incision made above each one. Cord is pulled out as far as possible and cut.



No disinfectant is needed on the open wound. Wound closes quickly without visible scars.

Fig. 9. The steps in belly castration.

Hogs are fast-growing animals and are fed heavily on concentrate feeds (especially cereal grains). They need balanced rations—balanced for nutrients rather than for ingredients (Fig. 10).

### Swine Rations

CORN is the most widely used of all hog feeds. It is palatable and high in energy, but low in protein and minerals, especially calcium. Corn is somewhat deficient in the B vitamins. Yellow corn contains some vitamin A in the form of carotene. Corn is an

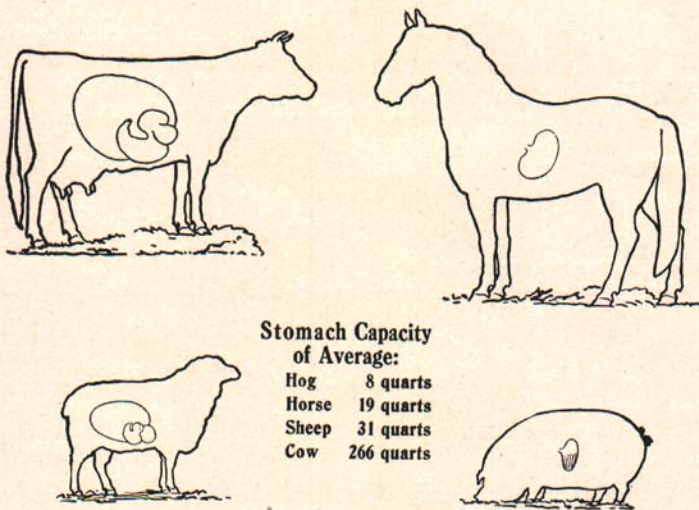


Fig. 10. Hogs must be fed concentrate type rations because of their relatively small digestive capacity.

excellent fattening feed if properly supplemented with the needed proteins, minerals, and vitamins. It may be fed on the ear, shelled, or ground. Ground ear corn, due to its high fiber content, is not a good fattening feed. It is satisfactory for brood sow rations where bulk is needed.

BARLEY has about 90 to 95 percent of the feeding value of corn. It can be used to replace all the corn in the ration. Scabby barley should not be fed to hogs.

TABLE 2—Value of corn-substitutes for fattening hogs

Feed	No. of bushels in a ton	Relative fattening value	Approximate value per bushel when a bushel of corn is worth:				
			\$1.00	\$1.25	\$1.50	\$1.75	\$2.00
Shelled corn.....	35.7	100	\$1.00	\$1.25	\$1.50	\$1.75	\$2.00
Ground wheat.....	33.3	105	1.13	1.40	1.68	1.96	2.25
Ground barley.....	41.7	90—95	.79	.98	1.18	1.38	1.58
Ground rye.....	35.7	90	.90	1.12	1.35	1.48	1.80
Ground oats.....	62.5	70—80	.43	.53	.64	.75	.86

OATS vary in feeding value according to the amount of hull or fiber. Usually oats are worth only 70 to 80 percent as much as corn. Heavy, plump oats with a high percentage of kernel may approach corn in feeding value. Grind oats for best results. In fattening rations, limit the amount to not more than 25 percent of the ration. For breeding animals, the amount fed can be much higher.

HULLED OATS, due to a low fiber content, have a very high feeding value. ROLLED OATS are especially good in creep rations.

WHEAT in the fattening ration is worth about 5 percent more than corn. However, this added value is offset by the fact that wheat should always be ground and is usually higher in price. For best results, wheat should be fed in combination with other grains.

RYE is a rather unpalatable feed and should not make up more than 20 percent of the ration. When used in limited quantities, it has 90 percent of the feeding value of corn. *Rye which contains ergot should never be used.*

SALVAGE GRAINS. Grains in storage or intended for industrial use are sometimes damaged by fire, smoke, water, mechanical injury, sprouting, discoloration, shrinkage, etc. The feeding value is dependent upon the extent of the damage. In most cases, salvage grains are suitable swine feed.

BAKERY WASTES may be substituted for a part of the grain portion of the ration. Bread, the most commonly used bakery waste, contains about 30 percent moisture and has about three-fourths the feeding value of corn. Bakery wastes have about the same deficiencies as the cereal grains and should be supplemented accordingly.

POTATOES must be cooked for best results. When potatoes are thoroughly cooked and supplemented with protein, minerals, and vitamins, it takes from 3 to 4 pounds to equal 1 pound of grain. Cooked potatoes should not exceed two-thirds of the total ration.

CULL BEANS should be cooked and the amount fed limited to 25 to 30 percent of the ration. Although cull beans are fairly high in protein, there is need for additional good quality protein as well as minerals and vitamins. Lack of palatability seems to be one of the limiting factors in the use of cull beans.

WHEAT BRAN is a bulky, slightly laxative feed frequently used in brood sow rations. It is particularly good during the farrowing season. Because of its high fiber content, it is not a good fattening feed.

WHEAT MIDDINGS are used in many swine rations. Best results are obtained when the amount fed is limited to 20 percent of the rations.

SOYBEAN OIL MEAL (41 to 44 percent protein), because of its high quality and usually economical cost, is widely used in the corn belt. Low in both vitamins and minerals, it should be supplemented. Soybean oil meal is one of the most palatable of all swine feeds.

RAW SOYBEANS may be used to a very limited degree in swine feeding. They are not a satisfactory substitute for soybean meal.

LINSEED OIL MEAL (35 percent protein) is a slightly laxative tonic feed. It is most valuable in brood sow rations at farrowing time and in fitting rations. It should be used with other sources of protein.

COTTONSEED OIL MEAL (41 to 43 percent protein) should not be used as the only source of supplemental protein. It may be used to replace part of other vegetable proteins.

TANKAGE, MEAT SCRAPS, ETC. are packing plant by-products that are rich in protein (50 to 60 percent) as well as calcium and phosphorus. Being of animal origin, these products also contain variable amounts of vitamin B<sub>12</sub>. Both tankage and meat scraps are improved by mixing with plant protein supplements, such as soybean meal, and by the addition of B vitamins.

FISH MEALS vary in composition and feeding value. In general, they are rich in good quality protein. They are also good sources of calcium, phosphorus, and vitamin B<sub>12</sub>.

FISH SOLUBLES, and SEMI-SOLID or LIQUID FISH are by-products used by commercial feed manufacturers.

