Determining Optimal Maximum Culling Parity in Commercial Swine Breeding Herds

A.S. Leaflet R2559

Caitlyn Abell; graduate student;
Kenneth Stalder, professor, Department of Animal Science;
Anna Johnson, assistant professor;
Locke Karriker, assistant professor;
Gordon Jones, professor, Western Kentucky University

Summary and Implications

The objective of this study was to estimate the value of the genetic lag associated with maintaining sows for additional parities. Number born alive (NBA), 21 day litter weight (W21), and days to market (D113) were the traits examined in this study. The genetic improvement per generation (economic values assigned) for these traits were 0.3 pigs ($22.00/pig), 1.36 kg ($1.54/kg), and 3.0 days ($0.17/day), respectively. The value of the genetic lag represents lost opportunity and when this value exceeds the gilt development variable costs, it represents the optimal time for culling the sow from the breeding herd and replacing it with a gilt.

Introduction

Genetic lag is the time required for genetic merit or improvement to pass from its source, the nucleus through the multiplication level, to the commercial level of production and it is usually measured in years. Genetic lag is driven by the generation interval. While reducing the generation interval is desirable at the nucleus level of production in order to increase the rate of genetic progress, reducing generation interval at the commercial level of production results in unnecessarily high replacement rates and reduced profitability. If replacement occurs in the early parities, it is unlikely that enough time has passed for sufficient genetic improvement to occur in order for a replacement gilt to be genetically superior to the sow she is replacing. Additionally, early culling and replacement for commercial breeding herds negatively impacts profitability because the sow has not remained in the herd long enough to produce a sufficient number of weaned pigs for the initial gilt investment to be profitable.

Materials and Methods

An Excel spreadsheet was developed to determine the optimal parity for a sow to be replaced in the breeding herd taking into consideration generation interval of the seedstock supplier as well as the genetic progress for economically important maternal traits.

The sow's generation interval age was calculated as follows: Age at each parity / Generation Interval (an assumed value). The genetic lag was determined by multiplying the assumed genetic improvement per generation by the sow's age in generation units. To estimate the average value of genetic lag (in dollars) per sow in the herd at each parity the genetic lag for each of the traits involved in the study was multiplied by the economic value associated with each trait and then these values were summed together.

Results and Discussion

The findings support that it is not profitable to replace sows in the breeding herd at rates currently employed if the goal is solely to replace sows in order to keep up with genetic improvement that is occurring at the nucleus and multiplication levels of the genetic system used by the genetic supplier.

Table 1 shows the value of the difference in genetic potential between sows in the herd and a potential replacement gilt by parity and generation interval. Based on the data in Table 1, it can be recommended that sows should be voluntarily culled only when the average value of the genetic loss of the sows in the herd is sufficient to justify the purchase/development of a new gilt. Sows should be allowed to stay in the breeding herd as long as they are still producing satisfactorily based on number born alive and growth rate of the pigs.

Table 1. Value of the difference in genetic potential between sows in the herd and a potential replacement gilt by parity and generation interval.[1]

	Generation Interval at the Seedstock Level			
Parity	1.5	2.0	2.5	3.0
3	$25.67	$19.25	$15.40	$12.84
4	$36.32	$27.24	$21.79	$18.16
5	$48.27	$36.20	$28.96	$24.13
6	$61.33	$46.00	$36.80	$30.67
7	$75.32	$56.49	$45.19	$37.66

[1] Economic values assumed: \$22.00 pig born alive^{-1}, \$1.54 kg^{-1} 21-day litter weight, \$0.17 day to market^{-1}, Genetic Improvement per generation assumed: 0.3 pigs born alive, 1.36 kg of W21, and 3.0 D113.