Reproduction: a luxury function

Every tool available must be used to achieve the farm's reproductive goals including genetic resources, personnel, facilities, and feed, and not forgetting reproductive hormones too.

Juan Luis Úbeda

A back-of-the envelope calculation shows that the expenses directly related to reproduction have an almost negligible effect on the total cost per kilogram of meat finally produced.

Some may still think that this is an important cost. On the one hand, the insemination centre, with its facilities and staff, might spend €3.5/dose on 6.5 doses/sow/year, equating to €0.75 per kilogram of meat; but on the other hand, the farm must balance the cost of buying replacement sows and their associated costs for maintenance and other factors.

However, production begins with reproduction. Efficiency is important in the use of reproductive sows in order to obtain enough piglets to fill the maternity slots and, in turn, the transition and fattening places.

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SIP Consultors estimate that the impact of reproduction on the final cost of production is approximately 3%.

Reproductive success is not accidental, we must work hard to create the ideal conditions so that the genetic potential of these animals can be expressed.

Our teachers told us that "reproduction is a luxury function" when we were students, and that's the way it is. Each sow's priority is survival, maintenance, and growth and, if possible, reproduction but, like any luxury, she will not invest in 'what she can do without'.

Inefficiency problems

Efficiency losses are usually mitigated by increases in the population, although this only works in the short term because farms are usually designed based on the assumption that there will be a 90% fertility rate; therefore, not enough places will be available.

In addition, the covers of replacement sows begin earlier and so will fall outside the coverage objectives, which starts a subfertility loop that is difficult to escape from, leading to suboptimal prolificity results.

Designing reproduction

Given the above, reproduction design means considering physiology, metabolism, a diet balanced in nutrients, and that—other than at the time of weaning—the sow is in her best possible condition. Therefore, voluntary feeding during lactation must be maximised.

This may all be easy to understand, but in practice, it is very difficult to evaluate. Sows could be weighed or their back fat or loin diameter monitored when they enter and leave the farrowing rooms; however, this is rarely done. The feeding curve hypothesis is usually presented, which shows the evolution of sows from points 1 though 4, along with the desired changes one might expect in them, interspersed with individual monitoring when possible. Those points might be for the selection of a replacement sow, or for the time of covering, farrowing, or weaning. However, accurate and mathematically manageable information is usually lacking and so we tend to work with means to compensate for errors due to excess or absence.

It is important to also mention some other factors...

Sows must be in certain conditions at critical times. These conditions are different by virtue of the cycle but, nevertheless, are structured by the first cycle and thereafter, must be maintained.

In summary, the success of each phase depends on how it emerged from the previous one. Therefore, as reproduction managers, our objective is to generate ideal individuals for each productive stage.

What are the best possible conditions?

These are very difficult to define because we are not considering a specific static moment: weaning is both the end of the lactation process and also the beginning of a new cycle.

There is a demographic distribution cycle on farms that makes it impossible to specifically define ideal conditions. However, if we must define it, we could possibly talk about sow evolution and their final status, and how this was achieved. That is, for a post-weaning sow, logically, a thin body condition but without having lost too much weight during lactation would be adequate.

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Points to consider

- Select sows for reproduction that meet the minimum weight and body composition at a given age, as determined by their GMD.
- Sows must be sexually mature at the time of covering (heat stimulation).
- They should be carefully fed so that they will be covered when their weight and condition are adequate. In other words, we must maintain their growth in quarantine, continue stimulating heat, and cover within a predetermined period of time to avoid both small or immature sows as well as overweight and inefficient sows.
- Sows should be grouped and fed according to their nutritional needs in order to 'get them in shape' as soon as possible during pregnancy.
- We have to facilitate adequate environmental conditions during maternity to maximise voluntary feed consumption.
- Provide 'enough' feed for every day of lactation and care for these sows as they were our pets.
- At the time of weaning they should be housed in an appropriate, clean, and stress-free place with sufficient food.

There is a consensus for the starting point condition

Sooner or later, logic will prevail. Sows should not be covered at 180 days or 270 days. It is now clear that the ideal individual, or replacement sow, for covering is one weighing 140 kg–150 kg, in their second heat, and aged more than 210 days.

It should also be clear that replacement sows must receive a *flushing diet*, two to three weeks before covering, which must be at least 50% more than their normal dietary needs and, in general, amounts to about 3.2 kg–3.5 kg of feed per sow/day. If the sow is also caged, the flushing effect will be greater.

A sow that has grown during her quarantine phase until her selection, and that has received a suitable *flushing*, will easily exceed the 150 kg in weight we mentioned above, and correspondingly, her back fat should exceed 15 mm.

