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Segregated production: How far could we go?

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Introduction

Medicated early weaning, segregated production, and multi-site production are all production techniques well used in modern pig production. From the initial work of Dr. Tom Alexander and Hank Harris, many adaptations have been made, but the following key principals are always applied:

- Take maximum benefit from maternal immunity
- Wean piglets early and move them to another site
- Apply the all in/all out principal in all stages of production

Many lessons have been learned, and many mistakes have been made, but we have gained powerful insights from those experiences. For example, we now have a better understanding of the following:

- The benefits of true all in/all out production
- Specialization techniques, of both staff and buildings
- The practice of keeping like things together
- The huge differences among pigs of different ages

On another side, with the health differences among herds and the need for high quality replacement gilts, many problems (mainly health-related) have been solved with the introduction of replacement stock. We have used isolation units, acclimatization buildings and sections, well defined health programs, introduction of replacements at three or ten weeks of age. Meanwhile, the industry is still seeking the right approach to breeding stock introduction. Looking closer at what has been said and published related to gilt introduction, a great deal of information on introduction protocols and problems related to introduction has been published; however, not much has been said on their progeny. It is usually accepted today that the health status and the problems faced by gilt progeny are greater than the ones from the progeny of mature sows. Many times gilt progeny act as a destabilizing factor, both in the nursery and finishing barn.

The production system described below was not developed overnight, and it is the result of a trial and error approach. In the beginning, its development was driven by a production question: Can we keep our farrowing crates full at all times and have a steady throughput? Over time, however, we have been allowed to apply novel health strategies and push production segregation a step further.

The system

As mentioned above, the system (R. Robitaille, Inc., Farnham, Québec) went through many adaptations over time, but I will describe where it stands today. The system is self-sufficient, with its own boar stud, a closed herd multiplication unit, sow herds, nurseries, and finishing units. All production is done in a three-site, multi-loci system. Last year the system had 7200 sows, including gilts, and will be at 10,000 by the end of this year. The system received three-week old "GP weaners" for its multiplication unit and mature boars from two different sources for the boar stud. These were the sole outside animals introduced in the system. Some of the system's particularities were driven by the best possible use of existing facilities; these things would have been done differently if the system would have been built from scratch. Our main goals are to maximize task and production specialization and maximize "production segregation" in keeping together animals of the same age and immune status. Health-wise, the system is positive for PRRS and *Mycoplasma*, but those two diseases are relatively stable. The approach has stabilized the health status of the system and minimized the use of vaccines and medications. The key components of the system are as follows:

Acclimatization early on

At weaning, replacement gilts from the multiplication unit are placed in a commercial nursery (all in/all out per building) but in a dedicated room. It takes two weeks to fill the room. The GP weaners from an outside source are mixed with the replacement gilts in the same room. A specific vaccination program is applied to those replacement gilts. No vaccine is given until two to three weeks post-weaning. Those nursery rooms are operated on a nine-week cycle.

The principal behind this approach is to give a low exposure to the pathogens found in the system (same building, same staff, different air space) to our replacement stock early on in life.

"Cooling period" for gilts

When it is time to leave the nursery, each gilt batch is kept together and never re-mixed. They are placed in small, dedicated finishing buildings with no other animal additions. Those finishing barns are relatively well isolated, and there are no more than two barns on a given site. Replacement animals are kept in those finishing barns for a period of 100 to 120 days. When gilts reach 135 days of age, we start a vaccination and testing program. We will also perform a slaughter check when they reach market weight. Strict criteria have been set for the acceptance or rejection of each group. Rejection occurs on a group basis. Over the last two years, we have rejected 5% of the groups; however, none were rejected last year.

Gilt development

The first stage of gilt development occurs in the gilt finishing unit. Specific diets are used to raise gilts: a diet maximizing lean deposition up to 140 days of age is followed by a diet maximizing backfat deposition. Starting at 140 days, gilts are exposed to 16 hours of light daily. In the finishing period, we give to gilts nine to ten square feet. As of now, no boar exposure occurs in those finishing barns, but we believe much could be gained from it.

At about 185 days, gilts are moved to our gilt breeding barn for the last stage of development. They are placed in pens of ten gilts. All of our gilt breeding occurs in the same barn. Upon introduction to the gilt barn, gilts are kept on the same diet (backfat deposition). They are boar-exposed (20 minutes of fence-line contact) once daily, and estrus is recorded. As soon as a gilt is detected in heat, she is moved to the breeding section of the barn and crated. Gilts are crated in the order in which they come into heat; this ensures they are in the right order to be bred at the next cycle.

Gilt breeding and gestation

After gilts have been moved to the breeding section, there is no boar exposure for the next 14 days. They are kept on the same diet, but intake is restricted to five pounds a day, up to seven days prior to the expected breeding date. At that time, gilts are placed back on a full feed regime and they are boar-exposed twice daily. When estrus is detected (i.e., the second detected estrus), gilts are inseminated every 12 hours. On an average, gilts receive three inseminations. All matings occur with closed-contact to a boar—automated boar crates being used routinely. After the last mating, gilts are immediately moved to gilt gestation. At that time they are switched to a standard gestation diet and will receive four pounds of feed a day. Gestation crates are smaller than normal (20 inches wide by 76 inches long), and this certainly helps in keeping them much cleaner. Mated gilts are exposed to boars (using automated boar crates) on a daily basis for up to 30 days of gestation (until pregnancy detection). A specific vaccination program is used prior to farrowing. Serology is also performed on a weekly basis to assess gilt barn stability.