SKIM MILK is an excellent supplement to the cereal grains. When skim milk is fed in limited amounts (one-half to one gallon), 100 pounds are approximately equal in value to one-half bushel of corn or 12 pounds of protein supplement. One gallon of skim milk is equal to about one pound of protein supplement.

UNDILUTED BUTTERMILK has practically the same feeding value as skim milk.

WHEY is much lower in protein than skim milk and, therefore, has about half of the feeding value. It is better for older pigs than for young ones.

SEMI-SOLID and DRIED MILK PRODUCTS are excellent supplements and their value is directly related to the dry matter content. These products have their greatest value in pig starters, in feeding of unthrifty pigs, and in fitting animals for show.

*Liberal use of dairy products will help control internal parasites.*

ALFALFA MEAL is a substitute for pasture; its quality will vary directly with the quality of the alfalfa processed. Age and storage are also important. Since alfalfa is bulky (25 percent fiber), the amount fed to young pigs should be limited to 2 to 5 percent. For older hogs, the amount fed may be increased—ranging from 5 to 10 percent for market hogs, to as much as 50 percent for brood sows being self-fed during gestation. Second-cutting alfalfa hay of superior quality, fed either in a rack or as ground alfalfa, may be used as a substitute for commercial alfalfa meal.

### Minerals

In general, all swine have a high mineral-requirement. Limestone, bone meal (or dicalcium phosphate), and iodized (or trace mineralized) salt are the ingredients most generally used in mineral mixtures. Marl that is high in calcium may be substituted for limestone. For a mineral supplement, these three ingredients may be mixed in the proportion of 40-40-20. Minerals may be fed in a number of ways with satisfactory results. They may be mixed with the complete ration at the rate of 1 to 3 percent, added to the supplement at the rate of 8 to 10 percent, or self-fed (either mixed or free-choice).

Hogs need 0.5 percent salt in the ration, and in Michigan it is important that this salt be iodized. Feeding block salt as the only source of salt is not a recommended practice.

The need for trace minerals, other than iodine, has not been established on a uniform basis for the state. However, in areas of known trace mineral deficiencies, it is a sound practice to include some trace mineral carrier.

Pigs enjoy eating coal or charcoal, but numerous experimental tests show little or no value for these products.

### Vitamins

VITAMIN A is found in the form of carotene in yellow corn, green pasture, and alfalfa meal. It is also found in fish liver oil. Vitamin A is necessary for health and normal reproduction. Whenever swine are raised without pasture, the vitamin A content of the ration should be checked.

VITAMIN D is necessary to prevent rickets, a condition observed frequently on Michigan farms in winter and early spring. Vitamin D is obtained from sunlight, sun-cured hay, fish liver oils, and irradiated yeast. One-fourth to one-half pound of irradiated yeast, added to one ton of complete feed, will meet the vitamin D requirements of the pig.

**B VITAMINS.** Symptoms of a lack of B vitamins are slow growth, scouring (nutritional enteritis), "goose stepping," skin diseases, and poor reproductive performance. Riboflavin, pantothenic acid, niacin, and B<sub>12</sub> are the vitamins most likely to be lacking.

B vitamins are most commonly found in green pasture, alfalfa meal, fish solubles, distiller's solubles, and milk products. Vitamin B<sub>12</sub> is found occurring naturally in animal protein material, with condensed fish solubles being one of the best sources. Vitamin preparations are also available commercially in concentrate form.

### Antibiotics

The advantages most frequently associated with antibiotic feeding are faster growth, improved feed efficiency, increased appetite, less scouring, and greater uniformity of growth. The greatest response to antibiotic feeding is noticed in young pigs and in unthrifty pigs.

The amount of antibiotic needed will vary with conditions but, in general, it is decreased as the pigs get older and heavier. (Table 3.)

TABLE 3—Recommended antibiotic feeding levels

Type of feeding	Complete mixed ration		35% supplement
	Per pound	Per ton	Per ton
	<i>mg.*</i>	<i>gm.†</i>	<i>gm.</i>
Sick pigs.....	50	100	.....
Runt pigs.....	20	40	.....
Pig starters.....	20	40	.....
Regular creep ration.....	10	20	.....
Weaning to 100 lb. weight.....	5—7	10—14	40—50
100 lb. to market weight.....	3	6	30—50

\*Milligrams of actual antibiotic.

†Grams of actual antibiotic.

The antibiotics most commonly used in swine feeding are aureomycin, terramycin, and penicillin. Others will undoubtedly be added to this list as research develops. When using antibiotics for home mixing, follow the manufacturers' directions. Because of the difficulty in mixing the small quantities required, antibiotics are usually obtained in commercial swine supplements.



Fig. 11. Healthy fall pigs on lush rye pasture in November.

### Pastures

A well-planned pasture program will go a long way toward insuring profits from the swine operation. (Fig. 11.) These are the benefits associated with high quality hog pasture:

1. A saving of 5 to 15 percent of the grain, and 15 to 50 percent of the protein.
2. Parasites and diseases are more effectively controlled.
3. Less labor and equipment are needed.
4. Reproductive performance is improved.
5. Meatier hogs may be produced.
6. Soil fertility is improved.

Make the grazing season as long as possible. The best program involves the use of several crops in rotation. These should be managed to keep the growth green and succulent throughout the season. Figure 12 gives the growing season of Michigan pasture crops. Carrying capacity of pastures will vary but, when hogs are on full feed, a good rotation pasture should carry at least 20 head per acre. Restricting feed in any way reduces the carrying capacity.

MICHIGAN PASTURE CROPS RECOMMENDED FOR SWINE

Grazing Season for Michigan Pasture Crops												When Seeded	
Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.		
													Late summer or early fall
													Early spring
													Spring or summer
													Spring or summer
													Early spring
													Late spring

Fig. 12. Grazing seasons for principal Michigan pasture crops.

Permanent pastures may be a potential parasite and disease hazard. Sun scald is sometimes a problem with grazing hogs. This can be controlled by keeping the pasture clipped and providing shade.





Fig. 13. Rape is one of the good pastures for hogs.

Rape is an excellent temporary or emergency pasture (Fig. 13), but may cause sun scald if grazed when wet or allowed to get too rank. Light-skinned hogs are generally more subject to sun scald than are dark-skinned hogs.