Foxcroft *et al.* (Allen D. Leman Swine Conference, 2018) studied 'the origin-litter effect on replacement sows'. Their data indicates that some sows from genetic lines that are not especially hyperprolific produce underweight litters regardless of their total number of births (*figure 1*). It is estimated that approximately 20% of sows fit into this category, which is thought to be genetic in origin and is expressed according to environmental and management conditions. The authors of this study concluded that the best way to minimise this outcome was to cover young sows that were 'not too heavy'.

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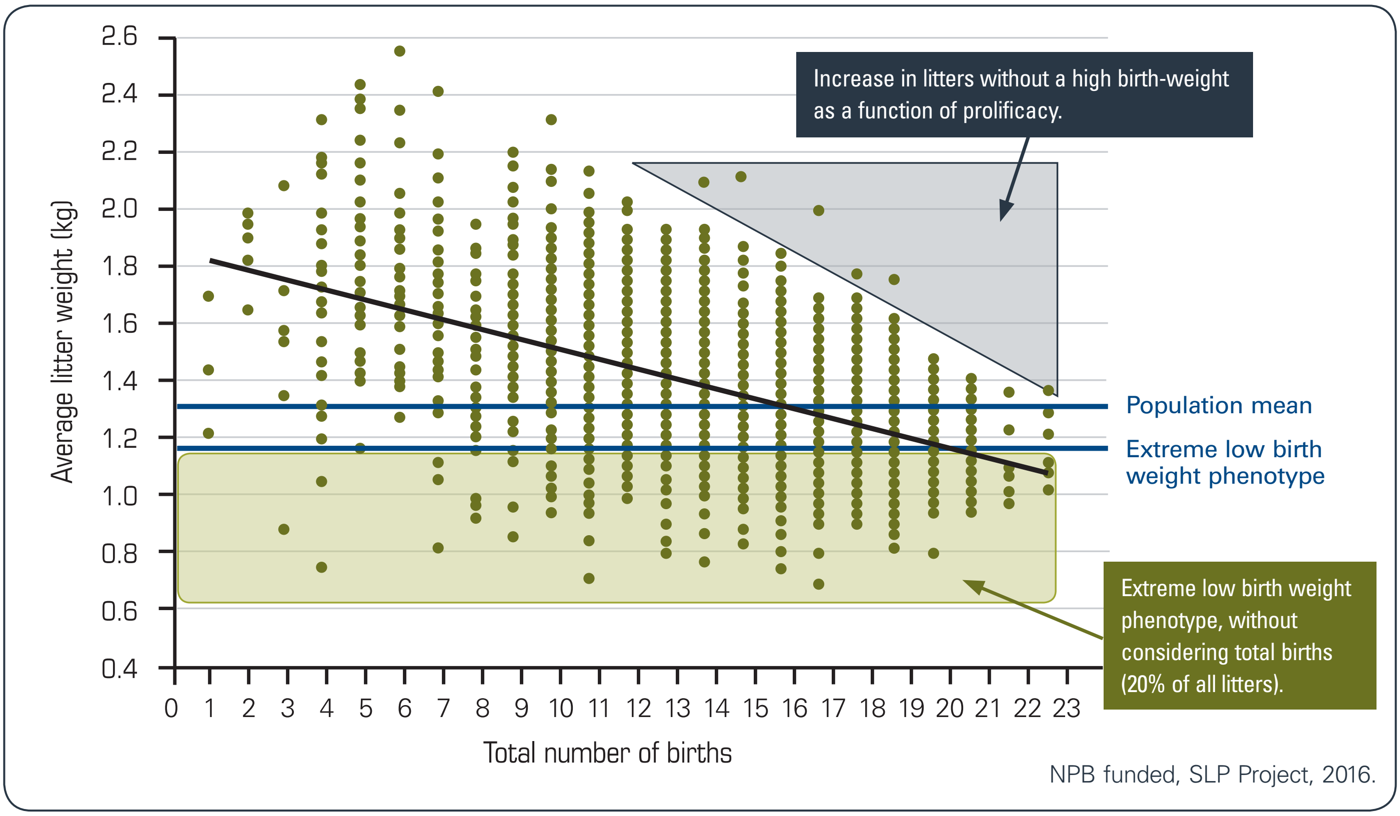

NPB funded, SLP Project, 2016.

Figure 1. Evidence of an induced 'low birth-weight litter phenotype' in less prolific commercial sow populations.

Efficiency in the use of genetics

Piglets weaned by sows in their productive life

Currently, the main economic and productive indicator of reproductive efficiency in sows is the number of piglets produced per sow eliminated (*the sow lifetime productivity or SLP*) which applies to sows that reach their third farrowing is a complementary production metric.

