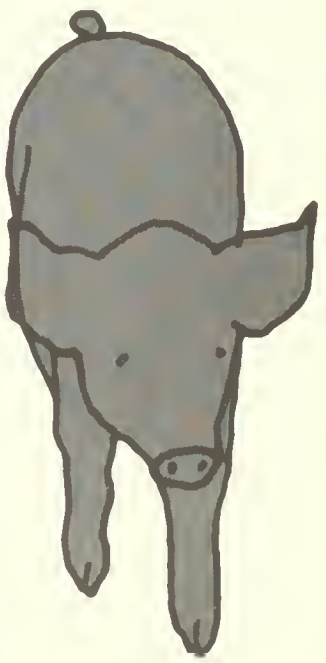
Agriculture
Canada

Publication 1442/E

Swine production and management



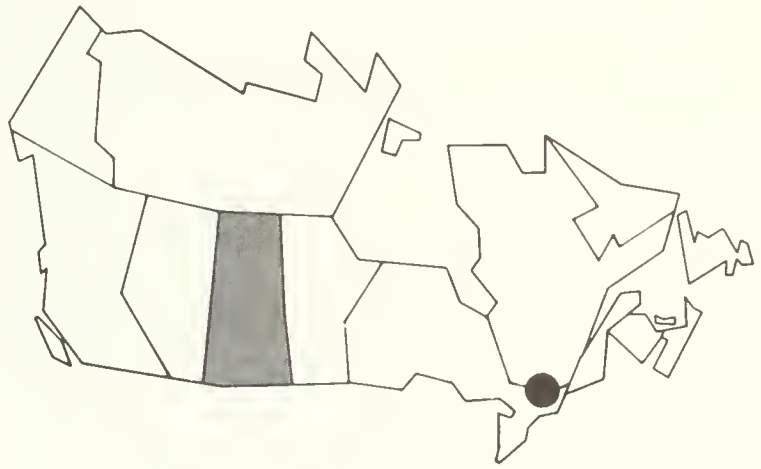
30.4
212
1442
984
1987 print)
3

Canada

Swine production and management

A FEDERAL/PROVINCIAL PUBLICATION

CANADA/SASKATCHEWAN



SWINE PRODUCTION AND MANAGEMENT

This publication was prepared by the Saskatchewan Department of Agriculture. Under the provisions of the Federal-Provincial Regional Cooperative Publishing Program, Agriculture Canada has agreed to print this publication.

Chairman, L.A. Blair, Regional Extension Services Branch, Saskatchewan Department of Agriculture, Tisdale

H. Fjeld, formerly with Animal Industry Branch, Saskatchewan Department of Agriculture, Regina

J.A. Strokappe, Department of Veterinary Clinical Studies, Western College of Veterinary Medicine, Saskatoon

A. Reddon, retired, formerly with Animal Industry Division, Pork Industry Branch, Alberta Department of Agriculture, Edmonton

PUBLICATION 1442/E, available from
Communications Branch, Agriculture Canada,
Ottawa K1A 0C7

Cat. No. A63-1442/1984E ISBN: 0-662-13170-3
Printed 1972 Revised 1984 Reprinted 1987 5M–10:87

Également disponible en français sous le titre
Enregistrement des animaux au Canada.

ACKNOWLEDGEMENTS

The bulletin *Swine Production in Alberta*, prepared by the University of Alberta, Edmonton, has been referred to in preparing this publication.

The authors are indebted to swine producers who have contributed management hints based on years of experience in their own operations.

CONTENTS

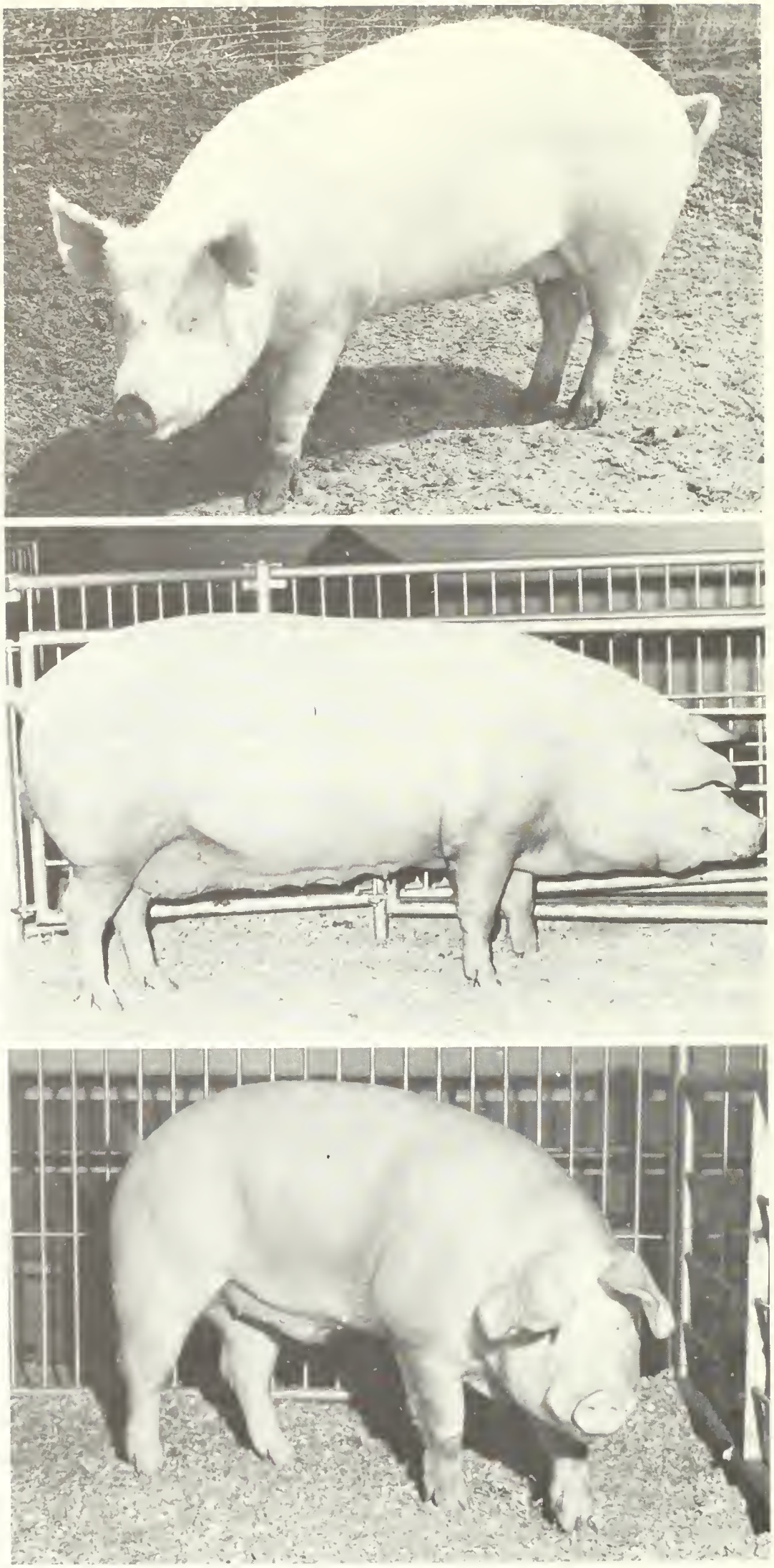


Figure 1 Three well-known breeds: Yorkshire (top), Lacombe (center) and Landrace.

HERD MANAGEMENT

Management may be defined as the capacity to control, direct or conduct a function to completion. In the case of hog production, it means the ability to coordinate such factors as feeding, breeding, health care, design of facilities, use of labor, and marketing. Individual hog farms will need different approaches to each of these for the most efficient production. Therefore, the job of management is to determine the methods that yield the maximum profit for *your* enterprise.

Hog businesses seldom fail due to one major problem. More often it is because of a lack of attention to the many small problems that arise from day to day. All operations experience production difficulties. A good manager not only understands production technology, but can recognize problems early and correct them. A poor manager may overlook small problems and delay taking action until a major crisis occurs.

