Continuing the domestication of the pig. Who pays?

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KEYPOINTS: Genetic improvement methods in pigs are moving beyond the measurement of growth rate and backfat in response to more sophisticated demands by consumers of pork products and the ever present need of the producer to reduce costs. Methods of measuring new traits and incorporating them in pig improvement programs are expensive. Who will pay for the research and development costs of including these traits in a program? A case is made for continuing public support for R&D for the Australian pig breeding industry.

The process of domesticating the pig or adapting it to man's needs has continued for thousands of years. For the past 60 years the science of quantitative genetics has speeded up this process. The way this was done in western countries is typified by the history of DPI's assistance to pig breeders over the past 40 years.

Initially DPI helped pig producers with low cost genetic improvement programs **on farm** using liveweights and backfats at turnoff. These traits can be cheaply measured on a large number of animals before they reach breeding age and are highly heritable. Economic gains, mainly from reduced food costs and increased carcase values can compound at about 3% per year. Most of the costs incurred in this on-farm testing were borne by the farmer, DPI providing technical assistance when needed. Further assistance was given to seedstock breeders by performance testing their boars in a **central station**. This allowed breeders, at a payment, to compare their boars with those from other herds in a common testing environment but was seen as a health risk although this, in fact, was never a problem in the 25 years of the station's operation.

Station testing led to the establishment and supply of performance tested boars to a pig **artificial insemination service**. It also gave rise to a service for testing breeding stock for the **stress (halothane) gene**. These services did not meet the level of cost recovery required by DPI so have all now been handed to the private sector. Expertise in pig genetics and the availability of old piggeries on DPI research stations facilitated a research program in pig genetics aimed specifically at developing high lean growth strains in challenging environments. For example, the good and bad aspects of the stress gene were investigated in a specialised herd developed with some PRDC support. The gene was found to reduce fat but this advantage was outweighed by negative effects on growth, survival and meat quality. The herd was also used to develop the molecular and **DNA tests** for the stress gene and by medical scientists as a model for a stress condition in humans. More recent research work found that **restricted feeding** during performance testing was better than *ad libitum* feeding for identifying breeding stock whose descendants perform well on a range of feeding levels and are less prone to the stresses incurred between farm and slaughter, particularly under conditions of high temperature. This work was partly supported by the Australian Centre for International Agricultural Research because of its relevance for Vietnam.

As optimum levels of fat are approached, the pig breeders' attention has turned increasingly toward improving **reproductive** performance. Unlike growth rate and fat, reproduction traits (e.g. litter size) are lowly heritable and effective selection for these traits is difficult. Most of the improvement to date has come from the replacement of coloured by white breeds and from the introduction of breed crossing systems to impart hybrid vigour mainly to the sow. The advent of computers and programs such as **Pigblup**, developed by AGBU in Armidale, have made it easier to

select for reproduction but require a quantum leap in the amount and accuracy of record keeping. This has mostly been adopted by specialised breeders who can recoup the extra costs incurred through the sale of breeding stock. Pigblup helps producers select their replacement breeders for growth rate, fat and litter size from within their own herds. With PRDC support, DPI developed computer software which enables breeders to compare their home bred stock with those of other breeders, provided the herds are genetically linked. This **genetic linkage** is achieved mainly through the use of the same AI sires by all the cooperating herds. DPI has also developed a facility by which farmers can access a central computer at any time by phone to compare the breeding values of their stock with those of stock in other linked herds. Since the early 90s this scheme has reduced fat by 2 mm, increased pigs born by 0.5 per litter and liveweight gain by 0.3 kg per week.

The foregoing outlines the main aspects of DPI's assistance to pig breeders to date by way of service and research projects. What of the future? Will the public(industry/state) continue to assist pig breeders with their genetic improvement programs? How much of this role will be taken over by the private sector? Most western countries appear intent on maintaining some public assistance for genetic research. However, to varying degrees, servicing breeding programs is left increasingly to the private sector. In Europe this replacement of public by private involvement in pig breeding is most advanced in the UK and least in Scandinavian countries. The coexistence of both sectors appears stable in countries such as France and Denmark.

New challenges are emerging for pig breeders. This is in response to more sophisticated demands by consumers of pork products and the ever present need of producers to reduce costs. Traits of emerging concern include lean quality, behaviour, disease resistance, feed wastage, adaptation and fat distribution. Is the public prepared to pay for the development costs of incorporating these traits in future pig genotypes? It seems most likely that this responsibility will be placed more and more on the shoulders of the private sector. A sign that this is happening is the **internationalisation** of breeding programs in most livestock species. This has advantages and disadvantages for both the producer and the consumer. Poultry breeding has advanced furthest down this road. It is evident pig breeding is following a similar trend although much slower. Advantages given for increased internationalisation include:

- Increasing the number of customers to offset high R&D costs
- Making use of genetic resources in different countries

Challenges posed by internationalisation include:

- Supplying a range of genotypes and breeding systems to cater for a wider range of demand niches. (tastes, climates, economies)
- Paying attention to traits of ill defined or possible future importance. e.g. behaviour, disease resistance, product quality.
- Maintaining genetically diverse stocks for the future
- Conducting research programs on genetic improvement techniques. e.g molecular markers.
- Securing ownership of genotypes to protect investment in genetic improvement programs
- Persuading buyers of breeding stock that price premiums to cover R&D costs will translate into higher monetary returns.

Curbs on the introduction of pig genetic material into Australia by the very necessary **quarantine** restrictions considerably reduce the advantages of internationalisation to us.This strengthens the need for continuing public support here for R&D for our pig breeding industry.

Keywords: Evolving pig genetic improvement technology