# MAKING CHANGES TO GET TO 30 PIGS/SOW/YEAR

**Robert Knox**
**Department of Animal Sciences**
**University of Illinois, Champaign**
**1207 West Gregory Drive, Urbana, Illinois 61801**
**E-mail: rknox@uiuc.edu**

## INTRODUCTION

This article will discuss the changes that can be made in an existing production operation to help move the farm closer to reaching the goal of 30 pigs weaned/sow/year (PSY). Although there are several areas integral in reaching this goal, this paper will discuss and expand upon four areas that producers can change with greater ease and includes: gilt management procedures, estrus detection and AI, and management of the breeding herd during gestation, farrowing and lactation.

## GILT MANAGEMENT

The period of time from gilt selection until entry into the herd influences immediate and even lifetime performance. It has been suggested that gilts should have *ad libitum* access to feed during development. From 130 days until expression of pubertal estrus, feed gilts a standard grow-finish diet that provides at least 14.2 MJ of DE/kg of feed, and which contains 0.72% lysine. Gilts should be limit fed beginning at 240 pounds to prevent excessive body weight at service. Once gilts reach puberty, they should be maintained on limited feeding until flushing. Flush feeding provides a 200% energy increase through increased feed in the 10 days before estrus. The flushing procedure increases the number of eggs ovulated by two to three at estrus and improves the chances for larger litter size. Gilts should have both adequate muscle and backfat at the time of mating. Once gilts are serviced, it is important to limit feed them in the following two weeks to prevent decreases in progesterone, and increases in embryonic loss as a result of increased gut activity clearing progesterone from circulation.

Attempt to mate gilts between 210 and 250 days of age. At this time they should weigh between 270 and 345 pounds. At this age and weight, litter size is maximized. Mating gilts at ages younger and older than this and at weights lighter and heavier may cause slight or even dramatic decreases in litter size. However, despite the focus on litter size, it is important to remember that lifetime pig production increases as breeding weight increases from 220 to 280 pounds with some evidence to support shorter longevity when first mating occurs at heavier weights. Another important aspect of gilt development involves the amount of backfat at time of mating. Target gilts for mating at 0.7-0.8 mm of backfat. They can be expected to weigh approximately 260 to 310 pounds at these backfat levels. In the development of fat stores, backfat measurements increase from 12 mm at 200 pounds near the time of selection, to 13 mm at the time of onset of puberty when gilts commonly weigh 240 pounds. After onset of first estrus, backfat increases dramatically and by the time gilts reach 280 pounds, they should

have nearly 18 mm of fat at the P-2 site. One exception to this pattern of growth may involve fast growing gilts, some of which may exceed the targeted weight. In this case, feed restriction may be necessary or the diet should be altered to provide less energy.

One essential aspect of gilt development is the controlled exposure to a mature boar in order to induce fertility, advance breeding age, and to synchronize estrus in the replacement gilts. The induction of early puberty and ensuing early mating appears related to improved longevity and lifetime productivity. Boar exposure can be initiated as early as 140 days and as late as 200 days of age. The choice for when to expose gilts may depend upon the location of the gilts, the space available, and the labor. Early exposure will be expected to advance age of puberty but will spread the synchrony of the exposed group over a much longer period of time. This may or may not have any beneficial or detrimental effect. In contrast, boar exposure at later stages has the advantage of still advancing age at puberty and providing greater synchrony for the exposed group. This occurs because the stimuli occurs closer to the time of natural puberty for more of the gilts. Regardless of the age of exposure, boar exposure itself improves the percentage of females that cycle before 240 days of age when compared to no boar exposure at all. However, age of exposure may not influence the overall percentage that become cyclic by 240 days of age. In light of this fact, the age at exposure becomes the prerogative of the farm management system.

Consideration should be given to the choice of boar for induction of early puberty. Factors which can advance the age of puberty include having boars at least 11 months of age and that are active in vocalization. Each of these measures has the potential to advance puberty more than 10 to 20 days. Avoid having gilts in groups of more than 40 and fewer than four. Physical or fenceline exposure are both desirable, but physical exposure has been observed to have a more potent effect on advancing age of puberty.