### Methods of Feeding

In general, self-feeding saves labor; and, in the case of market hogs, gains are faster. Free choice feeding is simple and easy and, with certain feeds, this method works well. However, if the supplement used is very palatable, the pigs will eat more than they need, thus increasing the cost. If the supplement is unpalatable, they will not eat enough to meet their requirements. A properly formulated mixed ration is often more efficient for pigs weighing less than 100 pounds.

The rate of gain or condition may be controlled by hand feeding. The same thing can be accomplished by self-feeding a ration made bulky by the addition of large quantities of high fiber feed, such as alfalfa, oats, wheat bran, corn and cob meal, etc. Whenever low-quality, high-fiber feeds (such as corn cobs) are used, care must be taken to balance the ration for needed nutrients.

### Feed Preparation

Feed preparation is justified whenever the feed saved, or the increased rate and economy of gain, pays for the added cost. Corn does

not have to be ground unless it is very hard or is to be mixed with the rest of the ration. The other cereal grains should be ground.

Soaking feed is not a good substitute for grinding.

Although alfalfa hay may be fed in a rack (Fig. 14), it is more desirable to grind it fine and mix it with the ration or supplement.

The practice of slop feeding usually does not justify the inconvenience and added labor involved. This is particularly true for the commercial feeder.

A pelleted feed is more palatable and is consumed with less waste than one finely ground.

#### SUPPLEMENTS FOR SWINE FEEDING

In swine feeding, the primary function of the supplement is to correct the deficiencies of the cereal grains. These supplements may be either home mixed or purchased as commercial feed. For those feeders who wish to mix their own supplement, Table 4 gives some suggested formulas. The rations recommended in this bulletin can be modified, provided that the nutrient requirements are met.



Fig. 14. Good quality, leafy legume hay can be fed to breeding stock in an open rack.

TABLE 4—Suggested supplements for swine feeding\*

Supplement No.....	1	2	3
Ingredients	Recommended for:		
	Bred sows, sows and litters, weanling pigs	Market hogs	
		In dry lot	On pasture
	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>
Soybean meal.....	580	530	770
Tankage or meat scraps.....	150	150	100
Fish meal.....	50	50	...
Alfalfa meal.....	150	150	...
Limestone.....	...	40	50
Dicalcium phosphate or bonemeal.....	40	50	50
Trace mineralized salt.....	30	30	30
Irradiated yeast (Vitamin D)† .....	<i>Million units</i>	<i>Million units</i>	...
	1	1	
Antibiotics.....	<i>Grams</i>	<i>Grams</i>	<i>Grams</i>
	30	20	20
B vitamins.....	‡	‡	...
B <sub>12</sub> .....	<i>Mg.</i>	<i>Mg.</i>	<i>Mg.</i>
	25	25	25
	1,000	1,000	1,000
Estimated protein (percent).....	38%—40%	38%—40%	48%—50%

\*These supplements may be fed mixed with the ration, or fed free-choice.

†Omit vitamin D if hogs are exposed to direct sunlight daily.

‡Use commercial vitamin concentrate supplying riboflavin, pantothenic acid, and niacin according to manufacturer's instructions.

#### FEEDING THE BROOD SOW DURING GESTATION

The feeding of the pig begins at breeding and not at farrowing time. His weight and vigor at birth depends largely upon how the sow was fed during gestation (Table 5). The sow should be kept in medium flesh. Too much fat means wasted feed and trouble at farrowing time. A general rule for hand feeding is to give the average sow 1 to 1½ pounds, and the gilt 1½ to 2 pounds of feed per hundred weight per day. The actual amount fed will be determined by the animal's condition. The sow will usually need to gain from 75 to 100 pounds during the gestation period. Exercise should never be overlooked.

Many prefer to hand-feed the bred sow, but the practice of self-feeding is increasing. High fiber feeds must be included in the self-

TABLE 5—The effect of weight at birth on development of pigs from birth to weaning\*

Weight of pig at birth	Percentage born dead	Percentage weaned	Average weaning weight
<i>Pounds</i>	<i>Percent</i>	<i>Percent</i>	<i>Pounds</i>
1.00	46.43	0.00	0.00
1.25	14.02	1.87	8.63
1.50	15.93	12.96	18.42
1.75	7.90	34.02	19.97
2.00	6.08	49.26	20.91
2.25	4.33	63.34	22.78
2.50	4.38	67.40	24.49
2.75	3.54	74.16	26.24
3.00	4.14	77.32	27.50
3.25	2.73	82.45	29.39
3.50	3.05	85.68	30.22
3.75	2.80	83.91	30.86
4.00	1.08	83.87	34.72
4.25	3.57	85.72	36.72
4.50	0.00	100.00	30.00
4.75	0.00	100.00	38.67

\*From Indiana Agricultural Experiment Station Bulletin 413.

fed rations. As the condition of the animal changes, it may be necessary to change the feed proportions. Table 6 gives some suggested rations for bred gilts and sows.

TABLE 6—Suggested gestation rations

Ingredients	Gilts		Sows	
	Hand-fed	Self-fed	Hand-fed	Self-fed
	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>
Corn (barley, wheat).....	450	300	450	230
Oats (middlings, bran).....	250	300	300	350
Alfalfa meal (hay).....	150	300	150	350
Supplement No. 1 (See page 27)	150	100	100	70
Total (pounds).....	1,000	1,000	1,000	1,000
Estimated protein (percent).....	15.1	15.1	13.9	14.8

If facilities do not permit mixing of the feed, sows (gilts) in dry lot may be hand-fed as follows: corn and oats according to condition, alfalfa hay in a rack, and three-fourths pound of supplement No. 1 (page 27) daily.

## FEEDING DURING LACTATION

To prevent a feverish condition and excess milk production during the first week after farrowing, make liberal use of bulky feeds, such as wheat bran. Begin feeding the sow a mixture of one-half wheat bran and one-half regular ration a few days before farrowing. On the day she farrows, the sow needs only water. For the next few days she may be given limited quantities of the same ration she received prior to farrowing. Then, this ration is gradually changed to a more concentrated one and, if normal, the sow should be on full feed in 7 to 10 days after farrowing. The ration may then be hand-fed or it may be self-fed. Care should be taken not to force the sow too fast during the first 10 days after farrowing. It is during this time that caked udders and scouring in pigs are frequent problems. Once the sow is on full feed, stimulate maximum milk production by giving her all she will eat. Good milking sows on full feed will eat twice as much feed (3 pounds per hundred weight) as they did during gestation.

