Pig Genetics Info

AGBU ANIMAL GENETICS AND BREEDING UNIT
A joint unit of I&I NSW and UNE

# From 28 to 32 piglets per farrowed sow per year in 5 years – A case study from France

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## *Performance is not an indication of the genetic merit of sows*

There is often debate in Australia about the maternal abilities of sows lagging behind performances achieved overseas and genetics is sometimes mentioned as a limiting factor. Reproductive traits of the sow such as litter size, survival and rebreeding success are lowly heritable. Therefore, management influences have the largest effects on sow performance and performance *per se* (phenotype) is not an indication of the genetic merit of sows. For example, the high performances achieved in high health, climate controlled and often family-owned units in Europe with highly trained and motivated staff are not directly comparable with the performance of Australian herds. However, the improvement of 4.2 piglets weaned per farrowed sow per year achieved over 5 years at EARL Dartois in Bretagne, France may be used as a case study to illustrate avenues for improved sow reproductive performance in Australia. It will also be shown how much improvement in sow performance can be achieved via selection each year.

## *The herd EARL Dartois in France*

The breeding herd EARL Dartois consists of 250 purebred Large White sows, which are part of the French National pig breeding program. The unit has a high health status with filtration of air entering the piggery as well as "washing" of air exiting the sheds. The rooms are climate controlled maintaining a specific temperature in different sections of the piggery. For example, room temperatures are set to 18-19$^{o}$C in winter and 20-21$^{o}$C in summer for gestating sows while farrowing room temperatures decrease from 26$^{o}$C in the first week after farrowing to 24$^{o}$C in the third week after farrowing. The herd is operated by the manager, his father (half time) and one employee. A 4-week batch farrowing system is used with 50 sows farrowed per batch. Litters are weaned at 21 days of age.

## *Four extra piglets in five years*

In 2008, this herd weaned 32.0 piglets per farrowed sow per year, which was an increase of 4.2 piglets since 2003 (Table 1). The main drivers for this improvement were:

- a reduction of pre-weaning mortalities of 1.1 piglets per litter equivalent to 2.6 extra piglets weaned per farrowed sow per year.
- a reduction in farrowing interval of 5 days equivalent to 1.1 extra piglets weaned per farrowed sow per year due to more litters per farrowed sow per year.

Pre-weaning losses were reduced due to fewer number of stillborn piglets (-0.5 piglets per litter) and less piglet mortality from farrowing until weaning (-0.6 piglets per litter). For comparison, the total number of piglets born increased only slightly (0.2 piglets per litter) during the five-year period. The impressive improvement in sow performance was mainly achieved by focusing on survival of piglets at farrowing and from farrowing until weaning.

Table 1. Changes in sow performance at 'EARL Dartois' from 2003 until 2008.

| | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | Change |
|---|---|---|---|---|---|---|---|
| Number of litters | 436 | 519 | 563 | 553 | 586 | 689 | |
| ***Piglets weaned per farrowed sow/year**** | ***27.8*** | ***27.7*** | ***29.8*** | ***30.0*** | ***30.7*** | ***32.0*** | ***4.2*** |
| Total born/litter (piglets/litter) | 14.9 | 14.2 | 14.4 | 14.2 | 14.4 | 15.1 | 0.2 |
| Liveborn/litter (piglets/litter) | 13.6 | 13.1 | 13.4 | 13.1 | 13.3 | 14.3 | 0.7 |
| **Weaned/litter (piglets/litter)** | **11.4** | **11.2** | **11.8** | **11.7** | **12.0** | **12.7** | **1.3** |
| Stillborn/litter (piglets/litter) | 1.4 | 1.1 | 1.0 | 1.1 | 1.1 | 0.9 | -0.5 |
| Mummies/litter (piglets/litter) | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0 |
| Pre-wean mortality (piglets/litter) | 2.2 | 1.9 | 1.6 | 1.4 | 1.3 | 1.6 | -0.6 |
| **Total losses until weaning (piglets/litter)** | **3.5** | **3.0** | **2.6** | **2.5** | **2.4** | **2.4** | **-1.1** |
| Pre-weaning mortality as % of total born | 23.6 | 20.8 | 18.3 | 17.5 | 16.5 | 16.3 | -7.3 |
| Pre-weaning mortality as % of live born | 16.0 | 14.5 | 12.2 | 10.9 | 9.4 | 11.2 | -4.8 |
| **Weaning to conception interval (days)** | **13.7** | **14.1** | **9.2** | **6.1** | **7.4** | **8.6** | **-5.1** |
| Farrowing interval (days) | 150.0 | 148.1 | 144.5 | 142.1 | 143.1 | 144.7 | -5.3 |
| Non-return rate at first mating (%) | 87.6 | 87.1 | 89.7 | 87.8 | 91.3 | 95.0 | 7.4 |
| **Number of litters per sow/year** | **2.43** | **2.46** | **2.53** | **2.57** | **2.55** | **2.52** | **0.09** |

* Derived as number of piglets weaned per litter per year * 365.25 / farrowing interval

## *Sow husbandry at EARL Dartois*

Optimal sow performance relies on the attention to detail for a wide range of aspects of pig husbandry including gilt development, nutrition, housing, health status and general care of the sow and her piglets. It is not possible to outline all factors that contributed to the high reproductive performance at EARL Dartois and only some general aspects are mentioned. A description of management practices of highly prolific sows in French herds was provided by Boulot *et al*. (2008).