Our goal in this gilt breeding barn is to overbreed (based on our replacement rate) so we can ensure meeting our system farrowing target all the time.

Gilt farrowing

Gilts are moved to the gilt farrowing barn (P1) when they are between 90 and 100 days of gestation. This move is needed because, as mentioned above, we use an existing building. If this system was developed from scratch, gilt farrowing could probably occur in the same building where gilt breeding and gestation is done. The fact that only gilts farrow in this barn makes the application of dedicated programs much easier. For example, the induction protocol is different in this herd than in mature sow herds, as well as the vaccination and medication program. A specific gilt lactation diet is also used to take in consideration their lower intake.

P1 breeding and gestation

P1 sows at weaning don't act like other sows, and this is why we have elected to specialize this task as well. It is well known that the wean-to-first-service interval is longer by a day or two on P1 sows, so we have planned the extra needed space in the breeding section to take this difference in consideration. In the system we also skipped all sows that are in heat between days 8 and day 12 post-weaning. With P1 we have a greater number of animals in this category, so, here again, we allow for the needed space to keep those sows.

After their mating, the P1 sows are moved to a gestation crate. Again, crates are slightly smaller than normal gestation crates to adjust for size differences. P1 sows are kept up to 60 days of gestation in this barn. Serology is done on a weekly basis to assess herd stability and stop animal movement if needed.

Mature sow herd

All of our mature sow herds received pregnant P1 animals between 50 and 70 days of pregnancy as replacement stock. In those herds, because we are dealing only with mature animals, we could use the same breeding pattern at all times—the wean-to-first-service interval is much more predictable and intake is better in lactation—these criteria make the barn management much easier to do. The number of gilts introduced is driven by the conception rate at 30 days of gestation. One of our goals is to maximize farrowing crate utilization; knowing how many P2+ sows should farrow allows us to decide the number of pregnant P1sows to introduce.

Progeny segregation

At weaning, in an effort to take full advantage of the system, progeny from P1 and progeny from P2+ sows are kept segregated in different nursery and finishing buildings. Doing so, we've observed huge differences among those two populations. We deal with more health problems in P1 progeny, along with less gain and greater mortality. On the other hand, the P2 progeny do not present us with as many problems. Keeping those two progenies separated has allowed us to use different vaccination and medication programs. For example, for the control of enzootic pneumonia, we are using a full vaccination program and a strategic medication program on gilt progeny, and even with those interventions, we still see occasional problems. Conversely, in the P2+ progeny pyramid, we are not using any vaccination, no medication, and we are not seeing any clinical problems.

Results

Below are a number of observations which we believe are related to the unique qualities of our system. None of these results are exceptional, but they are obtained in all herds of the system. Most significantly, they are achieved on a consistent basis.

- Gilt selection rate is 87.1%
- For each sow in inventory in the multiplication unit, an equivalent of 6.9 gilts farrow per year (in units downstream)
- Backfat at mating on gilts is 17.5 mm on average (measured routinely on a group of gilts)
- Average age at mating for gilts is 218 days
- Gilt conception rate is 89%
- P1 conception rate is 88%
- Litter size is 11.2 total born on P1; 11.6 on P2; and 12.3+ on P3
- Sow mortality in the gilt barn is 3%; in the P1 barn 4%; and in the mature sow herd 7%
- The average parity in the mature sow herd is 4.4
- Non-productive sow days in mature sow herd is 36 days, and replacement rate overall in the system is 46%
- Over the last year, an average of 322 sows farrowed per week for the entire system, with a variation not greater than 20 sows from week-to-week
- The main results for the nursery and finishing barns are shown in **Table 1**.

Discussion

There are many good and effective ways to produce pigs. The one described above is certainly not a conventional one, but it has worked so far. It might seem very complicated, but in reality it is a multi-loci system operated as one "big unit" with truck transportation between buildings. It is important to note that all gilts, sows, and nursery operations are within a 30 km radius. This is reduces the time for hauling.

This approach has allowed us to maximize the power of specialization with our staff and buildings. The fact that we are always dealing with a surplus of pregnant gilts has allowed us to produce, on a consistent basis, the 3000 weaners needed weekly to make sure the system is always in full operation.

The system was designed to maximize production, and has truly challenged some of the well-established swine health control principals. Even if some rules have been broken (e.g., direct introduction of replacement stock into the mature sows herd), it seems that, with the use of other rules (e.g., population segregation by age), we have been able to add stability to our system. The greatest risks in the system are the "gilt maturation/breeding" barn that is operated on a continuous flow basis and the necessity to

Table 1: Comparison of P1 and P2 progeny in nursery and finishing barns.

	P1 progeny	P2+ progeny
Weaning weights (kg)	5.30	5.70
Nursery mortality (%)	3.17	2.55
Nursery ADG (g/day)	412	435
Nursery drug cost (CDN $)	2.15	0.85
Finishing Mortality (%)	4.31	2.95
Finishing ADG (g/day)	735	765
Finishing drug cost (CDN $)	1.82	1.01
Lungs with enzootic pneumonia lesions (%)	31	11

move gilt and P1 sows almost every week (we could "hold" movement for two weeks, but not more). We are currently working in this area to see if we could find ways to reduce those risks or have some contingency plans in place.

Health-wise, one of the greatest lessons learned from those experiences is the difference (at least perceived) between the health status and stability of P1 and P2 progeny. We believe those differences should be taken into consideration in setting up large production systems in the future. Segregated production will not only mean raising weaners apart from the sows, but also keeping gilt and sow progeny in different production pyramids. We are still in the infancy of segregated production; there is so much to be learned!