TABLE 7—Lactation rations

Ingredients	Amounts	
	1	2
Corn (barley, wheat).....	600	700
Oats.....	200	...
Wheat standard middlings.....	...	150
Supplement No. 1 (See page 27)	200	150
Total (pounds).....	1,000	1,000
Estimated protein (percent).....	15.5	15.0

Posterior paralysis used to be a common problem late in the lactation period, with thin, heavy-milking sows nursing large litters. This condition may be prevented by feeding well-balanced rations, containing adequate amounts of minerals and vitamin D.

If the weather is such that the sow and litter cannot be turned on good pasture within 7 days after farrowing, steps should be taken to prevent anemia. (See page 15.) Feeding the sow minerals will not prevent anemia in suckling pigs.

Table 7 gives some recommended lactation rations.

## CREEP-FEEDING

Creep-feeding of pigs is a desirable practice. It supplements the declining milk flow of the sow and results in heavier, more uniform pigs at weaning time. This practice is necessary in those cases where pigs are to be weaned early, or when the sow is a poor milker. Creep rations should always be of the best quality, and should be very palatable. Table 8 gives some suggested creep rations.

TABLE 8—Suggested creep rations

Ingredients	Amounts		
	1	2	3
	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>
Corn (coarse ground).....	300	450	550
Rolled oats.....	300	300	...
Sugar.....	100	...	...
Oats (finely ground).....	...	...	100
Wheat middlings.....	...	...	50
Supplement No. 1 (See page 27)	300	250	300
Antibiotics (grams).....	5	...	...
Total (pounds).....	1,000	1,000	1,000
Estimated protein (percent)....	18.6	18.0	18.1

Start feeding creep rations when the pigs are between 1 and 2 weeks of age. It sometimes works best to free-choice feed shelled

TABLE 9—Suggested rations for pigs—weaning to market

Ingredients	Weaning* to 75 pounds		75 pounds to market weight	
	Dry Lot	Pasture	Dry Lot	Pasture
	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>
Corn (barley, wheat).....	600	700	730	800—850
Oats (middlings, bran).....	150	100	150	100
Supplements†.....	(No. 1) 250	(No. 1) 200	(No. 2) 120	(No. 3) 50—100
Total (pounds).....	1,000	1,000	1,000	1,000
Estimated protein (percent)....	16.4	14.9	13.0	10—12.0

\*If pigs are weaned at less than 30 pounds in weight, the amount of supplement should be increased.

†See page 27.

TABLE 10—General summary of feed requirements with average-to-good performance (dry lot)\*

	Grain	Supplement	Total	Feed per day	Number of days	Daily gain	Feed per 100 pounds gain
	Pounds	Pounds	Pounds	Pounds		Pounds	Pounds
<i>Breeding to weaning</i>							
Gestation							
300 pound gilt....	650	100	750	6.5	112-115	0.75-1.0	....
Lactation (+ creep)							
Sow + 8 pigs....	634	150	784	†14.0	56	....	....
TOTAL.....	1,284	250	1,534	....	....	....	....
<i>Weaning to market</i>							
Average per pig weaned (8).....	160.5	31.2	†191.7	....	56	0.6	§548
Weaning to 75 pounds.....	81.0	27.0	108.0	3.3	33	1.2	270
75 pounds to 125 pounds.....	125.0	30.0	155.0	5.0	31	1.6	310
125 pounds to 225	345.0	45.0	390.0	7.1	35	1.8	390
TOTAL (per pig, breeding to market weight 225 pounds).....	711.5	133.2	844.7	....	175	1.3+	375

\*Good pasture reduces grain requirements by 5%-15% and supplement by 15%-50%.

†Includes creep ration.

‡See table on litter size.

§Does not take into account gain or loss in weight of sow.

corn along with pig starter. Pelleted starters are more appetizing to baby pigs than those in meal form.

TABLE 11—Big litters mean lower feed costs

Number of pigs weaned	Pounds of feed per pig		
	At weaning	Weaning to 225 pounds	Total
	Pounds	Pounds	Pounds
2.....	722.0	653	1,375.0
4.....	368.5	653	1,021.5
6.....	250.6	653	903.6
8.....	191.7	653	844.7
10.....	156.4	653	809.4

## FEEDING: WEANING-TO-MARKET

The period from weaning to approximately 75 pounds in weight is one of the critical times in a pig's life. (Fig. 15.) When good pasture such as ladino, clover, alfalfa, etc., are available, feeding problems are less difficult than when feeding in dry lot.



Fig. 15. All six pigs here are littermates. Differences in top and bottom groups are due to feeding, emphasizing the importance of good nutrition in pork production.



Table 12 - Nutrient Requirements For Swine In Percentage or Amount Per Pound of Total Ration\*

	Description of pigs											
	Market stock						Pregnant females and breeding boars			Lactating females		
	25	50	100	150	200	250	300	Young stock	Adults	350	Glts	Adults
Live weight, pounds.....	0.8	1.2	1.6	1.8	1.8	1.8	1.8	0.75	0.5	0.5	0.5	450
Expected daily gain, pounds.....	2.0	3.2	5.3	6.8	7.5	8.3	8.3	6.0	7.5	11.0	11.0	12.5
Total feed (air dry), pounds.....	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Total digestible nutrients, pounds.....	18.0	16.0	14.0	13.0	12.0	12.0	12.0	15.0	14.0	15.0	15.0	14.0
Crude protein, percent.....												
Inorganic nutrients:												
Calcium, percent.....	0.8	0.65	0.65	0.55	0.55	0.55	0.55	0.6	0.6	0.6	0.6	0.6
Phosphorus, percent.....	0.6	0.45	0.45	0.33	0.33	0.33	0.33	0.4	0.4	0.4	0.4	0.4
Salt (NaCl), percent.....	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Vitamins:												
Carotene, mg.....	0.25	0.31	0.38	0.44	0.53	0.60	0.60	2.5	2.5	2.5	2.5	2.5
Vitamin D, I. U.....	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0
Thiamine, mg.....	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Riboflavin, mg.....	1.2	1.0	1.0	1.0	1.0	1.0	1.0	1.2	1.2	1.2	1.2	1.2
Niacin, mg.....	8.0	6.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Pantothenic acid, mg.....	5.0	5.0	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Pyridoxine, mg.....	0.6	0.6	...	...	...	...	...	...	...	...	...	...
Chlorine, mg.....	400.0	...	...	...	...	...	...	...	...	...	...	...
Vitamin B <sub>12</sub> , mcg.....	7.0	5.0	5.0	...	...	...	...	...	...	...	...	...

\*National Research Council Publication No. 295.

