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Successfully introducing replacement gilts into the breeding herd is an important aspect of breeding herd efficiency. To attain herd efficiency, females must ovulate adequate numbers of viable ova, express estrus, show willingness to mate and conceive in a regular manner. If these qualities are properly developed, pregnancy rate and litter size will be maximized. A gilt development and management program needs to be designed for gilts from birth to farrowing their first litter.

Selecting Gilts at Weaning

Numerous environmental situations and management practices can influence both litter size weaned and litter weaning weight. Generally, the tasks of keeping piglets alive and getting them off to a good start are classified as maternal effects. If management intervenes on the pig's behalf by fostering pigs to equalize litter size, by hand-feeding weak pigs and by administering timely treatment of baby pig health problems, the sow should not be held wholly responsible for differences in survival.

Ear-notching gilts at birth with litter and individual notches, along with a written record of birth date, litter size born and breed composition will normally meet the needs of a home-raised gilt selection program. Hernias, cryptorchids, and other abnormalities should disqualify all gilts in a litter as replacement candidates. If cross-fostering is used to equalize litter-size nursed, move male pigs from large litters to sows with small litters.

An evaluation of maternal performance for milk production and litter weaning weight should be done at three weeks of lactation. Before three weeks of age, pigs rely almost entirely on the sow as a source of nutrients. After the third week, the litter's need for nutrients often surpasses the sow's ability to produce milk. At that time, pigs can turn to dry feed to meet part or all of their needs.

Select gilts that were born in a large litter, are physically sound and have an adequate number of nipples. In addition, their mothers should have a good temperament and be capable of producing ample milk and weaning a heavy litter.

Gilt Rearing — Birth to 160 days

Litter size while nursing the sow. Research shows rearing environment has a large effect on the reproductive capacity of gilts. Gilts reared in litters of five or six tend to be more fertile dams or show more maternal traits than those reared in litters of 10 or more. Therefore, producers may want to reduce the litter size to six or fewer in litters containing possible replacement gilts by cross-fostering the barrow siblings to sows nursing piglets destined for slaughter. This practice requires no additional costs as there are usually more teats than pigs in most farrowing units.

Floor space. Although the minimum floor space needed to prevent a delay in reaching puberty has not been established, the floor space listed in *Table I* should allow prepubertal gilts to mature properly.

Table I. Floor space per pig.

Pig weight (lb)	*Space[a] (ft^2/pig)*	*Pig weight (lb)*	*Space[a] (ft^2/pig)*
15	1.3	150	6.2
30	2.1	180	7.0
60	3.4	210	7.7
90	4.4	240	8.4
120	5.3	270	9.1

[a] Floor space was calculated by using the equation $A = kW^{.66}$ where A represents square meters, k is a constant of .036, and W is the live weight in kilograms. The metric values were converted to English values.

Gilts per pen. Research is limited in this area. It appears gilts, when housed in groups of 10 to 30 per pen, should reach puberty from 5.5 to 9 months of age. Groups greater than 50 to 60 pigs per pen have shown to delay puberty when gilts were maintained under relatively crowded conditions throughout development. Housing prepubertal gilts in individual stalls or tethers or in groups of two to three per pen also will delay puberty.

Rearing mates. Rearing gilts from 70 to 160 days of age with contemporary barrows, contemporary intact males or fenceline contact with a mature boar does not influence age at puberty. It is advantageous, however, to physically expose gilts to mature boars at least three weeks before mating. This practice reduces the frequency of gilts exhibiting an inadequate standing response due to fear of the boar.

Season of birth. Environmental and climatic conditions existing when the gilt approaches sexual maturity have more influence on age at puberty than season of birth. The proportion of gilts reaching sexual maturity from June through September can be 23% to 60% lower than during other months of the year. Because of this, you want to increase the number of gilts selected for mating during June through September. It is critical these gilts be exposed to mature boars during the summer to increase the proportion reaching puberty.

Nutrition. The technology of feeding barrows and gilts separately is being widely adopted in the United States. Separate-sex feeding provides the opportunity to feed gilts for maximum sow productivity and longevity. *Table II* lists suggested nutrient recommendations for developing maternal-line gilts.

Table II. Nutrient recommendations for developing maternal-line gilts (as fed basis).[a,b,c]

Body weight, lb	*45 to 80*	*80 to 130*	*130 to 190*	*190 to 230*
Feed intake (lb / day)[d]	3.3	4.5	5.5	6.5
Nutrient	**Percent of diet**			
Lysine, total	1.00	.90	.80	.65
Lysine, digestible	.82	.73	.64	.51
Tryptophan	.19	.17	.16	.13
Threonine	.65	.59	.54	.44
Methionine	.27	.24	.22	.18
Methionine + cystine	.55	.50	.48	.39
Calcium	.85	.80	.75	.70
Phosphorus, total	.75	.70	.65	.60
Phosphorus, available	.49	.45	.40	.36
Nutrient	**Calculated daily intake, grams**			
Lysine, total	15.0	18.3	20.0	19.1
Lysine, digestible	12.3	14.8	16.0	15.0
Tryptophan	2.8	3.5	4.0	3.8
Threonine	9.7	11.9	13.5	12.9
Methionine	4.0	4.9	5.4	5.1
Methionine + cystine	8.2	10.1	12.0	11.4
Calcium	12.7	16.3	18.7	20.5
Phosphorus, total	11.2	14.2	16.2	17.6
Phosphorus, available	7.3	9.1	10.0	10.6

[a]Nebraska-South Dakota Swine Nutrition Guide, 1995.
[b]All diets are full-fed under thermoneutral conditions.
[c]Digestible and available nutrient levels are calculated based on a corn-soybean diet.
[d]Average dietary energy density is 1.48 Mcal metabolizable energy / lb.

Housing. Housing gilts indoors has increased breeding problems, mainly lack of estrus, but the indoor factor(s) which inhibit puberty have not been identified. Producers have attempted to circumvent the problem and hasten pubertal development by moving gilts outdoors at 70 to 120 days. Relocating indoor-reared gilts to other indoor pens at 70 to 120 days of age hastens pubertal development, but is less effective than moving them outdoors.

