

SECTION V

SWINE PRODUCTION

PROFITABLE PORK PRODUCTION

By

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SWINE PRODUCTION: A SOUND ENTERPRISE

On December 1, 1979, North Dakota had 370,000 hogs on farms, and in three years¹ following this number decreased so that by December 1, 1982, there were 210,000 head on farms. This was the lowest inventory on this date since July 1, 1964, when estimates began. Hog inventories have fluctuated a great deal and by December 1, 1987, the total hog and pig inventory stood at 320,000 head. The average value per head was \$77.50 on that date which was down 12 percent from 1986. In 1987, there were 2,600 farms with hogs which was down from 3,000 the previous year.¹ Our state could well stand a hog population several times greater than we have at the present time. The demand for meat should continue to be strong and while there will be more beef, poultry it appears, will be a weak competitor. In general, the price range for live hogs should be from \$35 to \$40 per hundredweight through 1989 with a strong outlook into the future. At present the outlook for the future is more uncertain than normal and will depend upon numbers of actual hogs, prices and cost of feed. There is a good profitability of at least average profits

using the present standards in the years ahead.

The years² making up the last full hog cycle were 1975 through 1986. Historically the low point for prices up to the present has followed the high point in production. The following table shows the U.S. December 1 all hogs and pigs inventory and the annual price per hundredweight for all hogs each year*:

Year	All Hogs & Pigs Inventory December 1 (000)	Annual Avg. Price for Marketing Year* \$/cwt.
1975	49,627	46.10
1976	54,934	43.30
1977	56,539	39.40
1978	60,356	46.60
1979	67,318	41.80
1980	64,462	38.00
1981	58,698	43.90
1982	54,534	52.30
1983	56,694	46.80
1984	54,073	47.10
1985	52,313	44.00
1986	50,920	49.30
*Marketing year, December 1 preceding year to November 20.		

The U.S. inventory estimate for December 1, 1988 is 55,299,000 head and the average annual market price \$42.30 per hundredweight. The current feed cost to produce 100 pounds of pork is approximately \$32.00³. with an estimated \$40.00 per cwt as the break even cost for all inputs. Hog prices are usually the highest in the summer and lowest in the fall. The price pattern might not always be true in cases of rapid expansion or rapid inventory reduction if something happens to affect the consumer demand for pork.

Hog prices usually have been the highest in late summer and lowest in late fall or early winter². This is due to heavier farrowings in the spring than in the fall. The increased number of producers specializing in hog production with year-round farrowing has increased the importance of farrowing during the summer and winter, the off seasons, which has done most to stabilize the market. In recent years pork has been processed more and more in less perishable forms and the storage of these pork products tend to level out wholesale prices which at one time reflected sharply the seasonal variations in slaughter. It is desirable not to jump into swine production when the demand is up and the prices are high. Remember - the market price is not apt to stay that way even with the present demand for pork.

Swine production should not be a short time enterprise. When a producer goes into the business or expands with hogs from \$30 to \$50 or even higher per hundred he should never feel that he can skim off the cream and get out before the price drops or that the prices will never go lower. His sights should be set on his contribution to the enterprise as a long term venture. This will see him through years of high prices and other years of low prices and will give him a stable income at a good average market price. Over the long period whether he starts at a high or low point, based upon market prices, the high and low points will tend to level out and the operation will become a lucrative enterprise.

With feed costs averaging \$32 to produce 100 pounds of pork each operators cost will vary depending on the type of ration and efficiency of the operation. Since it takes only from 5 to 5 ½ months to produce a marketable hog weighing from 200 to 220 pounds the turnover is rather rapid and if the operation is efficient there will be an income of about \$5 to \$15 or more per hundred above feed costs.

Ideally it might be best to get in or increase swine numbers when hogs reach a market price which is a low of the most recent market fluctuations. When hog prices are on the increase, if the increase in number doesn't quite meet

the demand for pork, the price will continue upward and the price pattern may change. Parallel with this the breeding stock on farms will begin to show a trend upward and will continue until the number marketed meets or passes the demand which results in a depressing effect on the market price. The slower the reduction in numbers on the farm the faster the market will drop.

Management of the swine herd, facilities at hand and finances are the most important factors that will determine whether or not the hog operation will be a profitable one. In management we have a need for an understanding of breeding, feeding practices, control of health problems and control of reproduction. The application of this knowledge to each specific operation, at the lowest possible cost per pig raised, will be the guiding factor which determines whether the enterprise will be profitable.

Pigs exceed all other farm animals in efficiency of converting their feed into edible meat. They also require less feed and digestible nutrients for every pound of live weight than do other farm animals. The result of this high rate of feed conversion is a higher percentage of dressed carcass, with a larger proportion of the carcass edible than other farm animals.

Swine are very prolific and do not require expensive buildings unless the operator wishes to go into a confinement operation. In North Dakota there is a place for the small hog producer as well as the operator who produces large numbers under semi- or total confinement.

North Dakota, the most wholly agricultural state in our nation, has a tremendous production of grain which can be blended and balanced into rations and marketed to advantage through swine for the production of high grade edible meat. Hogs can also utilize feed that might not have another outlet such as dairy by-products, waste garden vegetables, garbage, and mixtures containing feed that need sorting and selection to make use of the edible portions. These waste or low level feeds can be converted into meat very efficiently by hogs. This points to the many advantages of hogs as meat producers of great importance in contributing to a balanced farming or ranching operation, in an excellent grain producing state.

We must always keep in mind that a feeder pig of medium weight has a faster rate of gain and better feed efficiency than he will have as he gets fatter with increased age. For a pig to make real good gains coupled with good feed

efficiency he should be carried along without a set back or being exposed to any circumstance that retards his growth during the first few weeks of his life. Should he go through such a period in his early life his true potential can never be fully realized anywhere along the line in the feeding period leading to a marketable animal. Swine to be efficient must be of modern meat type showing length, depth of body and balance. The short, early maturing type requires more feed per 100 pounds of gain and yield a fatter carcass with more waste.

With the improvement of meat type animals in recent years and the greater demand for red meat with limited fat, starting with the right type of animal is essential. This requires study and consideration of the desirable features that should manifest themselves in the animal selected. Don't leave this up to someone else - each potential producer should learn this for himself before starting the enterprise. There is no substitute for being able to build a foundation herd of the right type animals with a background of the qualities desired extending over a period of years. It is not possible to buy into a good herd and maintain the standard unless the operator has a knowledge of swine type.

In building a herd emphasis must be given those traits that have economic value. Some traits of the greatest value are feed efficiency, backfat thickness, loin eye area, litter size and rate of gain.

The livestock man building a hog enterprise must be willing to devote enough time to the study of hog production to be able to start with animals that constitute an efficient herd of the modern type and, be able to manage the herd with gradual improvement.

To be successful in swine production a farmer or rancher, perhaps more so than with any other class of livestock, must have an interest in hogs that goes beyond the financial return. One who isn't interested in or dislikes hogs will probably not take the necessary steps to learn the essentials upon which a sound swine program must stand if the enterprise is to live over a period of years. These facts are summarized to point out that a thriving swine enterprise is tied so very closely to management, facilities, and control of disease and breeding in order to develop and maintain a profitable swine herd. A well managed swine operation will insure a steady, profitable income.

PUREBRED OR COMMERCIAL

In a purebred enterprise, the breeder must direct his attention towards a constant improvement of his herd by the selection of boars that will improve the weak points of his herd without losing the outstanding qualities already obtained. About 70 percent² of the progress made improving a hog herd comes from the boar. Both boars and gilts must measure up to two standards.

First: They must be of the right type as measured by visual inspection. This includes breed character of the breed selected, including masculinity or femininity whichever is appropriate, and with the proper set of ears. There must be good length, not less than 30 inches from the first rib to the aitch bone, and a well developed ham, not loose and soft, but with firmness and neatness, being well filled out down toward the hock.

The back should show at least moderate arch and no sign of weakness. Both boars and gilts should be smooth and uniform from the shoulders to a point even with the bulge on the rear of the ham. They must stand well on their feet, with strong pasterns, and dew claws well off the ground. The throat should be clean and not show a loose, wasty jowl.

The underline on both the boar and the sow should be straight, with not less than six well developed, uniformly spaced nipples on each side. Do not buy a boar or sow with inverted or undeveloped nipples. A boar should have testicles well developed and of uniform size. A boar with only one testicle is cryptorchid and has one testicle inside the body which is an inherited defect. He should show no sign of scrotal hernia; there should be no umbilical hernias on either boars or gilts, and in both instances, on any of their litter mates.

These are all characteristics a hog man can see, and should be taken into consideration in all selections for improving the herd or when buying foundation stock.

Second: Boars especially should be performance tested or come from performance tested litters if the greatest improvement in rate of gain and feed efficiency is to be expected in their offspring. In a production testing program boars should be selected from litter mates or lines that have the desired meat qualities on a cut out basis.

This includes a gain of not less than 1.8 pounds per day for the boars and a weight of at least 200 pounds in 165 days. A feed efficiency of 100 pounds of pork on less than 300 pounds of feed during either winter or summer is desirable. The backfat thickness measured in three places, over the shoulder, loin and ham, should not average over

one inch if the rate of gain per day is 2 pounds or less. The following schedule⁴ gives the maximum backfat thickness allowed, depending upon the daily rate of gain:

- If gain is 1.80 - 1.99, maximum probe 0.9 inch
- If gain is 2.00 - 2.19, maximum probe 1.0 inch
- If gain is 2.20 - 2.39, maximum probe 1.1 inches
- If gain is 2.40 or more, maximum probe 1.2 inches.

Litter mate barrows should have a loin eye of 4.50 square inches or more. All boars should index 170 or more, which may be calculated on the following basis.

The boar index (4) is calculated using 250 plus (50 x rate of gain) minus (50 x backfat probe) minus (50 x feed per pound of gain). If a boar gains 1.97 pounds per day, has .78 inch backfat and a feed efficiency of 261 pounds of feed per 100 pounds of gain, he should index 179.00.

In the performance test the rate of gain of barrows from the same litter as the boar should be considered, along with their length, loin eye, and backfat probe. All can be taken as a mark of what to expect from pigs the boar sires. Pigs from the first litters sired by a boar give a good indication of what the boar will do as a herd sire.

A program of constant performance testing should be followed. New sires brought into the herd should have a background and meat qualities that have a potential for improving the herd. Take great care to eliminate any characteristics that are inherited, such as ruptures, cryptorchid, poor underlines, etc..

In the purebred business the breeder must direct his attention toward having serviceable boars and open gilts for sale at all times of the year. Only boars and gilts of the best type should be sold as purebreds. Always furnish papers for purebreds sold; the buyer will prize his animal more highly. Cull inferior animals and market them for slaughter. This will do much to hold good customers over a period of years.

When starting a purebred herd, it is desirable to select a breed prevalent in the area, unless the prospective breeder feels strongly against these breeds. This provides an avenue for sales that should not be overlooked.

In starting a purebred herd the operator should secure the best animals he can in the breed selected. There is no one best breed, but constant improvement of the herd should be each breeder's goal. Animals selected should be of a modern meat type, and performance tested if possible. The market usually is quite good for breeds that farrow good sized litters, are good gainers and have a cutout record above average.

In a commercial swine operation the same consideration should be given to the purchase of foundation herd that is given selecting a purebred herd. In a commercial herd, pounds over the scale at a low cost is the index of the return. The best type meat animals will bring the top market price.

Feeder pig production can be a good enterprise for the commercial man, since it has some advantages not common to a finishing operation. This includes a more rapid turnover in the number of pigs that can be marketed each year. Each farrowing period up until the pigs are 4 to 8 weeks of age requires maximum labor, which is cut to a minimum from then until the next farrowing period.

The disease problem with each individual pig is less, because the producer has the young pigs for only a short period of time. This operation, however, does require the best of disease control precautions and immediate treatment for an ailing pig. This is a specialized operation, and the operator, to be successful, must keep his herd free from disease by handling parasites and disease, even in mildest form, in a minimum of time. This means treatment of an ailing pig not later than on in the day or night, but immediately, within the hour, when the sick pig is discovered. To delay treatment can mean a stunted or dead pig.

Pigs from this operation, unless the producer has a finishing operation, normally go direct from the producer to the feeder who has a growing-finishing operation. The more feeder pigs are handled, the longer they are in transit and the more places they are unloaded between the producer and finishing operation, the more danger there is of stunted pigs, disease, and pig losses. Large litters of uniform, strong, healthy pigs are essential for maximum profit and rapid turnover.

For rapid feeder pig sales, besides being free from disease, they must have smooth coats and be alert, with a vigorous and healthy appearance.

The producer may raise his own pigs, or buy them from a feeder pig producer. Don't go through channels that permit the pigs to come in contact with facilities that may harbor disease organisms. If feeder pig are bought, be sure they come from a disease free herd. Be sure that disease is not held down in the herd by antibiotics. This will cover up such diseases as infectious atrophic rhinitis. When pigs are taken off antibiotics, an outbreak may occur.