Differences in profitability between swine operators often mirror the differences in management. The herd's reproductive efficiency is one area greatly influenced by management; in average herds it is much below that in some of the top operations. The yearly cost of housing, sow feed and other overhead is the same regardless of the number of pigs weaned per sow. Thus, the more pigs weaned, the greater the profits. For example, by increasing the number of pigs weaned per sow from 14 to 18, you can double or triple your net return. As a general guide, assume you need 12 weanlings per sow annually to break even.

This publication discusses routine management of a swine operation. It outlines some practices that should be carried out during each phase of the pig's life cycle. Each swine operation is unique, making it impossible to design a management system to meet the needs of all producers. For that reason, the information presented will give you some background for developing a system to suit your own needs.

Topics include production and health records; management of the breeding herd; the sow and litter; and growing and finishing pigs.

PRODUCTION AND HEALTH RECORDS

Records are essential if you are to keep on top of your operation. A good record-keeping system will permit constant surveillance and monitoring of animal health and performance. It will help identify problem areas in the production program and maintain a steady flow of pigs. The appendix shows a typical reproduction and health record form.

A good herd-health program cannot operate without complete records. They are invaluable to you and your veterinarian in spotting health problems, in determining what caused them and in deciding what steps might be taken.

Unfortunately, records do not keep themselves! So keep the following in mind when designing a record-keeping system:

- Keep the records as simple as possible.
- Keep the records where they are readily accessible, preferably in an office area of the barn.
- Minimize the transfer of information from one record sheet to another.

The information that should be included varies with the type of operation being run. An extensive breeding stock improvement program will need more detailed records and more individual pig records than will a commercial operation.

Individual records help when culling nonproductive breeding stock and selecting replacement animals. They are the starting point for overall herd records.

Individual pig records

Sow identification
- number
- breeding background
- date brought into the breeding herd

Reproduction record
- date of first estrus or heat
- breeding dates
- farrowing dates
- number of pigs born alive and number born dead
- average birth weight (include comments on evenness of litter)
- abnormalities
- weaning date
- weaning weight

Litter management record
- dates of routine management procedures (e.g., iron treatment, castration)

Health record
- health problems
- treatments used
- success of treatments
- deaths and dates of deaths

Herd records

Keep a record sheet, summarizing important details of herd production on a weekly or monthly basis. Later, you can compare these details, which are really measures of production efficiency, with previous figures as well as with production goals set for the operation. The records should indicate subtle changes that could indicate developing problems. For example, deaths in the farrowing barn may change from 15% of the pigs born alive to 20%. Such a change would prompt you to look for the causes and to take steps to correct the situation.

Herd records should include the following:

Reproduction record
- females serviced (categorized as to first and repeat breedings)
- litters farrowed
- pigs born alive and number born dead
- litters weaned
- pigs weaned

Death record
- pig deaths by category, e.g., sows, nursing pigs, weanlings, 23-45 kg, 45-90 kg

Additional inventory changes
- pigs marketed (sows, stags, market or breeding stock)
- pigs added (breeding stock from outside the herd or from the feeder barn)

Feed consumed
- either herd total or by ration, i.e., dry sow, starter, finisher, etc.

Market information
- age at marketing of at least a sample number of pigs
- carcass indices of pigs marketed

From the above data, you will be able to draw such information as:
- average litter size born;
- average litter size weaned;
- percentage of pigs born dead;
- percentage of deaths in any category;
- repeat breedings as a percentage of the total breedings;
- feed conversion efficiency; and
- average market index.

The above all indicate how well production is progressing.

The success of any record-keeping system is not the design of the system but the regular manner in which the records are kept. This means you *must* maintain your herd records.

Identification systems

Animal identification is essential to any record-keeping system. The most common systems are tattooing, ear notching and ear tagging.

TATTOOING Tattooing is the identification system preferred by most producers of pedigreed stock, and is mandatory for animal registration. Occasionally, some commercial producers use ear tattooing to identify sows. Another system, recently introduced into this country, uses a tattoo gun to mark the shoulder or side of a sow with a large number.

EAR NOTCHING Ear notching is usually done within a few days of birth, using special pliers. It adapts readily to herds of all sizes. For example, it may be used to identify pigs individually or by litter, or to show the month and day of their birth. Some producers only notch a sample number of pigs and record their birth dates to permit checking on growth rates. Your local livestock specialist can help set up an ear-notching system that suits your operation.

EAR TAGGING Ear tagging works reasonably well for the breeding herd, as replacement gilts can be tagged as they enter. One of the most satisfactory tags fastens through the center of the ear and can be read from both sides.

Ear tags can be color coded to indicate which boar to breed, or to show the breeding background of the gilt. This helps during mating by eliminating the need to carry individual pig records with you.

The trouble with ear tags is that they can fall off. The ideal system uses both ear tags and tattoos. You can mark the animal permanently with the tattoo and use the tag for easy identification from a distance. You won't have to enter the pen or handle the pig.

SWINE PRODUCTION

Reproduction is one of the keys to profitability in swine production. The cost of producing one or two extra weaner pigs is small compared to their potential value. It is a fact that a maximum number of pigs weaned per sow annually is essential for profit. Also, the national average of weanings per sow yearly is far below what is considered desirable and possible. This has led to a great deal of research and extension work. No two farms are alike, and what works for one may not work for another. Therefore, we will outline basic concepts, rather than specific recommendations, that you may apply to your farm.

The number of pigs weaned per sow yearly depends on:

- total number of pigs born per litter;
- number of pigs born dead per litter;
- number of deaths per litter between farrowing and weaning; and
- number of farrowings per sow annually.

This takes us back to the topic of records. Records are not intended to show how well you did over the past year (your bankbook will do that!). Rather, they let you monitor production so you can assess how each variable affects the final outcome and then identify and correct any that are not up to par.

One cannot generalize about records; each producer has his own likes and dislikes about record keeping. The important thing is that the records be kept, because they are the first clue to the subtle changes in reproductive performance that are so much more common than drastic changes, such as abortions.

Let us now turn to the actual biology of reproduction and some of the problems that may be encountered.

Female

Anatomy

The female reproductive tract (Figure 2) consists of:

OVARIES Two grape-like organs close to the kidneys, these contain the eggs (ova). Near the end of estrus, the eggs escape into the oviducts.

OVIDUCTS These lead from the ovaries. The eggs are fertilized in the oviducts and grow into the early fetus, then pass on into the uterus.

UTERUS (WOMB) This consists of two horns that attach to the oviducts at one end and the body of the uterus at the other. The young piglets develop in the horns.

CERVIX This is the peculiarly grooved neck of the uterus. It usually remains tightly closed unless the female is in heat or farrowing. A plug of mucus prevents entry by bacteria. During mating, the boar's penis, with its corkscew configuration, locks itself in the grooves of the cervix.

VAGINA The lower portion of the genital tract, this receives the penis and serves as the birth canal at parturition. The bladder empties into the vagina by way of the urethra.

VULVA This is the external opening of the vagina.

A female must have a normal reproductive tract for proper cycling, fertilization and farrowing. Occasionally, one may find abnormalities such as missing ovaries, missing segments of uterine horns, or a combination of female and male parts (hermaphrodite). Abnormalities occur in only 1-3% of gilts born. These usually have small vulvas, and cycle irregularly or not at all. If abnormal cycling occurs in only a few animals, it does not warrant much attention; removal from the breeding herd is probably the best solution. However, if a larger number are affected, examine the tracts of a representative number of animals at slaughter. Although cystic ovaries can be found in a few older sows, they are seldom a problem.

Physiology

Reproductive physiology is the science that deals with the functioning mechanisms of the reproduction system.

The reproductive cycle of the pig can be divided into the following stages:

- selection
- puberty
- ovulation
- fertilization (day 1)
- implantation (day 13)
- fetus (day 35)
- birth (day 112-115)

We will discuss each stage separately and deal with the more important aspects in detail.

Selection of gilts

A steady supply of replacement gilts is required. There are two ways to obtain new stock:

- buy from a producer of breeding stock; or
- select gilts from within the herd.

When buying breeding stock, investigate the health status of the supply herd. There is no easy way to do this; finding an acceptable source of supply will take time and effort. Disease can easily be introduced into your herd by the indiscriminate purchase of breeding stock from many different sources. Thus, disease status and quality are often more important than price. When selecting gilts, follow a sound procedure; consider the following criteria:

GENETICS The crossbred female is preferred for commerical production.

BACKGROUND Gilts from sows that consistently produce good litters are most likely to be good candidates themselves.