## ESTRUS DETECTION AND AI MANAGEMENT

The key to getting to 30 PSY must center on methods that can improve estrus expression and detection. Some advocate continuous boar contact for cyclic gilts and weaned sows for advancing estrus and ensuring fertility. However, although this practice may have some beneficial effects on fertility, it can also prevent estrus detection, since pigs exhibit refractory behavior from excessive exposure to the boar. Refractory behavior occurs when estrous females are near boars for extended periods or are able to detect their pheromones or vocalizations from close housing. The female's ability to detect the boar stimuli elicits the standing behavior, but this behavior usually only lasts 10 to 15 minutes before refractory behavior occurs, and the female will not stand for the same stimulus. Thereafter, many estrous females will not stand for a period of at least 2 hours. The essential requirement then, is to ensure that boars are absent from the estrous females at least for 2 hours prior to detection of estrus.

When the objective is to determine the onset of estrus accurately, it should be noted that the efficiency of estrus detection is greatly improved when the boar can be seen, smelled, is vocal, and physical stimuli such as back pressure and side rubbing are provided from the boar

itself or from humans. The female's estrus response is most effectively elicited in situations that allow boar odor, sound, sight, and physical contact to be maximized. This can be facilitated by good lighting, short distances between the boar and the sow, reduced ventilation during this period, and low noise levels.

Accurate detection for onset of estrus is especially important across days. The sensitivity of estrus detection may be a factor that has been overlooked as a method for improving the timing of insemination for impacting both farrowing rate and litter size. Too much, or too little sensitivity may alter the accuracy of estrus onset and AI timing. Too much sensitivity can occur as a result of increasing the amount of boar stimulation on one day compared to another. Some examples of this occur in cases where the number of boars used for detection changes from day to day, the age of the boar used on different days differs by age of maturity, and the duration of exposure or frequency of contact within a day changes across days. Too little sensitivity can be caused by continuous boar contact, too short an interval between the last boar exposure event, or housing boars too close to the females to be checked so that they are refractory as a result of over exposure to the sounds and smells of the boar. Estrus detection should occur once or twice daily using the same method, time of day, and duration of exposure each day. Since there is inherent error in the accuracy for onset of estrus with detection performed at 12 to 24 hour intervals, it is important to maintain the same intervals and perform the check at the same time each day to provide for the needed level of accuracy. This should also involve the weekend labor since weekend labor limitations and skill levels often differ from the full time weekday laborers. A reminder should be noted in that the symptoms of estrus are not the same as the standing estrus response. For example, vulval swelling and mucus discharge are not accurate indicators for onset of estrus when compared to the rigid stance under full weight of either man or boar. It is often important to remind the breeding herd personnel that application of physical stimuli to the females is important and should involve rubbing on the sides and back of the sow, and in some cases may require full human weight on their back. The clear symptoms of estrus that should be used to determine time of mating should include that a standing female does not vocalize, becomes rigid under weight, and may show some evidence of ear reflexes regardless of whether ears are lop or erect in structure.

Twice daily detection can improve AI timing. AI can occur at 12 or 24 hour intervals using an am/am, pm/pm, or pm/am system. The timing of the insemination should be placed to make sure that semen is in the reproductive tract anywhere from 4 to 24 hours before ovulation. Producers should ensure that at least two inseminations occur at 12 to 24 hour intervals during the time the sow is standing. Too many single serviced females indicate a problem in estrus detection or AI timing. Two inseminations for each sow is the standard recommendation due to cost of semen, labor, and limited increases in farrowing rate and litter size. However, there is some evidence to suggest three and even four inseminations given during the standing period can slightly increase both measures. More inseminations may not be cost justified in some operations but could be beneficial in others.

It is important to practice and promote hygiene when performing AI, since unsanitary conditions at AI can introduce bacteria into the uterus and may contribute to poor sperm reservoir establishment, uterine infections, and pregnancy failure. The presence of the boar at

the time of mating is desirable for inducing the standing response, for reducing leakage at insemination, and for enhancing semen uptake and transport. Insemination should be performed using either natural uptake as a result of the uterine contractions of the sow and gravity flow, or through application of mild pressure and some gravity flow. In most cases, inseminations typically require between 2.5 to 4 minutes to get 80 mL of extended semen to be deposited. Many producers suggest leaving the catheter locked into the cervix and bent to prevent backflow for a period of 5 to 10 minutes following semen deposition. This procedure may be beneficial to prevent immediate backflow out of the cervix and uterus as a result of high levels of stimulation and uterine contractions as a result of the fluid within the uterus, the hormones released from stimulation by the boar, and resulting from oxytocin release from the side and back-rubbing during insemination. Most AI procedures today involve the deposition of 2.5 to 3 billion sperm cells in extenders that may be classified as short, intermediate or even long-term. Yet most semen is used within 96 hours from collection. The semen is deposited into the cervix and uterine body using a conventional foam-tip or spiral-tipped AI catheter. Leakage at the time of AI typically averages 10 to 20% of the total volume, but this loss probably has little impact on fertility. However any leakage indicates that catheter positioning, lock, or sow stimulation technique could be improved. It appears that by four hours following AI, nearly half of the sperm are lost in backflow as the uterus eliminates the less fertile sperm cells not transported to the reservoir. This elimination of infertile sperm is important to allow the uterus to prepare for pregnancy.