Gilt rearing — 160 days of age to breeding

Genetics. Pubertal development is genetically influenced. Specific conclusions about breed differences, however, are difficult to make due to the stimulatory and inhibitory factors that influence age at puberty. The average age at puberty ranges from 164 to 230 days. Also, within a contemporary group of gilts, a substantial range in age at puberty can be found from the first to the last gilt *(Figure 1)*. The average age at puberty of crossbred gilts is three to 36 days earlier than the average of either parent breed represented in the cross. Thus, crossbred gilts bred at the usual breeding age will ovulate more eggs and produce larger litters than purebreds bred at the same age because they have experienced more heat periods. Inbreeding, on the other hand, tends to increase age at first estrus.

Because the heritability of age at puberty is relatively high (35% to 50%), replacement gilts should not be kept from dams that were late (old) in either showing their first estrus or conceiving their first litter. Producers should not keep gilts for breeding that have not expressed first estrus by 225 to 240 days. Some genetically lean gilts may not cycle until 240 days of age or more.

Photoperiod. With indoor production, there is concern about the effect of light on the attainment of puberty. The influence of photoperiod on age of puberty and proportion of gilts reaching puberty remains controversial. Because many scientific studies used boar exposure to detect estrus when evaluating the effect of photoperiod on puberty attainment, the true effect of photoperiod cannot be determined from these studies. *Table III* indicates the proportion of gilts reaching puberty is greatest when gilts are exposed to mature boars, regardless of whether duration of daylight is increasing or decreasing. Neither the type of lighting (fluorescent or incandescent) nor intensity of light (lux) significantly influences puberty attainment in gilts. It is most economical to maintain developing gilts under cool, white fluorescent light (270 to 500 lux) for 10 to 12 hours per day. Complete darkness delays puberty when compared to 9 to 11 hour per day of natural light.

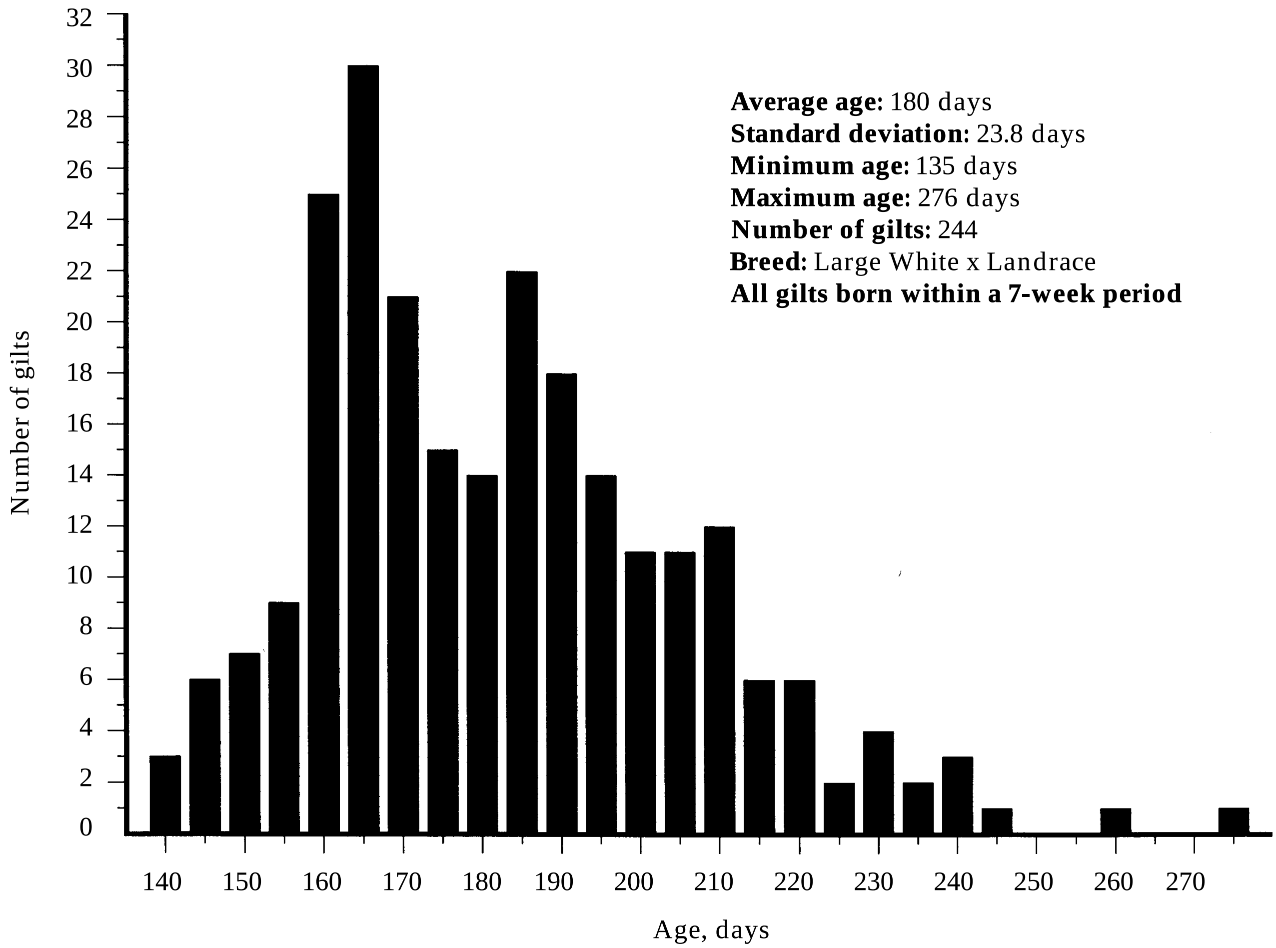


Figure 1. Distribution of age at puberty.

Ambient temperature. High environmental temperatures (>85° F) interfere with the expression of behavioral estrus, reduce feed intake and lower ovulation rate in cycling gilts. Protect replacement gilts from high environmental temperature (>85°F) by providing adequate shelter and supplemental cooling.

Indoor versus outdoor housing. During fall and winter periods, when seasonal conditions favor early puberty, indoor housing results in delayed puberty, an increase of irregular estrous cycles and an increase of behavioral anestrus (ovulation unaccompanied by standing heat) as compared to outdoor housing.

