



InnovatE

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In this issue...

Feature Article

Summary of papers presented at the AGBU Pig Genetics Workshop held 22-23 October 2008

Please note:

It is possible to present some of these papers via phone seminars to a wider audience.

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AGBU Pig Genetics Workshop

*by Dr Susanne Hermesch, Animal Genetics and Breeding Unit (AGBU)
a joint venture by NSW DPI and University of New England*

This workshop was delivered as part of APL Project No 2133.

Australian breeders and producers as well as a number of international visitors attended the AGBU Pig Genetics Workshop held in Armidale on the 22nd and 23rd of October 2008. This biennial workshop provides a forum for industry and researchers to discuss the latest research findings in pig genetics and improvement of pig performance.

This edition of InnovatE provides a brief overview of the papers presented. Full papers from this workshop, along with papers from the previous ten workshops, are available on the web at: <http://agbu.une.edu.au/pigs/pigblup/work.php>

Feed intake of sows during lactation has genetic relationships with growth and lifetime performance of sows

Susanne Hermesch, Rob Jones and Kim Bunter, AGBU

Genetic analyses showed that lactation feed intake and 5-day measures of feed intake are heritable traits and will respond to selection. Feed intake during lactation had no significant genetic relationships with litter size, average piglet weight at birth, still born, pre-weaning mortalities or number weaned. However, the direction of the moderate genetic correlations was favourable for average piglet weight at birth, still born and number weaned. Lactation feed intake had very high genetic correlations with traits describing lifetime performance of sows. A number of reproductive traits contribute to good lifetime performance of sows and lactation feed intake may be a selection criterion for sow longevity that captures the joint contributions of reproductive traits of the sow towards improved lifetime performance.

Sow body composition and its associations with reproductive and litter growth performance of the primiparous sow

Kim Bunter, Rob Smits, Brian Luxford and Susanne Hermesch, QAF Meat Industries and AGBU

Results to date show that there are no strong antagonistic genetic correlations between sow body size or condition, lactation feed intake and litter size. Genetic correlations indicate that sows that produce heavy piglets at birth will have higher litter gains and lose more body weight, which for some sows can be (partially) offset by higher intake during lactation. However, gestating litter size is associated with altered body composition of primiparous sows prior to farrowing, with consequences for longevity, supporting the importance of pregnancy feeding to adequately meet the sows' needs in the first parity.

Key message:

Lactation feed intake may be a selection criterion for sow longevity that captures the joint contributions of reproductive traits of the sow towards improved lifetime performance.

Sows vary considerably in how they transit between the time points of mating and farrowing, or farrowing and rebreeding. Healthy sows are able to adapt their lactation feed intake to some extent according to their own body condition at farrowing and to the demands of the litter which they nurse. However, this adaptability is small relative to energetic requirements and may be of less benefit for gilts compared to multiparous sows, which have a higher intake capacity generally. Finally, aspects of sow health are implicated in culling following the first parity, and in addition to the direct effects of feed intake on sow body composition at weaning. Reductions in feed intake are potentially an indirect indicator of problems in sow health. Further research into achieving the best farrowing outcomes and treatment in first parity is implicated for improving sow longevity.

Variation and trends for weight of individual carcass cuts

Isabelle Mérour and Susanne Hermes, IFIP and AGBU

The value of a pig carcass is determined by its weight, fatness level and muscularity but there are differences between genotypes in the weight of the loin, back leg, belly and shoulder. The results of this study show that selection on backfat and muscle depth in addition to estimated lean meat content does not improve conformation in the whole carcass.

The variation in saleable meat yield, defined as the weight of each primal cut multiplied with its respective price, was determined for carcasses with a fixed carcass weight and backfat depth. The difference between average carcasses and carcasses in the top 10% was approximately \$7 at the producers' level and \$21 at the retail/wholesale level. Carcass characteristics are moderate to highly heritable and it is possible to select for weight of valuable primal cuts. The development of new carcass measurement technologies will provide measures of the weight of primal cuts, which will benefit pig breeding programs if it is possible to incorporate this information into selection decisions.

Selection for carcass composition and meat quality in the national pig breeding program in France

Isabelle Mérour, French Institute for Pig and Pork Industry (IFIP), Rennes, France.

With 25 million slaughter pigs each year, France is one of the leading pig producers in the world. The French Institute for Pig and Pork Industry (IFIP) provides advice to pig farmers on general farming aspects, genetic improvement, economics and meat quality. The pig breeding department of IFIP is responsible for coordination of the national database, genetic evaluations, monitoring of test stations, preservation of local breeds and genomic research. Selection for carcass composition and meat quality is based on information collected on-farm and in central test stations. A wide range of traits are recorded enabling effective selection for lean meat percentage while maintaining meat quality.

Group characteristics influence the performance of individual commercially raised pigs

Rob Jones and Susanne Hermes, AGBU

These first analyses showed that average daily gain of pigs can be increased by understanding and manipulating group characteristics. These were, in order of importance, the proportion of males within a group, the proportion of Durocs within a group, the size of the group dependant upon the growing season and the mean flight time of the group. With the exception of group flight time these group characteristics can be manipulated through management decisions. Flight time can be manipulated over generations as this has been shown to be a

Key message:

Saleable meat yield differed by \$7 at the producers' level and \$21 at the retail/wholesale level between average carcasses and the top 10% of carcasses that had the same weight and backfat depth.