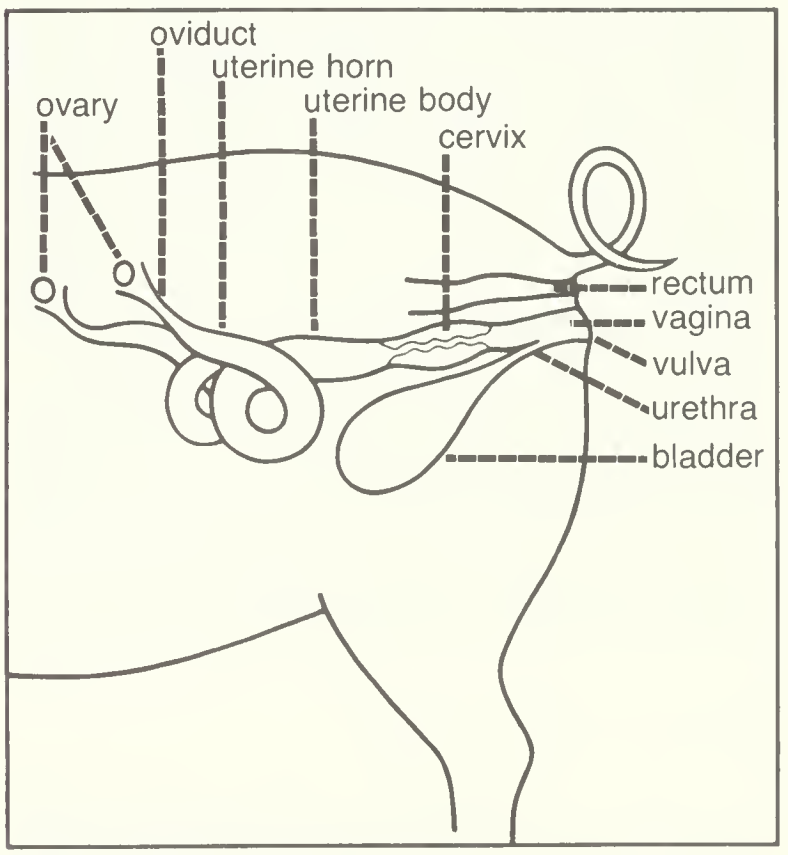


Figure 2 Female reproductive tract

ABNORMALITIES If there is any evidence of anatomical abnormalities (hernias, inverted teats, etc.) in a gilt or her littermates, she should be rejected.

TEATS There should be at least 12 well-spaced, functional teats, 6 of which are to the rear of the navel.

SOUNDNESS OF FEET AND LEGS Obviously if a sow is to stand, she should have sound feet and legs.

RATE OF GAIN AND BACKFAT THICKNESS These traits can be readily assessed through the federal-provincial Record of Performance (ROP) program for swine.

Make the selections when the pigs are between 77 kg and market weight. Selection at approximately 77 kg permits a reconditioning program that includes a slightly reduced growth rate (0.45-0.68 kg/day), exercise and early exposure to the boar.

Puberty

Puberty usually occurs when the gilt is 6-8 months old. The exact mechanism involved is not known, but it seems to be associated with the central nervous system and the hormone-secreting system. This would explain why a gilt often comes into heat soon after some kind of stress such as a move from one barn to another or a mixing of pigs. If a gilt is put into contact with boars at too early an age, she apparently becomes used to them and puberty is delayed. However, once she has reached 77 kg, it is advantageous to expose her to the sound and smell of a boar. This stimulates her sexual development. Carefully check a gilt for heat and record the date it occurs as a guide to when to expect subsequent heats. Delaying breeding from first heat to second or third will increase litter size by about one pig. Selection at 77 kg rather than 90 kg will facilitate such a program while minimizing farrowing age.

Flushing of gilts (increasing the feed intake for 2-10 days before breeding) will likely increase litter size. This is because one to three more eggs are released from the ovaries, depending on management procedures. Since about 70% of the ova shed appear as pigs born, this can give a substantial increase in litter size and profit.

A problem often encountered is that of gilts failing to come into heat. This may be caused by confinement, nutrition, heredity or other conditions, or by a combination of these. In such a case, have the problem analyzed so you can develop management techniques that solve it. Getting the gilts off to a good start should be one of the objectives of a good herd health program.

Estrus (heat) and breeding

A regularly cycling female pig comes into heat approximately every 21 days (a normal estrous cycle can be between 18 and 24 days). A pig is generally very consistent, varying by only 1 day from one cycle to the next. Cycles of less than 18 or more than 24 days should be considered abnormal and may indicate a problem breeder. During heat, the vulva reddens and swells. The animal becomes restless, and usually exhibits the "standing response" to the back pressure test. Normally, estrus lasts for about 2-3 days (Figure 3). However, an abnormal estrus may occur; for example, the sow may remain in heat for 5-7 days or its estrus may be interrupted for a day or so before resuming.

Sperm survive longer than the eggs (40 hours versus 10 hours). Therefore, it is desirable to have sperm in the female's oviducts by the time the eggs are released. To achieve this, breed late on the first day and again early on the second day of estrus. This will increase the conception rate and litter size enough to warrant the extra labor. When hand mating, it is generally recommended that the sow be taken to the boar and that breeding be carried out on a floor with a nonslip surface. Many boars have injured themselves or become shy breeders because the floor was too slippery.

Estrus and breeding of sows as related to weaning

The pig is characterized by lactational anestrus; this is, the sow will not come into heat as long as she is lactating. This is the basic reason for the trend toward early weaning — to permit a shortened farrowing-to-breeding interval.

Consider the following:

- It takes approximately 3-4 weeks after farrowing for the uterus to return to its normal nonpregnant state.
- The shorter the lactation, the longer the interval between weaning and subsequent estrus, and the greater the variation between individual sows. For example, a

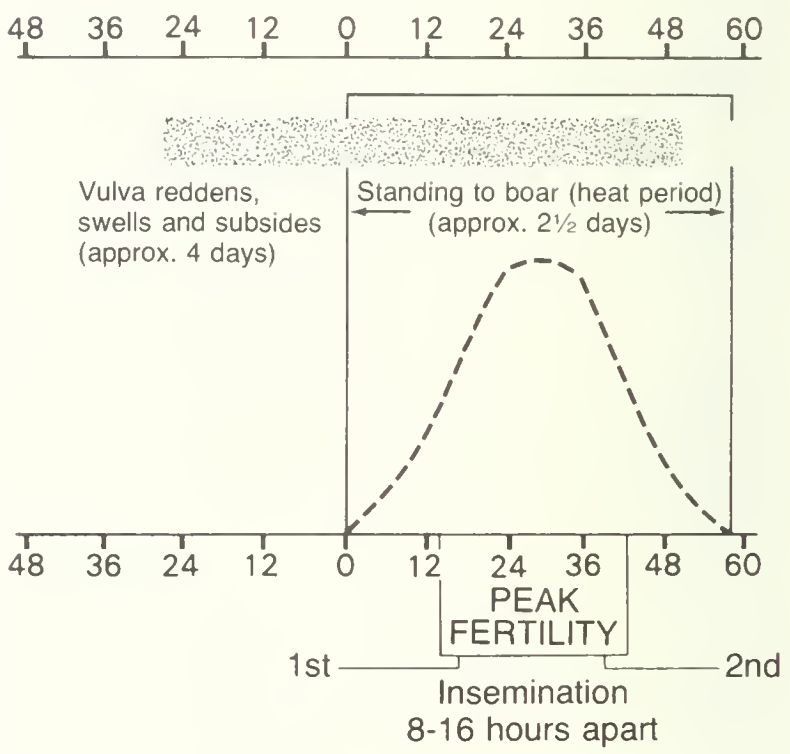


Figure 3 Sow heat and fertility periods

sow that weans at 10 days may take another 9-15 days to cycle, but one that weans at 21 days may take only 4-6 days more.
- A sow's milk production increases steadily until it peaks about 3 weeks after farrowing. After that, it starts to decline.

These factors point to a weaning age of not less than 3-4 weeks to get a weaning-to-breeding interval of 5-7 days. To maximize the number of pigs per sow annually, breed sows on their first heat after weaning.

It is fairly common practice in larger units to batch wean on a Thursday. This results in most of the breeding being done on Monday and Tuesday with the subsequent farrowing occurring during the week rather than on weekends.

