The development and implementation of farmer tools designed to support genetic gain and breeding decisions

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Abstract

In recent years the Australian Dairy Herd Improvement Scheme (ADHIS) has placed a greater emphasis on providing extension and education services to farmers to support their understanding and use of Australian Breeding Values (ABVs) in bull selection decisions.

ADHIS currently provides a range of tools to achieve this objective which include the Good Bulls Guide (the Guide) and Selectabull. Both of these tools aim to assist farmers customise their selection decisions based on their own individual breeding objective. Following the release of these tools ADHIS has investigated additional tools and projects aimed at supporting farmers understanding of the influence of genetics on their farm.

The Genetic Progress Report (GPR) which is currently in development aims to help farmers understand the influence of genetics within their herd by plotting the herd's genetic trend across a range of key traits (including the Australian Profit Ranking - APR) and benchmarking their performance against the national herd. Its main role is to assist farmers in reflecting on breeding decisions made in the past and to initiate a call-to-action to change bull selection practices if the herd is not at the farmer's own desired level.

Another new initiative is the Feeding the Genes project. This project which has recently commenced aims to better explain the benefits of selecting high genetic merit bulls (bulls that are in the Guide) across a number of feeding systems. The project will compare high vs low genetic merit cows within five clearly defined feeding systems. The project aims to provide information that allows farmers and advisors to be better informed regarding the impact of genetics within different feeding systems.

The GPR and Feeding the Genes project will provide farmers and advisors with confidence in advocating the use of the APR, the Guide and Selectabull as bull selection tools within the Australian dairy industry. Achieving this outcome will support improving the rate of genetic gain at both a farm and national level.

Keywords: Education, Extension, Genetics, Genetic Improvement, Breeding Values

Introduction

The Australian Dairy Herd Improvement Scheme (ADHIS) is the national genetic evaluation unit for dairy cattle in Australia and receives the majority of its funding from Dairy Australia through Australia's Dairy Service Levy (Dairy Australia, 2012).

Since its inception in 1982 the focus of activity has been on the science of genetics and the production and release of Australian breeding values (ABVs). Responding to the need to provide clear, independent information to assist farmers in making breeding decisions, a new extension program commenced in 2008. This program was aimed to re-enforce the benefits from genetics amongst both farmers and their advisers.

Australia's 1.6 million cows live in diverse dairying environments and experience temperate and sub-tropical climatic conditions. Feeding systems vary from almost entirely grazed pastures through to total mixed rations. On most farms, calving occurs in 1 or 2 batches each year (season / split calving) which means that bull selection decisions are generally made once or twice a year. In addition to domestically produced semen, Australian farmers have easy access to semen from a wide range of countries.

With a diverse range of choice increasing farmers understanding of the genetic merit of animals under consideration and their impact on farm productivity is an important objective for ADHIS. It is with this understanding that ADHIS has undertaken the development of three tools to support farmer decision making and is resourcing a further research activity.

Tools to support farmer decision making

The following outlines two current tools and a new tool in development which are available to farmers to help them breed the type of cows they want to milk.

Good Bulls Guide

The Australian Profit Ranking (APR) was introduced by ADHIS in 2001 as a national total merit index. The APR is a profit / economic based index that is the combination of a range of economically important production and non-production traits. The APR underwent an extensive review in 2009 and from April 2010, APR has been calculated with an updated formula which places more emphasis on daughter fertility, survival and mastitis resistance.

Coinciding with the updated APR formula was a significant extension initiative to increase the use of ABVs (including the APR) through the development and publication of the Good Bulls Guide (the Guide). The Guide is a bi-annual listing of Top Bulls (that are active, meet minimum reliability criteria and are more than 1 standard deviation above the mean for APR). Within the Guide there are lists of trait leaders for traits including the APR, production, longevity (survival), mastitis resistance (somatic cell count) and overall type as well as a listing of young genomic bulls. Bulls of higher reliability are also included in their own list. The Guide deliberately avoids the use of acronyms and is visually appealing to improve its readability.

The Guide directs farmers to 'highly recommended' bulls. That is bulls which rank highly on the overall profit ranking (APR) but also meet the given farmers breeding objective. The basic message is 1) decide your highest breeding priority and 2) pick from the list in the Guide which meets this priority. This approach effectively safeguards farmers against making a 'bad' decision rather than insisting that farmers should be buying bulls in the top 10. The general emphasis being not what bull the farmer picks but ensuring that they pick bulls which are in the Guide.

Selectabull

Launched in July 2009 Selectabull, is a web-based tool to simplify bull selection (ADHIS, 2012). This free on-line tool offers dairy farmers the capacity to easily access bull ABVs to find the best available bulls for their farm based on the farmer's individual breeding objective. The Selectabull tool allows farmers to:

1. Develop a strategic breeding objective. A 'wizard' tool asks a short series of questions to develop a list of desirable traits which becomes the breeding objective.
2. Find bulls which meet the breeding objective using ABVs. This can be achieved using either a simple search or a customised index. A short list of bulls which meet the input criteria is reported.

