Genetic Improvement refresher for vets

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Breeding plans are likely to remain the focus of breeding companies. For vets who want a high-level refresher of how to assist farmers with their breeding plan to make faster genetic gain in their Herd Improvement Strategy please see the following.

Using the best paternal genetics available (genomically tested) is the fastest way for genetic gain which is generally under the control of breeding companies and industry. Farmers can focus on taking replacements from top performing females to make faster genetic gain in the national herd, and ensure replacements are not kept from lower production animals. By concentrating on breeding the best cows, faster we get significantly more production from the same or fewer animals and will have less incidence of disease, better reproductive performance, have more days in milk and need fewer replacements improving profitability and reducing on-farm emissions intensity.

Genetic Improvement

- Once a farmer has defined their breeding goals (see later), to make genetic improvement they need to choose which animals they want to be parents of the next generation.

Data can come from

- Data about the animal e.g. herd test or genomic DNA data
- Data from its relatives

There are multiple metrics that can be used to identify the “best animals” including

- Industry defined breeding worth (BW)
- Specific traits as estimated by as estimated breeding value (eBV) e.g. for confirmation

The accuracy of heritability as a tool for genetic selection of KgMS and Kg LWT can be influenced through feeding and having accurate live weight data, so this is not recommended as a metric to select replacements on.

BW should be used as the guide to select the source of replacements. Expressed production (KgMS) is a combination of genetic (BW) and environmental effects (e.g. calving date, social hierarchy and age). Environmental effects are not heritable. In contrast many of the environmental effects are repetitive (e.g. late calving cows) making production or PW a good metric for culling decisions.

Breeding Company generated Quartile Reports

For herds undertaking at least 3 herd tests per year breeding companies are offering quartile reports where the herd is divided into the top, middle two and lower performers based on a variety of metrics. The stratification on BW can be used to identify high BW cows to be used to breed replacements from, while PW, KgMS and KgMS/Kg Lwt can be used to identify low performers for culling.

2023 data showed that efficiency as measured by KgMS/Kg LWT can vary by 42% between the top quartile and bottom quartile animals in the national herd (from 580,000 animals), being 1.04 KgMS/ Kg Lwt versus 0.73 KgMS/ Kg Lwt a difference of 310gm/ Kg Lwt.

Similarly, productivity (KgMS/ cow) varied significantly between the upper and lower quartile of cows in the national herd, with 536KgMS produced by the most productive cows versus 371Kg MS for the lowest quartile cows.

Having a focus on improved efficiency and productivity will assist with improved on farm profitability and sustainability.

Set a Herd Improvement Strategy

Farmers with a Herd Improvement Strategy that they follow year-on-year will make faster genetic gain for the breeding goals they have. This needs to focus on: the calves they keep as replacements, the bulls they see (they should ideally be genomically tested), the cows they keep, accuracy of data (records and animal identification) and as always, their reproductive performance.

- Help farmers identify their long-term breeding goal(s) e.g. milk production, genetics, health, or temperament.
- Help farmers define their breeding objectives: including defining their breeding objectives e.g. to increase milk yield while maintaining or improving other traits such as fertility or disease resistance.
- Help farmers use data from their herd to inform their decisions: e.g. herd testing records, health records, and to inform your breeding decisions.
- Select the right paternal genetics: Use of bull of the day will drive genetic improvement, as will use of any breed company paternal genetics for traits the farmer is prioritising
- Implement a breeding program: Develop a breeding program that includes a clear plan for selecting sires and managing the genetic diversity in your herd (including beef/ SGL where relevant).
- Monitor progress: Monitor the progress of your breeding program by regularly measuring and analysing performance data and adjust if necessary

Once you have determined which animals to use in your herd the farmer then needs to determine which animals to breed together.

The basics

- Emphasize the importance to your farmers of having timely, accurate and complete records for everything, but especially for breeding and culling decisions, this includes making sure all ear tags are accurate and readable
- Consider tagging cows where calves will not be kept as replacements to reduce mistakes
- Encourage genomic testing to reduce the inaccuracy of maternal recording
- To make genetic gain we need good reproductive performance so continue to encourage your farmers to focus on improving their 6WICR

The breeding plan

As a generalisation, consider the following:

- Whenever possible only retain replacements from the highest genetic merit cows using BW.
- Whenever possible remove the lowest production worth (PW) animals from the herd when making culling decisions.
- Select genetics that will improve efficiency, improved desired traits (the right semen).
- Look at strategically mating only highest BW cows for replacements and lower BW animals for non-replacements.
- Consider using sexed semen to improve the chance of getting a heifer from the best genetic merit cows (increases from 50% to 90%) who are cycling well
- Consider, if practical, AI mating yearlings for replacements to speed up genetic gain.
- Consider mating lower genetic merit cows to:
  - Short gestation bulls to increase days in milk.
  - Easy calving beef bulls to increase the options to maximise the value of the non-replacement calves & help with inadvertently keeping the wrong calves.
- Use short gestation bulls on any late mating's to condense calving and increase days in milk.
- Consider using genomically tested bulls to speed up genetic gain.
- Consider how AI synchronization protocols for non-cycling and late-calving cows could be used to condense calvings.

Making Faster Genetic Gains

The speed of genetic gain is impacted through generation interval selection, intensity, accuracy of selection and less importantly genetic variation. When farmers can make discretionary culls they have increased selection pressure ability. Thus, continue to emphasise the importance of the 6WICR so they have more highly productive animals available to select the next generation from rather than being forced to keep animals due to poor herd reproductive performance.

Selection Accuracy is critical. For accuracy of selection encourage farmers to undertake 4 herd tests and weigh their whole herd to improve BW accuracy. Also encourage genomic (DNA) testing of calves to understand their genetic merit potential more accurately and their maternal genetics.

For those farmers with excellent management and well grown heifers there is the opportunity for them to consider AI breeding their heifers and potential using of sexed semen. They must be made aware of the potential impacts on conception rates with the use of sexed semen. Other more advanced ways to shorten the generation interval including embryo transfer etc.

Genomics

Genomics allow the genetic potential of an animal to be known before the animal reproduces and has production records of its own. Using a DNA sample a genomic estimate gives reliable BW and EBVs early in life so the farmer can make replacement decisions. This negates the need for using parental average values to select on.

Genomic bulls can also be used where high BW bulls can be used at a younger age (rather than waiting 2-3 years for progeny testing).

Genomic testing of calves is a cost-effective choice. Over time the whole herd will be profiled as replacements move through the herd. Genomic testing takes a period of weeks and farmers need to understand costs and availability of testing.