The goal for high pregnancy rates and large litter sizes has been to ensure that inseminations occur within 24 hours before the time of ovulation. Since this time period is not known to the producer, multiple inseminations are performed to ensure that at least one AI hits the targeted window. The detection for onset of estrus can be underestimated by as much as 12 to 24 hours depending upon the time interval between estrus detection. In fact, in this scenario, it is not the first, but the second AI that typically hits the targeted window 75% of the time. The reason for this is that most AI procedures are based on AI occurring at 24 hour intervals. Since estrus lasts on average 52 hours in sows, and ovulation occurs at 42 to 44 hours after onset of estrus, inseminations are timed to occur at 0 to 12 and 24 to 36 hours from onset of estrus. From the time of insemination, the sperm require a 2 to 4 hour time period in the uterus to become capacitated and able to fertilize an egg. So it is of utmost importance for sperm to be inseminated ahead of the time of ovulation. The ovulated eggs that are fertilized show the highest rate of embryo development and quality when they are fertilized by sperm within the 8 hour period from the time they are ovulated. Avoid late inseminations, and remember that sows will remain standing for 12 to 18 hours after ovulation has occurred. Late inseminations are undesirable and may do more harm than good, since they may facilitate embryo loss and uterine infection. This can sometimes be a contributing factor in cases of low litter size and discharges at 21 days post-mating. Lastly, it should be noted that not all sows and gilts will have the same estrus to ovulation intervals. The interval from onset of estrus is variable for gilts and sows and is influenced by the interval from weaning to estrus and is highly related to the duration of estrus. Most females will ovulate at 60 to 75% of the way through the duration of the standing estrus period. If twice daily estrus detection is performed, even temporarily, it can be used to help improve and help pin-point time of ovulation and improved AI timing. For example, sows that return to estrus soon after weaning on day 3 or 4, frequently have longer durations of estrus and longer estrus to ovulation intervals, while those

returning to estrus on days 5 and 6 tend to have much shorter durations of estrus and shorter intervals from estrus to ovulation. AI timing can be much more precise for either of these groups with this knowledge in hand.

## GESTATION MANAGEMENT

Ensuring mated sows establish and maintain pregnancy and maintain and maximize embryos and fetuses to challenge the limitations of uterine capacity is a primary goal of gestation management. A related, but somewhat distant, goal involves optimizing body condition of the sow during gestation. This aspect is of great importance since it ultimately controls performance of the sow at farrowing, lactation, and the rebreeding period. Therefore the control of sow gestation weight gain and body condition becomes a critical control point. This level of body condition control is often only possible in some type of individual or electronic feed management system. In many situations, a body condition score (BCS) can be used to classify sows and can be practical and useful for adjusting sow weight gain and body condition during gestation. The body condition score has been shown to be relatively accurate for estimating the level of P-2 backfat. For example, a BCS of 2 estimates the sow has about 16 mm of backfat, a BCS of 3 has 19 mm, and a BCS of 4 has 22 mm. With a good and consistent assessment for either backfat or BCS, the targeted backfat level can meet the expected increase to >20 mm at the time of first farrowing for gilts and can near, meet or exceed this level in older sows. Gilts and parity one sows are expected to gain 80 to 100 pounds during gestation. Older sows on the other hand should only gain 55 pounds during gestation as their lactation appetites are expected to be greater and their loss of muscle and fat lower during lactation. Yet while weight gain is important, excessive weight gain and over-conditioning can cause problems in the form of dystocia, stillborns, and reduced lactation feed consumption. For example, sows that consume an average of 4.5 lb of feed during gestation will have greater longevity when compared to sows that consume 5.5 lb of feed during gestation. This is predominantly related to lower feed intake during lactation and loss of body weight. For weight gain and increased feed intake, make sure this occurs during the third to eighth week of gestation and not any earlier or later.