A problem to be avoided after weaning is that of stress caused by fighting, heat, crowding or other conditions. Keep the sows in individual pens and starve them for a day after weaning. The boar should be close to the sows to hasten postweaning heat and to increase heat expression.

Fertilization

As long as the semen quality is good and the time of breeding is correct, you will encounter little trouble at this stage.

Gestation

From ovum fertilization to birth, the piglet develops in three distinct stages. About 48 hours after the beginning of estrus, the ovum is fertilized in the oviduct and is then called a zygote. Around the 8th day the zygote enters the uterus and about 2 days later the placenta (afterbirth) starts to form; the zygote is now an embryo. Implantation starts about the 18th day and is completed about the 25th day. At about 30 days the basic organs are all present in the embryo, which is now called a fetus. From this point, growth is very rapid.

The number of eggs that are released and fertilized is much greater than the number of piglets born. In other words, there is a considerable loss of embryos during gestation (for example, of an average of 18 eggs released, 17 are fertilized and of these, 6 are lost). Factors that may affect this loss are high energy intake, heat stress, fighting, etc., especially when these take place during the first 13 days of gestation, the period preceding embryo implantation in the uterus. This means that superovulation (that is, increasing the number of eggs released) with hormone injections is impractical since it does not lead to a greatly increased litter.

A number of diseases may occur during gestation. Even with good management, you can expect to lose the following embryos before birth: 12% by 10 days; 18% by 25 days, 27% by 65 days and 28% by 110 days. With excellent management it may be possible to reduce these from 28 to 20%. Conversely, losses during pregnancy could exceed 40% of the eggs released.

Pregnancy diagnosis

The diagnosis of pregnancy during early gestation is relatively new in the pig industry. Such a diagnosis can be done at a veterinary pathology laboratory, but this is time-consuming compared to using ultrasound at the farm. With ultrasonic equipment, pregnancy can be determined within 30 days of conception. Once you have become familiar with the equipment, the procedure takes very little time. The advantages are early elimination of nonproductive sows, better prediction of farrowings and easier detection of estrus. Certainly, pregnancy diagnosis should be a routine part of your herd health program.

Farrowing

Swine production today is highly intensive. To avoid some of the problems associated with this type of operation, you need warm, draft-free, clean and disinfected farrowing quarters. It is best to move the sow into these quarters about a week before farrowing. This will give her a chance to get used to the surroundings and achieve a balance between her own bacterial flora and that of the new environment.

Normally, a sow farrows a litter in 10-15 minutes, although some animals take up to 5 hours. The longer farrowing takes, the greater the chance of dead or weak piglets.

Be prepared to act effectively if the sow has difficulty. There are several causes of farrowing difficulty in the sow, the most common of which are uterine inertia (the uterus does not have the strength to contract and push the piglets out) and fetal malpresentation (the piglet is positioned crossways to the cervix). The birth canal is seldom too small for the piglets to pass through.

When trouble is suspected, the first thing to do is investigate by inserting your arm into the birth canal to check for stuck piglets, malpresentation, etc. This is not a task for the untrained; it is far too easy to infect the sow. Get advance instruction on the proper procedures from your veterinarian.

If the birth canal is not clear, contact the veterinarian immediately.

If you find the birth canal empty, and the sow is still having difficulty, oxytoxin may be injected to speed up farrowing. Follow the label directions on the container. Make certain the cervix is relaxed (usually after the first piglet has been born) or the oxytoxin may cause it to be torn.

If the oxytoxin is not effective, call the veterinarian immediately. Don't wait too long; a sow with dead piglets in her is a poor candidate for any kind of help, especially surgical.

Sow feeding during pregnancy

Restricted feeding of the sow during pregnancy improves reproductive performance; research has shown that high

energy intake during the first month of pregnancy will increase embryo loss. The sow should be in thrifty body condition, but not fat. Fat sows are more prone to such farrowing difficulties as uterine inertia, slow farrowing and heat stress. Large weight gains during pregnancy are also costly and inefficient; a sow that gains heavily will lose more weight during lactation than a sow that has remained lean.

The sow should gain 23-34 kg during pregnancy. Much of this will be the uterine contents.

Three methods of restricting the sow's energy intake are:

- Hand-feeding 1.36-2.62 kg of a well-balanced, high-energy ration to the sow daily.
- "Skip-a-day" feeding, whereby the sow is allowed access to a self-feeder with a high-energy ration for about 2 hours every second day.
- Self-feeding a high-fiber ration.

There are two important points to remember when restricting feed:

- Energy is the only nutrient that is being restricted. A ration that is being limit-fed at about 1.8 kg a day should contain a higher percentage of protein, vitamins and minerals than one that is being fed at 2.7 kg.
- Environmental conditions, disease, breeding, etc., will determine the level of feed restriction. For example, sows housed outside in cold weather will require a higher energy intake than sows housed in a warm barn.

Sow herd management tips

Keeping track of sows in a large farrowing operation is difficult. Various management aids can help with the task. A few examples are:

- Group sows according to their stage of gestation.
- Use color-coded ear tags to indicate to which boar the sows should be mated.
- Place each sow's record card in an envelope fastened to the front of the pen she's in. On the front of the envelope, list the numbers of all the sows in the pen and update this each time sows are moved.
- In the barn, keep a large board showing the pen numbers. Hang tags bearing the sow numbers on the board under the numbers of the pens in which they are located.
- Carry a small notebook and jot down information as you collect it (breedings, farrowings, deaths, etc.). At the end of each day, transfer the information to a summary sheet.
- Use a sow breeding wheel (see Appendix). This is a circular board at the center of which is a wheel with four large plastic arms. These are spaced according to the sow's reproductive cycle, and her management routine. When a sow is bred, fix a marker bearing her number to the board under the "breeding" arm. The wheel is turned one notch each day; 20 days later, the sow's number will be under the "check for rebreeding" arm. If the sow is rebred, again place her number under the "breeding" arm, but this time closer to the center of the board to show that she has been bred a second time. The other arms indicate the appropriate time to carry out routine management such as deworming, and when to move the sow to farrowing headquarters.

Male

One of the best ways to improve the genetics of any herd is through careful boar selection. On many farms, boars are the only animals introduced into the herd from outside and, consequently, they present the greatest danger of undesirable characteristics being introduced. They may also be the means by which diseases are brought in.

The importance of careful boar selection is emphasized by the fact that after three generations of boars, the genetic base or the inherited characteristics will be 87.5% due to those boars and only 12.5% due to the original sows.

Anatomy

The male reproductive tract consists of two testicles, the epididymis, the penis and a number of accessory sex glands that secrete various fractions of the ejaculate.

Usually there are not many anatomical problems, but you must be aware of such problems as small testicles and tissue growth between the penis and prepuce (tied penis).

Physiology

The testis is composed of a large number of coiled tubules lined by several generations of germ cells. These cells undergo a series of divisions and ultimately give rise to the sperm cells (or spermatozoa). In a boar, sperm formation takes about 34 days and another 10 days are needed before ejaculation for the sperm to travel through the epididymis. A mature boar produces about 20 billion spermatozoa per day.

Boar selection

In selecting a boar, concentrate on the more heritable, economically important traits such as backfat thickness, growth rate and feed conversion ability. Also consider the "fitness characteristics": the boar should be healthy, physically sound in feet and legs, and have good conformation. If he is to sire replacement gilts, check his underline for teat defects and placement.

Remember that litter size is determined to a significant degree by the sire.

Two programs can be of great assistance in breeding stock selection. The ROP program for swine provides information to help select animals that have demonstrated a potential for above-average performance. Since the traits measured are inherited in varying degrees, those boars that perform above the average of their group should pass their superiority on to their offspring. You can get this informa-

tion from federal and provincial departments of agriculture.

Provincial herd health programs also provide valuable information for selecting breeding stock. Most provinces have such programs that monitor the health status of enrolled herds. A herd entered in a program is not guaranteed free of disease, but at least you are able to obtain information.

Breeding guarantee

Most boars over 6 months old are sold with a breeding guarantee that is conditional on their being given proper care and management. Should any boar fail to serve or settle sows, the seller will usually replace it or refund the purchase price when the boar is returned. The seller may direct the marketing of the boar and refund the difference between the purchase price and the market value.