The piggery EARL Dartois is operated by very experienced and dedicated staff who monitor sows for at least 18 hours each day from 6 AM to midnight during the farrowing period until three days after farrowing. Boulot *et al*. (2008) describe the close supervision of sows during the farrowing week by staff who spend approximately 1.5 hours with each sow during the farrowing period. Batch farrowing has facilitated the ability to closely supervise farrowing sows, which has contributed to the reduction in stillborn piglets and pre-weaning mortalities in particular shortly after farrowing when piglet mortality is highest. The setup of only 5 batches of sows improves the efficiency of this close supervision of sows around farrowing.

The reduction in weaning to conception interval from 13.7 to 8.6 days was partly due to the transition to a new batch farrowing system, which also affected the non-return rate at first mating. Oestrus detection in sows was improved following modification of the mating shed in 2007 to increase sow stimulation via better exposure of sows to boars. In addition, a more stringent culling regime has been implemented for sows that return to oestrus and these sows

are subsequently excluded in the calculation of non-return rate and weaning to conception interval. This might have contributed to a reduction in weaning to conception interval and highlights the need to clearly define procedures to calculate parameters describing sow performance.

Sows are structurally sound and appeared uniform in size and condition at farrowing. The feeding system during gestation is tailored towards the needs of individual sows. The amount of feed provided to each sow during gestation depends on her body condition with the aim to reduce variation between sows. The targets for weight and backfat levels are shown in Table 2. Gilts are mated at 33 weeks and should weigh approximately 150 kg.

Table 2. Targets for weight and backfat of sows at farrowing and loss of backfat during lactation.

| | Gilts | 2nd parity | 3rd parity and above |
|---|---|---|---|
| Weight at farrowing (kg) | 240-260 | 270-280 | max: 350 |
| Backfat depth at farrowing (mm) | 20-22 | max: 25-26 | max: 25-26 |
| Loss of backfat during lactation (mm) | 7-8 | 7-8 | 7-8 |

## *How much can genetic improvement contribute?*

Genetic trends for litter size and pre-weaning mortality were shown by Guéry *et al*. (2009) for the Large White breed of the French National pig breeding program. Since 2002, there has been no genetic gain in number of piglets born in total due to a shift of selection emphasis towards number of piglets born alive. The average genetic gain per year was 0.14 piglets born alive/litter and 0.15 piglets weaned/litter from 2002 to 2007. Research is underway to include the number of surviving piglets until weaning as an additional trait to improve pre-weaning survival of piglets. So far, weaning to conception interval has not been considered in genetic evaluations of the French National pig breeding program

The potential annual genetic gain in individual traits is determined by the additive genetic variation available for each trait. Reproductive traits of the sow are generally lowly heritable. However, this limitation in regard to genetic improvement is offset by considerable variation in these traits. In practice, pig breeding programs achieve annual genetic gains in individual traits of approximately 5 to 25% of the additive genetic standard deviation available for each trait (Hermesch, 2006). The expected range in annual genetic gain in reproductive traits of the sow given the genetic variation observed in Australian studies for each trait is shown in Table 3 for illustration purposes.

Table 3: Expected annual genetic gain (range) for sow performance traits given the heritability and genetic variation available for each trait.

| | Heritability[1] | Genetic standard deviation[1] | Expected annual genetic gain |
|---|---|---|---|
| Total born/litter (piglets/litter) | 0.10 | 0.79 | 0.04 to 0.20 |
| Liveborn/litter (piglets/litter) | 0.10 | 0.70 | 0.04 to 0.22 |
| ***Weaned/litter (piglets/litter)*** | ***0.05*** | ***0.38*** | ***0.02 to 0.10*** |
| Stillborn/litter (piglets/litter) | 0.10 | 0.13 | -0.01 to -0.03 |
| Mummies/litter (piglets/litter) | 0 | 0 | 0 |
| Pre-wean mortality (piglets/litter) | 0.10 | 0.45 | -0.02 to -0.11 |
| ***Total losses until weaning (piglets/litter)*** | ***0.10*** | ***0.57*** | ***-0.03 to -0.14*** |
| ***Weaning to conception interval (days)*** | ***0.05*** | ***0.28*** | ***0.01 to -0.07*** |

[1] estimates based on Bunter (2009), Hermesch *et al.* (2001) and Tholen *et al.* (1996);

## *Message for Australian producers*

The performance of sows is not a reliable indicator of the genetic merit of sows. Reproductive traits of the sow are lowly heritable and genetic improvement in these traits can easily be masked by changes in environmental factors. Attention to detail in a wide range of on-farm management aspects is required for achieving the high performance observed in some herds overseas. The program 'Target 25' helps Australian producers to identify key management strategies to improve performance on farm.

Genetic improvement of sow lifetime performance has been researched in Australia since the mid 1990s and results have been presented to breeders at the AGBU pig genetics workshops (http://agbu.une.edu.au/pig_genetics/workshops.html). The genetic trends available from breeders provide information for producers about the rate of genetic improvement achieved for individual traits.

Finally, pig husbandry practices have to accommodate the changing needs of modern genotypes that arise from genetic improvement of pig performance. This includes nutrition during gilt development, gestation and lactation as well as sow and piglet housing and monitoring.

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