Growing and finishing pigs takes a little longer period than that required to raise feeder pigs, usually between 3 and 4 months. If watched closely, disease and parasite troubles can be kept from getting acute as easily as when raising feeder pigs.

Pigs in a finisher operation should be fed in a small area, using a self-feeder, or on a tight floor of concrete, plank, or other hard surface material which can be thoroughly cleaned. Raising feeder pigs or finishing in confinement requires a house with a slatted floor and a manure disposal system that will be discussed later. Feeding in limited space prevents excessive exercise, contributes to maximum gains and best feed efficiency. If a disease problem arises, a concrete floor can be more easily disinfected and kept cleaner than a wood floor. A dirt floor does not lend itself to good disease control methods when space is limited, and especially in a large swine operation.

Growing and finishing large numbers of hogs can be handled under confinement with less labor, and is desirable if the operation is large enough to provide a fair income even when the margin is small. Without temperature controlled winter quarters, feed efficiency will drop slightly. In the North Dakota climate, with a small or limited operation, a dry lot or pen with the house or shed for sleeping quarters, which provides only wind and sun protection, is satisfactory in the spring, summer and early fall. In winter the hogs being finished should be housed in either a building of the shed type which may be open on the south or a hut type house. These houses can be easily be moved to a new location, and the old location cleaned up with tractor mounted equipment. With this type of setup, wind protection for both the feeding a watering areas may have some advantage in keeping up the rate of gain and feed efficiency.

Growing and finishing can be done on pasture during the summer. This requires more space, almost the same feed costs, and slower gains because of exercise the pigs take on pasture. Limiting the feed on pasture may not increase the cost per 100 pounds of pork, but does slow up the rate of gain.

In the grower-finisher setup, self-feeding or feeding on concrete are best for more rapid and more economical gains.

Select a self-feeder of strong construction and one which gives pigs the least chance to waste feed.

The basic ration in North Dakota should be made up of home grown feeds, oats and barley being the most practical to get, except where corn is available, with only enough supplement to give the protein and amino acid content desired.

Facilities should be available for storing and handling a good volume of feed if the growing-fattening operation is for a large number of hogs.

BERKSHIRE

[\(click here for picture\)](#)

The Berkshire is a prepotent breed of hardy hogs, with good soundness and the ability to perform well in the pasture or in confinement. The sow is easy to handle at farrowing time.

Berkshires sometimes are considered a balanced breed in the fundamentals necessary for profitable pork production: (1) productivity, (2) feed conversion, (3) carcass quality, and (4) soundness. The sows are good mothers with a docile disposition that makes them easy to handle during farrowing time. They farrow and raise good-sized litters with heavy birth weight. They make good rates of gain and have a good feed efficiency. The Berkshire produces a high quality carcass.

The American Berkshire Association is at 1769 U.S. 52 North, Box 2436, West Lafayette, IN 47906.

CHESTER WHITE

[\(click here for picture\)](#)

Chester White sows are prolific, do an exceptionally good job of suckling their litters, and are good mothers.

The breed is known for its deep smooth sides of ample length and uniform width. The breed is long and comparatively level at the rump, carrying down into deep plump hams. Chester Whites are early maturing and can be satisfactorily marketed at a lighter weight than some breeds. They will sunburn until acclimated, after which bright sun is no problem. The sows have good disposition and are easily handled in farrowing crates.

The Chester White Swine Record Association is at 1803 Detweiller Drive, Peoria, IL 61615.

DUROC JERSEY

[\(click here for picture\)](#)

The popularity of the Duroc among hogmen indicates the success the breed has had in satisfying the requirements of a good commercial hog.

The breed matures early, developing readily at an early age. The Duroc is noted for fast growth, feed efficiency, and hardiness. They are of mild disposition and are fair grazers. The breed is prolific and the sows good mothers.

The association is the United Duroc Swine Registry, 1803 Detweiller Drive, Peoria, IL 61615.

HAMPSHIRE

[\(click here for picture\)](#)

The Hampshire bred is outstanding in its ability to cross well with other breeds and the crosses perform well in the feed lot.

The breed has a good record in rate of gain and feed efficiency. They excel in muscling and have low backfat. They have a good record in crossbreeding programs. As a breed, they have to a rather high degree those traits that can be measured and that are important to profitable hog production. Hampshires are vigorous, particularly sound on feet and legs, and are well suited for conditions prevailing on large, modern, intensive units.

The association is the Hampshire Swine Registry, 1111 Main Street, Peoria, IL 61606.

POLAND CHINA

[\(click here for picture\)](#)

Farmers have always liked the size of the "Polands", one of the largest modern breeds. They are a very uniform and attractive breed, with a black body and white points. Poland Chinas are very quiet in disposition and rugged in constitution. They can grow well in confinement as well as under pasture conditions. They are good in loin eye and muscling and are very meaty, growing extremely large when kept as mature animals. Polands are aggressive. Problems rarely arise because a boar fails to breed. They are extremely hardy.

The record association is the Poland China Record Association, Box 71, Galesburg, IL 61401.

SPOT

[\(click here for picture\)](#)

This breed was developed for use on the American farm where pork production is a major enterprise.

The Spot is a large breed of hogs that carry down deep in the ham and are neat and uniform in depth of body. They are considered above average in growth, soundness of feet and legs, and soundness of underline and length. They are average in mothering ability, litter size, and muscling. They have ample bone and stand well on their feet and legs.

The National Spotted Swine Record Association is at P.O. Box 2807, West Lafayette, IN 47906.

YORKSHIRE

[\(click here for picture\)](#)

No breed does a better job of suckling their litters than do Yorkshire sows or sows carrying a high percentage of Yorkshire blood.

Yorkshires are very muscular in confirmation, deep, uniform, and well laid in at the shoulder. They carry down into well-shaped hams. Yorkshires are clean-cut along the underline, about the jowl, and the face of the ham. Because of their length they weight heavy for their appearance. Yorkshire sows are prolific and make excellent mothers. When kept in the barn or under extensive shade and are turned out to pasture on bright, hot days they make sunburn rather severely. They become acclimated if turned out on days with moderate sunshine, and no sunburn problems then result.

American Yorkshire Club, Inc., 1769 U.S. 52, P.O. 2417, West Lafayette, IN 47906.

LANDRACE

[\(click here for picture\)](#)

The Landrace was developed in Denmark and other Scandinavian countries solely on the basis of progeny and performance listing. The first shipment into the United States was in 1934.

Landrace hogs are high in lean meat with a good rate of gain and feed efficiency. Litters are large, strong, and grow fast because the dams are good milkers, and show good mothering ability. Boars and gilts weigh 200 pounds at five months of age. The Landrace is sometimes called the universal hog because animals of the breed are found in many countries. They are used extensively in crossing programs.

The American Landrace Association, Inc., is at Box 111, Culver, IN.

SELECTING SEEDSTOCK

All breeds have certain valued characteristics. For the individual who wants to build a purebred herd, selection of the breed should depend to a large degree on his personal preference.

The same is true for the commercial producer in that the foundation gilts or sows should be selected from his favorite breed or a cross of his favorite breeds, having the characteristics he considers of most importance. Animals of a breed or crosses known to have a gentle disposition, to farrow large litters, and to have a good mothering ability are desirable. Large litters are essential to any successful hog operation. In cross breeding, start with crossbred gilts or sows if the crosses desired are available. This will save one year in getting started with the best sows to build a foundation sow herd.

The right meat type animals can be found in any breed the producer believes most suited to his needs, whether the operation is purebred or commercial. Selecting a breed quite prevalent in the area makes it a little easier for the purebred breeder to get herd boars and replacement animals. It also provides a ready market for purebred boars and gilts the breeder may have for sale.

Breeders seldom buy expensive animals or build a good herd unless they know the breed and can select new animals with the characteristics needed to improve on the animals they already have. Unless he is of the type and has the qualities needed to improve weaknesses in the sow herd, the price paid for a boar is meaningless. Every herd can be improved, and you don't improve by buying just good boars. Animals extreme in the qualities the herd is weak in will probably make the desired improvement. Following this method, the extreme boar may sire pigs that lose or lessen certain strong favorable herd characteristics. This policy of boar selection may be continued, always looking ahead toward improving undesirable characteristics or weaknesses that may show up from time to time. To do this successfully, one must know the hog business and the specific breed or breeds he is dealing with.

Boars play a dominant role in the progress achieved per generation, in the development of and continued improvement of a swine herd. Never buy an animal unless you are satisfied that it is the one you want. No one will establish a top flight herd of hogs unless he selects boars that will improve his sow herd in some way with each generation. A purebred herd must always be improved toward breed type, and a commercial herd toward market

demands. Gaining ability and feed efficiency are two qualities in a boar that every producer must strive for. If the boar has not been performance tested, a pen of his barrows or gilts should be fed out to get, as early as possible, a check on their rate of gain and feed efficiency. A purebred breeder should performance test the different lines in his herd.

Performance testing should be followed by carcass evaluation of market barrows to determine backfat, loin eye, length of carcass, percent of ham and loin to live weight and yield. In commercial production, market hogs that score high in these traits always bring top market prices. Boars from high gaining and efficient lines with good meat qualities, including low backfat thickness, good cutout value in square inches of loin eye, length, and percent of ham and loin to live weight are always in demand.

Boars should have a feed conversion of about 280 pounds of feed for 100 pounds of gain, and weigh at least 200 pounds at five months of age. They should probe no more than one inch of backfat, and littermate barrows should meet certification standards with at least 4.5 square inches of loin eye. Both barrows and gilts should have a feed efficiency of 300 pounds of feed per 100 pounds of gain.

Before selecting breeding stock, decided on the breeding program to be followed, and where the herd replacements will come from.

In a commercial operation, a crossbreeding program must be followed to insure the greatest possible income. Crossbred sows usually show an increase in productivity and fertility. They also farrow larger pigs with an increase in rate of survival. Under normal conditions, the pigs are heavier at weaning and make more rapid daily gains from weaning to market. Crossbreeding appears to have little effect on carcass traits and feed efficiency.

Always organize a crossbreeding plan on paper before starting.

The single cross system is simply crossing two breeds. As an example, purebred Yorkshire sows are mated to purebred Hampshire boars. When purebred sows are needed for replacements they can be purchased, or several purebred Yorkshire litters can be raised when replacement females are needed.

Another plan using two breeds is called a rotational cross. Boars of two different breeds are alternated with each

generation of pigs. Replacement gilts are selected from the herd and each gilt is bred to a boar of the same breed as the boar that sired her dam. This program maintains some hybrid vigor in the sow, but not as much as the three breed rotation.

A third program is similar to the rotational cross except that three boars are used in place of two. Gilts are selected and bred to a boar of the same breed as the boar that sired the dam of the gilt's dam. This system appears to have some advantages over the two breed plan, especially in hybrid vigor.

Diagram: [Three-Breed Rotational Cross System](#)

The programs including three or more breeds, as well as the two breed rotation, can be continued indefinitely with little or no loss of hybrid vigor and without the need to start over with purebred gilts. Where a program of crossbreeding is planned, there is some advantage in starting with crossbred gilts of known ancestry and breeding in preference to purebred gilts. This permits the use of maternal heterosis from the start, rather than having purebred gilts mothers of the first generation of pigs.

During the four winters 1963-64 through 1966-67 crossbred pigs were compared with purebred Yorkshires at the Dickinson Experiment Station. Hampshire boars were used the first two years and Spot boars the last two years for the crosses. All crossbred pigs were farrowed by Yorkshire gilts.

In three of the four years the litter weights of the first generation crosses were heavier at birth than those from the purebreds, and the crossbred market pigs were significantly heavier at the trial finish than the purebreds when handled under exactly the same conditions.

The performance of purebreds and crossbreds in trials at Oklahoma State University is shown in tables 1 and 2.

Table 1. Performance of purebred gilts with purebred litters compared to purebred gilts with crossbred litters ^a .				
	Duroc	Hampshire	York	Overall^b

	pure	cross	pure	cross	pure	cross	pure	cross
Litter wn. wt.	133	182	158	197	192	193	144	178
No. pigs weaned	5.5	7.4	4.7	6.7	7.9	8.1	6.0	7.4
Percent raised	55.0	72.0	40.2	71.6	82.3	78.2	59.2	74.0

aIncludes spring 1971 farrowing season.
bEach breed group weighed equally.

