Optimal Sow Management for Optimal Sow Performance?!

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▪ Introduction

Sow reproductive performance, as measured by weaning-to-oestrus interval, litter size and farrowing rate, varies considerably between countries, but even more so between farms within countries. **Table 1** shows some of the variability in several countries around the world.

Table 1 Sow reproductive performance in countries around the globe[1]

	Canada		Netherlands		Denmark		USA		Brazil	
	all	Top 10%	all	Top 20%	all	Top 25%	all	Top 25%	All	Top 33%
Sows/farm			402	445	640	722			640	1840
WOI, d			5.6	5.5	6.0	5.6	6.7	6.0	9.3	5.6
Farrowing Rate (%)	83.9	91.8	87	90	87.3	90	85.2	90.5	85.6	91.4
Live born/ litter	12.1	12.9	14.7	15.2	14.8	15.5	13.4	14.2	12.8	13.7
Weaned/ litter	10.7	11.8	13.6	14.2	12.7	13.6	12.1	13.0	11.9	12.6
Weaned/ sow/year	24.7	26.9	28.1	30.8	28.8	31.5	24.8	28.0	25.9	28.8

WOI: weaning-to-oestrus-interval; Weaned/sow/yr: piglets weaned per sow per year
[1]Data derived from PigChamp (Canada; only 16 farms), Bedrijfsvergelijking AgrovisionBV2011 (Netherlands), Pig Science Centre (Denmark), www.nationalhogfarmer.com july2012 (USA) and AGPECS and Agroceres PIC (Brazil).

These differences in performance can partly be attributed to the use of different breeds in different parts of the world or between farms, although several genetics lines (PIC, Topigs and Danbred) are now used worldwide. Environmental challenges to sows such as heat stress may also differ between countries and farms, but a major factor causing differences in reproductive performance on farms is quality of management. This includes many factors, such as ‘skills’ for optimal oestrus detection and insemination, but also nutritional management, which is of utmost importance throughout the (reproductive life) of a breeding sow. One important gauge of reproductive function on farms is the occurrence of the so-called ‘second litter syndrome’, defined as an increased weaning-to-oestrus interval, a reduced farrowing rate or a reduced litter size in the second parity compared to first parity sows.

▪ Optimizing Sow Management: Second Litter Syndrome

The ‘second litter syndrome’ or ‘dip’ of second parity sows used to be expressed as an increased weaning-to-oestrus interval, but in our modern sows selected for short weaning-to-oestrus-intervals, is it expressed more often as reduced farrowing rates and litter sizes (see Foxcroft 2012; Kemp and Soede 2012a). This decrease in performance is related to sow weight loss during lactation (Hoving, 2012). Sows with a high lactational weight loss (>13.8%) had a similar ovulation rate, but fewer viable embryos at Day 35 of pregnancy (14.9 vs. 16.8) and also fewer implantation sites (17.2 vs 19.5) than sows with low lactational weight loss, identifying increased embryo mortality before implantation at approximately Day 15 of pregnancy as a problem. This confirms that lactational weight loss affects embryo quality, resulting from reduced follicle and oocyte quality (Foxcroft 2012). In France, Boulot (unpublished results) recently found that 38% of the 842 farms studied had a second litter size of at least 0.2 piglets below that of the first parity sows. When other criteria were also taken into account (weaning-to-oestrus-interval >7 days, farrowing rate < 85%), as many as 79% of the farms were defined as having a second parity problem.

Subsequent Performance

The reduced reproductive efficiency of second parity sows might also lead to early culling. Hoving (2012) studied relationships between failure to farrow and litter size at second parity with reproductive performance in later parities in 45,000 sows. In these data, a total of 15.7% of the second parity sows inseminated became repeat breeders. Being a repeat breeder in second parity did not affect litter size in subsequent parities, but it was associated with decreased farrowing rate in parity 3 (-4.1%) and 4 (-3.4%), and second parity repeat breeder sows were on average culled 2 parities earlier (parity 5 vs. 7, respectively),compared with non-repeat breeders. Furthermore, sows with a low second parity litter size also had a smaller litter size in parity 3 and above, compared with sows with a moderate or large litter size at second parity. The magnitude of this effect was smaller in first parity sows with larger litter sizes. Furthermore, sows with a smaller litter size in second parity were culled one parity earlier, compared with sows with a moderate or large litter size in second parity. These data show that a large part of the sows with poor reproductive performance in second parity are at risk of having a poor reproductive performance in subsequent parities, resulting in earlier culling.

Solutions

Since lactational weight loss is a crucial factor influencing reproductive performance in second parity sows, any management solution that leads to higher lactational feed intake or reduced milk production, will benefit the reproductive performance of second parity sows. These solutions include gilt management (development and feed intake capacity), nutritional strategies during lactation (e.g. ad libitum water intake, gradual increase in feed intake), prevention of high ambient temperatures in the farrowing barn, and lactational strategies (piglet numbers, lactation length). Another approach can be to allow sows time to recover from lactational catabolism before insemination. The normal weaning-to-oestrus interval in contemporary sows shown in Table 1 is too short to allow for this recovery. Skipping breeding at first oestrus can improve pregnancy rates by 15% and subsequent litter sizes by 1.3 to 2.5 piglets, but increases the number of non-productive days by 21. Providing a shorter recovery period than a full cycle length, by providing a progesterone analogue post-weaning, might be a more economic option (see **Table 2**). In her PhD thesis, Leeuwen (2011) concluded that altrenogest use for periods shorter than 8 days is only effective if follicle development during lactation is severely compromised, which is expected in sows with a substantial loss of body reserves. Longer treatments (e.g. until day 14 after weaning) always give a substantial improvement in performance. The best time to start altrenogest treatment may be a few hours before weaning, to fully benefit from the LH suppressing effects during the first hours after administration. In modern hybrid primiparous sows with high lactation weight losses and short weaning-to-oestrus intervals, extending the period from weaning to first ovulation seems a promising route to improve reproductive performance.