Holding gilts older than nine months in the indoor facility where they were reared seems to increase incidence of irregular or abnormal estrous cycles and lack of estrus. Gilts eight months of age or younger and near the age when cycling first occurred have delayed puberty onset but have fewer problems with irregular estrous cycles.

Some breeds (e.g., Landrace, Large White and their crosses) reach puberty about as readily indoors as outdoors. In other breeds, such as Duroc and Yorkshire, puberty is markedly delayed indoors.

Gilts reared indoors respond readily to relocation and boar exposure stimuli when they near the spontaneous onset of puberty (165 to 190 days of age). Gilts reared indoors should be relocated within the facility or moved outdoors and provided contact with a boar about three weeks prior to their exposure for breeding.

Stocking density. Research has not been conducted to determine whether the number of gilts per

Table III. Proportion of gilts reaching puberty when the duration of daylight is increasing or decreasing

	Duration of daylight is increasing		*Duration of daylight is decreasing*	
Study	*Boar exposure*[a]	*No boar exposure*	*Boar exposure*[a]	*No boar exposure*
1	74.0	13.9	89.4	52.6
2	72.4 (195)[b]	2.9 (227)	62.1 (196)	54.1 (212)
3	79.0 (192)	31.0 (200)	80.0 (205)	12.0 (199)

[a]Age of gilts at initiation of boar exposure was 165 to 173 days.[b]Numbers in parentheses are average age at puberty in days

pen or square feet per gilt affects the ability of a gilt to express regular estrous cycles.

Boar effect. The exposure of prepubertal gilts to a mature boar will significantly reduce the age of the gilt at puberty attainment. Because the interval from first boar exposure to puberty can be quite variable *(Figure 2)*; many times it is assumed boar exposure does not work. Although it is true that the effectiveness of boar exposure can be influenced by nutrition, genetics and environment, the reason boar exposure may not "work" is due to a failure to observe the "rules" of boar contact. Consider the following factors when using boar contact:

Age of gilt at first boar exposure. The age of the gilt at first boar contact influences the interval from boar contact to puberty. Gilts less than 140 days of age take considerably longer to reach puberty after initial boar contact than do older gilts *(Figure 3)*. Average age at puberty is similar among gilts exposed between 145 and 175 days of age. The interval from boar exposure to puberty is lowest when gilts are exposed to boars at 185 to 200 days. Schedule boar contact to maximize the earliest possible puberty or synchronized first estrus desired. In cases where synchrony is desired, provide boar exposure about three weeks before the breeding season starts and when the gilts are 165 days of age or older.

Age and sexual behavior of boar. Pheromones and physical contact are the major components of boar exposure which stimulate puberty in gilts. A major source of pheromones is the submaxillary portion of the salivary gland which does not develop until about six months of age. Therefore, boars used to stimulate puberty should be at least 10 to 11 months of age. Boars of this minimum age, however, may not stimulate puberty in gilts as effectively as older boars. Considerable differences do exist between mature boars in their ability to stimulate puberty attainment in gilts. Puberty attainment in gilts occurs 14 to 30 days earlier when they are stimulated with a high-libido boar as compared to a low-libido boar. It is speculated this difference is caused by the level of pheromones emitted and tactile stimulation provided to the gilt.

Type of boar contact. The method of exposing gilts to the boar is important, as direct physical contact with a boar is usually more effective than fenceline contact. Also, a greater proportion of gilts are likely to attain puberty if they are taken to the boar area for estrous detection. The interaction between a boar and gilt was found to significantly decrease when the number of gilts per group was increased from two to eight or the size of the exposure pen was increased from 14.7 sq ft to 117.3 sq ft per gilt.