TABLE 13—Partial composition of some hog feeds (Air-dry basis)\*

	Energy and protein		Inorganic nutrients		Vitamins per pound feedstuff				
	T. D. N.	Crude protein Percent	Calcium Percent	Phosphorus Percent	Thiamine mg.	Riboflavin mg.	Niacin mg.	Pantothenic acid mg.	
									Percent
<b>Grains and other carbohydrates:</b>									
Barley.....	72	12.7	.09	.47	1.7	.8	24.1	3.7	
Corn, No. 2 yellow.....	78	8.6	.02	.27	1.8	.5	10.2	2.7	
Oats.....	65	12.0	.09	.43	2.9	.6	8.2	6.8	
Rye.....	75	12.6	.01	.33	2.0	.7	7.1	4.2	
Wheat.....	80	13.5	.05	.37	2.2	.5	26.6	6.0	
Molasses, cane.....	58	3.1	.74	.08	.4	1.0	21.3	17.9	
<b>Mill concentrates:</b>									
Wheat standard middlings.....	65	17.6	.09	.90	7.5	1.1	56.1	7.1	
Wheatbran.....	57	16.4	.14	1.30	3.6	1.2	126.5	13.2	
<b>Protein supplements (plant):</b>									
Cottonseed meal (41%).....	72	41.0	.23	1.18	5.0	2.5	13.0	6.4	
Linseed meal (35%).....	68	35.4	.38	.86	3.5	1.5	16.8	8.0	
Soybean meal (solv. 44%).....	78	46.0	.25	.68	6.1	1.7	11.4	10.1	
Distillers' solubles, dried.....	77	28.0	.35	1.40	3.2	6.1	58.0	10.6	
Yeast, brewers, dried.....	71	46.8	.11	1.52	43.0	13.0	213.6	49.1	
<b>Protein supplements (animal):</b>									
Buttermilk, dried.....	77	32.4	1.35	.94	1.7	13.7	2.8	13.5	
Fishmeal, menhaden.....	65	62.2	5.00	3.40	.2	2.4	25.9	4.2	
Meat and bone scrap (50%).....	67	50.6	9.70	4.20	...	2.1	24.8	2.4	
Skimmed milk, dried.....	86	34.7	1.27	.10	1.5	10.0	5.7	16.0	
Tankage (60%).....	71	60.6	6.11	3.01	1.1	1.2	19.2	1.2	
Whey, dried.....	83	12.2	.91	.75	1.8	13.0	5.1	22.4	
<b>Miscellaneous:</b>									
Alfalfa meal, sun-cured (17%).....	30	17.6	1.50	.30	1.1	5.0	16.1	12.7	
Alfalfa meal, dehydrated (17%).....	33	17.8	1.70	.28	1.5	7.3	18.3	17.4	
Bone meal, steamed.....	..	6.2	29.30	13.60	.9	.4	2.0	.8	
Dicalcium phosphate.....	..	....	26.0	18.0	....	....	....	....	
Limestone (98%).....	..	....	38.0	0.0	....	....	....	....	

\*Feed composition data taken largely from National Research Council Publication No. 295.

The nutritional needs of pigs weighing more than 75 pounds are less critical than for the lighter pigs. The ration is therefore easier to balance and, in many cases, expensive ingredients can be omitted. (See Table 8 for some suggested growing and fattening rations.) When small amounts of supplement (low-protein rations) are used, the pigs should always have access to a mineral mixture.

## SWINE DISEASES<sup>4</sup>

### Hog Cholera

Cholera is still the most destructive disease among swine. It is caused by a virus and is highly contagious. The only preventive measure is vaccination. Pigs should be vaccinated either shortly before, or soon after weaning. Several methods of immunization are available. *In Michigan, state law requires that vaccination must be done by a veterinarian.*

1. A DOUBLE TREATMENT of serum and live virus has been the standard vaccination for many years and will produce a good immunity. It has a disadvantage in that the use of a live virus brings the disease onto the farm. The entire herd must be kept vaccinated when this treatment is used. Use this method only on healthy, thrifty pigs. The cost of vaccination increases with the size of the pig.

2. The SINGLE TREATMENT of serum is used where immediate protection is desired. Serum gives immunity lasting only 3 to 4 weeks.

3. CRYSTAL VIOLET and BOYNTON'S TISSUE VACCINE (BTV) are single treatment vaccines. These are not effective until about 3 weeks after vaccination. Protection lasts from 5 to 7 months. These two vaccines, although giving only a temporary immunity do have an advantage in that the disease is not brought onto the farm.

<sup>4</sup>The sections on swine diseases and parasites were prepared with the assistance of Dr. Frank Thorp, Jr., Professor of Animal Pathology, School of Veterinary Medicine.

4. The "RABBIT" VACCINES contain a modified live virus produced from rabbit tissue. The reaction to this vaccine is less severe than with the double treatment vaccines.

In Michigan, all swine vaccinated with live virus (or modified) are placed in quarantine for 21 days. Check with the veterinarian doing the vaccinating as to whether this quarantine applies to the vaccine he is using.

Animals that go into the breeding herd as replacements should be re-vaccinated. If live virus is used, this vaccination should be done before breeding. Do not vaccinate during the gestation period.

### Erysipelas

Erysipelas is a serious disease often confused with cholera. The disease may appear in two forms; acute, killing the pigs in 2 to 4 days; or chronic, with few death losses. Symptoms of chronic erysipelas are severely retarded growth; sloughing of small, diamond-shaped areas of the skin; fever; and swollen joints.

Erysipelas responds to treatment with erysipelas serum and penicillin. If the disease becomes firmly established on the farm, it is advisable to sell all infected animals, buy clean breeding stock, and start on clean ground.

### Enteritis

Several types of enteritis are recognized in swine. All forms of enteritis are characterized by scours and loss of appetite.

One type is *nutritional* in origin and associated with rations composed largely of corn, low in protein, and low in some of the B vitamins. Increasing the amount of protein in the ration, adding B vitamin supplements, and feeding a high level of antibiotics have proven helpful in preventing and curing the nutritional type of enteritis.

TRANSMISSIBLE GASTRO-ENTERITIS (TGE) is very serious when it occurs in young pigs. High mortality is common during the first 3 days. Older pigs seldom die from this disease, but their growth rate is retarded. Once a break does occur on a farm, isolate all sows that are not due to farrow for at least 30 days and allow them to farrow in an uncontaminated area.

