GETTING TO 30 PIGS/SOW/YEAR

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Bearing in mind the physiological limitations discussed in our earlier paper, gilt development programs can be refined to match the individual needs of the producer (i.e. "in house" or outside source), to identify the potential fertility of the gilt and provide opportunities to improve fertility and retention through gilt "conditioning" and pre-breeding management**.** Three key aspects of a good gilt management program should include:

1. Implementing a strict selection program that identifies 75-80% of the most fertile animals.
2. Achieving appropriate weights at first breeding to sustain maximum lifetime performance. A minimum body weight after farrowing of 175 kg (135 kg at breeding) may be necessary to protect against excessive loss of protein mass in first lactation.
3. Minimizing accumulated non-productive days (NPD) in the gilt pool. Low growth rate, unnecessary delays in stimulating pubertal estrus and breeding gilts, and inefficient allocation of gilts to breeding groups, are the largest contributors of NPD's in the herd.

Identifying "select" gilts at an early age is a critical part of a successful gilt development program. Gilts should undergo a strict selection process before being chosen to be a part of the breeding herd. This selection process will involve three steps.

Pre-Select 1. Occurs at the time the gilts leave the nursery. At this time gilts must have good conformation, 12-14 teats and be free of hernias or ruptures. As more data becomes available, it may also be appropriate to exclude gilts with inadequate growth rate at this stage. After gilts leave the nursery an opportunity exists to "condition" gilts to achieve adequate weights and body condition at puberty to sustain lifetime performance. Available data consistently show that at commercially acceptable growth rates (0.55 – 0.80 kg/d) (birth to 100 days of age), growth rate does not limit age at puberty. Experience in commercial practice suggests that modified, high energy, "conditioning" diets can be used to increase body fat stores in very lean gilts. In studies in which we attempted to slow growth in gilts with high fibre diets from 50 kg until puberty induction we had very little impact on bodyweight at first estrus.

Pre-Select 2. Pre-Select 2 will occur at 140 days of age, at which time gilts will be weighed to determine weight, growth rate and backfat depth. At this stage, gilts must achieve a lifetime growth rate of at least 0.6 kg/d. It is important to remove gilts with low growth rates, because a slow growing (< 0.6kg/d) and early maturing gilt (first estrus at 160 days) would weigh approximately 96 kg at first estrus. If this gilt was bred in the appropriate weight range (135 – 150 kg body weight), she would need to be bred at 4th or 5th estrus and would accumulate nearly 84 days in the gilt stimulation/pre-breeding area. Similarly, a slow

growing (<0.6 kg/d) and late maturing (190 days) gilt would accumulate 30 days in stimulation and an additional 42 days to reach the minimum breeding weight. Therefore, at Pre-Select 2, gilts not achieving a growth rate of 0.6 kg/d at 140 days of age would not be permitted to enter the stimulation phase. Instead, they would be considered "Non-Select" gilts and become a market animal. In a study conducted at the University of Alberta, 13% of 228 gilts would have been culled because they did not meet the minimal growth criteria.

At "Pre-Select 2" gilts will be further examined to ensure that all gilts have good conformation, locomotion, 12-14 teats and are still free of hernias, ruptures and other ailments. Again, conformation data obtained at "Pre-Select 2" can be used to set up gilts on "fattening" diets if needed.

The number of gilts required to enter the stimulation phase will depend on the breeding requirements of the herd. In a trial recently completed at Prairie Swine Centre, the results indicated that approximately 125% of breeding gilt requirements should enter the stimulation phase (expecting 22% not to cycle and 3% to be culled) to obtain the required number of gilts cycling within 40 days. However, if the target number of gilts needed to enter the gilt pool cannot be met with gilts that meet minimal growth targets at "Pre-Select 2", an appropriate number of "Non-Select" gilts can enter the puberty induction phase, *as a last resort*, accepting that these gilts will either tend to be bred below target breeding weight, or will accumulate excessive NPDs before breeding.

Final Selection – Puberty Induction

The age to begin puberty stimulation will depend on a number of factors. Generally, as illustrated in Figure 4 (refer to page 37), a younger age at stimulation corresponds to a decreased age at puberty, but requires more days in stimulation; and vice versa, older gilts at stimulation are typically older at puberty, but require fewer days of stimulation. If a large proportion of gilts are required to reach a synchronous puberty, commencing boar exposure at an older age is desirable. This is also probably most efficient in terms of labour and space utilization. However, stimulating gilts at an earlier age has several benefits (Figure 6; refer to page 39).