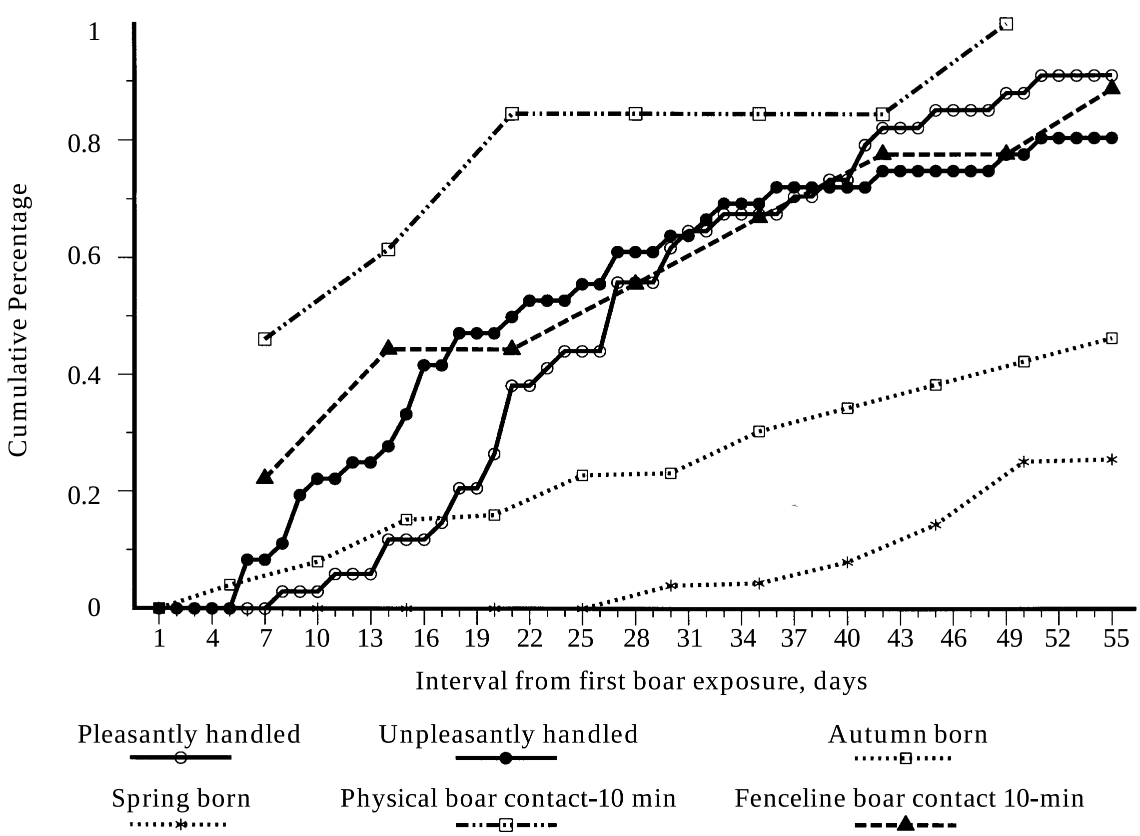
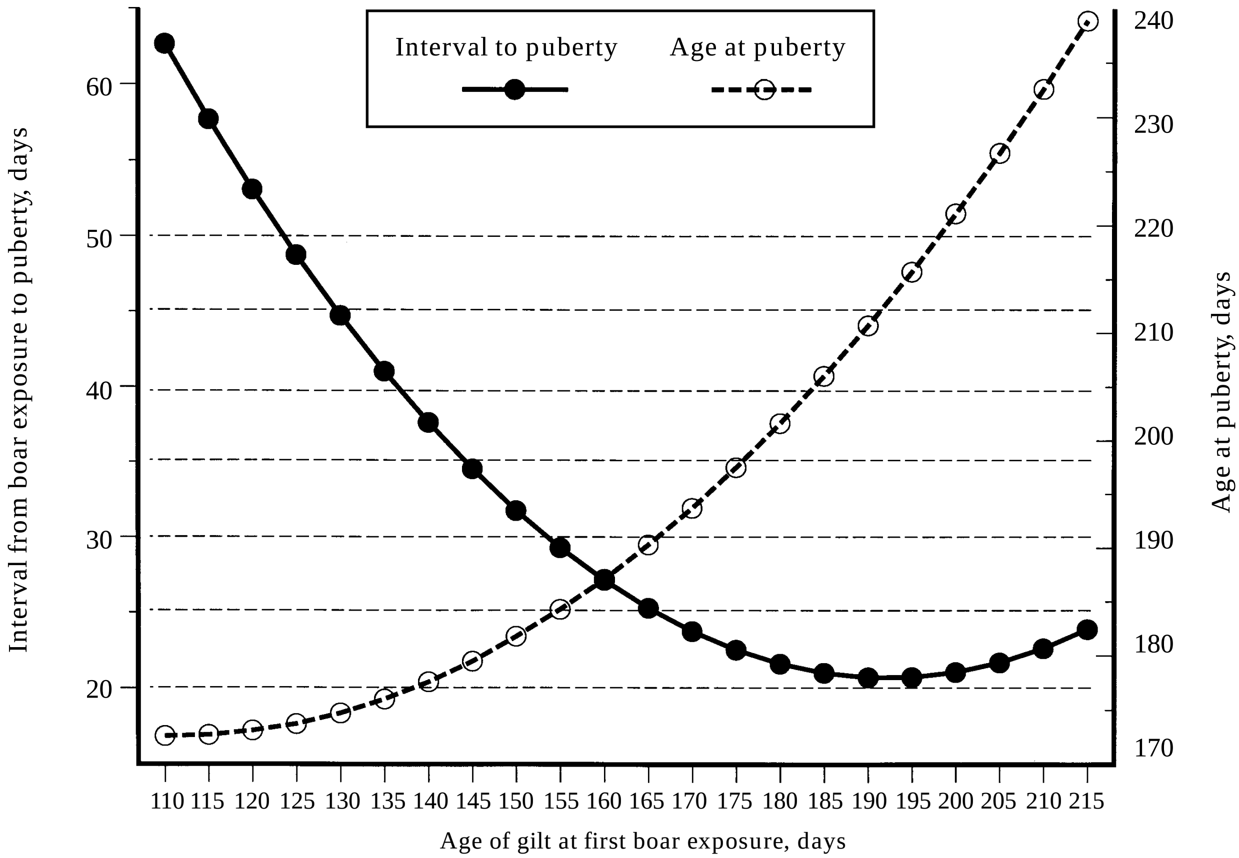


Figure 2. Variability for cumulative percentage of gilts expressing pubertal estrus after initiation of boar exposure



Summary of 38 experiments

Figure 3. Generalized trend for age of gilt at first boar exposure on attainment of puberty

However, the number of gilts per group and the size of the exposure pen did not affect the proportion of gilts reaching puberty within 21 days after starting estrous detection. Additional research is needed to evaluate how the level of boar sexual behavior influences the maximum number of gilts that can be exposed at one time per pen and size of exposure pen.

Frequency and duration of boar contact. Although exposing prepubertal gilts to mature boars for 10 to 15 minutes daily can stimulate puberty relative to no boar contact, puberty stimulation is maximized by providing gilts with boar contact two or three times per day. Increasing the frequency of boar contact is more beneficial during the summer than winter months. Exposing gilts to boar contact on alternating days delays puberty. Research shows five to 15 minutes of boar contact per exposure is sufficient to stimulate puberty in gilts provided there is ample opportunity for physical contact between gilts and boars.

Estrous sow effect. Although boar exposure is generally more effective to stimulate puberty in gilts than estrous sow exposure, research shows contact (continuous or 20 minutes per day) with estrous female pigs can both stimulate and synchronize puberty onset in gilts. When exposing 160-day-old gilts to an estrous sow, the age at puberty ranged from 176 to 197 days, the proportion cycling by 215 days ranged from 26% to 80% and the interval from first exposure to puberty ranged from 12.6 to 45 days. Research has not been conducted to determine whether the combination of boar and estrous sow exposure have an additive effect on puberty attainment.

Transport phenomenon. "Transport stress" triggers a synchronous first estrus in prepubertal gilts nearing puberty. Many swine producers have observed this response when gilts are moved outdoors after being reared indoors. The response varies according to how close the gilts are to reaching puberty spontaneously when transport is initiated. Most gilts responding to the "transport phenomenon" (15% to 30%) normally show estrus four to six days after transport. The main stimulus in the "transport phenomenon" seems to be the change in location, rather than the change in social grouping caused by mixing unfamiliar gilts or the actual transport. Relocation should be scheduled after 165 days of age and combined with the initiation of boar exposure to obtain the maximal response. Transport and boar exposure should occur about three weeks prior to breeding.