The seller should have the right to try the boar for about 1 month after it is returned before he makes the final adjustment.

Breeding problems

The major breeding problems fall into the following categories:

- The young boar that fails to settle any females.
- The boar that mounts the female, but will not enter her.
- The boar that breeds vigorously, but does not impregnate females, even though he may have previously produced progeny.
- The boar that simply will not breed. This includes those that lack sex drive because of injuries.

BLEEDING PENIS Bleeding from the penis needs special attention. It may be caused by injury during copulation, by fighting or by other causes.

A bleeding penis or prepuce may also be caused by infections of the urogenital system. The reason should be determined since, in some cases, the problem can be corrected surgically.

PENIS ABNORMALITIES One abnormality is the adhered (tied) penis. Before breeding, it is normal to have the penis tied to the prepuce by a small piece of tissue. It is usually released during normal development, but when this fails to happen, the problem can often be corrected surgically.

Another problem is the small, limp (infantile) penis that prevents the boar from entering the sow. Penile injuries are common in these animals.

DEGENERATION OF TESTICLES Some boars show degeneration of one or both testicles. If there are significant differences in size, consistency or shape between testicles, breeding potential may be affected.

DECREASED LIBIDO (SEX DRIVE) This is perhaps the most common reproductive problem in boars today. We have already discussed some of the conditions that may lead to it. At other times, however, no cause can be found. Hormone injections may give temporary improvement, but are usually of little use.

INADEQUATE LIBIDO Poor sex drive may come from bad breeding experiences when the boar was first used. He may have been bullied by large sows or penned with a very dominant boar so that he had only an occasional chance to breed. Hormonal deficiencies may also be responsible.

LAMENESS Lameness may result from such causes as fractures or arthritis. However, in young boars the reason is often unknown. Lameness is a major cause of poor breeder performance; make an attempt to find the cause. In some cases, exercise seems to help.

Introduction of disease into the herd

Most boars are obtained from outside sources and, consequently, may introduce disease into the herd. Always obtain stock from a herd you know is healthy.

Prebreeding management

Following their selection, boars should be put on a conditioning program as they near market weight. Keep them in trim body condition and give them ample exercise. To minimize the risk of introducing new diseases, quarantine a new boar for about 30 days and introduce him to the sows through fence-line contact to permit establishment of common microflora.

Although a boar may appear big enough to breed at 5-6 months of age, he often does not reach sexual maturity until 7-8 months old and does not usually reach his peak semen production for another month or two.

It is important that the boar's first mating experience be successful and for this, bring a gilt or small sow in strong standing heat to his pen. Let him perform other early matings in the same pen or area so that he is not distracted by strange surroundings. The floor should not be slippery; shavings or sand will give a nonslip surface to concrete floors. The development of bad habits, such as mounting the head, can often be avoided by close attention during the first few matings.

Management of the breeding boar

It takes about 34 days for sperm to form and another 10 days for it to pass through the epididymis. Adverse conditions (such as poor nutrition, very high or very low temperatures, stress of confinement or disease) can affect semen quality and result in temporary sterility. It will then take 6 weeks or more for the boar to regain his normal

breeding ability. Some boars inherently produce poor-quality semen. When there is some doubt about a boar's fertility, have his semen examined.

Boars may vary greatly in their ability to produce semen. However, use the following guidelines for frequency of use:

Services per:	Day	Week	Month
Junior boar	2	8	25
Senior boar	3	12	40

Double mating will increase both the conception rate and litter size by about 10%. However, there must be sufficient "boar power". Servicing with a boar that has been used too often will reduce conception rate and litter size.

Breeding systems

There are two basic breeding systems: hand mating, where you supervise each service, and pen mating, where the boar is allowed to run with the sow herd.

Hand mating offers a number of advantages: it gives you accurate breeding dates for the females; it ensures more sows are bred by a boar because he is not allowed to service the same female two or three times in a relatively short time; and it lets you detect boar or sow fertility problems sooner. It does have the disadvantage of taking more time. If you don't have the time to watch the sow herd closely for those in heat, you will miss too many sows and would be better advised to go to a pen-mating system. Many producers try to supervise the first service and then run a cleanup boar with the sows to catch any repeats.

If a pen-mating system is used, follow a program of boar rotation (This is not acceptable in purebred herds). Alternate boars every 24 hours. This will help to ensure that all sows are bred twice during the estrous cycle and it will also give the boars a chance to recuperate.

The big disadvantage of boar rotation is that it becomes difficult to maintain sire records for each litter. You will take longer to identify boar breeding problems if one boar has been settling all the sows.

Artificial insemination

In the past few years, artificial insemination (AI) of swine has become a reality through the use of frozen semen.

Advantages

- AI permits wider use of genetically superior boars, resulting in faster genetic improvement.
- AI makes possible maximum use of "boar power", thus facilitating batch weaning programs. When using natural mating, batch weaning along with double mating per service requires one boar for every 8-10 sows in the herd.
- A seed-stock producer can sample a number of high-quality boars in his herd without a large capital investment in boars or the risk of introducing disease.
- The use of boars as AI studs justifies extensive proving of their worth.
- When an injured boar cannot mount a live sow, a producer can use dummy sows and AI.

Disadvantages

- Compared with natural matings, AI requires a higher degree of management since you must spend more time and effort at breeding time, both in detection of heat and in insemination.
- With unfrozen semen, storage is limited to 3 days. Toward the end of that period conception rates tend to fall.
- The cost of semen may be too high for producers who are able to raise quality boars or buy them at reasonable prices.

Artificial insemination of swine has been undergoing extensive research for the past 25-30 years and the chemical and physical properties of boar semen have been studied. Of all domestic animals, boars secrete the largest volume of semen. Age and frequency of ejaculation greatly affect the volume and the number of spermatozoa in the ejaculate. On average, a mature boar ejaculates about 300 mL containing 50 billion spermatozoa at 3-day intervals. Chemical composition of the semen varies among boars, but this is seldom associated with fertility differences.

Boar spermatozoa are sensitive to sudden temperature changes and are easily damaged by too-rapid cooling. Their life support system can be influenced by many substances, so handling of semen requires extreme care and attention to maintain its fertilizing capacity. The amount normally ejaculated in a natural mating may be used to inseminate 15-20 sows artificially, provided some form of extender, such as the following, is added:

- glucose, 13 g
- sodium citrate, 14 g
- potassium chloride, 0.29 g
- sodium bicarbonate, 1.5 g
- streptomycin, 3 g
- penicillin, 3 g
- distilled water, 1000 mL

Rather than 1000 mL of distilled water, you may use 100 mL of egg yolk and 900 mL distilled water.

The above extender, when added to the semen, will have a total volume of 1000 mL, sufficient for 20 inseminations.

Semen can be stored for up to 72 hours if the temperature is 7°C; but results are better if it is used within 48 hours. The best time for insemination is as near the middle of the estrous period as possible. This will usually be 13-30 hours after detection of estrus.

To further increase conception rate and litter size, double inseminations, using 25 mL each time, have proven successful. The first insemination would be about 24 hours

after detection of heat and the second about another 12 hours later.

The most commonly used volume of extended semen is 50 mL per single insemination, with the semen containing at least 3 billion spermatozoa; smaller volumes and fewer spermatozoa frequently result in reduced conception rates. With good AI technique, the conception rate and litter size can equal those of natural mating. In fact, the improved observation and management necessary with AI often improves reproduction rates. The biggest problem in artificial breeding is the difficult and time-consuming task of accurate heat detection.

The following suggestions may help you detect heat:

- Don't try to detect heat at feeding time or when strangers are in the barn.
- Use a teaser boar. This causes the strongest heat expression and therefore best estrus detection.
- Spray an artificial boar scent around the sow's nose.
- Play taped boar mating calls in the sow barn.

Swine AI is a simple technique that can be mastered quickly. Companies distributing boar semen offer 1-day training programs. Some producers collect and extend semen and inseminate sows on their own farms.

For more information on swine AI studs, supplies of swine semen and swine AI training courses, contact your provincial department of agriculture.

MANAGEMENT FROM FARROWING TO WEANING

Gilts and sows, on the average, lose 25% of their pigs during the period from birth to weaning. The first 3 days of life are the most critical and 65% of the deaths occur at this time.