The farmer's breeding objective and selection criteria are stored within the Selectabull tool which enables farmers to log on and review their selection decisions from year to year. This enables a more consistent approach in bull selection over time and assists in achieving the farmer's individual breeding objective.

A New tool – Genetic Progress Report

Genetic improvement is a long-term investment by dairy producers. Decisions made regarding bull selections and culling decisions have a significant impact on the rate of genetic gain for traits of interest. However breeding and joining decisions made one year don't start to impact the herd as a whole until at least three years later (when heifers start entering the herd).

As a result of this time lag the impact of bull selection decisions is not immediately clear nor is the long term genetic trend within a herd for various traits clearly understood. ADHIS has developed a Genetic Progress Report (GPR) (figure 1&2) to measure, monitor and benchmark the genetic trend of a farmer's herd against the national average for the given breed.

The first part of the report provides a 'snapshot' of the herd (figure 1). This snapshot gives the average APR for the herd and its rank compared to the national herd. It also summarises the impact / influence of bulls selected over the last 10 years on the herd by indicating if the genetic trend for various traits are increasing, remaining stable or are falling. The aim of this section of the report is to provide a succinct and clear message about the genetic trend within the herd. Reference is also made at the bottom of the first page to the number of cows used in the report and the number of cows bred by bulls that made the Guide.

The main component on the first page of the report is the genetic trend of the herd for the APR. The genetic trend is produced by plotting the average APR of cows born in the herd by their year of birth over the last 7 years. The national rate of genetic gain for APR is also plotted together with the top 10% of herds. Page 2 of the report plots the genetic trend for a range of other key traits. These traits include the protein kg, fat kg, longevity (survival), fertility, mastitis resistance (somatic cell count) and overall type.

The main objective of the GPR is to assist farmers in reflecting on breeding decisions made in the past and to initiate a call-to-action to change bull selection practices if the herd is not at the farmer's own desired level. The benefit of the GPR to farmers is that it will provide clarity on the rate of genetic gain within their herd, highlight the impact of past breeding decisions, reinforce the benefits of genetics and be easy to access, easy to read and independent from commercial interests/organisations.
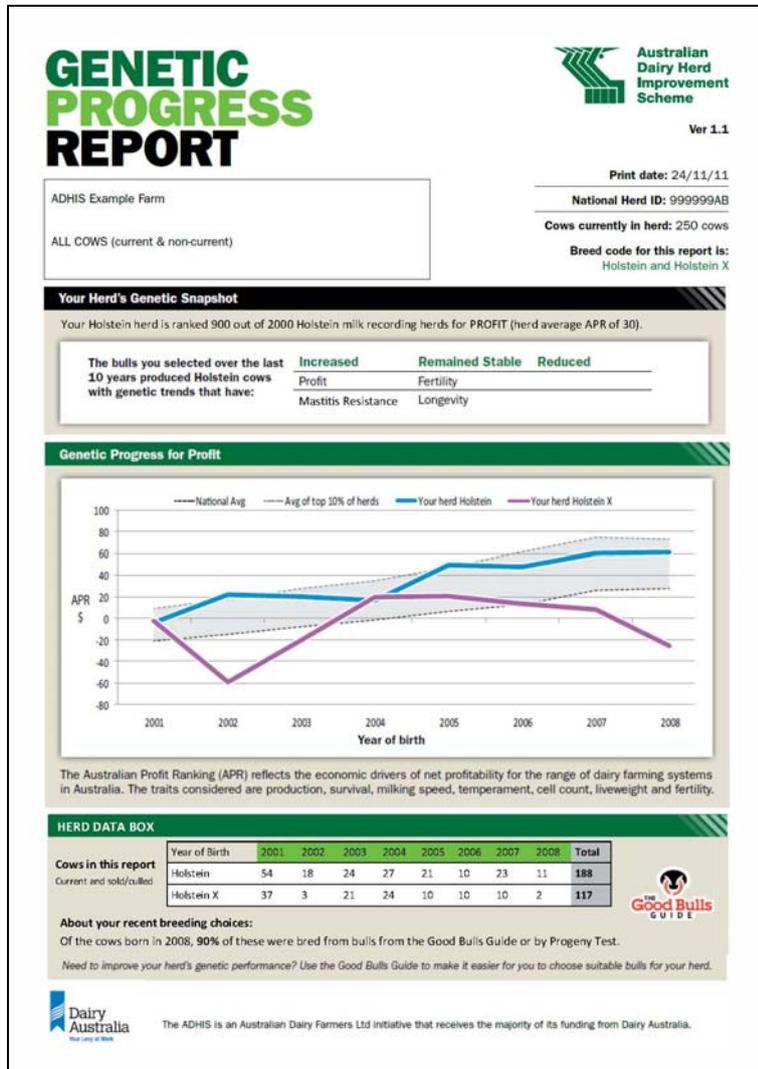
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Figure 1. Genetic Progress Report - Page 1

Figure 2. Genetic Progress Report - Page 2

This report is aimed to be used in several ways.