Air quality. The rearing of gilts indoors and exosing them to a gaseous environment may delay puberty. Research shows 33% of gilts reared in an environment having 5 to 10 ppm ammonia reached puberty by 203 days of age compared to 12% for gilts reared in a 20 to 35 ppm ammonia environment. However, the proportion of gilts attaining puberty by 240 days of age was similar and their average age at puberty was not different.

Nutrition. Although the current trend in the pork industry is to increase carcass leanness and animal growth, the best diet formulation and method of feeding high-lean growth replacement gilts from selection to mating is debatable. The daily feeding amount and the formulation for feeding gilts from 180 lb to mating varies with genetic composition, number of days from puberty to mating, estrous number at mating and desirable age, weight and backfat at mating. Regardless of how replacement gilts are fed, the main objective is to maximize both reproductive performance and longevity.

Limit feeding. Gilts are developed to 180 lb by *ad libitum* feeding of growing-finishing diets, allowing maximum expression of their genetic potential for growth rate and backfat. When gilts reach 180 lb, restrict their feed intake to 85% to 90% of *ad libitum* (about 6 lb per day) until 10 to 14 days before mating. In reducing the diet, restrict energy, not amino acids, vitamins or minerals. At 10 to 14 days before breeding, increase energy intake to 11,000 kcal per day of metabolizable energy by providing 7.4 lb per day of feed (*ad libitum* feed intake) so gilts are in an improved nutritional state and are gaining weight. Continue high-energy feeding until breeding to maximize the number of eggs released. Flushing the gilts increases the number of eggs ovulated by about 2.6 as compared to limit feeding until puberty. High-energy feeding must be discontinued after mating to prevent an increase in embryonic mortality. When it is not possible to remove gilts from the high energy diet immediately after mating, feed them 5 to 6 lb per day during the breeding period. Gilts can continue on this level of energy without the risk of increased embryonic mortality encountered with high-energy feeding.

Other factors influencing the level of feed required when limit feeding are animal activity, opportunity to huddle together, use of bedding and environmental temperature. Gilts maintained indoors require about 10% less feed than gilts maintained outdoors. During winter's extreme cold, requirements are about 25% greater for gilts kept outdoors.

Full feeding. Full feed only those gilts not excessively fat at mating. Gilts selected for high-lean gain rate eat less feed, are younger and heavier at puberty, are larger in mature body size and may have less backfat at puberty than conventional gilts. There is evidence that restricting lysine intake by feeding a diet containing .45% lysine and 1,340 kcal metabolizable energy per lb of diet to high-lean, fast growing gilts from six months of age to first service and during gestation will restrict lean growth. This restriction will increase gilt backfat at farrowing and improve subsequent reproductive efficiency and longevity. The ability of gilts to produce ample milk, rebreed promptly after weaning and produce a large second litter depends on both the amount of body reserves present at farrowing and the extent of losses during lactation. Because high-lean-growth gilts lactate when they still have the potential for substantial lean tissue growth, a lactation diet containing .95% lysine and 1527 kcal metabolizable energy per lb is used when restricting protein intake during gestation.

Age, weight, backfat and estrous number at mating. Pork producers are concerned about feed cost during the non-productive period from selection to first pregnancy and the influence age, weight, backfat and estrous number at first mating have on long-term reproductive performance. There are considerable ranges in age (140 to 258 days), body weight (198 to 286 lb) and backfat (.4 to 1.2 inches) at puberty among and within genotypes. Because several variables change simultaneously, interpreting data as to the true effect of age, weight, backfat and estrous number at first mating on sow longevity and reproductive performance is difficult. In seven studies, sow longevity and reproductive performance were not influenced by body composition, live weight, backfat depth or age of gilt at first breeding. In contrast, three other studies showed increased gilt age and(or) increased backfat at first mating enhanced sow longevity and reproductive performance. Disagreement between studies suggests the effect of live weight and backfat depth at first service on longevity appear to be related to other factors, such as housing, breeding system, lactation length, litter size, milking intensity, nutrition through successive reproductive cycles and culling programs.

French survey data indicates a positive relationship between gilt backfat depth at 220 lb body weight and the ability to farrow four litters *(Table IV)*. However, a Canadian study found no association between live weight or backfat depth at first successful service and subsequent reproductive performance when gilts are managed to minimize body weight and condition loss during lactation *(Table V)*. If total body weight loss occurs as sows progress through reproductive cycles, it might be advisable to delay breeding gilts until they have a backfat depth of .71 inches (18 mm) or more and weigh about 286 lb.

A study of commercial farms in The Netherlands indicates the optimal economic age at first conception, when the cost of housing and feed of the gilt from

Table IV. Sow retention rate as influenced by days to 220 pounds and backfat at 220 pounds

	Days to 220 pounds				
	< 140	*140 to 150*	*150 to 160*	*160 to 170*	*> 170*
Retention rate (%)[a]	28.5	34.0	36.0	39.5	45.0
	Backfat thickness at 220 pounds (inches)				
	< .55	*.55 to .63*	*.63 to .71*	*.71 to .79*	*> .79*
Retention rate (%)[a]	28	36	39	40	46

[a]Sow retention rate to 4th parity

Table V. The influence of gilt breeding weight on sow longevity

	Live weight at breeding (pounds)					
Item	*<178*	*178 to 198*	*200 to 220*	*222 to 242*	*244 to 264*	*> 264*
Number of gilts bred	9	14	26	19	12	21
Sows having four litters (%)	67	57	58	47	55	43

entry to first conception are taken into account, was 200 to 220 days of age. An analysis of over 8,500 sow records on Camborough-15 gilts found litters per lifetime did not differ with age at first service. However, lifetime piglets born alive was greatest for gilts first serviced at 240 to 250 days of age *(Table VI)*.

A reduction in litter size born occurs when gilts are bred at puberty instead of mating at second estrus. However, the lifetime production difference between mating gilts at puberty or second estrus narrows as the number of litters produced increases (*Figure 4* and *Table VII*).