About 7% of all pigs born are stillborn or die within the first few hours and another 18% die between then and weaning. Adequate observation and assistance could save 90% of the pigs born alive. This could add another 2-3 pigs per sow a year, resulting in a large increase in net return per sow.

Farrowing

The length of farrowing may affect the number of piglets born dead or with a reduced ability to survive. This is often caused by damage to the umbilical cord during birth and the resulting partial or complete asphyxiation. Conditions that may slow down farrowing include hot weather, and sows that are too fat or constipated. Some piglets may be born in the afterbirth or with their snouts covered by fetal membrane. Never assume that a piglet, although seemingly stillborn, is dead; after the fetal membrane is removed from its snout, a brisk massage or immersion in cool water may revive it.

Colostrum

Baby pigs are born without antibodies to protect them against diseases in their new environment. The colostrum of first milk, in addition to important nutrients, also contains antibodies that help protect the baby pigs until they can produce their own antibodies at 3-4 weeks of age. As the piglets' ability to absorb these into their bloodstream begins to decline soon after birth, they must consume as much colostrum as possible within the first few hours.

Chilling

The newborn piglet has little ability to regulate body heat. Its critical temperature is approximately 35°C, below which it must burn up some of its meager energy supply to try to maintain body temperature. Normally, the mechanisms that regulate the piglet's body temperature are working properly by 4 days after birth. However, if it is chilled within the first few days, it takes longer for these mechanisms to fully develop. The baby pig loses body heat in four ways:

- by radiation (loss to the surrounding ceiling and walls);
- by conduction (heat conducted from the body by whatever it is touching);
- by convection (loss to air flowing over the body); and
- by latent heat loss (loss through evaporation of body moisture).

Place the piglet in an environment that minimizes loss of body heat. The farrowing barn should be around 18.3-21.1°C for the sow's comfort but the baby pig should have temperatures of 29.4-32.2°C for the first week, 2.7°C cooler the second week and another 2.7°C cooler the third week. Keep the creep area draft-free and have the floor surface either heated or insulated. An overhead source of supplementary heat is needed.

Chilling is one of the most important contributors to baby pig mortality. It makes the piglet weak and sluggish, leaving it vulnerable to other dangers such as crushing and starvation.

Iron requirement

Since the baby pig grows very quickly, its blood increases rapidly in volume; consequently, it must have an adequate supply of iron. A sow's milk contains little of this mineral and feeding her large amounts of iron will not greatly increase the amount in her milk. To prevent anemia, the baby pig should receive supplemental iron within 3 days of birth. Anemia is characterized by pale skin and listlessness, and, in severe cases, rapid, heavy breathing.

Iron may be given to the piglets individually in a powdered reduced form, but an injectable iron dextrin compound is better. This should be injected intramuscularly at 3 days of age. Use a dosage of 150-200 mg. A second dose at 2-3 weeks of age may be needed if the piglets are eating very little creep feed.

Other nutrients

The sow's milk only gives the baby pig sufficient nutrients for maximum growth for the first 2-3 weeks. Her milk production starts to decline by the third or fourth week of lactation even though the piglet's demand for nutrient is increasing (Figure 4). Until the piglet is about 4 weeks old, its digestive system is unable to use plant proteins and starches efficiently.

Make a highly palatable and digestible creep ration available to the litter at 1 week of age. Sprinkle some on the floor in the creep area when the sows are fed to help to get the piglets to eat. The piglets will eat the ration from self-feeders when 3-4 weeks old. It is important that the feed be kept fresh to encourage consumption. Also provide fresh water in the creep area; it will significantly increase creep feed intake and improve its utilization. Although creep feeds are expensive, young pigs convert such rations to body tissue more efficiently than older ones. Thus, the cost per kilogram of gain is relatively low.

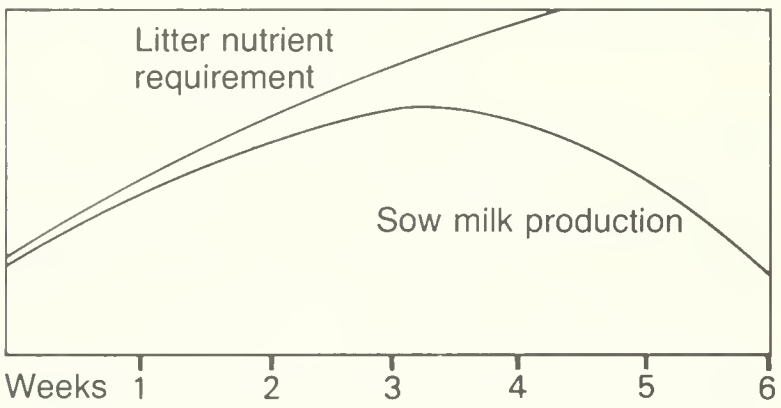


Figure 4 Sow milk production versus litter nutrient requirements

Routine procedures

You should carry out several management procedures as a matter of routine at or shortly after birth.

REMOVAL OF NEEDLE TEETH These are the eight small teeth (two on each side, top and bottom) that could injure the sow's teats and the faces of other piglets during suckling. Remove the teeth at birth by clipping them off with side-cutting pliers. Take care not to damage the tongue or gums.

DISINFECTION OF NAVEL To prevent entry of disease organisms, treat the navel cord with tincture of iodine soon after birth. Where umbilical bleeding is a problem, tie the cord within 25 mm of the body with umbilical tape or string.

TAIL DOCKING Tails should be docked within a few days of birth; it is quite often done when the teeth are clipped. Remove the tail at about 6.2 mm from the body. Docking reduces tail biting at later stages.

CASTRATION Castrate male pigs intended for market. The operation is less of a shock and the wound heals faster when the pigs are young. It should be done before the pigs are 3 weeks old and at least 1 week prior to weaning.

Fostering

When sows and gilts farrow in batches, it is possible to equalize litters and adjust litter size to the number of functioning teats or to the nursing ability of the sows. Transfer pigs from sow to sow as early as possible (about 3-4 days after farrowing). If the odor of the pigs is masked by some strong-smelling substance, the transfer can be made at a later time. British studies indicate that this system promotes lactational estrus and leads to early breeding and, therefore, greater productivity.

Multiple suckling is also becoming more common. Under this system, sows and litters may be run together in groups of four to six sows, usually after the litters reach 2 weeks of age. However, some producers group sows as early as 1 week after farrowing. A common variation is to let the litters run together 24 hours after birth, then later allowing both sows and litters to run together. The age difference between litters should not be more than 1 week.

Orphan pigs

Commercial milk replacer products are available that you can use to raise orphan pigs or extra pigs from large litters. Raising such pigs is time-consuming; it is feasible only if the pigs get some colostrum from a sow and if excellent sanitation practices are followed. The following formula may prove useful in an emergency:

- cow's milk 1 L
- water 0.5 L
- corn syrup 18 mL
- antibiotic supplement (preferably soluble and containing approximately 0.25 g of antibiotic)

Feed this formula at least six times daily for a few days. It must be kept fresh and fed at body temperature (38°C).

MANAGEMENT OF GROWING AND FINISHING PIGS

Deaths among growing and finishing pigs (18 kg to market weight) are normally low. If good feeding, management and sanitation programs are followed, you should encounter little trouble during this period.

Disease prevention is essential for profitable and healthy livestock. The most important points are parasite control, a strict cleaning and disinfecting routine, and early diagnosis and treatment of disease. Good management ensures that each pig is observed daily for possible disease or injury. If an animal is off feed, shows a temperature rise or is scouring, get a proper diagnosis and begin treatment or

preventive measures. Isolate sick pigs and give them special treatment.

Isolate newly purchased pigs in clean, disinfected and comfortable pens. Treatment for worms and mange is recommended. Discuss possible addition of antibiotics or other drugs to the feed or water with your veterinarian.

Grouping of pigs

Group the pigs in lots that are uniform in size, sex and general health. When grouping or mixing different lots of pigs, try to keep fighting (and the resultant stress) to a minimum. The following procedures may help.

- Don't add one or two pigs to a larger group.
- Mix groups in a pen new to both groups.
- If all else fails, spray pigs with a strong-smelling, nontoxic substance to help mask odor differences.

Feed barrows and gilts separately. Barrows grow faster, go to market sooner and tend to have poorer carcass quality than gilts. Feed restriction during finishing may be economically justified for barrows but seldom for market gilts.