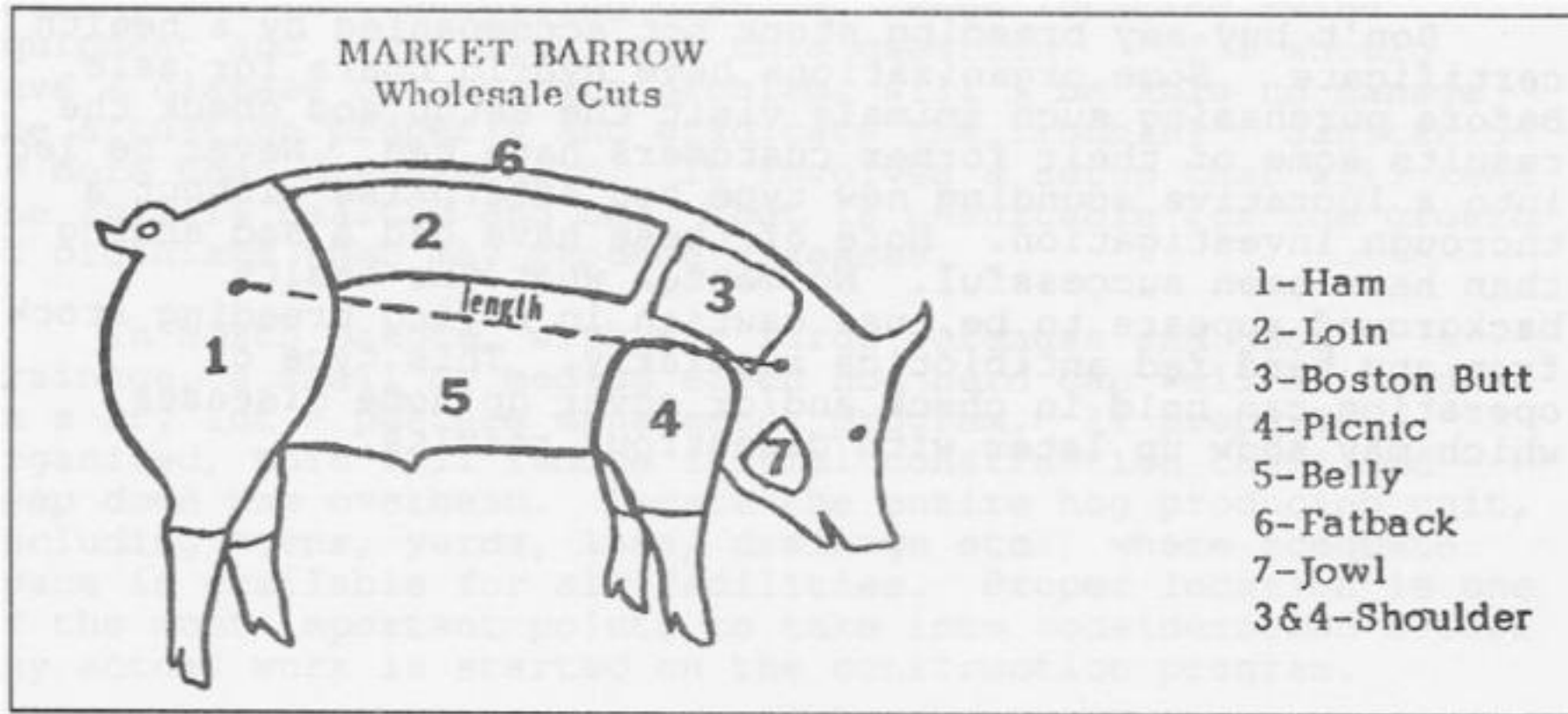
All pigs were weaned at six weeks⁸ and moved to the confinement finishing facilities at Fort Reno when they were 8 weeks of age. Pigs were self-fed by breed in groups of about 16 pigs per pen until they reached 220 pounds.

Table 2. Feedlot performance and probe backfat thickness for purebred and two-breed cross pigs^a.

	Pigs	Daily gain	Days to 220 lbs.	Feed per lb. gain	Probe backfat for gilts
Durocs	69	1.39	181.7	3.16	1.47
Hamps	70	1.33	185.5	3.14	1.20
York	67	1.36	186.1	2.82	1.22
Duroc-Hamp crosses	132	1.48	173.9	3.04	1.24
Duroc-York crosses	153	1.51	171.6	2.94	1.31
Hamp-York crosses	124	1.49	174.1	3.03	1.28
Purebreds	206	1.36	184.4	3.04	1.30
Crossbreds	409	1.50	173.2	3.00	1.27

includes pigs from 1971 spring farrowing season.

The market barrow pictured below shows the wholesale cuts of the preferred meat type⁵.



The ham should be well filled, the back strong, with a wide, firm loin. The side should be smooth, with a balance between the hams and shoulders. Feet and legs must be strong, showing good bone, with strength of pastern. The gait should be straight forward and strong, with straight legs set at each corner of the body. A clean cut head with a neat jowl is essential. In breeding animals the head should show the breed characteristics, including masculinity in the boar and femininity in the gilt or sow. On both the sow and the boar all nipples should be well set, evenly spaced and free from inverted or pin nipple types.

Some important breeds of swine showing the preferred meat type along with other outstanding characteristics of the

breed are included in this section. The pictures provided are a good image of outstanding animals of each breed.

Other breeds, hybrids and crosses can be purchased in starting a foundation herd. Some are entirely satisfactory; however, take caution in purchasing animals of unknown breeding and background. In starting a hog operation, no gilts are worth more than the cost of good gilts of any one type of the pure breeds.

It is best to purchase breeding stock outright, and not go into a leasing program. Don't buy breeding stock from a dealer who claims he'll sell all the boars and/or gilts that can be raised at a premium, unless you thoroughly investigate the dealer's operation and are satisfied with his integrity. Many of these deals have left producers very disappointed with the development of their herd. In some cases the herds have been disease-ridden. In buying "seedstock", unless you go into a purebred operation with one of the recognized breeds, figure your income on the basis of selling your pigs as commercial animals for slaughter.

Don't buy any breeding stock not accompanied by a health certificate. Some organizations have hybrid boars for sale. Before purchasing such animals visit the setup and check the results some of their former customers have had. Never be led into a lucrative sounding new type hog enterprise without a thorough investigation. More of these have had a sad ending than have been successful. No matter what the health background appears to be, use caution in buying breeding stock from any herd fed antibiotics regularly. This type of operation can hold in check and/or cover up some diseases, which may show up later with disastrous results.

FACILITIES AND SANITATION

Sanitation is of utmost importance in keeping swine healthy and in controlling disease. When locating swine equipment and facilities, ask this question: "If I should have a disease or parasite problem, will I be able to manage the situation properly and eradicate the trouble?" Sanitation is more than disinfection. It involves a setup that will keep the animals healthy and one that is unsuitable for the growth of organisms that may produce diseases.

In North Dakota, with our large acreages and good drainage, a small or medium sized hog herd can well be handled in a dry lot - pasture management program. If properly organized, this will reduce initial construction costs and keep down the overhead. Locate the entire hog producing unit, including barns, yards, lots, drainage etc., where adequate

space is available for all facilities. Proper location is one of the most important points to take into consideration before any actual work is started on the construction program.

The first step in planning yards and facilities is to decide the number of hogs that will be produced and the number of farrowings per year. All inputs into the enterprise, including building, equipment and management, will depend on the number of pigs to be marketed. Whether purebreds, feeder pigs or finished hog are marketed, good planning and expert management must go into the operation.

Don't plan any hog lots or buildings in the yard with other buildings. Keep the location away from the house, a town, or any location where people live. Don't select a layout that will drain into a creek, river or into any area like a shelterbelt that will be difficult to cleanup. Do not plan pastures on permanent sod or areas with trees, boulders or obstacles that are a hindrance to a thorough cleanup program.

Drainage from buildings should go into a manure pit, cesspool, or lagoon, so drainage is not into the open area traveled by the hogs. Manure, if hauled out, should be removed at once. If held for several days, it should be piled on a concrete apron with drainage of the ramp into the same trap the barn and feeding areas drain into. Liquid manure should be hauled from the manure pit to the field, unless the pit drains or is pumped into a lagoon.

Pastures and lots should be rectangular to make thorough plowing up of soil possible. Lots of all types, including the central holding area or corral, should be tilled and seeded once a year.

Temporary pasture crops provide a more satisfactory disease and parasite free grazing area than permanent native or perennial grass pastures, and the gains from some temporary crops, like winter wheat planted in the spring, compare favorably with gains on clean alfalfa pasture.

In selecting a new site, if possible locate the entire swine plant with drainage in one direction. There should be enough area between the swine buildings and yards where pigs are handled so the ground can be tilled once a year, and more often if necessary, like following a disease outbreak. If pasturing is in the program, leave enough space between the pasture lots and buildings so the area can be worked up with power machinery. This won't take much extra room if just enough space is left to work up the main traveled areas with a tractor and plow. Where possible,

keep away from lanes that cannot be tilled. Don't build a lane right up to the barn from pasture lots. This eliminates the possibility of plowing the area. Lots or pastures should have gates opening into the central holding lot of perhaps an acre or more in size so the holding and driving area can be plowed and seeded to some crop at least once a year.

One acre lots are adequate for pasture. If they are all the same width and length they can easily be tilled two at a time.

Fence the entire hog plant, and allow no one enter without first walking through a good disinfectant. Always accompany a visitor. If the setup is S.P.F. or a similar program, the regulations governing the operations require adequate sanitation and disease control measures. Fencing the plant also helps keep out the dogs, skunks, etc. Don't let a rat problem get started, since these filthy rodents are great spreaders of disease.

Sound sanitation is a must. Give special consideration to the following:

1. Take precaution to maintain a clean herd.
2. Buy animals only from herds known to be sound and healthy.
3. Be sure that anyone admitted to the premises carries no disease organisms on his shoes or clothing.
4. Properly handle manure by keeping it away from the buildings.
5. Always rotate hog lots. For little pigs, pastures or dirt lots should be used only one year in four.
6. Clean and disinfect all buildings at least once each year. Always disinfect buildings where young pigs are kept before each new crop of pigs is moved into it. Follow this or a similar system:
 - a. Clean all equipment and the inside of the building of any trace of foreign material or manure that might absorb the disinfectant, such as bedding, dust, feed, etc.
 - b. Remove all movable equipment from the barn before attempting to clean the building.
 - c. Soak the entire inside of the barn and all equipment with warm water to which detergent has been added, using a pressure sprayer.
 - d. After washing the building and equipment, cover with a light spray of good disinfectant, used according to directions. If the disinfectant has an odor, use it enough in advance of moving animals in so most of the odor will have disappeared.

- e. Before using disinfected feeding equipment, wash with warm water under pressure.
- f. Thoroughly clean any equipment used for handling manure before using it to move feed.

Diagram: [Design of a Satisfactory Pasture System](#)

AVOIDING DISEASE AND PARASITES

Disease, parasites, and inefficient use of feed are extremely costly to the swine industry. Hold all purchased animals in isolation for 30 days before putting them on clean premises, and for 60 days before using them in the breeding program. If any disease symptoms show up, never put the animals on the clean premises. All animals bought should be vaccinated for erysipelas at least 14 days before being delivered. Visitors should be required to disinfect their shoes or boots with a strong disinfectant before being permitted in the swine production center. Guests should be accompanied by someone working with the hogs, and then never allowed in the lots or pens where the hogs are kept.

Proper sanitation is basic. Use of antibiotics and other drugs may stave off trouble for awhile, but will not take the place of clean premises. The goal of the successful operator must be clean, uncontaminated premises and good management. Remove sick animals from the herd at once and place them in quarantine quarters, where they can in no way contact healthy animals. Never drag dead animals, but move them directly into a vehicle for disposal. Any discharge from a dead animal, even in the isolation area, should be removed. Bury dead animals in a pit after covering them with quick lime, or send them to a rendering plant. If a front-end loader is used to remove a dead animal and there is a possibility that the animal died of a contagious disease, disinfect the scoop before using it again. Never permit mud wallows. They are a source of contamination for disease and parasites.

An adequate supply of clean water should be available in each lot, so placed that droppings cannot contaminate the water. Keep waterers clean at all times. Electrically heated waterers are best, since they provide an adequate water supply the year around.

Construct feeding facilities to prevent feed contamination and to allow for frequent cleaning.

Disease cannot be prevented or controlled unless it can be identified. When the operator recognizes a disease it should be handled and treated at once, meaning within the hour if possible. If he does not recognize the symptoms, he should call his veterinarian immediately. If there is any doubt about what the trouble may be after consultation with a veterinarian, specimens from the sick or dead animal should be sent to a diagnostic laboratory at once. The best specimen is a recently dead animal. The next best is a live animal, untreated, that has been sick for some time.

Mass treatment of animals through feed or water may be satisfactory in the case of some diseases, or for internal parasites. Where individual treatment is given you are assured of each animal being properly treated.

When giving young pigs a hypodermic injection, always disinfect the injection site with 7 percent iodine, alcohol, or some other good disinfectant. Be sure syringes, needles, etc., are sterile. Syringes can be washed or sterilized in boiling water. Needles can be kept in a glass jar in denatured or rubbing alcohol. When giving injections to swine, keep a small bottle or epinephrine in the medical kit to be given according to directions if an animal goes into shock.