Another option may be to stimulate body weight recovery during the subsequent pregnancy. During the first two-thirds of gestation, the energetic demands for litter growth are low and young sows can use this period to recover from lactation weight loss. Hoving (2012) thus investigated whether a 30% increase in feed intake during the first month of second pregnancy increases litter size. Unfortunately, results were equivocal. In a first study, the increased feed intake increased litter size by 2 piglets. However, in a second study aimed at investigating the physiological background of this increase, embryo survival was not affected. Based on these and other data, an increased feed intake during the first month of second pregnancy is beneficial for body weight recovery and may also increase reproductive performance.

Table 2. Reproductive performance after post weaning altrenogest treatment (Alt) compared to untreated controls (recent papers).

Treatment			Parity	Lactation length	Farrowing rate		Litter size (n)		ref
Start	dose	Duration			C	Alt	C	Alt	
Alt started before weaning									
-48h	15	7	2-7	18	-	-	11.8	ns	1
-48h	15	14	2-7	18	-	-	11.8	+1.8	1
-24h	20	4	1	20	89	ns	11.9	ns	2
-24h	20	8	1	20	89	ns	11.9	ns	2
-24h	20	15	1	20	89	ns	11.9	+2.5	2
-24h	20	8	1	21	88	ns	11.9	+1.5	3
-24h	20	8	2-3	21	93	ns	13.7	ns	3
Alt started after weaning									
+3h	20	5	1	21	84	-14	11.1	-1.7	4
+3h	20	5	1	21	97	-30	10.7	ns	4
+24h	20	5	1	21	-	-	12.3	ns	5

[1]Patterson et al. 2008; [2]van Leeuwen et al. 2011a; [3]Van Leeuwen et al. 2011b; [4]Werlang et al. 2011; [5]Fernandez et al. 2005.

In conclusion, optimal second parity sow performance is crucial for farm performance and requires good management, starting with good gilt management.

▪ Environmental Challenges

Annual variation in reproductive function is mostly attributed to the negative effects of high temperature, although for countries with major annual changes in day length, such as Finland, the annual variation seems more related to this factor. These annual changes may affect all aspects of reproductive function, including age at puberty, weaning-to-oestrus interval, farrowing rates and litter sizes. The mechanisms by which temperature affect reproductive functioning are diverse, but seem mostly related with a reduced feed intake (see Prunier et al., 1997) or stress effects on uterine luminal contents. Obviously, management should be optimised to increase feed intake (increased feeding frequency, liquid feeding, fresh water, cooling sows), but this will often not be sufficient to prevent the reduction in performance. Interestingly, the Dutch breeding company Topigs is now evaluating genetic differences in heat stress tolerance between sow lines, which may lead to sow lines that maintain their reproductive performance in high temperatures (Bloemhof et al., 2008).

Future Changes and Challenges

Genetics

Although most pig breeding companies include some kind of piglet survival parameters in their breeding goals, they still also select for a higher litter size. This increase in genetic potential is largely realized at commercial farms level; in the Netherlands for example, where Topigs genetics represents >80% of the sows, litter size (total born) increased from on average 12.1 in 2000, to 14.7 in 2011. Concomitantly, number of weaned piglets per litter went from 10.0 to 11.8, which means that piglet mortality (of total born) increased from 2.1 to 2.9 per litter. Increased mortality with larger litter sizes, is related with the reduction in birth weight and the increased variation in birth weight within litters. The attention of farmers is, therefore more and more shifting to the early post partum period, aiming for improved piglet survival.

Welfare Friendly Housing Systems

In Europe, housing conditions of sows are currently changing, related to the larger emphasis on animal welfare. For example, from January 2013 onwards, in the EU pregnant sows need to be group housed from day 28 of pregnancy onwards. Some countries have more strict national legislation; in The Netherlands, e.g., pregnant sows need to be group housed within 3 days from insemination, and in the United Kingdom and Sweden sows need to be group housed from weaning onwards. It is anticipated that these changes in housing conditions will also extend to the lactation phase (ban on farrowing crates).

Group housing during pregnancy need not affect reproductive functioning; in France, Boulot et al. (2011) found that farms with group housing during pregnancy had similar reproductive performance as farms with individual housing during pregnancy, with a large variation in performance within systems. Not only performance, but also the group housing systems vary considerably in terms of feeding systems, being dynamic or stable, use of bedding etc. These factors are not necessarily affecting reproductive performance. However, the two major factors that may negatively influence reproductive functioning of group housed sows are insufficient feed intake, especially in low ranked and thin sows and chronic stress associated with grouping and being housed in groups (Kongsted, 2006, Spoolder et al., 2009). These factors need specific attention, especially for gilts.

A change to non-crated farrowing pens poses a further challenge to the reproductive management of sows; on one hand, the non-crated environment improves the farrowing process by reducing the duration of parturition and higher piglet survival during farrowing, but on the other hand, post-farrowing piglet crushing may be increased (Kemp and Soede, 2012b).

Conclusion

Sow reproductive performance is affected by factors such as genetics, climatic conditions and adoption of "welfare friendly" housing requirements, but is mostly affected by management and animal handling skills of farmers. Optimal management means adequately responding to individual sows, changing genetics, and possibly changing "welfare friendly" housing conditions.

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