The SLP indicator is strongly dependent on prolificity and, therefore, on the genetic line in question. Not as many sows reach their third farrowing, which makes comparison between pyramids with different genetics easier.

If the goal is for 75% of sows to reach their third farrowing, 8% of the sows can be lost in each of the first three cycles. This data is not usually easily accessible.

Percentage of sows inseminated versus number of sows entering the facility

Another indicator which is not widely used is the percentage of sows inseminated compared to those selected or purchased. This percentage gives comparative information on:

- The quality of the facilities.
- The design of the health plan.
- The handling carried out from their entry until covering.

As an ambitious objective we could aim to inseminate 95% of the selected/incoming sows.

Opportunities

Every tool available should be used to help us achieve our goals, starting with genetic resources, personnel, facilities, and feed. Reproductive hormones should not be forgotten.

Reproductive hormones have been used to remedy the consequences of the misuse of the tools described above, and indeed, that is their purpose. However, it is better to consider their orderly use as part of a reproductive strategy design.

Fertility index

Age and sexual maturity at the time of insemination are determining factors. We must clearly understand when the best time for the first insemination is and we must consider both fertility and prolificity when making this decision.

There is an indicator called the fertility index which is calculated by multiplying fertility by the total number of births to obtain the number of piglets farrowed per 100 inseminations.

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This indicator is very solid and easy to calculate, although the exact age of the sows must first be registered in a computer. *Figure 2* shows how the best results are obtained from inseminations carried out in sows aged 227 to 242 days and, on a second farm with different genetics (*figure 3*), in sows aged between 222 and 231 days.

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Gilts

In summary, the best sows for insemination are usually around 145 kg, around 225 days old, and have cycled twice. All this can be left to chance or it can be programmed. In its 2017 Gilt Management Recommendations, the PIC determined that 75% of the sows should have cycled within 21 days of starting heat induction, with this figure rising to 90% at 42 days. This is an ambitious goal, and therefore, unless excellent handling and conditions are implemented, it may not be achieved.

- What are its consequences?
- How many sows are covered in the first or second confirmed heat?
- Could hormonal treatments be used as a supplement to management rather than as an emergency option?

Regarding the first question, it is important to keep an electronic record of the heat number in which each sow is inseminated, which helps answer the second question.

If the objective is to maximise the sow reproduction capacity, the best option would be to leave as few factors as possible to chance.

The use of hormones as a supplement

In the author's opinion, currently, the biggest opportunity at the reproductive level is the use of hormones as a complement to exquisite management during the quarantine and heat stimulation phases in order to maximise the number of sows in their second heat at the right age.