Always follow directions in giving any medicine to swine. Subcutaneous injections are given just beneath the skin. The best place for this injection is the loose skin next to the body just back of the elbow. Intramuscular injections are given directly into the muscle of the animal. When injections are given into the rear quarters, the needle should be inserted into the muscle and the syringe plunger pulled slightly backward to determine that the needle is not in the blood vessel, which is indicated if blood is drawn into the syringe. If no blood is in evidence, slowly give the injection. Never give more than 10 cc injections in any one site.

Keep swine as free of stress as possible. Internal parasites, moving in hot weather, holding in large groups, keeping small animals with large ones, rough or excessive handling, all create stress. Animals under stress are more subject to disease. Always move hogs as little as possible. When animals are moved, try to keep them comfortable. Don't crowd swine excessively before loading. If possible, keep animals of about the same size in each load or lot.

SOME DISEASES AND PARASITES OF SWINE

Symptoms of some of the more common hog diseases and parasites are outlined here. If there is any doubt about what disease is causing the trouble in a swine herd, consult a veterinarian at once. Though the problems discussed

are the ones most common in North Dakota, they are not the only diseases that may give trouble, and if there is any doubt as to what may be affecting the sick animals, have a carcass, or diseased specimens or organs sent to a diagnostic laboratory.

Mastitis

Caking, congestion and edema of the udder may be caused by improper feeding or lack of exercise, but should not be confused with infectious mastitis.

If the udder trouble is not infectious and immediate treatment is given, the problem often can be handled by administration of oxytocin, a hormone which causes the sow to let down her milk. Preventive measures such as massaging the udder with ointment like woolfat, exercise, prevention of constipation, and feeding the sow for several days on a light feed like bran, in limited amounts, may alleviate the condition.

Chronic or infectious mastitis may involve one or more udder sections. The milk flow is reduced or entirely absent. The gland may become atrophied and fail to function for future farrowing. The sow or gilt having extreme toxemia seldom gets up, and her temperature may go up to 106 or 107⁰F. The skin over the rear udder sections may become purple and very swollen. In this case, the litter probably will die unless fed in another manner.

This condition requires the use of antibiotics or other therapeutic agents and unless the operator understands the disease, the services of a veterinarian will be required.

Anemia

This is a common ailment among young pigs. It causes heavy breathing, a rough coat, and sometimes death, unless prevented or properly handled. Anemia is an iron deficiency in the blood. There are several ways of preventing it. One, which is quite satisfactory, includes making parasite-free soil available to young pigs from birth. The most reliable method is giving young pigs, from 5 to 7 days of age, injectable iron according to directions. Some operators provide soil and injections. Be sure the syringe and needle are sterile, and disinfect the injection site. While pigs raised on the ground may not need this injection, it may be beneficial to administer one when they are 5

to 7 days of age. Pigs not raised on the ground should be given a second injection about 10 days after the first, repeated each 10 days until they are eating creep feed well. Do not inject iron into the ham after pigs weigh about 25 pounds because of the possibility of causing a dark spot in the ham. If such an injection is necessary, give it in the jowl.

If anemia is present in pigs at birth it is a sign of iron deficiency in the sow's rations, or some other form of anemia other than iron deficiency anemia. In this circumstance, administer iron when the pigs are from 2 to 3 days of age.

Roundworms, Nodular or Whip Worms

Hogs may have large roundworms, which are the most common of all internal parasites affecting swine. They may also have nodular or whip worms.

They may give the animals a rough appearance, cause tail rubbing, and in severe cases, diarrhea and emaciation. If in doubt, have a veterinarian take a sample of droppings for a worm egg count. The roundworm is a thick worm, and when fullgrown is about the size of a pencil, and yellow to pink in color.

One good treatment for all intestinal worms affecting swine is diclorvos, which is mixed with feed according to directions. Sodium fluoride, piperazine and hygromycin are all approved chemical treatment for worms. Be sure to follow directions when any treatment is used.

Young pigs should be dewormed after they are on feed following weaning, and if the worm infestation is severe, a second treatment should follow a week later. Bred sows should be dewormed between one month and two weeks before farrowing, and the pens thoroughly cleaned before the sow is put in for farrowing. If the sow farrows outside, or the litter is moved out on pasture, a rotation system should be followed so that each pasture is used only every other year. Where circumstances permit, use of a pasture only every third year is desirable. The lot should be tilled and used for some crop the years it is not used for pigs. This management practice will help keep down the worm infestation.

Lungworms

Lungworms manifest themselves by causing coughing, labored breathing and loss of appetite in pigs. Parasitic pneumonia may develop, especially in young pigs. These worms live in the pig's lungs, grow to be about two inches long and are white to pinkish-red in color. Lungworms may bring on other diseases by weakening the pigs. These worms cannot be effectively treated by chemicals.

Improved management methods and sanitation do the best job of controlling lungworms. Lungworm eggs are coughed up, swallowed, and passed in the feces. The eggs are eaten by earthworms, the larvae hatch in the worm, and if the earthworm is swallowed by a pig, the earth worm is digested and the lungworm larvae set free and finally work themselves to the pig's lungs. Don't turn young pigs into a pasture infected with earthworms. These pastures may remain infected for years. Where lungworms are a problem, pigs should be placed on a clean floor or in a clean, well drained pasture that has not been used for hogs for several years and is free of manure and trash.

Diarrhea

Diarrhea, or scours, may occur in young pigs any time from birth. Clean quarters, washing the sow before she goes into her farrowing pen or crate, a dry floor, uniform temperature of 50°F or more and vaccination of the sow for erysipelas one month before farrowing may help prevent this condition.

Beginning the hour they are born, any time young pigs show any signs of a watery or loose feces they probably are developing diarrhea. Treat these cases with whatever your veterinarian recommends to stop the scours without delay. If a watery discharge is noted in small pigs, treat the litter at once. Don't wait even an hour. Delayed treatment can mean the difference between losing and saving the litter.

In some areas transmissible gastroenteritis (TGE), a severe form of enteritis, causes heavy losses among young pigs. There is no satisfactory medication for this disease. If it contaminates the premises, practice extreme care in the management of sows and their litters. Do not permit stepping from litters contaminated with TGE organisms to clean litters in stalls where pigs are not showing signs of the disease. Disinfect thoroughly any pen where diseased pigs have been held before any young pigs are allowed in. Laboratory diagnosis of an infected pig results in the best suggestions as to how the immediate outbreak of any disease may best be controlled. Consult your veterinarian on the best management in your specific case. Don't let disease get a start in your hog lots.

At the Dickinson Research Center the following formula has given excellent results in curing an outbreak of scours in pigs ranging in age from newborn to several weeks old. Mix well one-third Tylan 200, and two-thirds erysipelas antiserum. Store in a dark place under refrigeration. The most successful dosage is: 2 cc from birth to 5 days old, 3 cc up to 14 days, and 4 cc after 2 weeks, given subcutaneously just under the loose skin below the elbow joint back of the front leg. This treatment gave excellent results when all others seemed to fail. Sometimes little pigs go into mild shock following the injection, but in all cases at the Research Center this condition was of short duration and no ill effects followed. Good effects have been obtained at the Research Center by treating scours in older animals with Tylan 50 according to directions for animals under one month old, and with twice the recommended amount for a pig over that age.

Intestinal or Gut Edema

This is a form of enteritis that may cause quick death to young pigs following weaning. A very rich ration of 30 per cent corn, 20 per cent oat groats and 30 per cent of a good supplement, 10.5 per cent dried milk or whey, along with 5 per cent sugar, proper minerals and vitamins, has been known to bring this condition about.

Diluting this or any other ration with from 30 to 50 per cent of finely ground oats will stop the death losses from intestinal edema. No medication is of known value at this time.

One way of treating for gut edema has been to give the baby pigs a laxative, such as Epsom salts. In the process of creating a good severe diarrhea, they dehydrate themselves and eliminate the edema in this way.

Skin Diseases

Pigs fed zinc sulphate or zinc carbonate at the rate of 180 grams per ton of feed should not develop parakeratosis, which causes a rough condition of the skin on the body, in the ears and on the legs. Zinc should be included in all balanced rations. Keeping the calcium content of the ration below one per cent also will help prevent this trouble.

External parasites, such as mange, mites and lice, may cause a rough skin condition. These can be eradicated with lindane, applied according to directions. Other approved medications may be used for this purpose. Always follow

the directions approved for use on swine for any medication. Do not spray pigs before weaning and at least 30 days before slaughter. If pigs are dipped in lindane the holding period before slaughter is 60 days.

SMEDI Virus

This disease causes sows or gilts to be serviced several times without establishing pregnancy. It also causes them to farrow smaller than normal litters. Dark mummified pigs are farrowed and whole litters do not do well. The disease is a combination of embryonic death, infertility, stillbirth, and mummified fetuses.

No vaccine or drugs are available to control this disease. After running a course of several months it may correct itself. Isolation of the organism can be satisfactorily done only if a bred sow is sacrificed about two months after breeding.

If this condition is suspected, keep all visitors, animals, birds and insects away from the herd. Exposing all animals in the herd to the areas on the farm most contaminated with this disease about 4 weeks before breeding may give some protection by establishing immunity. One currently recommended practice to control the SMEDI virus is to have through-the-fence contact with any new additions to the herd or infected animals at least 30 days before breeding. This creates a spread of infection through the animals and builds up immunity previous to breeding.

Atrophic Rhinitis

Rhinitis is an inflammation of the mucous membranes that line the pig's nose.

Sneezing is the most common clinical sign. Sniffing, snorting, and coughing are commonly observed signs. A moist, crescent-shaped area below the eye is often present. Discharge from the nostrils is frequently observed. Clear or yellowish, this discharge may contain blood in some cases. Crooked noses and shortening and thickening of the nose may occur.

Control of atrophic rhinitis is possible. Control methods include:

1. Careful monitoring of the flow of animals into the herd.

2. Maintenance of environmental quality and sanitation.
3. Medications. The type of drug used, route of administration, and the period during which it is employed will vary.
4. Judicious use of immunizations. Multivalent vaccines or autogenous bacterins may be used, depending on specific needs of the herd. Immunizations are part of but not a substitute for comprehensive control measures.
5. Periodic evaluation of progress. Routine slaughter checks, tabulation of feed efficiency and growth rates, and percentage of poor-doers and stunted hogs are all used, singly or in combination to assess the economic impact of control measures.
6. Vaccination is a useful aid in the control of atrophic rhinitis. The swine veterinary practitioner, in cooperation with capable personnel at a diagnostic laboratory, is the best resource person to determine which control methods will be most cost effective for a particular pork production unit.

Mycoplasmal Pneumonia

Mycoplasmal pneumonia probably is the world's most serious swine disease. Pigs usually show the first signs of the disease between 3 and 10 weeks of age. The incubation period is between 10 and 16 days after exposure.

Some of the first signs are diarrhea for 2 or 3 days, followed by a dry cough with little or no material being expelled. Suckling pigs may go through a period of sneezing for several weeks. This is most marked when pigs come out in the morning, and may be brought on by vigorous exercise. Otherwise, respiratory movements may be normal, unless the case is extreme.

Pigs usually eat well, but do not make gains and become stunted. There may even be a weight loss. Pigs may apparently recover from the disease, and then get a relapse several months later.

There is no adequate treatment of established mycoplasmal pneumonia currently available. Good management will help minimize the effects of the disease.

Swine Influenza

Swine influenza is a herd sickness, affecting large numbers of individuals rather than one or two. The disease comes on suddenly, and affects most of the herd under one year of age. Fever runs high. The animal becomes prostrate and develops a cough. The period of illness usually is not over 6 days, and recovery is sudden. Death losses usually are light.

There is no known treatment for influenza except good management. Keep the animals in a clean, dry warm place free of drafts, well bedded, and as comfortable as possible.

Erysipelas

Death losses from erysipelas in North Dakota can be serious, and the disease, which affects animals in numerous ways, may render the animals worthless if it doesn't cause death. It is transmitted to poultry, sheep and man. Animals that have not been vaccinated for erysipelas shouldn't be brought into a herd.

Acute erysipelas may cause sudden death of one or more animals in the herd. Animals with erysipelas have high temperatures, sometimes show lameness, may have a stilted gait, and if touched, squeal because of severe pain. The skin on the sides usually becomes red or purple, and later may get very dark. Animals often are found dead as the first warning of an erysipelas outbreak. Call your local veterinarian at once, and if there is any question about what the disease really is, send a specimen to an approved laboratory for diagnosis.

In many cases, recovery by animals with the disease is very good if anti-erysipelas serum and a suitable antibiotic is administered.

Both medications should be given in an amount about three times greater than generally recommended, i.e., about 50 to 70 cc of the anti-erysipelas serum and 20 to 30 cc of the antibiotic, streptomycin penicillin. In the chronic form, the joints may become swollen, lameness develops, the pigs become unthrifty and gain slowly. They will never develop into first class market hogs.

