Developing a Genomics Testing Strategy for Your Herd

Angus seedstock breeders across Australia now have access to the latest generation of breeding and genetic technology, genomics, with increasing numbers of Angus animals being genomically tested each year.

When combined with pedigree and performance information, genomic information adds an additional source of information for the calculation of the TransTasman Angus Cattle Evaluation (TACE) Estimated Breeding Values (EBVs), enabling the generation of EBVs with additional accuracy, and ultimately enabling more accurate selection decisions to be made.

Genomic testing is a considerable expense and any investment in testing seedstock animals needs to be carefully evaluated to maximise the benefits that are obtained.

Consideration 1: When will DNA Samples be Collected?

DNA samples for genomic testing can be collected on animals of any age, and so should be undertaken at a time that best fits in with other normal, routine management practices.

Ideally, having genomic information incorperated into the generation of EBVs, the verification of parentage and establishing genetic condition status is incredibly valuable at a young age. By utilising genomic information earlier, when an animal has very little other information collected on it, EBV accuracy can be bolstered and selection decisions can be made with confidence, earlier.

Irrespective of whether genomic testing is to be conducted, a good strategy is to collect hair or tissue samples using a Tissue Sampling Unit (TSU) on all calves at a young age (e.g. weaning) and store the samples for possible testing at a later date. To best preserve the sample, hair samples should be placed in either a box or an envelope, clearly identified, and stored in a dry, dark environment.

If collecting hair samples, collection should not be done on very young calves (e.g. at birth). Hair samples must have clearly visible follicles before they are suitable for testing, which usually occurs from 3 – 4 months of age onwards however, tissue samples collected using a Tissue Sampling Unit (TSU) can be collected from as early as birth.

Consideration 2: What DNA Samples will be Collected?

Tail hairs, semen straws, or tissue samples can be accepted by Angus Australia for genomic testing, with tail hairs being most commonly utilised.

When considering which sample type will be collected, it is important to consider that additional fees may apply depending on the sample type to cover the additional expenses associated with DNA extraction and storage.

Consideration 3: Which Genomic Product will be Utilised?

TACE currently incorporates genomic information from two different genomic products, being the HD50K product offered by Zoetis Animal Genetics, and the AngusGS product offered by Neogen Australia.

Both HD50K and AngusGS genotype results are standardised through a process called imputation to offer comparable results, however there can be pricing and turn-around time differences between the two companies. For current information please see the Angus Australia website or contact staff at Angus Australia.

Currently, all genotyping products available to Angus members are of a density of approximately 60-70K SNPs. Due to the standardisation proccess of imputing, the higher SNP densities of this range currently offer no known advantage for genetic evaluation through TACE.

Consideration 4: What Animals will be Tested?

In contrast to performance information, there is no requirement to collect DNA samples for all animals in a contemporary group.

Testing can consequently be conducted as many or few animals as desired, depending on the objective. Common testing strategies include:

- testing an individual animal
- strategically testing a group of animals of specific interest, for example candidate bulls for use in a breeding program
- testing an entire calf drop
- testing high value/impact animals, such a donor cows
- testing each cohort of replacement heifers, eventually resulting in a fully genomically tested female herd

When making a decision as to what animals will be tested, it is important to consider the incorporation of genomic information is of more value when an animal's existing EBV has low accuracy.

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For example:

- When an animal is very young
- For traits that are hard to measure, or traits that cannot be measured prior to an animal entering the breeding herd
- For traits that have a low heritability
- In situations where collecting effective performance information is problematic, such as in small herds, or when an animal has been removed from its contemporary group
- In situations where little information is recorded with TACE for the animal, such as recently imported overseas sires

It is also important to be mindful that genomic information is of limited value if the animals being tested are not related to the animals that were used to develop the genomic product. For this reason, the genomic testing should only be conducted on black Angus animals (or Red Angus animals with at least one black Angus parent).

Consideration 5: Cost of Testing

The cost of testing with each different genomic product differs, depending on the product being utilised.

Information regarding the cost of testing with each different genomic product is available from the Angus Australia website.

When considering cost, it is important to consider that genomic testing does include several benefits that are additional to the calculation of EBVs with increased accuracy, such as parentage verification (when candidate parents have also been genomically tested), and the ability to add-on testing for genetic conditions at a lower cost.

Consideration 6: Obtaining Advice

Optimal utilisation of genomic technology will vary with each individual seedstock enterprise.

In addition to being a considerable investment, utilisation of genomic testing should be considered in association with other components of the seedstock breeding program, including the performance recording program being undertaken, and the use of reproductive technologies.