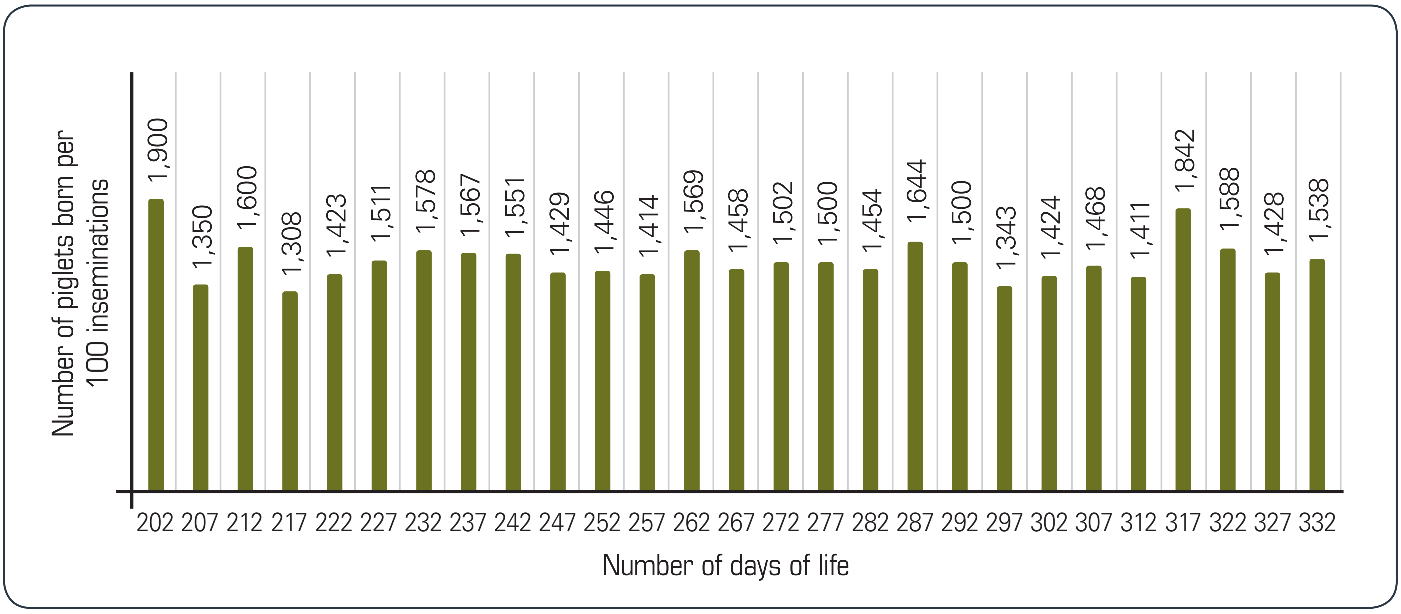

Figure 2. F1 fertility index.

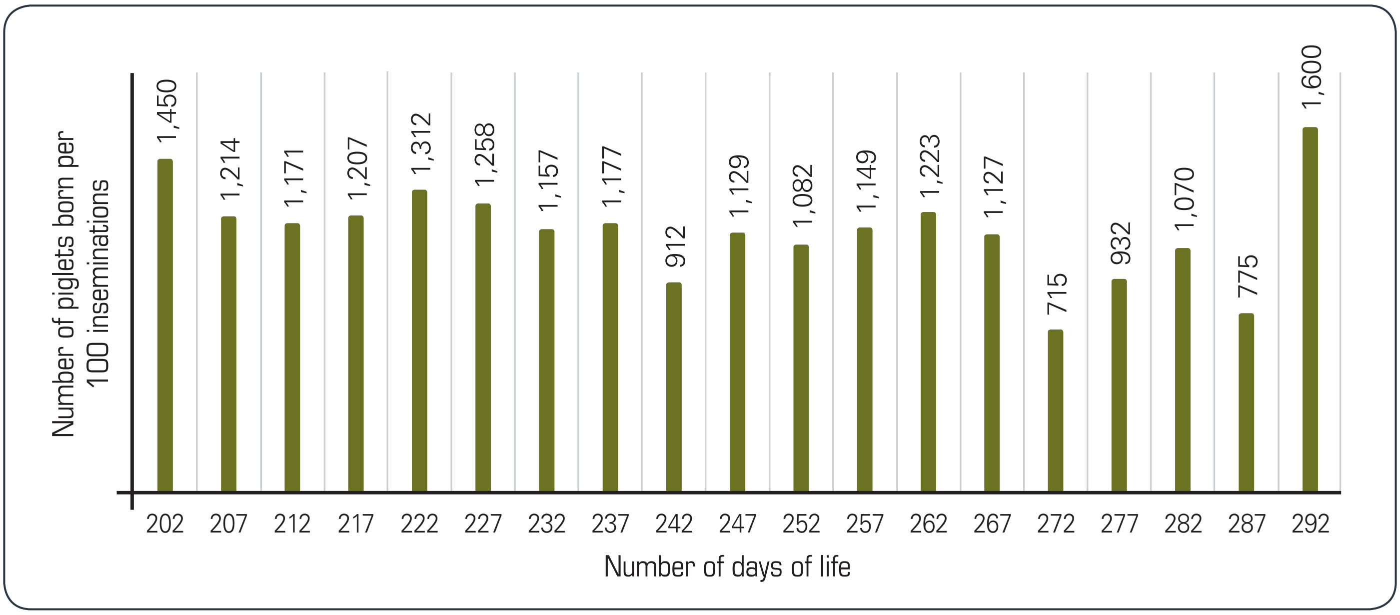

Figure 3. Genetic line fertility index 2.

Let's transform a luxury function into a function of luxury.

This strategy requires the combined use of Excel sheets, gonadotropins, and progestins. What role do Excel sheets have in this reproductive approach? Well, a lot.

We must record their first heats and those whose second natural heat will appear at the right time for the farm (in terms of age) without any treatments. These second natural heats would be completed with previously cycled sows after treating them with altrenogest and introducing them into the batches. A third group would comprise gilts treated early with gonadotropins (such as those that did not show signs of heat 20 days after exposure to a boar), which could be inseminated in their next natural heat after treatment or after programmed treatment with progestogens.

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Conclusions

In summary, the idea is to program reproductive function, provide one more cycle to sows that may still need to improve their body condition, and to guarantee that sows have been *flushed* before they are inseminated in their second heat, preferably before 240 days of age. This helps us to maximise results, reduce non-productive days, and optimise our resources.