Before erysipelas is on the premises a regular vaccination program should be followed. This includes vaccination of

healthy pigs with vaccine or bacterin at about 6 weeks of age, and, if there has been a recent outbreak, re-vaccinate again in 3 weeks. Gilts kept for breeding should be vaccinated when selected at about 220 pounds and again about 4 weeks before farrowing. Breeding stock over one year old should be re-vaccinated annually.

PRODUCTION

In North Dakota, with our large acreages a conventional type setup is satisfactory for the small or medium sized swine operation and requires less investment.

Thus most suggestions and recommendations in the first part of this chapter deal directly with the conventional swine operator, concerning problems connected with management of either the feeder pig or finishing enterprise. Problems of the operator who wants to "go Big" will be discussed later, since he has many things to consider in addition to the problems most common to a routine hog management program.

Before starting, anyone considering a hog production enterprise should ask himself some questions. How many hogs will he farrow or market each year? Will he build a hog production factory, or keep a small herd of anywhere from a few to 50 sows? Will he raise pigs to be sold as feeders, or finish feeders for market, or both?

The size of his operation will determine the direction to go. For maximum returns, confinement facilities require a substantial investment and a rather large operation when raising either feeder pigs or a growing and finishing unit.

Any operator starting a swine enterprise, no matter how large his plans for the future, could do well to begin and operate for at least a year with a herd of medium size. This is true when starting any type of hog enterprise. The smaller operation will give him the "feel" of swine production. He can determine if his picture of a swine enterprise seems the one most desirable for the conditions under which he operates. If he plans a feeder pig unit, it will enable him to become acquainted with some of the problems. Management of swine is different from any other type of livestock, with disease, perhaps, the greatest hazard. Establishment of an economically sound swine enterprise includes preventing any disease or infection from entering the herd, and eradicating at once any disease that may get started. Once a herd of hogs needs to be treated for disease or infection, the profit is gone for that lot. Disease, infections and parasites result in slow gains, a drop in feed efficiency, and stunted pigs, along with others, that may

appear all right but simply do not thrive.

In a small farrowing operation, gilts are grown out on pasture, with both sows and gilts kept on pasture until shortly before farrowing. For growing out gilts or grazing sows, adequate pasture should be provided during the summer months. One acre of good pasture will provide for about 10 sows. One highly regarded pasture crop is alfalfa, but since the pasture should be rotated, or at least be tilled each year, a crop like winter wheat planted in the spring will provide good grazing on a clean field. A pasture must have an adequate water supply. One hog waterer that can be electrically heated during the winter can be placed on the line fence to service two pastures.

Pastures of one acre each should have a gate at each end of the division fence between each two lots, so both can be moldboard plowed in one operation (Figure 10).

One year the furrow slice can be thrown to the outside of each lot, and to the inside next to the center line fence the following year. This method of tilling makes plowing easy and eliminates dead furrows, which can cause water erosion and rough lots. It is desirable to have cement ramps on the inside of each pasture lot next to the fence forming the central holding area so that self-feeders have a firm foundation. If the concrete slabs are constructed large enough the pigs may be hand fed on the slab. If pasture finishing is planned, the same type of pasture setup can be used for finishing following weaning. The holding area should have the barn at one end, and the lots on each side, with the other end fenced and with a gate.

About 20 pigs of approximately the same weight is about the right number in one finishing pasture or drylot. Try to start with the right number of pigs in each lot, since adjusting the number between pens as they increase in size may result in fighting and sometimes the loss of a pig. The fighting involved in establishing the social order also results in poorer gains and feed conversion.

A barn for farrowing may be constructed or converted from another building. A hog barn that is also used for cattle is not ideal, unless it has a concrete floor and is thoroughly cleaned before the hogs are moved in for each series of farrowings. A cattle yard which cannot be thoroughly cleaned in wet weather becomes muddy and filthy and makes disease control almost impossible.

The barn should be insulated, and with a minimum of, or without windows. Doors should be constructed so they can be closed tight enough to eliminate all draft. An adequate ventilating system should be installed, which may be an air duct constructed in the attic, with at least one exhaust fan at each end and a fan in the center to draw in fresh air. The fans on the ends should be thermostatically controlled, and the one in the center controlled by a time clock so the center fan can change the air at regular intervals even though the temperature of the barn has not changed.

Solid floor farrowing houses may be used in small swine operations, but require more labor and bedding. A 24 foot wide house with a 4 or 5 foot alley is adequate. Slope the floors one-half inch per foot towards the alleyway. Because of our cold winter weather an outstanding hog breeder in North Dakota covered the concrete floor with planks to provide a warmer floor for the pigs during cold weather. It is possible to heat the floor with electric tapes imbedded in the concrete or three fourths inch copper pipes in the floor, through which hot water is forced. However, if the floor is covered with planks this should not be necessary. Additional heat can be provided in the building with 5000 watt heaters placed near the ceiling at both ends of the barn and thermostatically controlled. If steam is used in heating the floor, additional heat can be provided by using a boiler. A one inch layer of styrofoam beneath the concrete containing the heating pipes or tapes will greatly reduce the heat loss. The styrofoam should be above a firm layer, preferably concrete, to hold it in place.

A sow wash room is desirable. It can be an extra stall with a semi-smooth floor pitched to the center at one fourth inch per foot and draining into the lagoon or a septic tank. If pens are used, the sow can go from the wash to the pen. Plans should be made to heat water for washing the sow. The same water system can be used for washing the barn when it is being cleaned at the start of the farrowing period. Wash the barn with hot water to which detergent has been added. It should be forced out at not less than 200 pounds pressure. Following washing, spray the barn under pressure with a disinfectant solution, covering all wall and pen surfaces. Use of a good disinfectant with a minimum of odor.

If farrowing crates are not used, pens 8 by 7 feet with an iron trough built in the gate for hand feeding makes a satisfactory arrangement (Figure 11). Sows can also be fed on the floor in which case the feeding should be done at the high end of the pen. If the sows are not hand fed they can be self-fed. The hand feeding or feeder filling can be easily handled by using a feed cart in the alley. Feeding at the high end of the pen requires a barn more than 24 feet wide, since feeding this way requires an alleyway on each side from 3 to 4 feet wide in front of the pens. In some

cases liquid feed is used especially in confinement farrowing barns, and with a balanced ration this works out satisfactorily.

The pen should have guard rails and a brooder with a reflector light or a heat lamp (Figure 12). The brooder should be protected from the sow by a gate across the corner that permits the pigs to enter. An iron trough in the front gate is desirable unless automatic waterers or nipples are used. This setup does not require any other equipment, unless the pen is equipped with iron gates, hinged 22 to 24 inches apart, at the head of the pen next to the wall. These swinging gates and guard rails (Figure 13), can be used to reduce the farrowing area in case the sow is restless, serving the same purpose as a farrowing crate. One gate can also serve as a creep, behind which a small self feeder can be placed when the brooder is removed after pigs are a week to 10 days old. In case the sow or pigs need medication it provides excellent protection, and makes handling the sow and/or her litter a very easy matter. When the gate is open to the maximum it gives the sow adequate room for exercise without moving her out of the pen. The gate can be chained in any position desired.

[Figure 11](#). Farrowing pen showing gate with built-in trough for feed and water

[Figure 12](#). Brooder with heat lamp

[Figure 13](#). Swing gates used as a farrowing crate

Sows and their litters can be held in the farrowing barn until the pigs are ready for weaning, or moved out into lots or into the pasture when from 3 to 10 days of age to make room for other sows to farrow. It is not desirable to put more than two or at the most three sows and their pigs in one lot.

Following weaning, the pigs can be left in the lots or pastures and the sows removed, or they can be moved to a dry lot with a concrete floor with or without slats, for finishing. Floors for finishing houses are described under "Confinement Finishing". If no slats are used, the waterer should be placed at the end of the floor from which the manure is removed. The feeder should be placed toward the front of the pen, away from the manure removal area. One waterer space or nipple is adequate for 20 pigs, with one waterer serving two pens and one nipple for each pen. One four-hole feeder should be adequate for 20 pigs. The pigs could be fed on the floor at the high end of the

pen. Floor feeding promotes the best dunging habits in pigs.

Farrowing crates are ideal and the right way to go. Each crate usually requires an area of about 30 square feet. Many types of commercial crates are on the market, or they can be built at the time the barn is constructed. About the same size barn is desirable when crates are used in place of stalls, except that there should be an alley space in front of each line of crates for feeding, etc. This adds about 6 to 8 feet to the width of the barn.

Pigs can also be finished in the farrowing pens, following weaning, unless the pens are needed for more farrowings. Another alternative is to add a pig nursery to the facilities. The nursery can be used for pigs anywhere from newly weaned to a weight of from 40 to 80 pounds. It should be so designed that it can be kept warmer and more comfortable in cold weather than the finishing facilities.

Each pen should have about 8 square feet per 200 to 220 pound pig. Younger pigs do not require that much space. Some producers handle this by having the center alley offset to one side. The pigs are all started in the smaller pens on one side in uniform groups, and are moved to the larger pens across the aisle as these, in turn, become empty. Floors should be semi-smooth and pitched at the rate of one fourth inch per foot.

Unslatted floors should be pitched to the alley, and the manure shoved out into a mechanical gutter cleaner, which saves considerable labor in facilities of this type. If the alley is 8 feet wide, the manure can be loaded on a manure spreader from a gutter.

The slatted area in pens should be 2 inches below the cement floor, which is pitched back from the alley. Pigs also may be finished on pasture, which takes a little longer than when finished in a concrete lot or in confinement. No pasture should accommodate more than about 20 pigs of the same weight. Feeding can be handled with a self feeder or on the floor, with all feeding done on a cement ramp next to the alley.

For North Dakota, a semi-confinement setup will serve the purpose for multiple farrowings and hold costs to a minimum if a confinement program is desired.

Grain storage should be close at hand, with metal tanks probably the most satisfactory. Where home grown feed is fed the processing equipment requires a grinder mixer of adequate size. A portable unit is most desirable. Use

home grown feeds when possible. They cost the least, and when supplemented are satisfactory for any type of hog operation. If processed feed is purchased, a large storage facility may not be necessary, as the feed will be delivered as needed.

Good water with a pressure system should be available at the hog plant. Unless the line can be connected to the underground water system it may be best to have a well right at the hog plant. Nipples can be used to water hogs in the summer or in heat controlled buildings, one nipple for each 20 pigs. Where the temperature is not controlled for cold weather and automatic watering system should be provided for in the barns, pastures and outside lots, with waterers that can be electrically heated. If properly installed, one waterer will take care of two lots. Adequate water is a must for economical swine production. It is the cheapest and most important feed element.

Confinement

Devoting the major part of one's time to hog production requires a large operation. Because of the labor involved, it should be set up on a confinement or semi-confinement basis. Don't start this type of operation without knowing something about hogs. This is the reason for a small operation and a thorough study of swine production before the expansion.

With the advancement in hog rations and feeding, large numbers in swine can be produced in confinement from farrowing to market, on concrete or in dry lot.

Confinement requires more complete rations, which may cost slightly more than rations fed under other systems. Total confinement has the advantage of controlled temperature both winter and summer. Internal parasites can be controlled satisfactorily, and more hogs can be produced with less labor if the quarters are well arranged. Hogs in confinement make disease control more difficult. Proper manure disposal, tail biting, odors and flies are problems that should be recognized and appropriate control action taken.

One of the greatest confinement problems is selecting breeding stock feet and legs strong enough to withstand continuous exposure to concrete or other hard flooring. Slatted floors in some cases seem to cause additional trouble to feet and legs.

In a semi-confinement system the pregnant sows can be pastured, with adequate grazing, during the summer months, and can be self-fed in dry lots during the winter until shortly before farrowing. Winter housing can be provided in sheds or small houses (Figures 14 and 15).

[Figure 14](#). After farrowing, one gate is removed and the other is swung back to protect the breeder, leaving ample room for the sow.

[Figure 15](#). Hog houses used at the Dickinson Research Center.

[Figure 16](#). Hog houses set up in a unit to accommodate several sows and their litters.

Developing a large feeder pig production unit, or a growing and finishing unit, requires expensive confinement facilities for either one or both operations. To use this equipment properly, the hog program must be so organized that the facilities are in use the year around. It is feasible to start with one operation, perhaps feeder pig production, and later branch into the other if a total production unit is decided upon.

Try to hold down expense, keeping new and untried features to a minimum. You will be less likely to want to change the building after the operation is under way.

A confinement finishing unit should handle at least 500 head or more at one time. To operate economically it must be filled to capacity at all times. Finished hogs should be marketed, and replacement feeder pigs added as near the same time as possible. Outline a plan for a source of feeder pigs, either purchased or raised on the same unit, to be available, disease free, when needed. A smaller unit than this may not pay for both liquidating the initial cost of facilities and providing a good income. If the owner of a finishing unit is furnishing his own feeder pigs, he must have a farrowing setup that will farrow out and raise 35-to-50 pound replacement feeder pigs to be ready at the proper time. This may require sows farrowing each month, with perhaps up to 10 percent more bred that is believed needed to allow for shy breeders, and ensure enough feeders of the right weight at the proper time.

