DELIVERING NEW CRC TECHNOLOGIES TO THE NORTHERN BEEF INDUSTRY

R.A. Farrell¹, V.J. Edmondston¹, J.D. Bertram², P. Venamore³ and S. Hudson⁴

CRC for Cattle and Beef Quality
¹DPI&F, Yeerongpilly, Q, 4105, ²DPI&F, Goondiwindi, Q, 4390
³Emerald Agricultural College, Berrigurra, Blackwater, Queensland
⁴Tremere Pastoral, Moura, Queensland

SUMMARY
This paper describes two delivery strategies used to create awareness of Cooperative Research Centre (CRC) technologies. The Department of Primary Industries and Fisheries, Queensland as a core partner of the Beef CRC has focussed its extension effort through the Commercial Application of Beef Genetic Technologies (CABGT) project. In addition to creating awareness of CRC outcomes across the northern beef industry, the CABGT team selected temperament and the use of flight time (as an indicator of temperament) and the use of DNA marker technology as specific examples with two client groups (students and seedstock beef producers). Adult learning principles and the action learning cycle concept were incorporated into delivery to facilitate understanding of the technologies and progress toward application and adoption of these technologies on farm. Evaluation of CABGT delivery activities to date indicates that 90% of participants believed that they could apply some of these technologies on farm.

Keywords: Extension, genetic technologies, temperament, delivery

INTRODUCTION
The CRC for Cattle and Beef Quality has been responsible for research relating to beef production in Australia. The outcomes of that research have resulted in practical tools that beef producers can apply on farm to assist in breeding programs and selection of animals. Two of those tools were selected to demonstrate their use in an action learning environment in diverse situations. In this paper, delivery is defined as awareness and development of skills in using the selected tools – flight time and DNA marker technology.

Temperament is one trait that beef producers frequently identify as a problem (Elder et al 1980) but they traditionally address the issue by culling animals with perceived poor temperaments rather than selecting animals with good temperaments (Bertram pers comm.). This means only a fraction of the potential genetic improvement of the trait is achieved. To select for temperament, producers need to be able to distinguish animals with genetically poor, good or excellent temperaments (Burrow 2003a). Flight time is an objective and repeatable measure of temperament in cattle. It is an electronic measure of the time it takes for an animal to travel a predefined distance (~1.7 metres) after exiting a weighing crush (Burrow and Dillon 1997).

A DNA marker is a small segment of a chromosome with a known DNA sequence. It can be equated to a signpost or a tag for a specific piece of DNA (Dundon et al 2000). The key application for DNA markers is to provide genetic information on traits that are difficult or expensive to measure (Genetic Solutions 2003). There are currently five gene markers available to the beef industry. These
diagnostic tests have been commercialised by Genetic Solutions Pty Ltd and are marketed as GeneStar® Feedlot (Marbling) and GeneStar® Tenderness 2.

MATERIALS AND METHODS
1. Awareness of CRC outcomes have been presented by the CABGT team of extension officers using adult learning principles at a range of locations (39 specific CRC workshops, 10 Bull Selection workshops delivering integrated technologies) across northern Australia during 2004 and 2005. A questionnaire was completed by all participating producers at these workshops to gain an insight into their satisfaction, knowledge gained and topic areas of particular interest to their commercial beef enterprise.

To facilitate industry adoption of the selected CRC technologies, the CABGT team has worked with two particular groups – agricultural college students and a seedstock producer in central Queensland – to improve skills in using and applying these technologies to on-farm selection practices.

2a. Emerald Agricultural College (EAC)
The college educates students at Certificate IV and Diploma level and these students are an important component of the future beef cattle industry workforce. To expose the students to the outcomes of CRC research, college instructors and DPI&F extension staff developed “research projects” that the students carried out using the college herd. The projects examined 3 methods of selecting for docility (flight time, crush score and yard test) as well as the frequency of marbling and tenderness gene markers in the college herd. Using this process, the projects provided an opportunity for the students to develop skills in planning a project, collecting and collating the data and compiling a report. In addition, the “hands on” experience gained by the students in applying these technologies in the college herd reinforced the theory learned in lectures. This participatory process catered for various learning styles (e.g. activists, theorists, pragmatists and reflectors) of the students with the additional benefit of the action leaning cycle i.e. planning, acting, reflecting and generalising.