VIBRIONIC ENTERITIS is characterized by bloody scours and is often called bloody dysentery or swine dysentery. Like transmissible gastroenteritis, it is highly contagious. All ages of swine may be affected by this disease which will kill or stunt the animals. Arsenicals and antibiotics are used in treatments.

A form of enteritis may also result from chronic hog cholera.

### Vesicular Exanthema

Vesicular exanthema (VE) is not a deadly disease in itself, but is dangerous because of its resemblance to foot and mouth disease. It is highly contagious, and is spread mainly through the feeding of raw garbage and by contact with infected animals. To control VE, Michigan, along with almost all other states, has a law which prohibits feeding of raw garbage on a commercial basis. Infected animals are disposed of, and the area is quarantined.

### Swine Influenza

Swine influenza is a respiratory disease common in fall and winter. Symptoms are fever and loss of appetite. Although mortality is low, the weakened condition makes the animals susceptible to infection by secondary diseases. It is possible to prevent hog flu to a large extent by providing dry, draft-free housing. Infected pigs may be helped by placing them in dry, comfortable quarters and administering antibiotics or the sulfa drugs.

### Pneumonia

Pneumonia is a common disease of the respiratory tract. Contributing factors are irritation by dust; damp, poorly ventilated housing; or a weakened condition, resulting from poor nourishment or diseases and parasites. Good nutrition, management, and sanitation will aid in preventing this disease.

### Brucellosis in Swine

Brucellosis or Bang's disease in swine is due to the organism *Brucella suis*. This is a very virulent organism which will cause Bang's disease (abortion) in other classes of livestock, and undulant fever in man. Brucellosis cannot be successfully treated. Diagnosis is by the blood agglutination test. A herd test gives a more reliable picture than

individual tests. When acquiring breeding stock, purchase animals from disease-free herds, subject to negative tests at the time of purchase and also after 30 days of isolation or quarantine.

For the purebred breeder, it is desirable that all breeding animals be blood-tested before the breeding season. Where brucellosis occurs in the herd, ask your veterinarian to help in developing a program to eliminate the disease.

### **Atrophic Rhinitis**

Atrophic rhinitis of swine is a contagious disease for which no treatment is available. The symptoms are retarded growth, sometimes a deformity of the snout, and violent sneezing, frequently accompanied by a bloody discharge from the nose. Since there is no cure for atrophic rhinitis, the present solution is to feed out and market all animals through commercial channels, and keep swine off the contaminated area for at least a year. The feeding of high vitamin and antibiotic levels will help improve the rate of gain of affected market animals. If rhinitis is suspected, call your veterinarian.

### **Bull Nose**

This is a bacterial disease causing sore mouth and swelling of the nose. A common treatment is to remove the diseased tissue from the area and swab the wound with tincture of iodine. Keeping pigs in clean surroundings under sanitary conditions is the best prevention.

### **Hairless Pigs**

Hairless pigs at birth are usually the result of an iodine deficiency in the sow's ration. Minerals containing stabilized iodine or iodized salt should be used in the rations of swine, especially pregnant sows.

### **Anemia (Thumps)**

Anemia is common in suckling pigs which do not have access to soil. It is caused by a deficiency of iron and copper in sow's milk, and usually affects the largest, fastest growing pig first. Pigs suffering from anemia become pale, weak, listless and have a harsh hair coat. They develop a characteristic thumping motion of the chest when breathing. Prevention is much better than cure, since recovery is slow. Prevention has been discussed under the management of the sow and litter. (Page 15)

### **Rickets**

Rickets is a disease of the growing bone, caused by lack of Vitamin D and/or minerals in the diet. Rickets can be prevented by adding irradiated yeast, or other Vitamin D concentrates and mineral supplements, to the ration. Rickets occurs more commonly where hogs are confined indoors during winter and are receiving a limited amount of sunlight.

### **Swollen Joints**

Swollen joints are common in pigs and may be caused by rickets, navel infection or swine erysipelas, or may result as secondary complications associated with other swine diseases.

### **Caked Udder or Mastitis**

Over-feeding, drying up the sows without reducing their feed, cold, damp quarters, and bruises may cause swollen inflamed udders. Massaging the udder and applying ointments will tend to relieve this condition. If it is severe, a veterinarian should be consulted.

### **Constipation**

Constipation is frequently due to feeding highly concentrated rations lacking in bulk, or to lack of exercise. This condition is more common with sows during the farrowing season than with other hogs. Exercise and the addition of bulky and laxative feeds—such as alfalfa meal, linseed oil meal, and bran—to the ration tend to prevent this trouble. A common treatment is to feed a dose of epsom salts, 1 tablespoonful for each 100 pounds of body weight.

### **Piles**

The feeding of excessive amounts of fibrous or indigestible feeds may cause this trouble. Mild cases may be relieved by overcoming constipation and by cleaning the protruding portion of the rectum with warm salt water and pressing it back into place. Advanced cases may require surgical operation.

### **Tuberculosis**

Swine are susceptible to the avian or chicken type of tuberculosis. This disease can be prevented by keeping hogs away from chickens and other birds.

## SWINE PARASITES

### EXTERNAL PARASITES

#### Lice

The louse is an external parasite which lives by sucking blood from hogs. When lice are present, they can usually be found on the flanks, shoulders, and back of the ears. Numerous eggs may also be seen attached to the hairs close to the body.

A widespread economical means of control for lice is the use of crude oil, or crankcase oil. The problem is to get the pigs completely covered. Crowd the hogs into a small pen and then apply the oil, using either a sprinkling can or an old broom. The crowding and activity of the pigs will aid in complete coverage. Where a sanitary wallow is provided, a small amount of oil on the surface of the water is another way of applying oil. Insecticides used to control mange will also control lice.

#### PRECAUTIONS WHEN USING OIL—

1. Freshly oiled pigs are easily overheated and sunburned. They should not be driven far in hot weather, or placed on pasture without plenty of shade.
2. Avoid oils containing highly chlorinated naphthalenes. These compounds are found in many detergent and extreme pressure lubricants, and are known to be responsible for "X" disease in sheep and cattle. They should be avoided for all classes of livestock.

#### Mange

Mange in hogs is caused by microscopic mites that burrow in the skin. This parasite is spread by contact, and is much more common during winter and early spring when hogs are confined. In early stages, mites cause small pimples on the belly and sides. The hogs become restless and spend much of their time rubbing and scratching. In advanced stages, the skin becomes dry, thick and scaly. Mange lowers the vitality of the pigs and makes for slow and expensive gains.

