Project Number & Title: 2B-104: DEVELOPMENT OF PRACTICAL STRATEGIES TO CONSIDER ENVIRONMENTAL SENSITIVITY, SURVIVAL AND PRODUCTIVITY IN PIG BREEDING PROGRAMS

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Aims and Objectives: a) better definition of environments for genetic analyses, b) development of genetic models for evaluation of genotype by environment interactions, c) evaluation of selection strategies, and d) fostering adoption of results

Key Findings:

Providing the best environment possible to pigs is the first priority. The methodology developed in this project can be used to describe fluctuations in environmental conditions over time using information readily available on farms. The models can take systematic changes in husbandry practices into account and provide alternative avenues to consider information about multiple traits in an overall environmental index. Information about growth and feed intake was most informative for describing environmental conditions and for estimating genotype by environment interactions.

Variation in estimates of environmental variables based on backfat, muscle depth and feed intake generated economic differences of $17 per pig. Farmers should improve environmental conditions on farms to improve health, welfare and productivity of pigs.

Multiple genetic models were developed for evaluation of genotype by environment interaction. Sire by environment interaction models and multi-trait models provide simple methodology that can be used to evaluate the extent of genotype by environment interaction. This can be extended to evaluation of response of selection lines, or sire lines using random regression models, and allows appropriate selection of sires so that their progeny are allocated to the environments best suited to them.

The more efficient selection line (line with low residual feed intake) was less sensitive to environmental changes than the less efficient line. This favourable association reveals good opportunities for genetic improvement of both robustness and efficiency.

Sensitivity analyses demonstrated the importance of accurate genetic correlations, in particular for traits with less information and for trait combinations with unfavourable associations. Genetic parameters should be updated regularly in breeding programs.

Post-weaning survival was the most important trait in the breeding objective based on the genetic standard deviations of breeding objective traits. Results indicated that it would take about 12 generations to improve post-weaning survival by one percent because information for this trait is limited at selection. The use of genomic information to boost genetic improvement of post-weaning survival should be explored.

Application to Industry:

Genetic improvement of robustness and health remains challenging. The genetic models developed in this study can be applied to alternative traits, and can be adjusted easily for systematic effects on an individual-farm basis. These innovations can be applied in breeding programs that have large data sets, preferably from multiple farms, with appropriate data structure available.

More weight measurements should be collected on farms, including sow mature weight which is an important trait in the breeding objective, because growth is regarded as a health indicator, it was most informative in describing environmental conditions and genotype by environment interactions were found for growth in multiple herds.