Non-Negotiables of Gilt Development

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Introduction

Effective gilt management programs that will meet replacement targets from a smaller pool of gilts with improved lifetime breeding performance (*select gilts)* are urgently needed. By making gilt management more efficient, we improve both the utilization of space and labor, and actually achieve a flow of eligible (service-ready) gilts within the design specifications of the gilt facility. This will ultimately reduce annual replacement rates (target for top 30% of breeding herds should be <50%), improve sow "fitness", decrease sow death losses, and increase labor efficiency and space utilization.

In addition, effective gilt pool management strategies allow producers to achieve desired body (weight, back fat) and physiologic (age, estrous cycle) targets for gilts at 1st service, whilst at the same time maintaining the economic efficiencies of a small, well managed, gilt pool. Achieving desired body and physiologic targets is essential for maximizing lifetime productivity of the female.

Targets at 1st service

In a major collaborative study on key factors affecting sow lifetime performance carried out in collaboration with Maschhoff Farms on a 3,000-sow commercial start up unit the impact of weight and body composition at first service on lifetime productivity of 1674 prepubertal gilts was analyzed. Back fat measurements (P2 position) and weights were recorded within 3 weeks of mating. Subsequent reproductive performance, including number born, number born alive were recorded for each parity.

Based on the results collected in this study, our current recommendations for weight, backfat and estrus at breeding are discussed below:

Weight

Results (based on experimental data and cost/benefit analysis) illustrate that gilts should be bred at a target weight of 135 – 150 kg. Gilts weighing less than 135 kg (300 lb) at breeding had less total pigs born over 3 parities than gilts weighing over 135 kg (**Figure 1**). Achieving the desired weight allows for proper body mass to be achieved at first farrowing (> 180kg) assuming a litter weight gain of 35 to 40 kg gain during first gestation. Interestingly, these conclusions are entirely consistent with the rationale for increase lean body mass at first service recommended on the basis of earlier intensive studies by research groups in Alberta and in France (see review by Foxcroft et al., 2004).

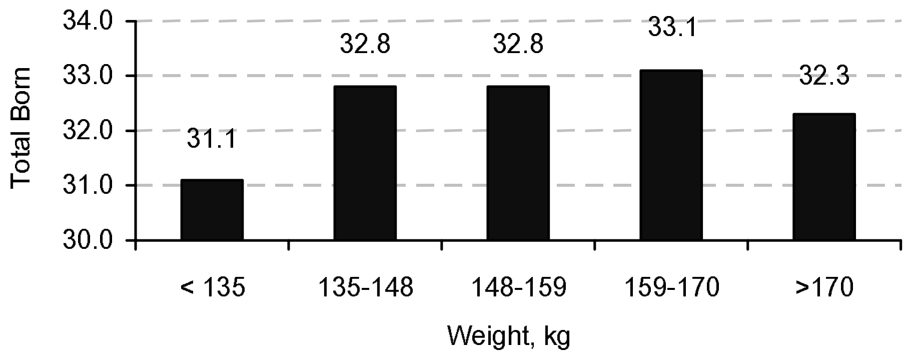

Figure 1. Impact of weight at first service on total born through 3 parities.

Backfat

Results illustrate that backfat at first service appears to have minimal impact on productivity through 3 parities (**Figure 2**). Therefore, gilts should be targeted to be bred at 135 to150 kg, regardless of age and back fat level. Furthermore, ongoing analysis of data accumulated from a comparable project on gilt selection and lifetime performance carried out in collaboration with Prairie Swine Centre, clearly indicates that although body weight and loin eye depth (an indirect measure of protein mass) at 100 days of age are reasonably related, there is little relationship between backfat depth and body weight at first service, or between changes in backfat and body weight over three parities. These data provide further evidence that although minimal levels of backfat may be desirable from a welfare perspective, ***measuring backfat will not provide a meaningful measure of sow body condition*** in terms of impacts on longevity and lifetime performance.