Some of the most successful hog raisers have remodeled existing buildings with real success. In remodeling or in new construction, arrange the space and put in the facilities you believe best suited to your own planned operation, based on your inspection tour. Hog production facilities over the main swine producing areas are of many types.

Some work, other don't. This only emphasizes the need for starting with what "grass roots" operators have found best.

Never start construction of facilities on the basis of recommendations by individuals or publications. Locate several successful producers with the type of plant you have in mind. Visit them. Find out what their problems are, and what changes they would make, if any, in their present operations. Try to visit no less than six or more successful swine enterprises of the type you are interested in. The time will be well spent, for it will be the cheapest of educations and will eliminate many pitfalls. Talk with the man in charge at each operation. Ask about the good and bad points of each enterprise. Then decide what your own facilities should be.

A confinement house for farrowing and/or nursery should be well be insulated, heated and ventilated.

The one used at the Dickinson Research Center is very satisfactory and is not an elaborate or expensive structure. It was a building originally used as a hog house, machine shed and storage building.

In 1952 it was converted into a low input farrowing house with pens, brooders and facilities necessary to start a sound but small operation on any farm.

In 1979 this building which is 24 feet by 60 feet was moved to the Ranch Headquarters. The building was set on a concrete foundation 18 inches above footings which were level with the ground. The building was then remodeled again into a modern confinement farrowing and nursery building. Figure 16 shows a view of the building in its new location.

Fiber glass insulation was used in the walls with vapor barrier to protect the insulation from the moisture which tends to move from the warm moist areas to the cooler outside. To eliminate this flow of moisture the vapor barrier was placed near the warm side of the wall immediately beneath the interior lining of celotex. A common vapor barrier used is a 4 mil plastic film. The outside of the building was sheeted with beaver board and covered with corrugated sheet metal.

The floor plan has a 3 foot center cement alley extending the entire length of the building pitched to a sewer drain about ten feet back from the front of the building. Sewer pipes were laid from the drain to a septic tank about 75 feet

from the building.

A concrete floor was poured from each side pitched $\frac{1}{2}$ inch per foot to the center alley. The alley floor was pitched $\frac{1}{2}$ inch per foot to the floor drain. Experience indicates that the alley which is level with the floor should be recessed about 2 inches and have three drains, one back 10 feet from each end and one in the middle of the alley. With the alley floor pitched $\frac{1}{4}$ inch per foot to each drain. From the center drain to the end drains the floor should be pitched from a half-way point to each drain. The floor should have a semi-rough surface.

[Figure 17](#) shows a close-up view from the front of the farrowing crates six on each side back 9 feet from the door. Experience indicates that the alley which is not quite 3 feet should be 4 feet wide and the alley in front of the crates which is 38 inches should be at least four feet wide. This will make it possible to move a feed cart down the alley when the pigs are being fed. The width of the building limited the size of the alleys. If a building were constructed it should be at least 26 feet wide inside measurements.

Fiberglass insulation was used in the walls with a vapor barrier to protect the insulation from the moisture which tends to move from the warm, moist areas to the cooler outside. To eliminate this flow of moisture, the vapor barrier was placed near the warm side of the wall immediately beneath the interior lining of the celotex. A common barrier used is a 4 mil plastic film. The outside of the building was sheeted with beaver board and covered with corrugated sheet metal.

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[Figure 18](#) is a close-up view of a farrowing crate. The floor of the crates as well as the floor of the nursery pens is elevated $10 \frac{1}{2}$ inches above the concrete. Note the guard rail to protect the pigs from the sow, and the slatted floor in

the brooder. The rear half of the crate where the sow stands is slotted. In the front she stands on a solid floor. The feeder in front of the brooder is used to get the pigs eating as early as possible. There is also a feeder at the head of the crate for the sow, and a nipple for water piped down from the ceiling water line. The feeders are next to the side alley to make easy filling from the feed wagon.

[Figure 19](#) shows feed carts used in moving the feed along the alley. Such carts can be constructed of a width that can be used in the alley.

[Figure 20](#) shows a small scale used for weighing pigs and feed.

[Figure 21](#) shows the two nursery pens on each side of the center aisle extending from the crates to within 4'6" of the back wall. The nursery pens 6'2"x7'2" the same width as the farrowing crates. The pig feeders are located next to the side alley. If the hog operation was such that the farrowing crates were used to a maximum it would be necessary to have another nursery with 6 to 8 nursery pens if the pigs were to be kept until weighing about 70 pounds.

If this house were equipped with four stalls and four nursery pens on each side as a unit it would accommodate and entire operation of farrowing and raising feeder pigs to about 40 lbs. Nursery pens of this size are adequate for about 10 pigs.

Ventilation is handled by an AAA Heat Trapper II installed in the building near the ceiling about half way down the side of the barn. Incoming fresh air is brought from the bottom of the outside wall and is pulled through the exchanger core by the intake fan which is mounted above head level. This permits moving about easily and provides good air distribution. The exhaust fan pulls foul air through the filter system and then through the exchanger core to transfer its heat to warm the incoming air. The heat transfer core is constructed of durable co-polymer plastic for long life.

Additional heat needed is provided by two 5000 kilowatt heaters thermostatically controlled and suspended one on each side at the front of the building. When sows are farrowing the temperature should be about 90°F which may require additional heat in the brooders. Over a period of about 10 days the temperature can be reduced to 60°F.

The entire barn is cleaned by washing the manure under pressure to the center alley. This is where it is important to

have the floor pitched $\frac{1}{2}$ inch per foot. The manure in the alley is then washed to the drain and flows to the septic tank. Three floor drains in the alley with a pitch of $\frac{1}{2}$ inch per foot will make this easier. Each drain could lead to a separate septic tank or the same tank which ever is most feasible. Enough water should be added in the septic tank to keep the liquid at the desired consistency. The septic tanks can be pumped out and spread on the fields. It is desirable to have an agitator to keep all solids in solution when the tank is being emptied.

The pigs at the Dickinson Research Center are finished in dry lot and self-fed. The pigs can be watered with nipples in the summer with a nipple for every 20 pigs. In winter an electrically heated waterer is an absolute necessity.

A dry lot that is satisfactory for any finishing operation should be located so it will drain naturally if possible. Houses like the one shown in [Figure 22](#) can be provided for protection in the winter and shade in the summer.

It should be next to the outside wall and 2 inches deeper than the solid part of the floor that is pitched $\frac{1}{2}$ " per foot to the slats. Long narrow pens encourage superior dunging habits by the pigs compared to square or nearly square pens. The slats should run the long way of the pen since pigs prefer to walk on slats the same way they are moving. When a portion of the floor on the high end is solid it results in more dunging on the slats and less foot injury to the pigs. About 8 square feet should be provided for each pig. In this type of setup the manure falls through the slats in a pit about 5 feet deep, and can be pumped out or drained in a lagoon back of the house. Enough water should be added to keep the liquid at the desired consistency. There should be a ventilation space between the floor and the pit with a low volume fan to keep the air circulating. Even with this there may be some odor problems. The building must have a ventilation system which consists of air intakes and an exhaust fan. A louver in the attic will provide a good intake through a slot in the ceiling of the house. If a second air inlet is needed it should be just under the ceiling on the wall opposite from the exhaust fan. The ventilation system used in the farrowing and nursery at the Dickinson Research Center is very satisfactory.

Confinement Finishing

When pigs are finished in complete confinement the building should be well insulated and properly ventilated. The floors should be pitched $\frac{1}{2}$ " to the foot to the alley and the manure removed from there. The alley should be about 2 inches lower than the floor and pitched $\frac{1}{2}$ " per foot to the floor drains. The drains should be about 30 feet apart and

pitched from the center between two drains to each drain. The drains should lead to one or more septic tanks.

If the floor is slatted, properly reinforced concrete is as good as any; however, steel and plastic are satisfactory. The slatted area should be about 4 feet wide.

When a lagoon is used with two cubic feet capacity per pound of live hog it will digest all the liquid and solid wastes coming from the production building. This should be calculated on the basis of the maximum weight of the animals on the farm at one time. The lagoon bank should be two feet higher than the highest liquid level the liquid will reach in the lagoon. It should not be located near a creek or river because of contamination.

SWINE RATIONS

A profitable swine enterprise depends upon the proper nutrition of swine in each phase of production. The correct nutrition is built into the ration with adequate protein, energy, vitamins, and minerals. Protein is made up of about 22 amino acids, 10 of which are critical to the pig's diet. Amino acids in the diet must be balanced according to the pigs' needs. The pigs' requirement for protein is determined by the amino acids that make up the protein. If the amino acid lysine is low in the ration it will limit the rate of protein synthesis and the diet will be inadequate. The use of grain raised on each farm is essential and will produce satisfactory gains when properly supplemented.

Pigs convert feed into edible meat more efficiently than other four-legged animals. The amount of feed required per 100 pounds gain is lowest in young pigs and increases steadily as they grow older and increase in weight. The rate of gain begins to decrease at about 240-250 pounds.

The best sources of energy are barley, oats and wheat, and corn in those areas of North Dakota where corn is produced as a grain crop. The grain raised in any area is the source of energy that should be used locally. Do not feed blighted, moldy, or ergot-infected grain.

For satisfactory rate of gain and reproduction, grains need supplementary protein to increase both the quality and quantity of protein, or amino acids, provided. This can be accomplished by addition of soybean oil meal, or by-products such as meat and bone meal, fish meal, meat meal, or tankage. A prepared protein supplement for swine can be obtained from a local feed dealer. These supplements will furnish minerals and vitamins as well as high-

quality protein. When buying a protein supplement, calculate the best price on the bases of lysine content. Liquid whey from cheese plants can be used profitably, providing distance from a cheese plant is not great.

Swine rations always require mineral fortification, because grains are extremely poor sources of calcium and one half to two thirds of the phosphorous present in grains is nutritionally unavailable to pigs. Minerals can be provided by buying a mineral mixture and adding according to the directions or by adding dicalcium phosphate and limestone at the rates of about one percent each in the average grain ration. When protein supplements of animal origin are included, less calcium and phosphorous need be added.

Growing-finishing pigs should receive 0.7 percent calcium and 0.6 percent phosphorous or more in the ration. Slightly higher levels of both minerals are desirable for young pigs. The calcium to phosphorous ratio for growing-finishing pigs should be kept between 1.0:1 and 1.3:1. Although calcium is comparatively cheap and an essential addition to swine rations, using excess amounts can interfere with absorption and utilization not only of phosphorous but several trace minerals as well, including zinc, iron, and copper.

Sows can tolerate somewhat wider Ca:P ratios. For lactating sows, 0.75 percent calcium and 0.6 percent phosphorous should be minimum levels. Sows occasionally "go down" following lactation; this is usually due to inadequate calcium in their lactation ration, but could be due to vitamin D deficiency.

Sows that are limit-fed during gestation need higher levels of minerals in their rations because of sharply restricted ration allowance. Sows restricted to four pounds ration or less should have 1.0 percent calcium and 0.8 percent phosphorous in their ration. When sows are allowed more feed daily, mineral levels in rations for limit-feeding can be reduced accordingly.

Salt should normally be included in swine rations at levels from 0.25 to 0.50 percent of the ration. This should be in the form of a special salt, formulated to meet the mineral needs of swine. Where farms have water supplies high in sodium content, no salt or reduced amounts should be included in the ration.

Trace elements also are essential additions to hog rations. Hairlessness in pigs at birth indicates iodine deficiency. Feeding stabilized iodized salt will help prevent this problem. Only 0.1 milligram iodine added per pound of ration for

bred sows is enough to prevent shortage.

Parakeratosis is a severe skin disease that sometimes shows up in swine when zinc intake is inadequate or when the calcium content of the ration is excessively high. The disease can be controlled by adding zinc carbonate or zinc sulphate to the ration at the rate of from 0.01 to 0.02 percent.

Real young pigs may develop iron deficiency before they are old enough to eat a creep ration. This comes about from rapid growth of the young pig, low iron reserves at birth, and very low iron content of sow's milk. This is almost exclusively a baby pig problem and can be controlled by injecting iron according to directions. If the pigs are on concrete dry lot and not on creep feed at two weeks of age another injection is desirable. Do not use injectable iron after four weeks of age or the meat at the site of the injection may be stained. If an injection is necessary at that age it should be made into the jowl. Ordinary soil from areas not frequented by hogs also is helpful in providing iron to baby pigs if placed in the farrowing pen twice weekly.

Vitamins A and D are of extreme importance in swine feeding. Swine on green pasture do not need vitamin A or D additions to their diet. Well cured high quality legume hay fed to sows and boars in dry-lot will help insure against vitamin shortage, but it is best to rely on additions of synthetic vitamins for finishing pigs in dry-lot.