1. Farmer use – the aim is to enable farmer's easy access to their individual GPR either directly or via their adviser. This report can then be used during breeding seasons to refine bull selection decisions to support the individual farmers breeding objective.
2. Extension activities - experience gained in road-testing this report has shown that the GPR provides a really great starting point to talk to farmers about bull selection decisions at a practical level. It has also been shown to be an effective tool to start the 'genetics' conversation.
3. Herd test reports - With the support of herd test centres, the GPR is planned to be included with annual herd test summary reports to support the link between genetic merit and on-farm performance.
4. Advisers and Independent resellers – Experience with other similar reports (Fertility Focus Report, Mastitis Focus Report) has shown that advisers are the predominant users of these reports. ADHIS plans to use the GPR with advisers (independent semen

sellers, consultants, factory field staff, vets) to support the messages around the benefits and importance of genetics to on farm profitability.

Research projects – Feeding the Genes

Recent survey work has indicated interest from non herd-improvement service providers in

understanding more about the benefits and opportunities from superior genetics.

The current index, the Australian Profit Ranking (APR), aims to achieve economic optimum across a range of standard input/output parameters. However, farmers are seldom 'standard'. Based on adviser surveys, the most obvious area to investigate is the performance of high genetic merit animals within different feeding systems.

The Australian dairy industry is highly diverse in the feeding systems it employs. Given the variation in climate and payment systems across the nation, feeding systems range from majority pasture or conserved fodder with very low concentrate use, right through to total mixed ration systems.

The different feeding systems in use in Australia have been categorised into five groups by Dairy Australia's Feed2Milk program (Feed2Milk, 2012);
1. Pasture + other forages + low grain/concentrate feeding in bail. (Grazed pasture + other forages + up to 1.0 tonne grain/concentrates fed in bail).
2. Pasture + other forages +moderate-high grain/concentrate feeding in bail. (Grazed pasture + other forages +more than 1.0 tonne grain/concentrates fed in bail).
3. Pasture + partial mixed ration ± grain/concentrate feeding in bail. (Pasture grazed for most or all of year + partial mixed ration on feed pad ± grain/concentrates fed in bail).
4. Hybrid system. (Pasture grazed for less than nine months per year + partial mixed ration on feed pad ± grain/concentrates fed in bail).
5. TMR system. (Zero grazing. Cows housed and fed total mixed ration)

The Australian Breeding Values (ABVs) used to calculate the APR are based on animal performance under Australian conditions and the APR represents a national breeding objective. Advisors and farmers work at an individual farm level and may believe that the farm in question is different from most other Australian dairy farms and question the validity of the APR in their situation.

To better explain the benefits of selecting high genetic merit bulls (bulls that are in the Good Bulls Guide), a project referred to as "Feeding the Genes' has commenced that compares high vs low genetic merit cows within the 5 identified feeding systems.

This project aims to support the performance of the APR within the different feeding systems in use in the Australian dairy industry. This project will analyse the phenotypic performance of high and low genetic merit groups of cows within herds of known feed systems to

- assess whether effects of cow APR on milk yield and survival of Holstein-Friesian cows within commercial Australian dairy herds differ substantially between herds with different feeding systems.

- Prepare appropriate extension material, in collaboration with nutritionists, to address the perception that genetics is not as important because 'most cows are not fed to their genetic potential'

This project is aimed to be completed by end of 2012 with results to be used to provide confidence to advisors to advocate the use of APR and the Good Bulls Guide as tools for herd bull selection.

Conclusion

Since the introduction of ADHIS' extension program a more uniform and structured message regarding the benefits of genetics has been developed. Through the use of clear messages and benchmarking tools ADHIS aims to drive the rate of genetic gain in Australia whilst supporting farmers to achieve their individual breeding objective.

The uptake of both the Good Bulls Guide and Selectabull together with direct feedback from farmers, advisors and key stakeholders has been very positive. The Guide is also being recognised and used by bull companies as a mark of approval within their marketing material. Due to the simplicity of the Guide and its recommended use key stakeholders and funders have shown greater confidence in promoting the benefits of genetic improvement to farmers even if they are not considered 'genetics experts'. The simple message being 'use the Guide'. Outcomes from the current Feeding the Genes Project further aim to support farmers understanding of genetics and its relevance at the farm level. The on-going support from ADHIS' key funder Dairy Australia is recognised in assisting to deliver this outcome.

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