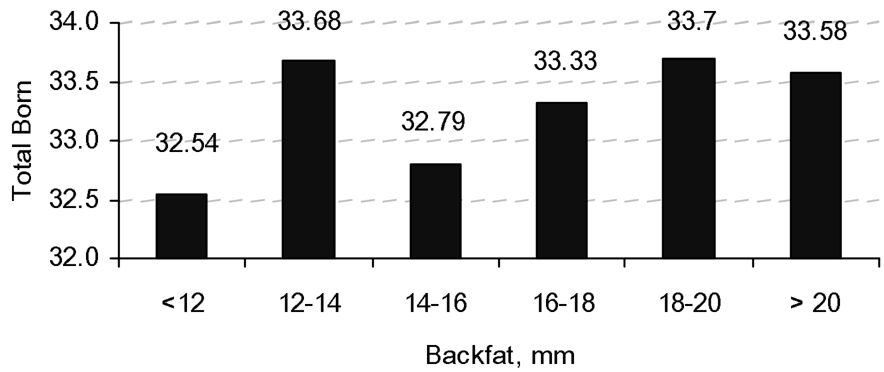

Figure 2. Impact of backfat at first service on total born through 3 parities.

Targets for Physiological Age

Breed sows at 2nd estrus *(if body weight is at least 135 kg)*. Data in **Figure 3** demonstrates that productivity through three parities is similar regardless of whether sows were bred on second or third estrus.

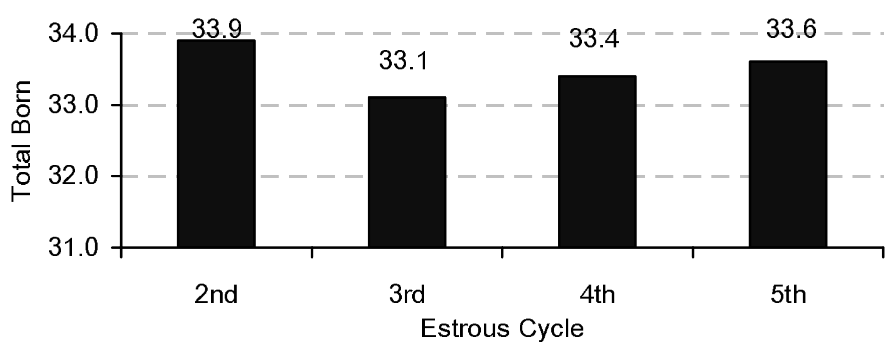

Figure 3. Impact of estrous cycle at first service on total born through three parities.

This confirms that accumulating the cost of an extra 21 NPD is not economically justified. However, although not compared in the Maschhoff study, there is still usually a benefit from breeding gilts at second rather than first standing heat. In a recent comparison of litter-mate gilts bred at similar weights and ages but at either first or second induced estrus (University of Alberta Swine Research & Technology Centre, unpublished data, 2004), we recorded an increase in total born (11.1 ± 0.4 v. 10.0 ± 0.3) in gilts bred at second versus first estrus, respectively (P < 0.05). Additionally, breeding at second estrus allows estrus synchronization and other production advantages to be realized.

<u>Therefore, current recommendations for targets at first service are:</u>

	TARGET
Body Composition Target →	**135 kg Body Weight**
Physiologic Target →	**Breed sows at 2nd estrus**

▪ Achieving targets at 1st service

Whether gilts are reared in 'in-house' gilt multiplication systems, or supplied by a breeding company, proper selection and management of replacement gilts in purpose-built Gilt Development Units (GDUs) should be an integral part of any breeding herd. Further improvements in gilt development programs can lead to major increases in breeding herd efficiency.

Briefly, a GDU should be designed to identify gilts as either *select gilts* (recorded heat-no-serve (HNS) within 28 days of puberty stimulation) or *opportunity gilts* (no recorded HNS by 28 d, but available for breeding after hormonal treatment). Ideally, only gilts that are identified as *select* should be bred to enter the sow herd (**Figure 4**).

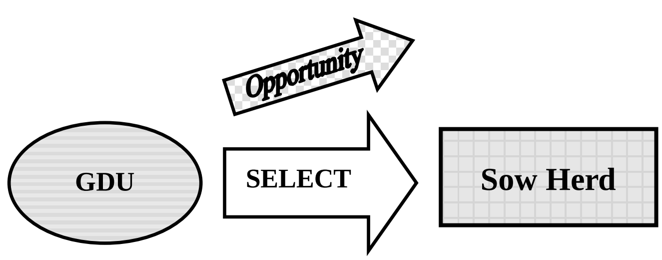

Figure 4. Ideal flow of gilts in the breeding herd.

The overall targets of the GDU are to achieve:

- 80% gilts selected within 28 days (85-90% including opportunity gilts),
- 100% gilts bred at > 2nd estrus,
- 100% gilts bred at target weight (135 to 150kg), and
- 85% of gilts bred during a 5-day period.

However, the current trend in larger breeding herds tends to be towards decreasing efficiency of breeding herd management. PigChamp data for 2003 showed that on larger breeding sow farms in the USA and Canada, annual herd replacement rates were often between 60 and 70%, with a number of important consequences (**Figure 5**).

