RESEARCH ABSTRACT

ANIMAL SCIENCE

Title: Managing gilt "litter of origin" to improve sow lifetime productivity" **– NPB #18-138**

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Scientific Abstract:

The overall goal of a nucleus-multiplication program is to optimize the transfer of the best dam-line genetics available in the industry to the commercial sow farm level. This ultimately will improve downstream commercial performance and is driven by both the quantity and quality of weaned gilts produced. Sow birth weight phenotype (BWP) is an important factor in the overall efficiency of replacement gilt management. Litters from sows with a repeatable low average BWP are largely composed of low individual birth weight (BWi) gilts, many of which are already lost or culled from the pool of potential replacement gilts before weaning. In the present study BWP was established in 262 first parity nucleus-multiplication sows producing replacement gilts in a large commercial operation and classified as low (L-BWP, < 1.0 kg, n = 24); medium (M-BWP, ≥1.0 to ≤ 1.22 kg, n =109) or high (H-BWP, > 1.22 kg, n = 129) on the basis of a BWi of 1.0 kg below which there was a high risk of early mortality (AUC = 0.93%; $P < 0.0001$) and the average BWi (1.22 kg) for the population. Potential replacement gilts born to these sows (n = 1588) received a unique identification tag that allowed the impact of BWi, BWP and their interactions on the efficiency of replacement gilt production to be evaluated. Nearly 68% of the gilts produced from sows with a low BWP were in the low BWi category. Negative effects of BWi on mortality until d 4 after birth, and cumulative losses to weaning, to d 70 of age, and to final pre-selection at 170 d of age, were confirmed ($P < 0.05$). Cumulative losses to weaning were affected ($P \leq 0.05$) by the interaction between BWP and individual weaning weight (WNWi; $P < 0.0001$). At weaning, the probability of mortality was lower for M-BWP compared to H-BWP classes until WNWi exceeded 4.8 kg; above a WNWi of 7.2 kg, cumulative losses increased ($P \leq 0.05$) in M-BWP compared to H-BWP gilts. Mortality until d 70 and d 170 after birth was affected ($P \leq 0.05$) by WNWi but not affected by BWP, nor by the WNWi x BWP interaction. A lower WNWi was associated with increased cumulative gilt losses ($P < 0.0001$). As a proportion of gilts tagged, fewer L-BWP gilts were retained in the herd compared to M-BWP or H-BWP gilts at weaning (L-BWP: 34.09 ± 14.1; M-BWP: 66.0 ± 12.6; H-BWP: 70.7 ± 11.7 %) and at 170 days of age L-BWP: 21.1 ± 7.5; M-BWP: 49.3 ± 9.3; H-BWP: 52.5 ± 9.3 %). A smaller lactating litter size by day 4 of lactation (12-14 vs 15-16 pigs suckling) increased weaning weight (12-14: 5.4 ± 0.1; 15-16: 5.1 ± 0.1 kg) and resulted in more pigs being retained at weaning (12-14: 83.3 ± 0.9; 15-16: 72.2 ± 0.1 %), d70 (12-14: 79.4 ± 0.8; 15-16: 64.4 ± 1.0 %) and d170 (12-14: 64.0 ± 0.9; 15-16: 53.9 ± 0.9 %). In the 93 nucleus sows that farrowed a second litter before the study was terminated, there was a positive relationship between parity 1 and parity 2 litter average birth weight ($y = 0.3695x + 0.9$, $R^2 = 0.14$, $P < 0.0002$). Results from the current study are consistent with previous reports that BWP is repeatable across successive parities. Overall, results show that

sows with the L-BWP are largely composed of low individual birth weight gilts and confirm that low individual birth weight is a primary concern for early losses of potential replacement gilts before weaning. Strategically removing the 9% of sows with an extreme low birth weight phenotype will increase the overall efficiency of genetic transfer from nucleus to production level. On all remaining females, intervention strategies during lactation can improve weaning weights and retention of potential replacement gilts. Monitoring and managing the number of replacement gilts bred as a measure of nucleus-multiplication performance will increase the overall efficiency of pork production systems.