

Lifetime Reproductive Traits in Landrace, Yorkshire and Crossbred Sows

A.S. Leaflet R2561

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Summary and Implications

Selection for more robustness could improve sow longevity. The problem is that sow longevity is truly expressed in crossbred sows in commercial herds but selection is performed among purebred animals in nucleus herds. The present study investigated sow longevity traits on both levels to determine whether the use of commercial performance can facilitate added genetic progress in nucleus animals. Heritability estimates were estimated from 0.00 to 0.16 for Landrace, Yorkshire and crossbred F1 sows. Preliminary results indicate that it could be useful to implement data from crossbred sows in breeding evaluations to improve selection accuracy for sow longevity.

Introduction

Sow longevity is an important economic and animal well-being trait which can be improved by selection for more robust animals. Selection for sow longevity could be performed indirectly by selection for improved fertility or directly by implementing a longevity trait. The longevity trait could be either longevity (e.g. days in herd), stayability (removal or not after certain parity) or lifetime production (measured in number of piglets).

Selection is typically performed on nucleus herd purebred animals, but the longevity traits are truly expressed in crossbred sows in commercial herds. This could be a problem if longevity in crossbred sows is different compared to longevity in purebred sows. This study objectives was to investigate longevity traits at both levels, to determine if accuracy of selection in nucleus animals would be improved by incorporating data from the commercial level.

Materials and Methods

Data consisted of 5,763 Landrace (L), 11,982 Yorkshire (Y) and 9,295 crossbred (F1; L×Y and Y×L) sows with first-parity farrowing records between 2001 and 2008. Statistical analyses were performed with DMU6 (AI REML), on complete records with five generations of pedigree information.

The statistical model included farm and year as fixed effects and random effects of animal and contemporary

group (3-month first parity farrowing period within herd). In the analysis of number pigs weaned, the model also included number of piglets after transfer. Univariate analyses were performed to estimate heritability (h^2) and bivariate analysis to estimate correlations.

Several reproductive and lifetime traits were analyzed; age at first farrowing (AFF), number born alive parity 1 (NBA1), number weaned parity 1 (NW1), accumulated born alive to parity 2 and 3 (ABA2 and ABA3), length of productive life (LPL), removal parity (RPAR), accumulated lifetime born alive (LBA), lifetime number weaned (LNW) and lifetime born alive per parity (LBA/P). In addition, stayability (removal or not after certain parity) traits were analyzed. These binary traits was assigned a value 0 for a sow removed before 2nd or 3rd parity respectively and 1 for a sow staying up to 2nd or to 3rd parity, respectively.

Results and Discussion

The average F1 sow was 355 days old when she had her first litter and had a productive life of 579 days before removal. The average litter size per parity was 11.2 born alive and 11.0 weaned piglets. At removal, the average F1 sow had produced 3.85 litters, 43.8 piglets born alive and had weaned 41.1 piglets.

Lifetime born alive heritabilities were estimated from 0.07 to 0.12 and the corresponding figures for removal parity were 0.04 to 0.12 (Table 1). Heritability estimates of the binomial measure of stayability from parity 1 to 2, ranged from 0.02 to 0.08, while corresponding figures for stayability from parity 1 to 3 ranged from 0.02 to 0.09. Heritability estimates for accumulated number born alive up to parity 2 and 3 ranged from 0.08 to 0.09 and from 0.07 to 0.13, respectively.

Analyzing stayability among F1 sows to parity 2 and 3 with a binomial distribution resulted in higher heritabilities (h^2 range: 0.07-0.15) than when fitting normal distribution (h^2 range: 0.02-0.03). Among F1 sows, lifetime born alive had an estimated genetic correlation to age at first farrowing at -0.59, to stayability from parity 1 to 2 at 0.88, to productive life at 0.71, to removal parity at 0.94 and to life time number weaned at 0.91.

Preliminary estimates of genetic correlations between purebred and crossbred performance indicates that significant genetic by environment interactions exist for some traits and the use of crossbred information may increase the accuracy of genetic evaluation for longevity characters.

Iowa State University Animal Industry Report 2010

Acknowledgements

We gratefully acknowledge the National Swine Registry for making this study possible by providing the data.

Table 1. Estimates of heritability for reproductive and lifetime traits among Landrace, Yorkshire and F1 sows¹.

	AFF	NBA1	NW1	STAY12	STAY13	ABA2	ABA3	LPL	RPARITY	LBA
Landrace	0.05	0.14	0.05	0.04	0.06	0.09	0.13	-	0.10	0.13
Yorkshire	0.13	0.09	0.05	0.08	0.09	0.10	0.12	0.23	0.12	0.13
F1	0.16	0.13	0.00	0.02	0.02	0.08	0.07	0.05	0.04	0.07

¹AFF=age at first farrowing; NBA1=number born alive parity 1; NW1=number weaned parity 1; STAY12=stayability from parity 1 to parity 2; STAY13=stayability from parity 1 to 3; ABA2-ABA3=accumulated born alive to parity 2-3; LPL=length of productive life; RPAR=removal parity; LBA=accumulated lifetime born alive