Key message:

Group characteristics, including proportion of males within a group, proportion of Durocs within a group, size of the group dependant upon the growing season, and the mean flight time of the group, can influence the performance of individual commercially raised pigs.

heritable trait. Overall group characteristics were of a higher importance for average daily gain than for back fat. Often group size and pen information is not routinely recorded on farm and breeders should be recording this information as it appears to be an important aspect of individual animal performance and can be used in future studies to enable further genetic progress.

Genetic selection on number of teats

Danye Marois and Mélanie Larochelle, Génétiporc, Québec, Canada

The number of functional teats influences sow productivity. Sows must have a high number of functional teats to accommodate the increase in litter size achieved by selection. Different kinds of teats including functional, inverted and supernumary or extra teats were described. The authors outlined how genetic gains are possible for total number of teats and number of functional teats since sufficient genetic variation exists for these traits. In contrast, the number of inverted and extra teats for genetic improvement has been found not to be useful.

One approach to improve the general quality of teats is selection based on the number of good teats and to avoid the selection of sows or boars which have inverted or extra teats. Genetic improvement of teat number was demonstrated using data from a commercial maternal line.

PIGBLUP V6.00

Tony Henzell, AGBU

The analytical capacities of PIGBLUP have been significantly enhanced since the previous version with the expansion of traits available for analyses. It is now possible to analyse 31 production, carcass and meat quality traits in one multi-trait genetic evaluation. These traits are defined as generic traits providing users with greater flexibility in setting up their specific genetic evaluations.

The PIGBLUP software package includes a number of additional programs that are used for data preparation (FileMerger), data checking (PigCheck), migrating of settings from old versions to new versions (Migrate) and scheduling of PIGBLUP analyses (PigSched). All of these programs have been further updated and developed.

Adoption of further traits to increase genetic gain in the \$Index

Susanne Hermes, AGBU

Australian pig breeders have set themselves a high target of annual genetic gain. This paper outlines factors that affect the economic importance of performance traits and highlights selection strategies to increase genetic gain in the breeding objective or \$Index. The \$Index is the basis of selection and combines all economically important traits into one index value expressed in monetary units. The relative economic importance of individual traits was compared.

For example, higher feed prices will place more economic emphasis on feed conversion ratio. The successful selection for higher litter size has placed higher importance on pre-weaning survival. In addition, low backfat levels have decreased the economic importance of this trait and alternative measures of carcass value should be explored. Selection strategies for feed conversion ratio, pre-weaning survival, sow longevity and carcass traits are outlined to address this shift in selection emphasis for individual traits.

Key message:

Pigs account for just 1.6% of Australia's agricultural greenhouse gas emissions, compared with 70% for cattle and 22% for sheep.

Genomic selection - potential for pig breeding

Brian Kinghorn, University of New England

Genomic selection aims to predict genetic merit of individuals as a function of all the marker information available from SNP chips (Single Nucleotide Polymorphisms) with 50,000 or more candidate markers. Genomic selection is highly fashionable right now. There is special interest in the dairy industry, driven largely by the prospect of evaluating bulls quite accurately without the need for a progeny test. The impact on pig breeding is unlikely to be so dramatic, and yet if genomic selection proves to be as reliable as it is hoped, we should be able to select among young animals on traits such as performance under commercial conditions, meat quality and sow longevity. However, the investment required to achieve this will be high, especially for difficult and lowly heritable traits. The need for large quality datasets and strong financial resources may restrict activity to large companies and cooperative efforts.

Science delivery and cost in the pig industry - the British experience

Rex Walters, Livestock Genetics Ltd, UK

Of all the meat available, pig meat is the most highly consumed meat in the world today with 14.6 kg per person in 2000 (FAO, 2007). Production of pork (100%) per unit of cereal-producing land is more efficient than intensive feedlot beef (184%) and fat lamb (221%). Genetics is the first limiting factor in productivity, and the size of genetic improvements achieved over the last four decades can be judged by changes in performance at the commercial level. Examples were provided demonstrating that cost of pork production and its environmental footprint have been significantly reduced.

When pigs fly; what does it mean?

Rob Jones and Susanne Hermes, AGBU

Retrieving information from commercial abattoirs about individual pigs for pig breeding programs is difficult and often not possible. Therefore, traits recorded on farm that are genetically associated with meat quality are of particular interest to pig breeders. An example is the temperament characteristic flight time which is defined as the time to cover a set distance when exiting a form of restraint. Flight time has genetic associations with tenderness in beef and has been incorporated in the Australian genetic evaluation system BREEDPLAN used in the beef industry. This paper outlines the genetic background of flight time and its genetic associations with growth rate and backfat.

Future global sustainability and responsibility - what role for pig genetics?

Rex Walters, Livestock Genetics Ltd, UK

There is increasing interest and debate over environmental issues such as climate change, sustainability and global responsibility. A range of reviews were summarised outlining the impact of agriculture on greenhouse emissions. It is interesting to note that pigs account for just 1.6% of Australia's agricultural emissions, compared with 70% for cattle and 22% for sheep. Further, there have been significant reductions in various greenhouse gas emissions in pigs and poultry but this has not been achieved in beef or sheep. The annual reduction in global warming potential resulting from genetic improvement was outlined.

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