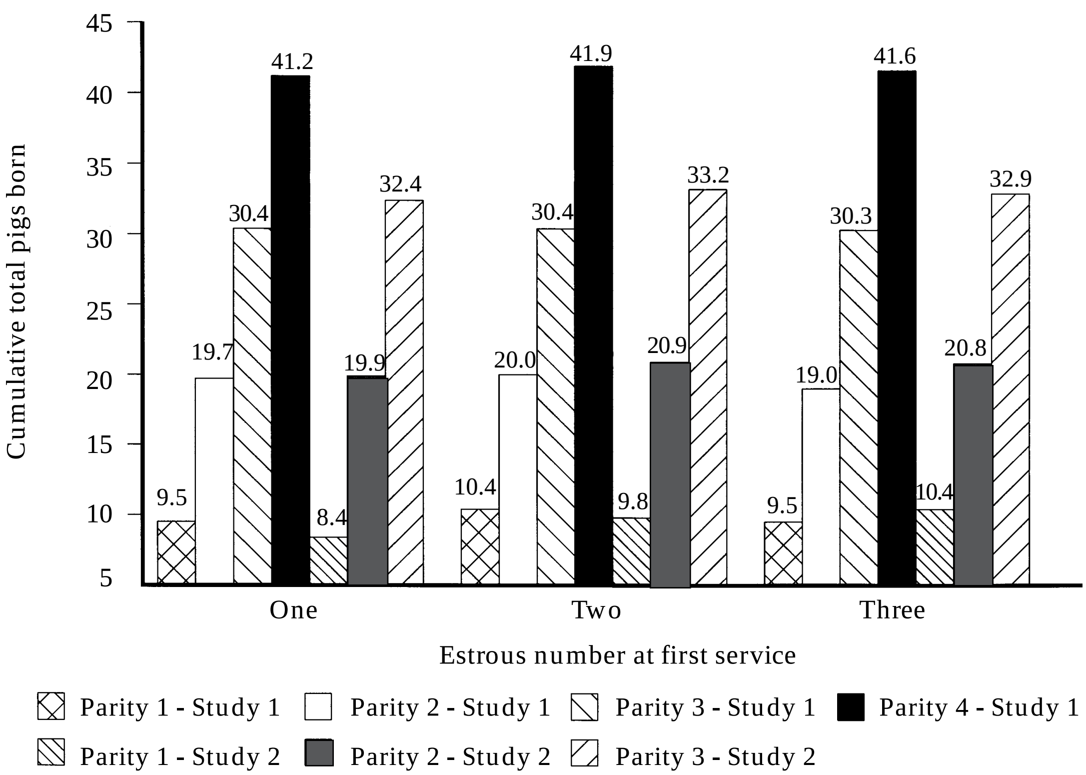


Figure 4. Effect of estrous number at first mating on cumulative number of pigs produced.

Table VI. The influence of gilt breeding age on lifetime performance of Camborough 15 females

	Age at breeding (days)							
Item	*<200*	*200-210*	*210-220*	*220-230*	*230-240*	*240-250*	*250-260*	*> 260*
Number of gilts	1105	1176	1266	1459	1129	925	607	1022
Parity / lifetime	5.10	5.05	5.18	5.10	5.14	5.27	5.16	5.07
Piglets born alive / lifetime	48.9	48.8	49.9	49.0	50.1	51.8	49.8	49.1

Table VII. Effect of feeding level and estrous number at mating on pigs produced.[a]

Estrous number at mating	*Feeding level to:*		*Number of pigs at Parity:*			*Pigs born (total)*	*Sows culled (%)*
	Puberty	*Mating*	*1*	*2*	*3*		
1	ad lib[b]	ad lib	9.5	9.1	12.2	31.0	28.6
2	ad lib	5.94 lb / day[c]	10.2	9.0	11.8	30.5	25.0
2	ad lib	Maintenance[d]	8.9	7.7	10.5	27.5	25.0
3	ad lib	5.94 lb / day[c]	9.2	11.5	10.0	31.1	22.2
3	ad lib	Maintenance[d]	9.6	9.5	11.0	30.5	33.3

[a]Landrace x Yorkshire gilts; first boar exposure at 120 to 130 days of age; average age at puberty was 172 ± 31.3 days.
[b]14% Crude protein corn-soybean meal finishing diet.
[c]14.3% Crude protein, 1.6 Mcal metabolizable energy / lb.
[d]Maintenance amounts of crude protein and metabolizable energy each day.
Reference: J. Anim. Sci. 1996. 74:138-150.

The decision of when to mate gilts becomes a compromise between costs (genetics, housing, nutrition and culling) and estimated lifetime production of pigs.

Exogenous hormones. When using a hormone or hormone-like substance to induce puberty, the hormone treatment should be cost-effective, produce a significant improvement in gilt reproductive performance and produce consistent and predictable results. A single injection (5 mL of PG-600) of 400 IU of pregnant mare serum gonadotrophin (PMSG) and 200 IU of human chorionic gonadotrophin (hCG) to prepubertal gilts (5.5 to 7.5 months of age) stimulated estrus in 52% to 87% of the gilts by six days after treatment. The proportion of treated gilts ovulating has ranged from 85% to 100%; pregnancy rate ranged from 60% to 88%. Injecting gilts at 154 days of age with PG-600 induced first estrous in 92% of gilts; however, only 42% showed a second estrus.

Estrous detection. The determination of first estrus in gilts is often difficult as they often do not exhibit clear signs. About 36% of replacement gilts exhibit a questionable first estrus; about 16% have a silent estrus. The efficiency of detecting estrus can be influenced by both the method and time of day of estrous detection. A research study found the proportion of estrous gilts showing the standing response was greater at 6:00 am (60%) than at noon (24%) or 6:00 pm (16%). For the greatest detecting efficiency, gilts should not be exposed to boar stimuli for at least one hour prior to estrous detection. Gilts stimulated to express the standing reflex will start becoming refractory to boar stimuli after about 10 minutes of standing *(Figure 5)*.

Duration of proestrus (reddening and swelling of the vulva) is longer at first and second estrus (avg, 47 hours; range, 12 to 72 hours) than at third to sixth estrus (avg, 26 hours; range, 0 to 72 hours). Duration of estrus tends to be longer at first through third estrus (avg, 51 hours; range, 36 to 72 hours) than at fourth through sixth estrus (avg, 45.6; range, 12 to 84 hours). Estrus in gilts is about 10 hours shorter than in multiparous sows.

Estrous behavior in gilts appears to be influenced by genetics. Heritability estimates for length of proestrus, length of estrus, ability to show standing reflex and intensity of vulvar symptoms are .23, .16, .29 and .24, respectively. Negative genetic correlations have been reported for growth rate and length of estrus (-.49), growth rate and ability to show standing reflex (-.61) and body leanness and intensity of vulvar symptoms (-.17).