Alfalfa hay additions to growing-finishing rations contribute too much fiber to the ration and cause lower gains and feed efficiency. Alfalfa hay can be provided in a hay feeder for sows and boars in dry-lot when not in the ration, however. Alfalfa can be used to dilute a sows's ration when self-fed in order to keep the sows in proper condition.

For pigs in dry lot, the required vitamins A, D, E, riboflavin, pantothenic acid, niacin, B12, and choline should be provided in supplements to assure against shortage of these important nutrients. A special vitamin premix prepared for swine or use of either a complete commercial hog supplement or complete commercial rations should be depended upon to avoid vitamin deficiencies in young pigs and growing-finishing hogs. The B complex vitamins are needed in limited amounts and can be supplied by green, growing pasture or high-quality alfalfa hay for breeding sows and boars. Sows and boars on green, growing pastures are unlikely to encounter vitamin shortage. For young and growing pigs in dry-lot or for breeding stock in dry-lot, use a product containing synthetic vitamins provided by your feed dealer mixed according to directions.

Remarkable progress has been made in recent years in our knowledge of swine nutrition. Problems have developed with hogs raised in confinement which may be closely associated with nutrition under such a system. Under confinement production all their nutritional needs must be provided in proper amounts and proportions by their ration since they have no opportunity to use their own instincts to select dietary needs. Recent experience and research has suggested need for supplementary vitamin E, selenium, and biotin under certain confinement conditions.

Simple rations based on barley, heavy oats, and soybean oilmeal plus needed minerals and vitamins form an economical basis for production of hogs in North Dakota.

Several rations are listed below as examples of rations useful for pigs of different ages. These rations may be modified to use economical feeds available on the farm or in the locality.

These rations are formulated with the percentage of protein and lysine at a level determined to be satisfactory for the class of swine being fed. The lysine content of the rations was calculated using the percentage of lysine listed after each of the following feeds: barley 0.40; oats 0.40; alfalfa 0.85; soybean meal 44% 2.90.

The following table gives the protein and lysine requirement for the different classes of swine as determined by the National Research Council.

Class of Swine	Protein %	Lysine %
Pigs weaned and up to 50 lbs.	18	0.95
Pigs 50-110 lbs.	15	0.75
Pigs 100-220 lbs.	13	0.60
Bred gilts, sows and adult boars	12	0.43
Lactating sows	13	0.60

Most of the protein that furnishes the lysine is added in these rations by 44% soybean meal. Some producers may want to add one supplement that includes the protein, mineral and vitamins the grain rations requires. Very satisfactory supplements can be purchased from feed dealers and when used should be added according to the feed dealers recommendation.

Oats is not used in rations for growing and finishing pigs because of the high hull content which lowers the nutritional value. It will results in lower average gains and the amount of feed per pound of gain will increase. If oats of about 40 lbs. test weight is available it can be used to replace about 1/3 of the barley with a minimum affect on the rate of gain and feed consumption.

Pre-starter type commercial baby pig feeds are available, but quite expensive. If the young pigs have access to the sows feed, they will learn to eat before weaning and a pre-starter type feed is not necessary. The pig starter to be fed prior to and following weaning should contain 0.95 percent lysine, 0.9 percent calcium and 0.75 percent phosphorous.

Ration I. Grower ration for young pigs after weaning (30-50 lbs.)	
Barley	1359 lbs.
Soybean oil meal	365 lbs.
Dicalcium phosphate	36 lbs.
Limestone	20 lbs.
Trace mineral salt	10 lbs.
Swine vitamin premix*	10 lbs.
Lysine monohydrochloride	0.7 lbs.
Total	2000 lbs.
*Use vitamin premix according to manufacturer's instructions.	

Growing-Finishing

From 50 pounds to market weight of 220 to 235 pounds, groups of healthy, parasite-free crossbred hogs should make average gains from 1.5 to 1.6 pounds daily. Select groups may gain faster. Approximate feed requirements per 100 pounds gain for this whole period will average near 400 pounds grain in summer on meal rations. Pigs fed complete rations in pellet form will gain up to 10 percent faster on about 14 percent less feed, so will require around 350 pounds ration per 100 pounds gain. Both the starting weight and the final market weight have important effects on the calculation of amount of feed needed per hundredweight gain by the growing-finishing pig. Feed requirements per 100 pounds gain are higher during the winter than during the warmer seasons. The amount of increase in feed needed during winter depends upon how much exposure to the elements the pig faces.

Studies show that pigs up to 125 pounds require a high-quality protein supplement and higher lysine levels, whether fed in dry lot or on pasture, for satisfactory gains. Pigs heavier than 125 pounds need supplemental protein for the best gains and feed conversion, although lower levels of protein and lysine can be used than for smaller pigs. Pigs on excellent pasture, have reduced needs for supplementary protein. High quality pasture will maintain satisfactory gains when lysine level of the ration is reduced several tenths of one percent, as compared to comparable pigs in dry-lot. The heavier the pigs are, the less critical is the need for supplemental protein. To minimize feed costs it is best to reduce lysine level of the ration as pigs grow, to correspond with their reduced dietary need for lysine.

When protein is high in price relative to cost of feed grains, it may be most economical to feed slightly less than the amount of lysine needed to give maximum gains and feed conversion efficiency. When the lysine level is lower than optimum, efficiency of feed conversion seems to decline more rapidly than gain rate. On the other hand, when grains are high in price relative to cost of protein supplements, it will be economical to feed higher levels of lysine to assure maximum gain rate and feed conversion efficiency.

When reducing lysine level, be sure to maintain ration mineral and vitamin fortification at adequate levels. This is especially important when using complete commercial supplements, as one depends upon these feeds to furnish ration mineral and vitamin additions as well as supplementary protein.

Ration II, with the percent protein as indicated, will do a good job of growing out pigs.

Ration II. Rations for growing-finishing swine.		
Ingredient	50-100 lbs.	100-220 lbs.
Barley	1664 lbs.	1761 lbs.
Soybean oil meal	272 lbs.	175 lbs.
Dicalcium phosphate	24 lbs.	24 lbs.
Limestone	20 lbs.	20 lbs.
Trace mineral salt	10 lbs.	10 lbs.
Swine vitamin premix*	10 lbs.	10 lbs.
Total	2000 lbs.	2000 lbs.
*Use vitamin premix according to manufacturer's instructions.		

Tankage, fish meal, meat scraps, meat and bone meal, or skim milk can be used in swine rations to bring up the protein to the desired level but may cost more and will probably not give any better gains than soybean meal.

Gestation and Lactation

Sows and gilts can be either hand fed or self-fed during pregnancy. Overfeeding of brood sows may result in smaller litters because of a higher embryo mortality, and adds to the feed cost per pig weaned. It also shortens the productive life of sows. Heavy sows are more apt to lay on and crush newborn pigs. Old sows need to gain slightly more than the weight of the newborn litter, plus the weight lost during the previous lactation period. Intake of protein, minerals, and vitamins is more critical during gestation than is energy. Pregnant sows and gilts should get at least 0.6 pound protein during the last third of pregnancy. Protein needs are less during the first two thirds of gestation. Grain and high quality alfalfa plus minerals and vitamins are adequate as protein sources for the first two thirds of

pregnancy.

Sows should receive from 1.0 to 1.25 pounds of feed daily per 100 pounds of body weight with an increase up to about 1.5 pounds during the last four to six weeks of pregnancy. Gilts under the same conditions should receive 1.3 to 1.6 pounds per head daily per 100 pounds of body weight up to two pounds the last four to six weeks before farrowing. Gilts should gain 100 to 125 pounds weight during the pregnancy period.

Ration III. Gestation rations for gilts and sows - hand fed.		
Ingredient	Oats & Barley	Barley Only
Alfalfa hay, ground	200 lbs.	280 lbs.
Oats	1070 lbs.	
Barley	650 lbs.	1640 lbs.
Dicalcium phosphate	50 lbs.	50 lbs.
Limestone	10 lbs.	10 lbs.
Salt	10 lbs.	10 lbs.
Swine vitamin premix*	10 lbs.	10 lbs.
Total	2000 lbs.	2000 lbs.
*Use vitamin premix according to manufacturer's instructions. Approximately twice the level used for growing-finishing pigs is needed per ton of ration for limit-feeding pregnant sows.		

Table IV. Gestation rations for pregnant sows and gilts (for self-feeding).

Alfalfa hay, ground	300 lbs.
Oats	1000 lbs.
Barley	660 lbs.
Dicalcium phosphate	20 lbs.
Salt	10 lbs.
Swine vitamin premix*	10 lbs.
*Use the premix according to manufacturer's instructions.	

When using rations of Type III, if sows and gilts appear to be gaining too much, reduce the amount being hand fed daily. Ration IV can be self-fed with continuous access to self-feeder, if enough alfalfa is included in the formula. The suggested ration IV contains 30 percent alfalfa. Increase the amount of alfalfa per ton of ration to restrict energy intake and gain of sows. An alternative to increasing the proportion of alfalfa is to permit the sows access to the feeders for only half the day, or keeping the sows away from the feeder every other day. The condition of pregnant sows should determine the amount of feed given each day.

A sow should have no feed for 12 to 24 hours after farrowing. She should have plenty of water available at all times. If she is restless for feed, a handful of bran on the water usually will quiet her. Her first feed could well be half a pound of wheat bran. Bran feeding at farrowing time also helps prevent constipation. Her feed the second day should be from two to three pounds of Ration V Split between a morning and evening feeding. Following this, gradually increase her feed so that at the end of a week she is being fed all she will eat, which can be by hand feeding or by self feeding. Self feeding is desirable and can be handled with less labor than hand feeding. During the period of lactation a grain ration of about half oats and half barley is satisfactory, as indicated with Ration V. Liquid rations can be used for sows in confinement during lactation, which requires a liquid feeding system and special rations. If a

liquid feeding system is desired, information on the system, the ration, and method of handling can be thoroughly checked into and decided upon at that time.

Ration V. Lactating sow ration.		
Ingredients	Barley & Oats	Barley Only
Barley	915 lbs.	1835 lbs
Oats	920 lbs.	
Soybean meal	100 lbs.	100 lbs.
Dicalcium phosphate	25 lbs.	25 lbs.
Limestone (calcium carbonate)	20 lbs.	20 lbs.
Salt	10 lbs.	10 lbs.
Swine vitamin premix*	10 lbs.	10 lbs.
Total	2000 lbs.	2000 lbs.
*Use according the manufacturer's instructions.		

Summary

There is no one best ration for the different phases of swine production. Make up a balanced ration with the feed available and keep a constant and close watch on how the animals are doing. Occasionally it is economically advantageous to substitute different grains or protein sources.

Trouble should be investigated and corrected at once. Always remove animals that are ailing from the lot at once. They should be isolated until in good health and never under any circumstances returned to the lot until all signs of sickness have disappeared.

BREEDING AND FARROWING

Nowhere is sanitation and disease prevention more important than in the farrowing house. Pork producers have many drugs that can effectively control disease conditions. However, if you follow excellent sanitary precautions routinely, disease prevention is a simpler matter. To have the most effective sanitation and disease prevention program during the farrowing and nursing stage, you should begin a few weeks before farrowing.

Only healthy, prolific sows should be saved from one farrowing to another. Take into consideration the number of pigs farrowed and number weaned, rate of gain and uniformity of the litter.

In selecting replacement gilts consider their rate of gain, feed efficiency, backfat, weight for age, and any carcass data from the litter or other pigs sired by the same boar. Select gilts from quiet sows with good dispositions and mothering ability. Do not select a boar or gilts from litters where some pigs have ruptures or any of the boars are cryptorchids. Gilts at 200 pounds should not probe more than 1.5 inches of backfat. Also consider carcass cutout information from other pigs in the same litter, if it is available. Gilts can be removed from the finishing pen at about 125 pounds. If they are in a trial, they can be removed when the trial is completed, at between 200 and 220 pounds. After gilts weigh about 200 pounds they can be hand fed a gestation ration until about 2 weeks before breeding. They can also be self-fed a gestation ration. If on pasture, the feeder can be closed every other day, or if in dry lot the feeder can be closed the afternoon and evening of each day.

The breeding season is of utmost importance in a brood sow operation. Boars, sows and gilts should be gaining at the beginning of the breeding season, to make sure they are in top physical condition. Sows and gilts should be flushed for at least two weeks before the breeding season and until one week after being bred. Take care that boars, especially mature animals, do not carry more than a moderate amount of condition or they get too heavy and become inactive. It is desirable to keep their weight down enough so they can be fed to gain in weight beginning at least 2 weeks before breeding. Excess handling and over exertion, including overheating, should be guarded

against before the breeding season. Try to keep away from medication during this pre-breeding season. Always provide plenty of clean water and shade. The breeding herd can be handled best on a clean pasture where adequate grazing is available. Plenty of exercise is important.