20 x 12 month-old Belmont Red x Droughtmaster x Red Angus heifers were measured for individual flight time (seconds) as well as a crush score and yard test assessment (both assessed on 1-5 scale; 1= flighty and 5= temperament). Tail hair samples for each animal for DNA analysis by Genetic Solutions to assess the frequency of the GeneStar® Marbling and GeneStar® Tenderness 2 markers were also collected.

2b. Tremere Pastoral Company, Central Queensland
Tremere Pastoral Company is a progressive commercial and seedstock beef production company. This herd is influential in the gene flow across the northern beef industry.

Individual flight time (seconds) were measured on 445, genotype Bonsmara, Belmont Red, Boran, Tuli, Composite, 5-6 month-old weaners. Sire lines were grouped and averaged to compare flight time differences between the progeny groups.
RESULTS AND DISCUSSION

Of the 606 producers that attended the CRC workshops and manage approximately 8% of the northern beef industry herd, valuable benchmark information was collected. The benchmark data reported by Bertram et al (2005) indicates that 96% of the participants found that attending the activity was worthwhile and 97% learnt new beef production technologies. This adult learning and action learning cycle delivery process has provided many in the beef industry with a superior learning outcome with almost 90% of participants indicating that some of these new technologies could be applied on their properties. As Bertram et al (2005) suggest, this data is limited and follow up evaluation will necessary to identify what participants have made of the information. That is, whether immediately applied, retained for future use or ignored, in order to quantify the adoption of these technologies across the northern beef industry.

In addition to the CRC awareness workshops, the EAC students had the opportunity to combine theory and formal presentation with practical components focussed on industry benefits while the producer was able to apply these skills on the property.

At the EAC, Figure 1A clearly shows the variability of the crush and the yard tests and the inconsistencies in assessment compared to the flight time measurement in this situation. These results show a range in flight time from 1.08 seconds to 2.86 seconds with an average flight time of 1.84 seconds. For a consistent and accurate assessment of temperament, flight time measurement offers more objectivity than the crush and the yard tests. Moreover, the range is similar to that reported by Gaden et al (2004) and at Tremere.

The frequency of the GeneStar® marbling and tenderness 2 genotypes are reported in Figure 1B. Although the sample size is small the results are consistent with published results, particularly for the tenderness (T1) gene in the Belmont Red genotype (Genetic Solutions 2003).

![Figure 1A: Temperament Assessment](image1.png)

![Figure 1B: Frequency of GeneStar® Marbling and GeneStar® Tenderness 2 genotypes](image2.png)

Figure 1. A. Docility assessment using 3 methods of evaluating temperament at Emerald Agricultural College. B. Frequency of GeneStar® Marbling and GeneStar® Tenderness 2 genotypes in the Emerald Agricultural College sample group.
The range in flight time at Tremere across all 2003 calves was 1.34 seconds (0.35 to 1.69) and the phenotypic difference in the average of the most temperamental sire compared to the average of the most docile sire was just 0.34 seconds (0.61 – 0.95). This difference may not seem considerable but when applied in the context of CRC research, the values are relevant. Burrow (2003b) reports that for each 0.1-second increase in flight time, the average daily gain (ADG) increases by an average of 0.04 kg/day, and an increase in hot standard carcase weight (HSCW) of 2.3 kg on average. Although the accuracy of this prediction was not tested in the Tremere herd, if these CRC results are applied to the Tremere data, we could expect that the ADG of the more docile animals to be 0.12 kg greater than the temperamental animals and the HSCW of the more docile animals to 6.9 kg heavier than the temperamental animals. The producer observed differences in the docility of the sire group calves and despite the narrow phenotypic variation within the group, was able to relate these differences to the phenotypic temperament of the sire. This observation as well as the, extrapolation of the CRC results to the herd has provided the producer with confidence that measuring temperament objectively is useful and will provide benefit along the supply chain.

ACKNOWLEDGEMENTS
The authors gratefully acknowledge the very generous support provided by Emerald Agricultural College “Berrigurra” Blackwater and Tremere Pastoral, Moura and the 2004 Beef Production Diploma II students of the Emerald Agricultural College for collection of the docility data from the EAC herd.

REFERENCES
Bertram, J.D., Farrell, R.A. and Edmondston, V.J. (2005) In “Moving from Research to Industry Adoption” NSW Department of Primary Industries and CRC for Cattle and Beef Quality Conference Proceedings pg 53