Benzene hexachloride (BHC), or lindane are very effective in controlling mange. Lindane (the purified form of the active ingredient in benzene hexachloride) does not possess the objectionable odor of BHC, and is just as effective. These chemicals are applied most effectively as a spray, but other methods of application may be used. Dusts



are not recommended. In spraying, best coverage can be obtained when the hogs are crowded together in a small enclosure. The spraying should be done under reasonably high pressure to assure adequate penetration. Follow the manufacturer's instructions for mixing the spray material.

#### PRECAUTIONS WHEN USING BHC OR LINDANE—

1. Pregnant sows or gilts should not be treated within 30 days of farrowing, or while they are nursing pigs.
2. It is not recommended to treat hogs within 30 days of slaughter.
3. Care must be exercised by the operator not to breathe the powder or mist.
4. Continuous mixing of the spray material is necessary.

#### INTERNAL PARASITES

##### Round Worm

The round worm is the most widespread and detrimental internal parasite of swine in Michigan. A good sanitation program will reduce the losses caused by this parasite. A system of control known as the McLean County System is recommended. It consists of these four practices:

1. Thoroughly clean the farrowing pen with boiling hot lye-water, or live steam from a steam cleaner.
2. Wash the sow with soap and water before placing her in the farrowing pen. Pay particular attention to the sides, udder, feet and legs.
3. Transport the sow and pigs to clean pastures as soon as conditions permit.
4. Keep pigs on clean ground until they reach a weight of at least 100 to 125 pounds.

Pigs that become infested with worms should be treated with a good worming agent. Sodium fluoride is very commonly used. A recommended treatment with this material is to feed the pigs for one 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 with each 6 pounds of dry ground feed. A commercial grade of sodium fluoride is satisfactory.

Do not mix more feed than will be used for one treatment. Make the pigs hungry by keeping them off feed for 12 hours, and provide plenty of trough space. Feed only what they will clean up in one day and then return them to their regular ration. If a small amount of medicated feed is left, it may be mixed with the regular dry feed.

Pigs severely infested with round worms may benefit from two successive treatments. Give one treatment soon after weaning, and the other about 5 to 6 weeks later.

#### PRECAUTIONS WHEN USING SODIUM FLUORIDE—

1. Always weigh the feed and the sodium fluoride. Do not guess.
2. Use dry ground feed, thoroughly mixed. Do not feed as a slop.
3. Feed the medicated feed for one day only.
4. *Sodium fluoride is poisonous!* The container should be plainly labeled.
5. Do not allow other classes of livestock to have access to the sodium fluoride feed.
6. Do not worm bred sows during the last half of pregnancy.
7. Do not allow the treated feeds to come in contact with water.

Recently, certain *cadmium salts* have been introduced as worming agents and the results appear promising.

#### Nodular Worms

This parasite is becoming more common in Michigan. It infests the intestine, causing general unthriftiness and other symptoms characteristic of parasitism of swine. Nodular worms should be treated under the directions of a veterinarian.

#### Lung Worms

This parasite affects the lungs and air passages. There is no control once the animal becomes infested. Since the intermediate host of this parasite is the earthworm, control is aided by keeping pigs off low ground or areas littered with trash, brush, straw stacks, etc., where earthworms thrive. Ringing the pig and feeding it an adequate ration reduces the tendency to root, and thus helps prevent picking up earthworms.

## BUILDINGS AND EQUIPMENT

### Feeders

Use feeders that keep wastage at a minimum. The many excellent commercial feeders on the market make home construction uneconomical in most cases (Fig. 16). The approximate amount of feeder space required is given in Table 14.



Fig. 16. A commercial self-feeder, designed by the manufacturer especially for creep-feeding of pigs.

### Hog Waterers

A good hog waterer will supply clean, fresh water at all times and an automatic hog waterer can be a great labor saver. Water needs will vary from 1 to 2 gallons per day for the market hog; to 3 gallons per day for the lactating brood sow. A hog will generally consume about 1 quart (2 pounds) of water for each pound of feed. More water is needed in summer than in winter. During winter, some method must be provided to keep the water from freezing. Allow one automatic watering cup for each 20 pigs.

TABLE 14—Feeder and water requirements

Size of pigs	Feeder space					Water requirements		
	Hand-fed (feet of trough space per hog)	Self-fed (hogs per linear feet or per hole)		Percent of self feeder space for protein supplement		Auto-matic water cup per 20 pigs	Water capacity per pig (gallons)	
		Dry lot	Pasture	Dry lot	Pasture		Winter	Summer
	Feet			Percent	Percent		Gallons	Gallons
Weaning to 75 pounds	¾	4	4-5	25	20-25	1	1.5	2
75 pounds to 125 pounds	1	3	3-4	20	15-20	1	1.5	2
125 pounds to market weight	1¼	3	3-4	15	10-15	1	1.5	2

### Farrowing Time Equipment

During cold weather, pig brooders are a must if losses are to be kept at a minimum at farrowing time. A 150 to 250 watt infra-red heat lamp is very satisfactory. All heating equipment is a potential fire hazard if improperly used. Observe these precautions:

1. Protect the heat lamp from the sow.
2. Do not place too close to bedding—a 250-watt lamp should be no closer than 2½ feet.
3. Check wiring and circuit load.
4. Use hard glass bulbs.
5. Do not suspend the lamp by its own cord; use a separate fastener to carry the weight.

Overlying losses (pigs crushed by sow) can be reduced by the use of guard rails and farrowing crates or "straight jackets". (Fig. 17.)

A pail suspended from a milk scale provides an excellent means of weighing newborn pigs.

A clean tub or basket is handy for handling the baby pigs during farrowing, and when marking and clipping needle teeth.

TABLE 15—Housing requirements

Size of pig	Feeding floor space in addition to sleeping quarters		Shelter space	
	Self-fed	Hand-fed	Summer (shade or housing)	Winter (housing)
	Sq. ft.	Sq. ft.	Sq. ft.	Sq. ft.
Weaning to 75 pounds.....	10	15	7	6
75 pounds to 125 pounds.....	10	15	9	8
125 pounds to market.....	10	15	12	10
Mature sows.....	..	..	20—30	25—40
Sows with pigs.....	..	..	30—60	48—80

A paint brush or cloth swab on a stick is handy for painting the sow's udder with an iron solution to prevent anemia.

