

Possible principles for breed association models in the genomics era, with reference to beef cattle and sheep breeds

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Abstract

Beef cattle and sheep breeding in some countries is characterised by important roles for breed associations or societies, including delivery of multi-trait genetic evaluations. In parallel, research and development is typically predominantly funded by the public sector and/or the whole of industry. The breeding sector is therefore providing a genetic improvement service to the rest of industry, while engaging in competition for market share both between and within breeds.

The basis on which inputs to genetic improvement are funded can vary, but typically involves some investment by breeders themselves, usually to cover costs of providing database and data analysis services. In such situations, there is considerable scope for very low relationship between investment and return, at the individual breeder, the breed or the industry level.

This potential misalignment can be exacerbated in the genomics era, in which it is possible to completely decouple investment in performance recording from obtaining estimated breeding values (EBVs) and other genetic information, and from genetic improvement. At the same time, “genomics” offers scope for almost unlimited increase in scale in multiplication and hence harvesting of value.

These developments create conditions in which it is appropriate to consider carefully the nature of breeds and how they self-organise, with issues including:

- Should all input services (such as access to database and evaluation) be provided on a cost-recovery or cost-plus basis, or
- Should value-creation models be considered, where the value of data contributed, and the use to which EBVs are put, be recognised and in some way rewarded
- If it is possible to apply some form of value-creation model, what governance would be needed, and who across an industry and community could or should contribute?

The perspective of this paper is that genetic improvement, and contribution to generating and delivering it, are – at least in multi-enterprise industries – quite particular economic goods, and further, that current models of organisation and of technology delivery are poorly aligned with the overall goal of maximising genetic progress. In very general terms, this is usually described as market failure, but this avoids the mental effort of diagnosing accurately what contributes to value and examining whether value-creation is prioritised.

Increasingly, genetic improvement in multi-agent organisations and industries will need to accommodate more nuanced thinking about externalities both within the breeding sector, and through the value chain, and whether and how to apply learnings from the literature on club or merit goods. Failure to do so will almost certainly lead to under-performance in terms of rate of genetic progress, likely coupled with hollowing-out of breed associations and loss of potentially valuable variation in decision-making.

There is real scope to evolve to new models of organisation and collaboration in this space, but very real changes in the “rules of engagement” in breed associations will be essential. This paper identifies some of the key challenges, and offers possible principles and approaches to addressing them.

Keywords: breeds, genetic progress, organisational models, genomics era