Size of Gilt Pool

One of the objectives of the breeding herd is to produce as many weaned pigs as possible. An analysis of PigCHAMP® data by the University of Minnesota has helped categorize the relative importance of factors influencing weaned pig output *(Figure 6)*. The number of pigs weaned per litter contributes 2.3% of the week-to-week variation in number of pigs weaned

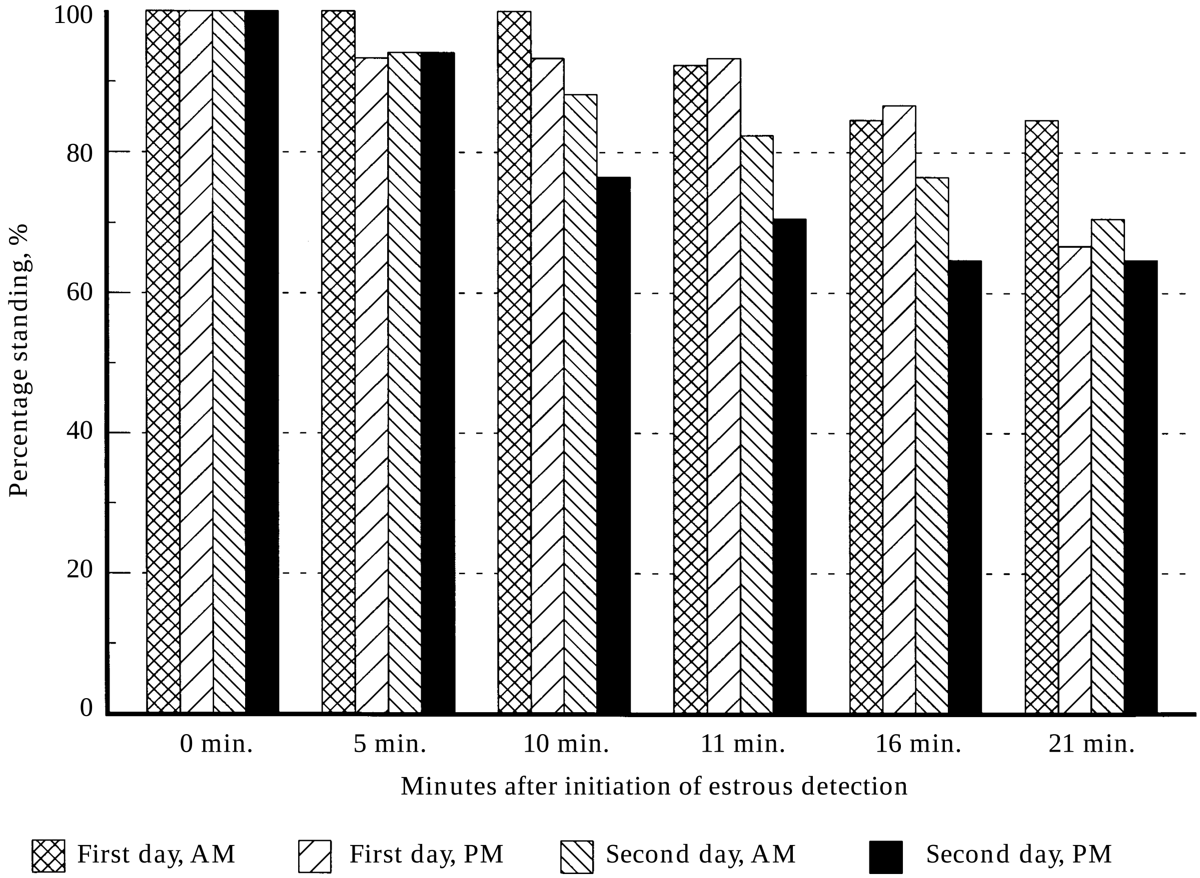


Figure 5. Proportion of gilts in standing estrus after initial boar exposure.