To avoid the possibility of contracting undulant fever, always wear

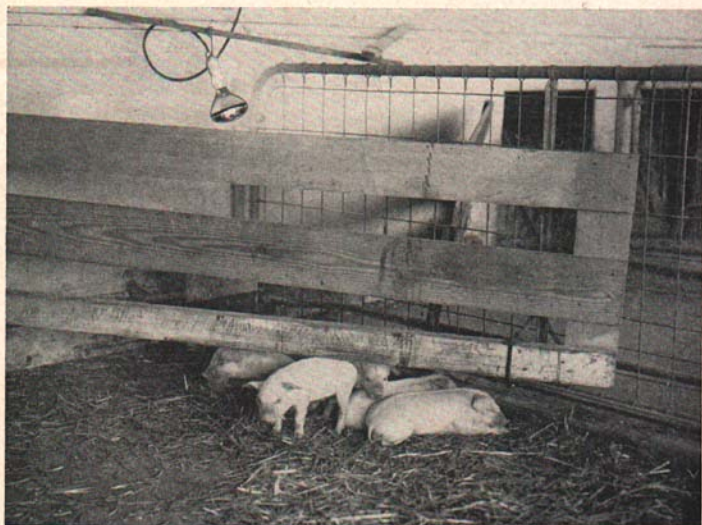


Fig. 17. A simple but effective pig brooder, easily constructed and easily moved to wherever wanted. Bottom bar should be high enough for the pigs to move in and out freely, but too low for the sow. Note that weight of the heat lamp is on the separate fastening, not on the electric cord.

**TABLE 16—High temperatures decrease gain, and increase feed requirements, of fattening hogs**

Results with hogs weighing over 166 pounds*			
Room temperature	Respiration rate per minute	Daily gain	Amount of feed per 100 pounds of gain
°F.		Pounds	Pounds
50	25	1.75	500
60	30	2.10	350
75	47	1.75	450
90	110	0.25	1,296
100	165	....	.....

\*Heitman and Hughes, Jour. An. Sci. 8:171, 1949. Calif. Exp. Sta.

rubber gloves when handling newborn pigs or giving assistance at farrowing time.

### Shelter and Shade

The primary purpose of housing and shade for swine is to provide a comfortable environment. (For housing requirements, see Table 15.) Swine, more than other farm animals, are sensitive to changes in temperatures.



Fig. 18. A portable sunshade for hogs. The frame is farm-made from scrap tubing, with a woven-wire top for the straw "roof."

Baby pigs are easily chilled in cold weather, and even fattening hogs are adversely affected by low temperatures. For winter conditions provide warm, dry, draft-free housing.

High summer temperatures are particularly detrimental to fattening hogs and breeding animals. Not only does rate of gain and feed efficiency drop drastically (See Table 16), but death losses are also relatively common whenever temperatures get to 90° F. or higher. During hot weather, have plenty of shade space available. Portable shades (Fig. 18) should be moved whenever the ground gets dusty. Sanitary hog wallows are also excellent in hot weather. They should be placed in the sun near the shade and self-feeders.

# GESTATION TABLE

Calendar showing dates of breeding and farrowing for sows, based on 112-day gestation period

Jan.		Apr.		July		Oct.		Jan.		Apr.		July		Oct.		Jan.		Apr.	
Date bred	Date due	Date bred	Date due	Date bred	Date due	Date bred	Date due	Date bred	Date due	Date bred	Date due	Date bred	Date due	Date bred	Date due	Date bred	Date due	Date bred	Date due
1	23	1	21	1	21	1	21	1	21	1	21	1	21	1	21	1	21	1	23
2	24	2	22	2	22	2	22	2	22	2	22	2	22	2	22	2	22	2	24
3	25	3	23	3	23	3	23	3	23	3	23	3	23	3	23	3	23	3	25
4	26	4	24	4	24	4	24	4	24	4	24	4	24	4	24	4	24	4	26
5	27	5	25	5	25	5	25	5	25	5	25	5	25	5	25	5	25	5	27
6	28	6	26	6	26	6	26	6	26	6	26	6	26	6	26	6	26	6	28
7	29	7	27	7	27	7	27	7	27	7	27	7	27	7	27	7	27	7	29
8	30	8	28	8	28	8	28	8	28	8	28	8	28	8	28	8	28	8	30
9	1	9	29	9	29	9	29	9	29	9	29	9	29	9	29	9	29	9	1
10	2	10	30	10	30	10	30	10	30	10	30	10	30	10	30	10	30	10	2
11	3	11	31	11	31	11	31	11	31	11	31	11	31	11	31	11	31	11	3
12	4	12	1	12	1	12	1	12	1	12	1	12	1	12	1	12	1	12	4
13	5	13	2	13	2	13	2	13	2	13	2	13	2	13	2	13	2	13	5
14	6	14	3	14	3	14	3	14	3	14	3	14	3	14	3	14	3	14	6
15	7	15	4	15	4	15	4	15	4	15	4	15	4	15	4	15	4	15	7
16	8	16	5	16	5	16	5	16	5	16	5	16	5	16	5	16	5	16	8
17	9	17	6	17	6	17	6	17	6	17	6	17	6	17	6	17	6	17	9
18	10	18	7	18	7	18	7	18	7	18	7	18	7	18	7	18	7	18	10
19	11	19	8	19	8	19	8	19	8	19	8	19	8	19	8	19	8	19	11
20	12	20	9	20	9	20	9	20	9	20	9	20	9	20	9	20	9	20	12
21	13	21	10	21	10	21	10	21	10	21	10	21	10	21	10	21	10	21	13
22	14	22	11	22	11	22	11	22	11	22	11	22	11	22	11	22	11	22	14
23	15	23	12	23	12	23	12	23	12	23	12	23	12	23	12	23	12	23	15
24	16	24	13	24	13	24	13	24	13	24	13	24	13	24	13	24	13	24	16
25	17	25	14	25	14	25	14	25	14	25	14	25	14	25	14	25	14	25	17
26	18	26	15	26	15	26	15	26	15	26	15	26	15	26	15	26	15	26	18
27	19	27	16	27	16	27	16	27	16	27	16	27	16	27	16	27	16	27	19
28	20	28	17	28	17	28	17	28	17	28	17	28	17	28	17	28	17	28	20
29	21	29	18	29	18	29	18	29	18	29	18	29	18	29	18	29	18	29	21
30	22	30	19	30	19	30	19	30	19	30	19	30	19	30	19	30	19	30	22
31	23	31	20	31	20	31	20	31	20	31	20	31	20	31	20	31	20	31	23