Feeding methods

The feeding method will depend upon the number of pigs to be fed, the amount of grain on hand, the rate of gain desired, the type of pig and the amount of labor available. When self-feeders are used, take care that they are properly adjusted to prevent wastage. No method of feeding will replace proper, balanced rations and personalized management. As interactions may occur between breeding, nutrition and environment, any feeding system should be adapted to the enterprise in which it is being used. You must base your own management decisions on economics.

FULL AND RESTRICTED FEEDING Two methods of feeding are commonly practised. Full feeding uses a self-feeder to keep feed before the pigs at all times; restricted or limited feeding gives feed to the animals once or several times a day by hand or by automation (usually 2.2-2.7 kg a day when pigs are near market weight). When self-feeding, the number of pigs per hole or per metre of self-feeder should not exceed 18.

LIQUID FEEDING Liquid feeding transports feed mixed with water to the pigs by pipeline. In a study at the University of Alberta, there were no differences in average daily gain or in efficiency of feed utilization when growing-finishing pigs were:

- fed a ration containing 2 or 3 parts water to 1 part feed; or
- fed the ration with a 2:1 water-to-feed ratio while provided with additional free-choice water; or
- fed the ration as a dry meal and given free access to water.

Numerous experiments in North America and Europe suggest that, on the average, feed intake and gain may be slightly higher for pigs on liquid feeding than for those on a dry self-feeding system.

WET VERSUS DRY FEEDING If the water-to-feed ratio is between 1.5:1 and 4:1 (optimum 2.5:1), performance of pigs will not likely vary. Any advantage of wet feed is probably because of the greater degree of food wastage with dry feed and the possibility of lung irritation caused by dry, dusty diets. Even when pigs are liquid-fed, they should have a source of water available.

FLOOR FEEDING Some automated commercial operations practise floor feeding. In 1963, the University of Alberta compared this method with conventional feeders. Pigs fed on a restricted scale had similar rates of gain, efficiencies of feed utilization and carcass quality, suggesting that the decision to floor feed or not must be based on space, convenience and cost. It is difficult to full feed pigs on the floor because of excessive wastage.

Feeding of growing and finishing pigs

Pigs weaned at 3-5 weeks of age weigh between 4.5-11.3 kg. They should continue on a starter diet until they reach 18 kg liveweight. However, pigs weaned at 7 weeks or older may be switched gradually to a 16% crude protein grower diet. For growing-finishing pigs, make all ration changes gradually. If this is not possible, reduce the level of the new diet until the pigs become accustomed to it.

For best growth rates, self-feed growing-finishing pigs from weaning to market weight. Where post-weaning scours are a major problem, try restricted feeding during the first week after weaning, rather than self-feeding. Rations containing high levels of medication are commonly used as preventive measures. For treatment, medication of the drinking water is preferable since sick pigs tend to go off feed.

The aim in pig production should be the production of lean pigs under a full feeding system. To achieve this you need:

- pigs with genetic potential for lean meat deposition;
- suitably balanced diets to achieve that genetic potential; and
- a satisfactory environment.

Some pigs grade well when self-fed whereas others become overly fat and grade poorly. Considerable effort should be made to select those animals capable of producing lean carcasses on full feeding. You can sell pigs at a lighter weight than the usual 93-97 kg liveweight. Or, you could restrict feed intake and, therefore, growth rate to obtain leaner carcasses. If you practise feed restriction,

give the pigs no less than 85% of full feeding and only after they reach 54 kg. This will lengthen the time to market, increasing labor and housing costs and reducing throughput. Therefore, decide whether the improvement in grade is great enough to offset the higher costs. As there is seldom very little difference in the total amount of feed consumed by pigs on restricted feeding or on full feed, feed costs will not vary greatly.

Restricted feeding may be accomplished by feeding the pigs to a predetermined scale or by giving them access to feed for two 20- or 30-minute periods a day. There is no advantage to feeding pigs more frequently. However, they must have adequate feeding space.

As pigs are carried to heavier weights, the dressing percentage increases. Therefore, selling at lighter weights will lead to some reduction in dressing percentage and tend to cancel the benefits of improved grade. However, killing at a lighter weight is generally a more economical and surer way to improving grade than is restricted feeding.

Pen size and pig density

Recommendations exist for the minimum floor area for pigs, but the optimum number of animals per group has not been established. Trials gave inconsistent results from season to season, but indicated that high temperatures cause more stress to large groups than to small groups. Tests in three different buildings showed that in the 16-45 kg weight range, 16-pig groups ate less and gained more slowly than 8- to 12-pig groups.

Pen size will dictate the number of pigs carried per group. Pens for groups numbering about 12 pigs have an advantage in terms of performance. The extra construction cost for smaller pens (more pens required) must be weighed against possible improved performance.

Younger pigs generally benefit from smaller groups since they are more affected by the stress caused by competition and social order adjustment in large groups.

Sanitation

Before a new croup of pigs enter a pen, give it a thorough washing, as can be done with a high-pressure sprayer (3500-4100 kPa). Follow this with a disinfectant spray. If possible, let the pen dry before the pigs occupy it.

In a feeder operation where animals are purchased from different sources, keep newly acquired pigs in isolation for the first 2-3 weeks to minimize the possibility of introducing and spreading serious diseases.

Parasites

Treat pigs for intestinal roundworms (ascarids) shortly after weaning. To effectively control this parasite, you must know something of its life cycle and the damage it does.

The adult worms live in the intestine and lay numerous eggs that pass out in the manure, contaminating equipment, feed, soil and pasture. When swallowed by feeding animals, the eggs hatch into larval worms that migrate through the lungs and liver, causing extensive damage (coughing and increased susceptibility to pneumonia) before they become established in the intestine as adult worms. There the adult worms cause irritation and damage to the intestinal wall, often resulting in enteritis and unthriftiness.

"Hygromycin" and "Piperazine" are the most common treatments for roundworms in swine. Hygromycin, fed in starter and growing rations, reduces ascarid egg production. It is generally not fed after pigs reach a weight of 40-65 kg.

Piperazine, a worm expellant, is effective against ascarids and most nodular worms. It is very safe — only gross overdoses can cause poisoning. Since the ascarids require 60 days to mature and start laying eggs, you can eliminate them by treating pigs every 50 days after birth.

Both mange and lice can be controlled by toxaphene and malathion. Complete coverage of the body is necessary for effective control.

Tail biting and cannibalism

Tail biting is common among growing pigs. It may be caused by management and feeding practices, such as overcrowding (particularly in groups of 20 or more) and mixing animals that vary considerably in weight. Wet, cold and drafty conditions or sudden changes in temperature or humidity may also start one or two aggressive pigs biting. If these cannibalistic animals are removed, further trouble may be prevented.

Lack of minerals (particularly salt, calcium iodine or iron), lack of protein, and extremely high-energy low-fiber rations may all contribute. Pigs on restricted feeding are more likely to bite tails, probably because of boredom. Putting an old tire, chain or similar distraction in the pen may help.

Some producers remove the tails of their pigs (at about 6 mm from the body) shortly after birth. Treating chewed tails with a creosote mixture or iodine compound may also discourage biting. There is no simple answer to tail biting, but a close check of the pigs should let you detect the problem early. Remove the bitten pig from the pen and try to identify the offender.

Water supply

Give the pigs a constant supply of clean, fresh water. Allow one automatic watering cup for 20-25 pigs. Water that has a high mineral content may prove harmful; if there is any doubt about the water, have it analyzed for mineral and salt content. Water with a total solids content of over 5000 ppm may cause scours. When a problem arises that cannot be readily diagnosed, the water source should be

suspected. If the salt level in the water is too high, reduce the salt content of the diet.

Normally, growing and finishing pigs given free access to water each drink about 2.25 kg to 1 kg of feed, or about 4.5 L daily.

Over-restriction of water or excess water in the feed will reduce feed consumption and growth rate.

High temperatures and low humidity increase problems associated with water restriction.

Marketing at correct weights

Swine producers lose thousands of dollars each year by marketing pigs at wrong weights. The grading system that came into effect in 1969 allows carcasses to go to 90 kg before they are downgraded as too heavy. This lets producers carry hogs to as high as 115 kg liveweight. Hogs have a tendency to deposit fat faster than lean as they approach 90 kg. This results in fatter carcasses as well as poorer feed conversion. Most producers find that the preferred shipping weight is 100-110 kg.