- Stimulating gilts at a young age enables the producer to identify gilts that are most sexually mature.
- Stimulating gilts early would permit a producer to cull non-cycling gilts as market animals, reducing the number of gilt NPDs and the financial cost to the producer.
- A producer is able to manage gilts so that at breeding, gilts have achieved a target weight (135 – 150 kg) and body condition.
- Early stimulation also allows a producer to synchronize estrus in gilts and thus meet breeding requirements from a smaller pool of select (service eligible) gilts.
- Finally, early stimulation of gilts permits producers to take advantage of the increased productivity of gilts bred at second or third estrus.

It is important to understand that stimulation of early onset of puberty does not mean that these gilts have to be bred at first estrus, or at an early age or light weight.

Historically, age at puberty has been shown to be normally distributed when growth rate is not limiting. The full extent of this variation in age at first estrus is most apparent if gilts are exposed to mature boars at an early age (say 140 days as in the studies discussed earlier). As previously mentioned, puberty induction at an early age serves to identify the precocious animals. In a recent experiment, out of 508 gilts stimulated with direct daily boar contact from 140d of age, 75% of gilts were pubertal within 40 days of stimulation. When stimulation is delayed to at least 160 days, it is possible to identify 33, 16 and 7% of gilts that do not respond to boar stimuli within 20, 30 or 40 days, respectively.

It is becoming increasingly important to identify the 75 – 80% of gilts that respond best to boar stimuli, because there are sound biological reasons, and increasing amounts of production data, to support the suggestion that late maturing gilts will have reduced lifetime fertility. An on-going study being conducted at Prairie Swine Centre, Saskatoon is examining the relationship between age at puberty and lifetime performance in Camborough 22 and L42 gilts. The gilts were housed in groups of twenty and received 20 min direct exposure to an epididimectomized boar daily, starting at 140.0 ± 4.7 d of age. Gilts attaining puberty by 180d of age were deemed to be "select" gilts and classified as Early (EP), Intermediate (IP) and Late (LP) with respect to age at first estrus. Gilts were deemed to be "Non-select" (NP) if first estrus was not shown by 180 days of age. "Select" gilts were bred at third estrus, regardless of age or weight. "Non-select" gilts were added to the gilt pool by production staff using available techniques (i.e. treatment with PG 600). To determine sow lifetime performance, data on sow body weight, loin and backfat depth at farrowing and weaning, total litter size born alive, dead and mummies, weaning to estrus interval and reason for culling are being collected over three parities.

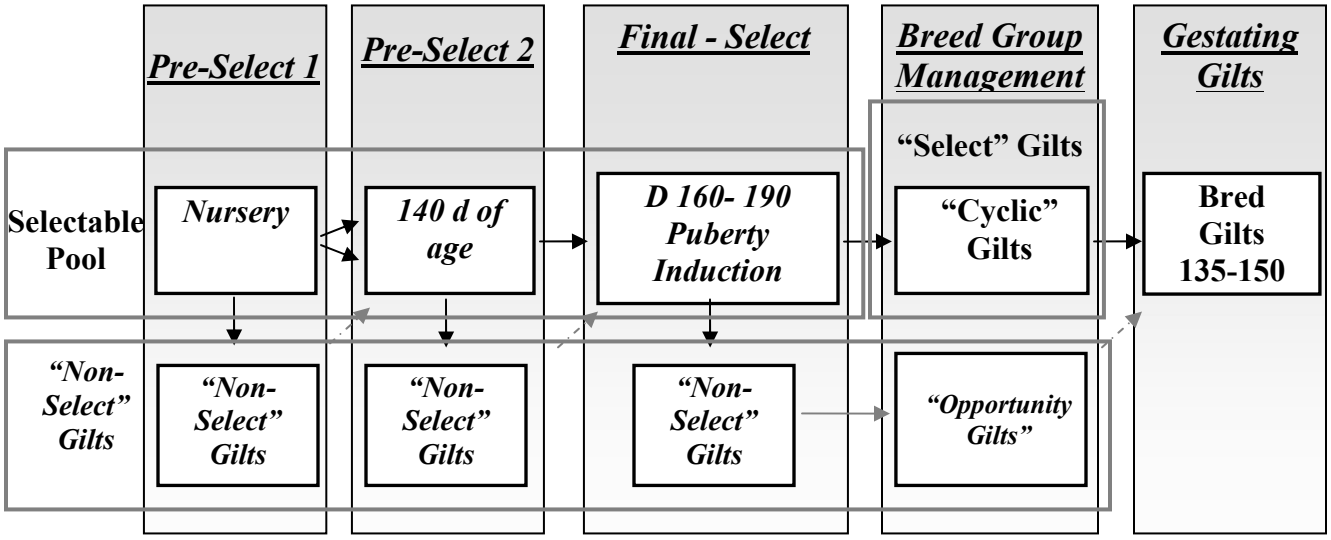
As a percentage of the total number of gilts on inventory at the start of stimulation in each group, fewer "Non-Select" gilts were bred than any of the classes of "Select" gilts. Consequently for NP gilts, pregnancy rate, farrowing rate, weaning rate and the percent rebred after weaning after first parity (expressed as a % of gilts originally on inventory) were lower than for EP, IP or LP gilts. Furthermore, considering only those gilts successfully weaned as parity 1 sows, class of gilt affected ($P < 0.02$) the percentage of animals pregnant as parity 2 sows (EP: 94.2; IP: 87.2; LP: 91.0; and NP: 76.6 %). Similarly, breeding herd efficiencies (Non-Productive Days/pig born) declined as age at puberty increased, when gilts were bred at third estrus irrespective of weight or age. Taken together, these data lead to the obvious suggestion that response to a standardized protocol of boar stimulation can be used to identify the 75-80% of gilts that are likely to be most fertile.