Controlling non-productive days is a necessity for management for a variety of reasons. From the time of animal breeding, sows that fail to conceive must be identified as quickly as possible to rebreed or cull. Check sows once daily using a mature boar at 18 to 24 days. Rebreed first time returns at estrus. Most sows that fail to conceive will return to estrus in weeks 3 and 4. Some will also return during weeks 5 and 6 post-mating. If ultrasound is available perform as soon as possible. For real-time ultrasound, perform at 26 to 35 days. Avoid culling sows based on an open diagnosis for ultrasound performed at 24 days and earlier, since fluid may be limiting even in pregnant females. Also avoid culling based on an open diagnosis with real-time ultrasound performed between days 39-50, as in this stage, in pregnant females, the fetus grow at the same time that fluid volumes are reduced. This is important because fluid visualization is the display parameter that we use to distinguish between open and pregnant sows when using real-time ultrasound.

## FARROWING AND LACTATION MANAGEMENT

Farrowing management is one of the keys for 30 PSY. This involves ensuring that pigs that are healthy and fully formed are born alive and stay alive during the first three days after farrowing. Almost all production operations have stillborns in the 5 to 10% range. When stillborns are above 5%, it is possible to reduce this loss by attending farrowings and by expending more efforts in preparation and through observation and intervention during the farrowing process. In most cases, attended farrowing and intervention can save 0.5 to 1.0 additional pigs/sow/year.

To prevent or minimize losses of liveborn pigs during the first three days following birth, management techniques must concentrate on prevention of the major reasons for piglet losses, chilling and inadequate energy intake, both of which predispose pigs to crushing. Oxytocin administration is one method used to stimulate milk letdown after farrowing to ensure piglets will have an adequate supply of energy through milk. Some also suggest that if pigs are confined to a creep area for one hour post farrowing, they can effectively be warmed and dried. In large litters that exceed 12 pigs born alive, the smaller pigs of the litter can get a jump start by being allowed to nurse for one hour before the remaining larger pigs of the litter. The fact that most of the pigs lost, are lost in the first three days due to crushing and trauma due to the sow is mostly preventable. These injuries increase as the piglets become chilled and the sow becomes over heated. These situations are easily rectified with properly placed heat lamps and heat mats that warm the pigs but not the sow. The room temperature should be controlled to meet optimal sow comfort. The use of heat lamps and mats prevent piglets from climbing on and under the sow to find warmth. A cool room is optimal for sow comfort and eliminates the sow getting up and down too frequently when she is too hot. Milk supplement can also be provided during days 3 to 10 and can be very effective for aiding piglet survival, energy intake, and growth, especially in large litters. However, care and attention must be paid to ensure milk is fresh and clean. From day 10 until weaning, pigs can be provided creep feed. This is clearly beneficial in helping pigs adjust to dry feed when weaned, and for increasing growth and weaning weight. Additional measures that can help to ensure that adequate energy is available for pigs during lactation and for the sow at weaning include the practice of feeding sows at least three times each day in order to maximize sow feed intake.

In some Danish production systems that are close to 30 PSY, they ensure gilt rebreeding and longevity by successfully extending the nursing period. In this system, gilts are weaned at 20 days and are then given piglets that are 5 to 7 days old. The gilt will then nurse an additional 12 to 15 days to allow them additional time for uterine repair. The sow providing the 5 to 7 day old pigs will then receive the extra pigs from other large litters and will typically nurse for 25 to 27 days before they are weaned. Caution should be used when cross-fostering pigs due to disease, regrouping stress, and establishment of new group hierarchy. Movement of pigs should be performed with whole litters where possible, since improper timing and procedures may cause lower growth rates and even reduced survival.

## PERSONNEL

The last element in making changes toward 30 PSY involves the production staff. How should employees be selected? Consider their interests, skills, strengths, and willingness to learn and develop. Try to select those who are reliable. These are people who agree to a task and they perform that duty as they were trained to do. Get those who are careful and pay close attention to detail and ask when uncertain. This prevents frequent and repeated mistakes. Select those with initiative who try to improve on existing problems and situations when they recognize an opportunity. Successful team members have confidence in their skills and know they can do the task. They also take an active interest in learning about their area of work and what other factors may impact their performance. Investing effort and time to get professional pig production staff requires training and development of people. Helping employees realize their importance and their impact to the success of the business, their fellow workers, and the animals themselves, is a foundation for long-term success. Help build interest and excitement through sharing knowledge, expertise, taking an interest in people, and their performance, and sharing with them how they also can benefit from improved performance. These people will have immeasurable impact on areas of gilt management, estrus and AI, sow management in gestation, farrowing and lactation, to help move producers closer toward their goal of 30 PSY.