Before the grading system was initiated, Canadian hog carcasses averaged 69 kg warm carcass weight (excluding sows and stags). Now it is at 77 kg.

Market bids for hogs are made by warm dressed weight. The bid price applies to those carcasses with an index of 100. A carcass with an index of 110 is worth 10% more per kilogram than the bid price, and one with an index of 90 is worth 10% less. Thus, the bid price is adjusted accordingly.

A scale for weighing market hogs is useful and should pay for itself in the increased profits you gain by marketing pigs at correct weights.

Carcass shrinkage

The dressing percentage of market pigs is important when assessing the economics of your management practices. A decrease of 1% (for example from 78 to 77%) in a 90 kg liveweight pig represents a loss of 1 kg in carcass weight. With pig carcasses at $1.75/kg, this is a loss of $1.75 a pig or $175.00 on 100 pigs.

In studies, withholding feed and water for 24 or 48 hours beyond the normal 20-hour withholding period resulted in an additional carcass shrinkage of 1-3.1% or a loss in carcass weight of up to 2.8 kg. This is a significant loss.

Management during transport

Avoid stress and injury to pigs when sorting, handling, loading and transporting them. Provide loading facilities that are free of sharp objects and have moderate slopes. You need partitions in the truck when hauling large numbers of stock or boars that have not been housed together.

Provide moist sand or other suitable bedding in the summer and adequate bedding in the winter. Pigs should have shade in the summer, and in hot weather they should be wetted periodically, either by an automatic sprinkler or with a garden hose.

Good management means savings

The average feeder hog has to gain 77 kg before it goes to market (purchased at 13.5 kg, and marketed at 90 kg). If we reduce the amount of feed required per kilogram of gain we can increase profits. For example, if the feed conversion rate (the amount of feed to put on 0.5 kg of liveweight gain) is improved from 1.9 to 1.81 kg, it would save 15 kg of feed per hog. For 500 hogs a year, the saving would be 7.7 t of feed.

This is possible without making improvements in the genetics of the herd; you simply keep the self-feeders or limit-feeders adjusted to reduce wastage.

This difference in feed conversion can also be realized by using a well-balanced ration rather than one that is not balanced.

To look at it another way, if the rate of gain is increased from 0.68 to 0.77 kg/day, the average hog goes to market 2 weeks earlier. This would increase annual marketings by 10%.

Such gains are feasible. Improvements in quality, parasite control, barn heating, ventilation or many other areas, when added together, could increase production efficiency by over 50% in most herds.

KEYS TO HIRING

Locating and keeping well-qualified help is one of the biggest problems experienced by large-scale swine producers. Some operations suffer a constant turnover of farm workers and others don't, indicating that some producers have worked out superior hiring programs. When hiring herdsmen, consider the following:

- Offer salaries competitive with those in local industry.
- Provide well-designed, pleasant work facilities. It is difficult to find anyone who is prepared to work in antiquated facilities that are inconvenient and require extensive hand labor. Poor working conditions also result in inefficient use of labor.
- Remember that all employees must participate in the Unemployment Insurance and Canada Pension Plans. Also, consider sick leave benefits and workman's compensation.
- Do not expect employees to live in substandard housing. Benefits in kind could include their own garden space and one or two pigs for slaughter each year.
- Ensure that all workers have regular days off each week as well as an annual vacation. No one can work continuously without a decline in job performance.
- Consider a bonus or profit-sharing program to create some incentive; employees might give that little extra attention so vital in a livestock operation. Such a plan might be based on pigs weaned per sow annually, pigs

marketed yearly or some other measure of production efficiency.

- Establish workers' individual duties at the beginning of their employment. Make them feel they are an integral part of the enterprise. Give each responsibility for at least one part of the operation and let them all participate in production decisions. Send workers to some of the short courses offered on swine production. In summary, treat them as partners in the operation, rather than just as hired laborers.

CONVERSION FACTORS

Metric units	Approximate conversion factors	Results in:
LINEAR		
millimetre (mm)	x 0.04	inch
centimetre (cm)	x 0.39	inch
metre (m)	x 3.28	feet
kilometre (km)	x 0.62	mile
AREA		
square centimetre (cm^2)	x 0.15	square inch
square metre (m^2)	x 1.2	square yard
square kilometre (km^2)	x 0.39	square mile
hectare (ha)	x 2.5	acres
VOLUME		
cubic centimetre (cm^3)	x 0.06	cubic inch
cubic metre (m^3)	x 35.31	cubic feet
	x 1.31	cubic yard
CAPACITY		
litre (L)	x 0.035	cubic feet
hectolitre (hL)	x 22	gallons
	x 2.5	bushels
WEIGHT		
gram (g)	x 0.04	oz avdp
kilogram (kg)	x 2.2	lb avdp
tonne (t)	x 1.1	short ton
AGRICULTURAL		
litres per hectare (L/ha)	x 0.089	gallons per acre
	x 0.357	quarts per acre
	x 0.71	pints per acre
millilitres per hectare (mL/ha)	x 0.014	fl. oz per acre
tonnes per hectare (t/ha)	x 0.45	tons per acre
kilograms per hectare (kg/ha)	x 0.89	lb per acre
grams per hectare (g/ha)	x 0.014	oz avdp per acre
plants per hectare (plants/ha)	x 0.405	plants per acre

APPENDIX

Swine reproduction and health record

BIRTH DATE _____ HEAD NUMBER _____

ARRIVAL DATE _____ REGISTRATION NUMBER _____

DESCRIPTION _____ TATTOO NUMBER _____

VACCINATION _____

BREEDING SELECTION CRITERIA _____

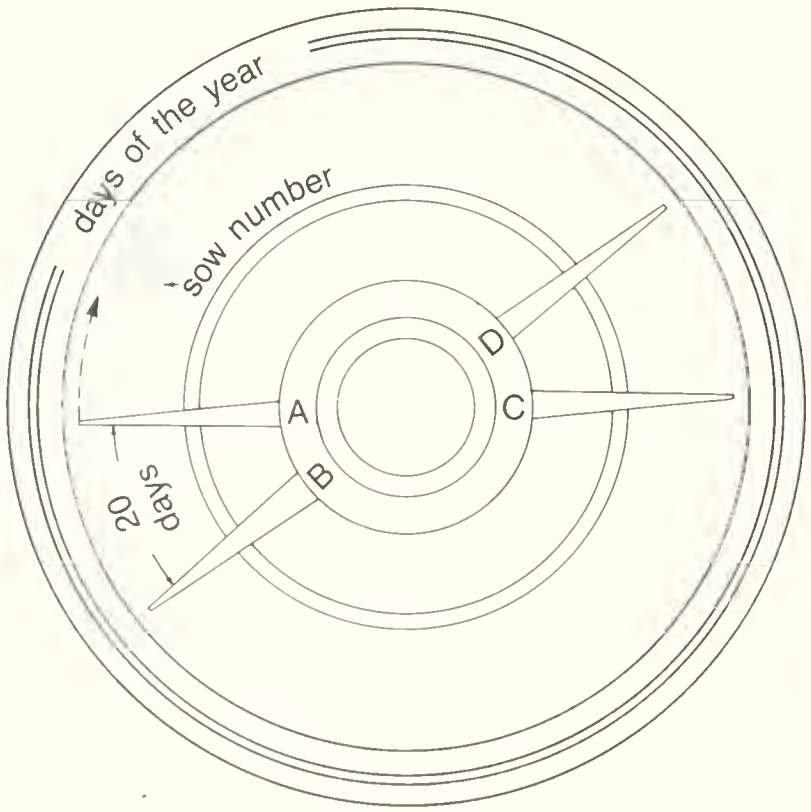
BREEDING AND PRODUCTION RECORD

Date	Event	Number of pigs born		Average birth weight	Pigs weaned		Sow weight		Reasons for culling — disease, piglet mortality, etc.
		Alive	Dead		No.	Average weight	Farrow	Wean	

Code for important events:
H— in heat — not bred
B— in heat and bred
W— Weaned pigs
F — Farrowed pigs

Date	DISEASE RECORD
	Removed from herd (reason)

Sow breeding wheel



A. Breeding arm
B. Check for rebreeding
C. Routine management (deworming of sows, etc.)
D. Move to farrowing quarters


helping
Canada
grow