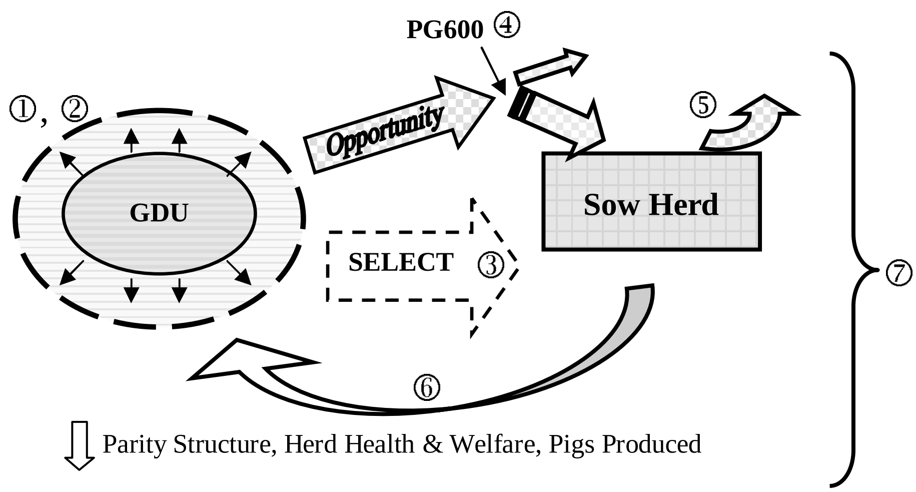

Figure 5. Trends and cycles in the breeding herd that perpetuate high replacement rates and increasing pressure on the GDU.

The sequence of events illustrated in **Figure 5** are as follows:

1. A larger pool of replacement gilts is needed to meet increased replacement requirements.
2. Increasing the size of the gilt pool, within the same GDU, leads to chronic over-crowding of pens in the gilt development area. It is known that over-crowding can be attributed to decreased growth rates and delayed puberty.
3. Pressure to meeting breeding targets results in even "*select" g*ilts being bred below target weights.

4. Pressure to meet breeding targets also results in less fertile (*opportunity)* gilts being bred using pharmacological interventions (i.e. PG600).
5. A larger proportion of *opportunity* gilts in the herd may result in increased culling (increased replacement rate) due to the known lower retention of these animals in the herd.
6. As a result,
   - breeding herd parity distribution is unstable and biased towards lower parity females,
   - negative impacts on health and welfare result, and
   - fewer pigs are produced due to more parity 1 females in the herd that are known to produce fewer pigs.
7. General performance and morale of GDU staff declines and staff retention is low.

To reverse these cycles and trends, a selection program involving a strict 28-day stimulation period should implemented in the GDU (**Table 1**).

Table 1. Summary of a 28-day GDU Protocol.

Time	Action
Day 1-13	• Direct (and fence-line) contact with vasectomized boars
Day 14	• Remix and re-pen all gilts
Day 23	• All “opportunity” gilts without HNS receive PG600
Day 28	• All eligible gilts are identified • Gilts without HNS are culled

On a daily basis, starting at approximately 170 days of age, gilts should be removed from their pen and taken to a designated heat-checking pen/stimulation area to allow full contact with a team of mature, active, vasectomized boar. Record standing heats, vulval responses and visual signs of estrus on a daily basis. As gilts exhibit a HNS they are weighed, and backfat and loin eye measurements are taken. If gilts have reached a target weight to be bred at second estrus, they are relocated to an individual crate. Gilts showing HNS but not at target weight are returned to group pens and designated for breeding at third estrus. At d14 after start of stimulation, all gilts that have not shown HNS are remixed to form new pen groups. Any gilt not recorded as HNS by day 23 of the stimulation period can be used as *opportunity* gilts, if anticipated breeding targets will not be met. As needed, the heaviest opportunity gilts available will be treated with PG600^{TM} and checked daily for standing heat. The GDU protocol dictates that any gilt not having a recorded HNS by d28 be immediately culled.

To demonstrate that efficient gilt pool management and selection techniques would improve the reproductive efficiency of gilts, a second major collaborative study is being was carried in collaboration with Pipestone Veterinary Clinic in a modern 3,200-sow farrow-to-wean farm with a designated and upgraded on-site GDU. The main reasons for initiating a gilt development project on this particular farm were 1) the relatively poor litter size of first parity females, 2) a high annual herd replacement rate which increased weekly gilt breeding targets to 40, and 3) the need to serve and retain as bred >90% of gilts entering the GDU.