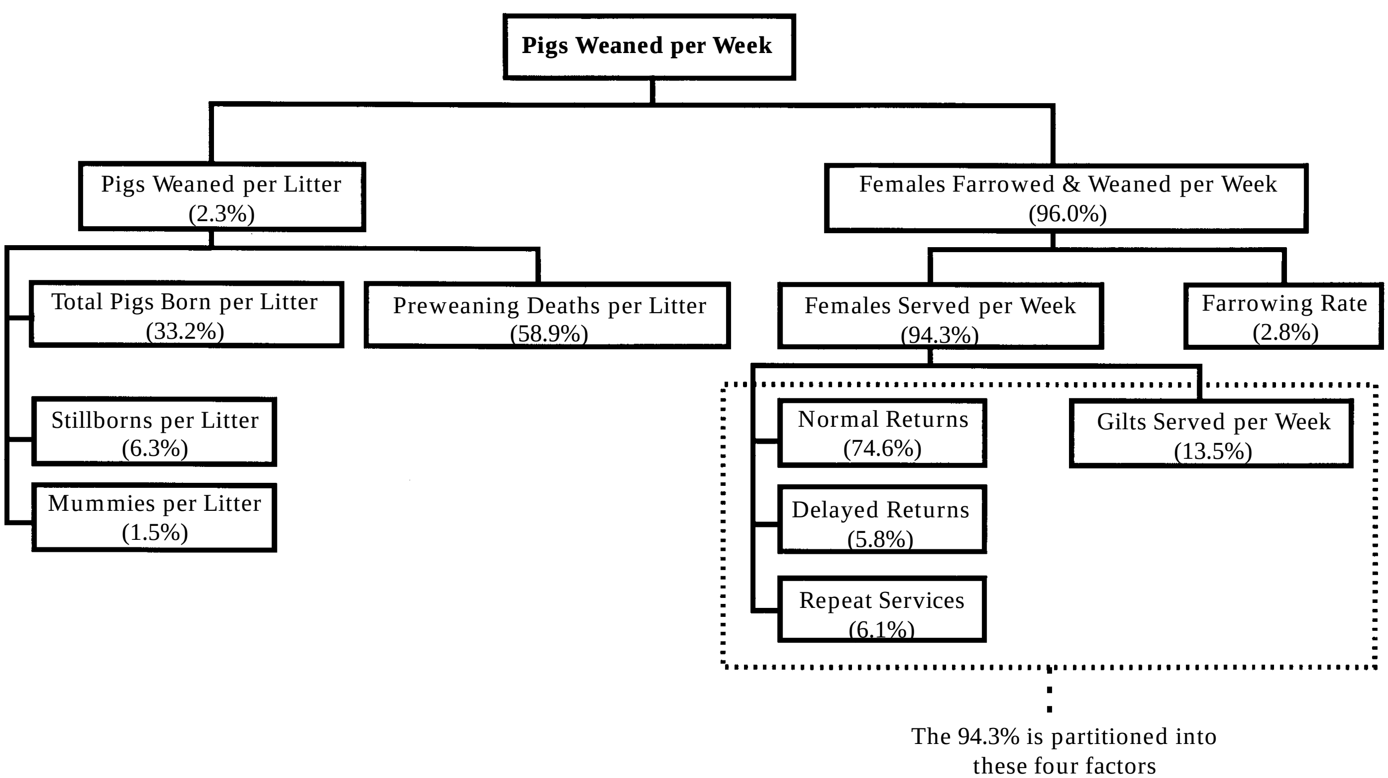


Figure 6. Interrelationship between the factors influencing number of pigs weaned per week.

per week, while number of females farrowed and weaned per week contributes 96% of the variation. The number of females served per week accounts for 94.3% of the variation in number of females farrowed and weaned per week, whereas farrowing rate contributes only 2.8%. The number of females farrowing per week accounted for 73% of the variation in pigs weaned per week in large farms (> 1,000 sows) and 91 to 96% in smaller farms (250 to 700 sows). Although the number of weaned sows returning to estrus within a normal period is the most important factor affecting number of females served per week, the establishment and maintenance of a gilt pool is the best method to ensure an appropriate number of females are bred per group.

The number of replacement gilts needed to complete a breeding(farrowing) group must be determined in advance. As previously discussed, season of the year, disease, environment, age of gilt and genetic composition influence the number of females showing estrus and conceiving at a particular time. The number of replacement gilts to maintain on a weekly breeding system can be estimated by using the following equations:

Equation 1. Number of gilts to be served per group (NGS)

NGS = (Average female inventory x replacement rate) ÷ (365 days per year ÷ number of days between farrowing groups)

Example: (500 x .40) ÷ (365 ÷ 7) = 3.8 gilts; 4 gilts

Equation 2. Percentage of gilts expected to be in estrus (%GIE)

%GIE = Number of days each group of gilts is available for service ÷ 21-day estrous cycle

Example: 7 ÷ 21 = .33 of gilt pool

Equation 3. Number of service-eligible gilts needed per group (NSEG)

NSEG = Number of gilts to be served per group ÷ % gilts expected to be in estrus

Example: 4 ÷ .33 = 12.1

Equation 4. Number of noncyclic gilts being acclimated (NCGAC)

NCGAC = [(NGS x average entry-to-service interval) ÷ number of days between service groups] x % noncyclic

Example: [(4 x 28) ÷ 7] x .05 = .8 gilt (1 gilt)

Equation 5. Total number of gilts being acclimated (TNGAC)

TNGAC = NCGAC + [(NGS x average entry-to-service interval) ÷ number of days between service groups]

Example: 1 + [(4 x 28÷ ÷ 7] = 17 gilts being acclimated

Equation 6. Total number of gilts in pool (TNP)

TNP = TNGAC + NSEG

Example: 17 + 12 = 29 gilts in the pool

Producers breeding (farrowing) sows less frequently can use the concept of number of replacement gilts needed per farrowing crate to be filled. Although *Table VIII* indicates the suggested coefficient to determine the number of females to bred each month, it is best pork producers to examine previous farrowing rate records to determine the number of females to bred. Under normal conditions, 15 to 30% of the weaned sows from each farrowing are culled when minimum turnover is practiced. It may be necessary to select as many as three replacement gilts for each farrowing crate to be filled. During problem breeding periods (hot weather, disease or infertile boars), the number of gilts needed to insure one pregnant gilt at the desired time may double or triple. The more gilts in the pool at any one time, the greater the chance of obtaining more than enough estrous gilts needed during the breeding period.

Table VIII. Suggested coefficients to determine the number of females to bred each month.

Month bred	*Estimated farrowing rate (%)*[a]	*Coefficient*[b]
January	86	1.16
February	89	1.12
March	90	1.11
April	88	1.14
May	87	1.15
June	81	1.23
July	77	1.30
August	76	1.32
September	74	1.35
October	81	1.23
November	85	1.18
December	86	1.16

[a]Estimated farrowing rate varies from farm to farm due to management and environment.
[b]Number to breed each month = (number of farrowing crates) x (coefficient).

Time Replacement Females Spend in the Gilt Pool

The amount of time a replacement female spends in the gilt pool depends on the age at entry into the pool and target age at service. The main object is to minimize the investment in feed, labor and facilities of any gilt pool program. The gilt pool needs to be designed and managed so noncyclic females are easily identified and culled. Gilts that do not conceive by the third mating should be culled.

Introducing Purchased Replacement Gilts

Isolation, blood testing of purchased replacement animals and strict sanitation and traffic control programs minimize opportunities for new disease organisms to enter the breeding herd. Purchased gilts should come from a single source per purchase to minimize potential health problems. A health certificate showing all tests and vaccinations should be obtained at the time of purchase. Make sure gilts are properly identified and delivered in a clean, disinfected truck. Producers bringing new gilts into their operation may increase herd health problems if the new gilts are not properly quarantined. All new gilts should be isolated from the main herd at least 300 feet from other pigs for a minimum of 30 days. After the first 15 days of isolation, the new gilts should be blood tested for disease. Talk to your veterinarian about which diseases to test for. After receiving negative test results, vaccinate and expose the new gilts to several cull gilts during the succeeding 15-30 days. This will give the new gilts a chance to develop immunity to any new disease challenges already present in the herd. At the same time, check the cull gilts for disease reactions, including fever, which may indicate that a disease organism is present to which the herd has no immunity. Introduce the new gilts into your herd only after negative blood testing results are received.