2B-102: Development of economic methodology to incorporate robustness in pig breeding programs

Project Collaborators –Susanne Hermesch, Cameron Ludemann and Peter Amer

Background

Improving robustness is based on improving health and survival of pigs as well as reducing environmental sensitivity and variability in performance. Selection for improved robustness requires economic values for additional traits describing aspects of robustness. Further, new methodology is required to quantify the economic importance of environmental sensitivity and variability in performance of pigs within batches.

Methodology

Concepts and methodology to quantify economic importance of environmental sensitivity and batch variability were presented in this Project. Further, a user-friendly tool was developed to derive economic values for a wider range of traits including various traits describing survival of piglets, growing pigs and sows.

Key Findings/Conclusions

The economic importance of environmental sensitivity depends on the position of the selection environment relative to the environment of commercial pigs. Less environmental sensitivity is economically advantageous if selection occurs in a superior environment. In contrast, more environmental sensitivity is economically beneficial when selection takes place in an inferior environment. The magnitudes of economic values for environmental sensitivity depend on the difference between selection versus commercial environments as well as non-linearity of profit along the environmental trajectory.

The primary determinant of the economic impact of batch variability was the opportunity cost of delaying termination date of a batch of pigs in order to minimise the number of underweight pigs at termination. The nature of the price penalties applied for underweight carcases was also found to be important, although not as influential as might have been expected. Further refinements to economic values of traits that can influence batch variability will be possible, once this batch variability model has been calibrated using industry data and consultation.

A spreadsheet, called PigEV, has been developed to compute economic values for a wider range of traits including a number of maternal and survival traits that so far have not had economic values derived for them in Australia. The sow component of the model uses equations to define the economic values of number of piglets born alive, piglet survival, age at puberty, sow mature weight and sow longevity. Further, economic values were presented for the genes of the sow affecting growth of the progeny. The finishing model estimates economic values for average daily gain, feed conversion ratio (or daily feed intake) and carcase fat depth at P2. The models above are combined to construct a terminal line and a maternal line index. The terminal line index uses only traits relevant for the growing pig. The maternal line index accounts for the fact that sows contribute to profitability through expression of their own maternal traits and their direct genetic effects on growing pigs as they contribute half of the genes to slaughter pigs.

Potential Users of Information

The tool PigEV allows users to define breeding objectives in pigs using their own input parameters in regard to cost structures, performance and marketing information. Further this tool can be used to evaluate the economic consequences of alternative management practices. Therefore, it may be used by producers to evaluate the economic feasibility of introducing a new technology.

Methodology was developed to evaluate economic importance of environmental sensitivity and batch variability. This part is more theoretical as new concepts had to be developed. Further information is required from industry to evaluate this new framework for specific industry situations and to identify factors affecting the economic importance of reduced environmental sensitivity and lower batch variability.