Figure 6 shows the accumulative percentage of the first three groups of gilts involved in the switch-over to the refined GDU protocol. Because of initial constraints at the study start-up, the full protocol was gradually implemented with each new batch of gilts, as summarized in (**Table 2**).

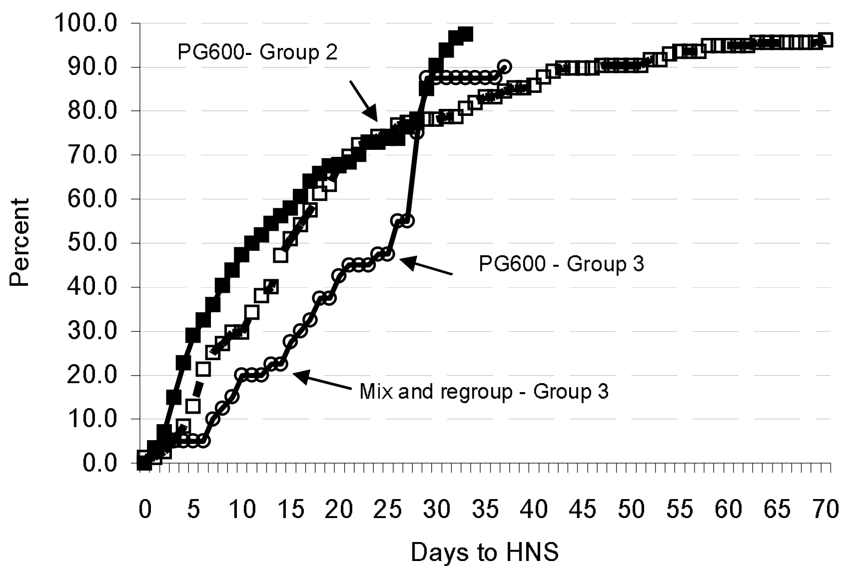

Figure 6. Accumulative percentage of gilts recorded as HNS in Group 1 (open squares), Group 2 (solid squares) and Group 3 (open circles) gilts first managed according the revised GDU protocols.

Table 2. Summary of data for a subset of 3 groups undergoing the 28-day GDU Protocol.

Group	n	Re-Mix	PG600	Final Selection	Extra NPD
1	155	-	-	96.0	450
2	112	-	D26	97.3	54
3	40	D15	D24	90.0	14

We expect to see the final selection rate to decrease as the benefits of gilt selection results in greater retention rates in the breeding herd and thus reduced annual replacement rates. This will gradually reduce the number of bred gilts needed each week, allowing increased selection pressure from the same sized gilt pool and a decreasing allowance on opportunity gilts to meet breeding targets. The ultimate goal is to only retain *select gilts* (i.e. gilts showing HNS within 28 of boar stimulation starting from around 170 days of age) for breeding purposes. The tendency to try and achieve cost savings by reducing the number of gilts entering the GDU by applying a selection rate of greater than 90%, will result in increasing numbers of less fertile gilts (*opportunity gilts*) entering the herd, and will trigger the cycle of events shown in Figure 5 all over again.

During the implementation stage of the project, the cost of delaying final selection (culling) past the d28 “selection window” resulted in an additional 450, 54 and 14 NPD, respectively for Groups 1, 2 and 3. This suggests that earlier intervention with PG600™ at day 23 is cost effective in terms of reduced NPD, as long as the lifetime productivity of PG600™ is not affected.

Preliminary results indicate PG600™ was an effective tool to induce estrus in *opportunity* gilts. From a total of 147 non-cyclic gilts treated with PG600™ to-date, 93.2% exhibited a HNS at a mean of 4.1 ± 0.9 d (range: 1-8 d) after treatment.

Conclusions

Implementing an effective gilt pool management strategy will allow producers to meet targets for body condition (weight, back fat) and physiological maturity (age, estrus at breeding) at 1st service, and ultimately reduce annual replacement rates (target for top 30% of breeding herds should be <50%), improve sow "fitness", decrease sow death losses, and increase labor efficiency and space utilization. Furthermore, all these advantages can ultimately be achieved whilst maintaining economic efficiencies of a small, well managed, gilt pool.

Acknowledgements:

We appreciate the cooperation of production staff and breeding management at collaborating commercial and research units, the technical support staff of Intervet Inc., USA and PIC, USA, and the financial contributions of collaborating companies and research funding agencies to the studies reported in this paper.

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