FUTURE SELECTION STRATEGIES FOR THE PIG INDUSTRY

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NATIONAL PIG FAIR FARMSTOCK AWARD 1994
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INTRODUCTION

The aim of this paper is to discuss issues which I believe will become of increasing importance in the future. The areas of conformation, sow productivity, meat quality and breeding technology will be discussed, reviewing many of the ideas and concepts which I was confronted with whilst on the study tour.

DISCUSSION

Conformation

As a breeder one of the areas of most significance in the next ten years will be the conformation of animals, particularly of the feet and legs. In the pursuit of meat content, quality and prolificacy we must not forget the importance of the conformation of animals. Structural soundness will produce results in all areas of production from reduced overlays in the farrowing crate to better litter size as a result of more quality matings.

Conformation is also a welfare issue. A well conformed animal in an intensive system is better able to cope with the rigours and expectation of life. It would appear from the early results of the PRDC's Sow Save project that lameness is a major contributor to the culling rate in our national herd. If we breed animals which have better foot and leg conformation, it is possible that the rate of unplanned culling may be able to be significantly reduced. With increasing pressures being bought to bear on our industry from external sources every move in the improvement of animal welfare is essential.

Sow productivity

Sow productivity will be a further area which will be of increasing importance in the next ten years. The traits of numbers born alive, weaning weight, non productive sow days, farrowing ease and sow longevity are the ones of primary importance to sow productivity.

Why should a sow be culled after six litters? Traditionally it has been that the reduction in litter size in later parities means culling sows at six litters was good practice but not enough sows are reaching the sixth parity. In breeding for productive longevity conformation is one issue to be addressed. In order for a breeding herd to keep up the rate of genetic gain, rapid generation turnover is essential but by doing this we have been unable to identify those animal within the population who are capable of producing eight litters and weaning eighty piglets. Due to the difficulty in assessing longevity in a breeding goal it is often precluded.

The introduction of Chinese breeds, such as the Meishan, will have a great effect on increasing litter size but the carcase problems that are associated with the introduction of such genetic material into a commercially viable product are substantial. In the UK, NPD are the only company who have successfully produced a Meishan derived gilt which has a litter size of three pigs per litter greater than their standard

gilt lines (Hoste, Pers com). The Meishan crossed to a western female line will also exhibit a higher degree of heterosis (Mercer & Hoste, 1994). There are significant productivity advantages to using the Chinese breeds but there are also significant disadvantages to carcase quantity due to the high fat content of the Chinese breeds.

The need to select for the "female traits" will see a definite divide develop between maternal and terminal sire lines in Australia in the future.

Meat quality

Meat quality is going to be a major future direction for pig breeding and genetics in Australia but there is currently little financial reward for breeders to breed for quality traits. The halothane gene status and intramuscular fat levels are probably the two issues which are easiest to effect genetically although pH fall post slaughter is influenced by breed effect and does affect the eating quality of pig meat (Wood, 1993). Muscle fat separation may also need to be addressed as we continue to breed pigs to be leaner.

The major area of breeding for meat quality in the few years will be the removal of the positive and carrier halothane genotypes from the breeding herd. If 30% of pork produced in Australia is pale soft and exudative (Trout et al., 1991), the amount of drip loss is going to be unacceptable to processors and the final product unattractive to consumers. The removal of halothane positive animals from the national herd will significantly reduce the level of PSE exhibited from genetic effects. Carrier animals of the gene have also been shown to exhibit two tone eye muscles which produces an undesirable product for the consumer. Commercial advantages for producing a carrier animal in the slaughter generation are of the order of $3.50 per pig produced (Luxofrd, Pers com) however.

The halothane gene is closely associated with genes controlling carcase composition and muscle thickness (Wood, 1993). By removing the halothane carriers and positives we will produce an animal that has a lower yield in the short term but with improved carcase quality due to lower levels of PSE and two tone colouring exhibited.

Intramuscular fat levels is the other area which is easily controlled genetically. Higher levels of intramuscular fat significantly improve the eating quality of pig meat. The Duroc breed seems to exhibit a much higher level of intramuscular fat as well as a higher proportion of red oxidative muscle fibres. It is quite well established that the Duroc breed exhibits much higher juiciness and tenderness than the white breeds (Wood, 1994). Intramuscular fat also has a heritability of 0.5-0.6 so to select for it if a valid and viable in vivo test can be developed ought to be of value in improving the eating quality of meat.

Until such time as processors introduce a quality component into their payment schedules little work will be done towards the breeding of meat quality traits as they are invariably difficult and expensive to measure. Without commercial rewards for breeding for quality traits little result will be seen particularly given the commercial advantages to the commercial grower for producing halothane gene carrier animals.

Breeding technologies

The advancement of breeding technology will probably be the area in which we will see the greatest advances in breeding and genetics in the next ten years. The use of AI, gene markers for commercially significant traits, the pigMAP project and a national cross herd evaluation using BLUP technologies are all going to significantly effect the way we practise breeding.

The use of AI as means of gene transfer and herd improvement will increase in use from its current levels of 3-4%. There is a need for more high quality information on the boars available for commercial AI in Australia. A system well worth examining is the Top Genetik programme run by the AI centre at Ascheberg in Germany. Progeny of AI boars are tested in the production environments in which they will be performing and information collected at the abattoirs using electronic chip identification. This information is then returned to the AI company who are able to identify the top performing animals but having removed genotype environment reactions can produce much more accurate estimated breeding values for carcase quality and quantity (Brandt, Pers com). Semen in Australia is currently too expensive, disease risks too low and not enough high quality boars are on offer to make high levels of semen usage a practical reality.

A national cross herd evaluation scheme using BLUP technology will also alter the way we look at breeding as each individual producer and breeder will be able to identify boars and seed stock suppliers who are trait leaders. The identification of herds which are trait leaders will enable breeders to better utilise the genetic resources available within Australia. It is, incidentally, a massive marketing tool for the companies which happen to come out on top.

The development of the pigMAP project and marker assisted selection will dramatically change the way we look at breeding in the future. The development of Toronto's halothane gene test has already begun to show how quickly the identification of halothane gene status can effect our breeding programme. Marker assisted selection will affect the timing, intensity and accuracy of selection. Markers which identify quantitative trait loci however need to be identified on a within family basis (van Arendonk et al., 1994), the upshot of this is that the technology is expensive which may exclude some smaller breeding groups from accessing the technology.

CONCLUSIONS

Conformation will continue to be an issue of utmost importance in the future of breeding and should not be sacrificed in the rush for growth, lean, litter size and quality. Of the sow productivity issues I believe that longevity and the introduction of Chinese pigs will be the most interesting. In terms of meat quality the eradication of the halothane carriers and homozygotes will be the best option, little more will be done until such time as there are more financial rewards. In the fields of breeding technology we are going to be faced with massive changes in the next ten years, particularly with pigMAP and marker assisted selection.

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