Boars should be checked on several sows or gilts before the regular breeding season starts, to determine if they will breed and settle the sows. Boars over one year of age can breed three sows per day, while young boars should breed about one less each day. Young boars, because of their lighter weight, can best be used on gilts, with the older boars on sows. By checking females carefully, an accurate determination can be made as to when they were bred. If hand mating is followed with only one mating, it should be about 24 hours after the heat period starts. If two matings can be made, matings will be most productive late on both the first and second days of the heat period.

When pasture mating, the sows and gilts should be separated into herds of about 18 to 20, and two boars used on each herd, if possible, one during the day and removed at night and the second one turned in until morning. If possible, this should be kept up until one-half to two-thirds of the sows are bred, then one boar can be used to finish the job. If information on the performance of the boar is desired, sows or gilts should be separated into smaller lots, with the same boar used on the entire lot. In this way the performance data can be obtained on each litter a boar sires.

During the gestation period sows and gilts can be self fed or hand fed 4 to 5 pounds of feed per day up to farrowing. If a self-feeder is used, the ration should be bulked up with alfalfa, and if they begin to gain more than is desired, close the feeders down and open the feeder moderately every half day or less often if they are on summer range. Watch the condition of the sows and gilts, and let that be a guide for the feed they should receive.

The pregnant sows should be wormed about one month before farrowing. If erysipelas is a problem, vaccinate about 4 weeks before each farrowing. Handle pregnant sows in a quiet, gentle manner. The easiest way to immunize sows is to have a holding crate and inject the bacterin under the skin either back of the elbow or behind the ear as each sow goes through the crate.

Move sow into the farrowing house about 3 days before farrowing. Wash her with warm water and a detergent. Rinse following the washing. A mild odorless disinfectant may be sprayed over the sow following rinsing.

When farrowing crates are used they can be placed far enough apart so one heat lamp can be placed between, and serve two crates. For information on the construction of stalls see Extension Circular "Swine Housing and Equipment Handbook", available through your county agent.

If a farrowing crate is set on a cement floor, a wood plank or plywood under the crate makes the sow more comfortable. The crate should be placed on the floor so that it is pitched to the rear. The slatted floor in farrowing crates separates the pigs from the sow's dung and urine. A one inch spacing between slats can be used and covered with a soft mat the first day or two to protect the baby pigs' legs. Narrow spacing will not keep the crate clean.

Optimum temperatures for sows up to time of farrowing is about 60°F. Be sure the houses have good ventilation, and that drafts are kept to a minimum. Floors should be kept as dry as possible (heated if concrete unless covered with a wood floor) and cleaned each day.

Stalls, which were mentioned in the chapter on Production and are described in more detail here, can best be used with guard rails and a brooder in one corner. In a conventional brooder like this a 150 watt lamp is satisfactory, using a cheap metal reflector to keep the bulb in place and direct the maximum heat on the pigs. A hardware cloth screen should be used below the reflector and on top of the brooder to prevent glass from falling into the litter in case the bulb should break.

The guard rails should be on brackets and held about 8 inches off the floor and 6 inches out from the wall. These should be on all wall surfaces where a sow could crush pigs when lying down, except next to the brooder and along front gates as shown in figure 10. The gates shown in figure 12 make excellent protective devices. They protect the brooder and if the sow is restless, the gates can be closed to serve as a farrowing crate of the width desired. When open wide, the gates limit the space the sow can move around in, and are of real value in protecting pigs from being injured or laid on. Use limited amounts of straw for bedding, so it can't be banked into a nest that serves as a trap for the little pigs when the sow lies down. Dry shavings make better bedding than straw and will absorb moisture. Dry sawdust-like shavings are also excellent since the sow cannot build up a ridge high enough to trap little pigs. Bedding is not used if the house has a slatted floor. Clean the floors regularly, at least once each day.

Optimum temperature for sows before farrowing is about 60°F. Be sure the houses have good ventilation and that drafts are kept to a minimum. Floors should be kept as dry as possible and cleaned each day.

Be on hand for farrowing. It will save pigs in many cases. If the sow is in labor over an extended period with no pigs being farrowed, she needs help. If the herdsman does not know exactly what to do, call a veterinarian. During farrowing the temperature should be above 90°F and gradually reduced to 60°F during the next 10 days.

After farrowing, the first feeding should be in about 10 or 12 hours, and, if possible, should be about half a pound of wheat bran. The next day, switch to a light feeding of about 2 pounds of the lactation ration. Increase that by about 2 pounds each day until the sow is on full feed. If the pigs begin to scour because of too much milk, decrease the feed to the sow. If the sow doesn't appear to feel well after farrowing and refuses to eat, 10 cc of streptomycin or penicillin given each day until she begins to eat often is beneficial. If she refuses to let her milk down, give an injection of oxytocin, following directions. Separate the pigs from the sow for 30 minutes, give oxytocin and put the pigs back with the sow at once. When a sow is restless and doesn't want to claim her pigs, a proper dose of a tranquilizer and Tylan 50 or Tylan 200 often will quiet her and relieve the distress.

It is desirable to switch the sow to a feeder once she is on full feed. Always be sure she has plenty of clean, fresh water.

Pigs usually are not weaned until they are 4 or 5 weeks of age. Some wait until they are 6 weeks old, and a few still wean at 8 weeks. Early weaning helps in disease control and gets the pigs away from the sow where parasites can be a severe problem. It also makes less work than handling the sow and her litter together. The Dickinson Research Center does not recommend weaning the pigs before they are at least 4 weeks old.

If the sow is to be re-bred in her first heat cycle following weaning, leave her on the self-feeder with the lactation ration until about one week after she is bred. Then switch her to the gestation ration hand fed or, if self-fed, open the feeder only every other day, depending on her condition following the policy outlined above.

If a time will elapse before breeding, reduce her feed, or keep the self-feeder open only for certain periods, so she does not gain excessive weight. Increase the feed about 2 weeks before breeding and one week after she is bred.

If it is desirable to have a uniform crop of pigs, keep 10 to 15 percent more sows and gilts than needed, and pick out those that will farrow at the time desired. The others can be marketed as bred sows. If any come in heat after the second cycle they are not reliable as breeders and should be marketed.

CARE OF NEWBORN PIGS

Since baby pigs cannot adjust to temperature fluctuations until they are several days old, extra heat should be provided by a bulb over the brooder or using a heat lamp above an area between two sows where the pigs will be attracted by the light and have extra protection. A temperature of 80°F is adequate for newborn pigs. Heat lamps can be adjusted to the proper height for the right temperature. Heat in the floor also is a satisfactory way of providing sufficient heat; however, a light is better since it attracts little pigs to the protected area. Be sure there are no drafts in the farrowing house. It is best to have solid walls in the pens or stalls to prevent drafts and to have a minimum of disturbance to distract or excite the sow with a new litter. Protect the farrowing house from flies, birds, etc. Drafts, dampness and chilling are baby pig's worst enemies.

Just as soon as possible after birth crush off the navel cord about 1 ½ inches from the abdomen, if it has not already been severed. If the cord bleeds when severed or if found bleeding, tie off the end. Dip in an iodine solution, either tincture of iodine or the stronger solution recommended for livestock. Either one is satisfactory. This will go a long way toward preventing an infection from going up through the navel cord.

At the same time the navels are treated with iodine, clip the needle teeth, keeping the clipper in a mild disinfectant when not in use. The teeth should be clipped far enough above the gums so the clipper does not cut into the flesh.

Observe young pigs several times daily from birth to determine if any signs of scours develop. Some scours are from pigs getting too much milk. However, more cases of scours come from erysipelas or low level infection picked up in the farrowing quarters. In the first stages of scours the excrement is of a watery consistency and the pig's hams and tail are apt to show signs of being wet. Pigs in this condition should be treated with a reliable scour treatment at once. Don't delay. Treat within the hour. There have been cases where pigs were born with an infection, or contracted one within an hour or so after birth, and if not treated, became hopelessly emaciated within a few hours. If the sows were vaccinated for erysipelas about a month before farrowing, the scours should not be the result of

erysipelas but from a low level infection picked up in the farrowing quarters.

When pigs are to be finished in confinement it may be desirable to clip off the tail. Do this before the pig are over one day old, leaving about one-half inch stub on the body and dipping or painting the stub end with iodine. Be sure whatever is used to clip the tail, or any instrument used on the pigs, is let stand in a good disinfectant when not in use.

If a sow has more pigs than she has good nipples and more than one sow has farrowed within 2 to 4 days of each other, it is a good idea to equalize the litters, giving the pigs to the last sow farrowing when this is possible. Pigs transferred may be dissatisfied for a few hours, but usually after nursing once, quiet down. Sows that are good mothers usually accept these pigs from other litters. Older pigs should be transferred to the younger litters if possible while their milk flow is good and before any of the nipples have had their milk flow reduced because the nipple has not been consistently nursed.

Pigs should be ear notched at birth so each pig can be traced to the litter from which it came, and each pig should have an individual identification mark, so it is always possible to check on any one pig in the litter. A sample of the universal system used by eight breed associations is shown on the following page. The value of each notch made with a small ear notcher is labeled in the area where the notch is made. A breeder with a commercial herd can set up his own system of notching. A purebred breeder should use the universal system, if approved by the breed association that registers his pigs.

Diagram: [Universal Ear Notching System](#)

Baby pigs should get iron when they are 2 to 4 days old to prevent anemia. Any good standard brand of iron-dextran can be used, according to directions. Disinfect the point where the needle is inserted for the 1 or 2 cc injection. Use iodine solution to dab on the seat of the injection, using a small piece of cotton or cloth held with a small forceps. The iron shot is necessary when the litter is on concrete, and is beneficial under almost all conditions up until the little pigs start eating a creep ration. The first injection can be given in the ham. If a second shot is given in about 2 weeks it should be given in the tissue around the neck. Iron given into the ham after 2 weeks of age may result in a coloring of the flesh at the site of the injection. There are other methods of preventing anemia, like keeping the young pigs on

soil or putting some clean sod in the pen or painting the sow's udder daily with an iron sulfate or copperas solution. Giving iron shots is recommended as a more sure way of preventing anemia and usually results in stronger, healthier pigs.

If castration cannot be done at least 2 weeks before weaning, do not castrate before the pigs are weaned and on feed.

With our present-day methods of swine management, practically all of our swine are castrated as small pigs from a few days of age up to the age of weaning. It is advisable to examine these small pigs for the presence of hernias and cryptorchidism. When castrating a large number at one time, those afflicted with these conditions can be put aside and operated on separately, and the routine for castrating large numbers will not be disrupted.

Wash the scrotum with a disinfectant before making an incision. Place the knife in the disinfectant before each operation. Distend the scrotum by placing the hand in front of the scrotum, exerting a pushing-back movement while pinching with the thumb and forefinger. The incision is made over the testicle on the somewhat distended and raised scrotum, and is facilitated by the distension. Make the incision low to assure drainage and carry through all the tissues into the testicle. This causes the testicles to "pop out" through the incision in the tunica. Grasp the testicle and pull until the cord separates. When castrating a ruptured pig, do not make the first cut through the peritoneum but just down to this membrane. Push back the intestines away from the testicle and by twisting the peritoneum, push the intestines into the body. Tie a cord around the peritoneum next to the body and take a stitch through the peritoneum to prevent the string from slipping off. Make an incision through the peritoneum to expose the testicle and clip off the cord. Cut off some of the peritoneum half an inch above the tie. Take at least 5 or 6 stitches, pulling the hams together over the last opening. When the hernia is only on one side the other testicle can be removed in a normal manner. In case of a double hernia, remove each testicle in the manner outlined, stitching the hams together after both testicles have been removed.

At about 3 weeks of age an 18 percent pig starter can be fed in a creep area. Pigs probably will be eating some of the sow's feed and, if weaned or given free access to a creep area, will begin eating at once. Put a small amount of feed in the creep each time, not more than enough to last the pigs a day, to keep the feed fresh. After pigs are from 7 to 10 days old, two sows and their pigs can be penned together. At about 21 days of age three or four sows may

be left together and a creep provided that only the pigs have access to. Some time between 4 and 8 weeks of age the pigs should be weaned and kept in groups of about 18 to 20. Weight, vigor and condition pretty well determine if a pig should be weaned; age alone should not be the determining factor. Pigs should weigh at least around 20 pounds when weaned. Do not wean pigs under 15 pounds. In confinement more pigs can be kept in one pen following weaning. Feed the starter ration, or a similar one, until they weigh about 50 pounds and are ready for the grower-finisher ration. When weaning leave pigs in litters when possible, rather than mixing pigs from all litters. Take out the smaller pigs and place them in one pen. When pigs of different sizes are placed together, usually the larger pigs keep doing better and gaining faster while the smaller pigs have trouble holding up their gains and may actually go backward. When put into the finishing area, each group should be as near as possible of the same weight for more uniform and better gains.

No hog farm is absolutely free from disease, but good management results in a minimum of trouble. Keep visitors away from contact with baby pigs. Control stray dogs and cats, and eliminate sparrows, pigeons, rats and mice from all swine quarters. Keep livestock trucks and feed trucks off ground to which young pigs have access.

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