As illustrated in Figure 1, to meet breeding targets, or in start-up situations, it may be necessary to retain Non-Select gilts as part of the breeding herd. However, retention of "Non-Select" gilts within the herd would;

- Incur costs of unknown numbers of additional NPD.
- Represent less efficient use of pen space within the gilt pool.

- Still not guarantee that gilts would eventually cycle.

Figure 1. Schematic diagram of an efficient gilt management system.



It is also important to emphasize that even if these gilts are bred, their expected fertility would be low. It may be good management practice to already designate these "Non-Select" gilts at parity 1 culls, if they are included in the herd to meet initial breeding targets.

Taking these factors into account, and considering cost-benefits of efficient use of space and time, we recommend that the puberty induction phase begins when gilts reach 160 days of age and continue until they exhibit their first estrus or until 190 days of age, whichever comes first.
However, be aware that puberty stimulation at a delayed age (> 160 days of age) will be reflected in the high body weight of "Non-Select" gilts (gilts that did not exhibit first estrus within 30 days). In our recent study, even when puberty induction began at 140 days of age, nearly 80% of "Non-Select" gilts at 180 d were over market weight (120 kg), creating financial penalties to the breeding unit if these gilts were then culled.

BREEDING GROUP MANAGEMENT

The results of the ongoing study at Prairie Swine Centre indicate that early exposure (135 - 140 days of age) of gilts to boars resulted in a large variation in weights and ages at puberty, ranging from 75.8 to 151.4 kg, and 132 to 190 d, respectively. Because all gilts were bred at third estrus, this variation in weight at puberty resulted in weights at breeding ranging from approximately 100 to 190 kg. These large ranges present several problems to the producer.

- Gilts that are heavyweight at breeding increase feed costs and may cause welfare problems because of potentially larger increased physical size of mature sows.
- Conversely, gilts that are lightweight at breeding may lack the necessary body reserves to sustain body condition through several parities.

Recent studies at the University of Alberta, and elsewhere, suggest that a minimum body weight after farrowing of 175-180 kg may be necessary to protect against excessive loss of protein mass during the first lactation. A body weight of 135-140 kg at breeding, assuming a 35-40 kg weight gain during the first gestation, would theoretically result in body weight after farrowing being 175 kg or greater. Development and implementation of gilt management strategies that ensure that all gilts achieve adequate body tissue reserves at farrowing are necessary.

To overcome the problems associated with large variations in weight, a stricter selection program should be implemented, stipulating that all gilts weigh between 135 – 150 kg at breeding. If 1), during Pre-Select 1 and Pre-Select 2 the slowest growing gilts were already culled, and 2), an upper limit of 3rd estrus for breeding was stipulated, the number of non-productive days can be dramatically reduced. It was predicted that 10, 32 and 58% of gilts would be bred at their first, second and third estrus, respectively. As the average cost of one NPD is believed to be greater than $2.00 per day ($1.70 - $2.25), these will be considered cost benefits if NPD could be reduced through efficient gilt management strategies. Our recent studies suggest that if a producer was to implement a gilt management program that incorporated such a strict selection program, a puberty induction phase that removes "Non-Select" gilts, and a breeding program that requires gilts to be bred between 135-150 kg or 3rd estrus, on a 600 sow unit, expected savings of $11,426 in NPD could be recognized.

CONCLUSIONS

PigCHAMP 2002 data shows that on Canadian farms the average herd female inventory is 1046 (range 240-2740) with an average replacement rate of 58.7% (range 33.4-74.4%). From these data, it is evident that an excessively large pool of cycling gilts is needed to meet these replacement requirements. Apart from the extra costs of maintaining a large gilt pool, the bias of production towards lower parity females places major constraints on breeding herd performance. Therefore, it is essential that a producer adopt a gilt management program that will meet replacement targets from a smaller pool of gilts with improved lifetime breeding potential. This will ultimately result in improved production through reducing animal replacement rates to a target of <45%, improving sow "fitness", decreasing sow death losses and increasing labor efficiency and space utilization