



PRODUCT THEMES

Summary and status of Beef CRC3 products to improve beef cattle efficiency

Theme	Product	Deliverable Product	Delivery	Status at 30 June 2012
Improved genetic gain with genomic technology	Beef CRC 3 DNA prediction equations for growth, feed efficiency, carcass and beef quality and reproductive performance	Enhanced EBVs that include the DNA prediction equations for: <ul style="list-style-type: none"> • Tenderness • Marbling • Meat yield • Reproductive performance • NFI 	Fact Sheets <ul style="list-style-type: none"> • Genomics - DNA Technology, Understanding the Basics • Genomics - Utilising DNA to Change Type Traits • Genomics - Improving Production Traits with DNA & intro to CRC prediction equations • GE EBVs for bull buyers • Utilising DNA for Parentage Verification • Managing Genetic conditions with DNA Presentations <ul style="list-style-type: none"> • Genomic tools – Overview of genomics for bull breeders • Genomic tools – What do I put in what do I get out • Genomic EBVs for Bull buyers 	Prediction equations for growth, feed efficiency, carcass and beef quality and female reproduction attributes based on Illumina's 50K SNP panel will be delivered to BREEDPLAN by December 2010. The amount of genetic variation accounted for by these prediction equations is likely to be less than 15%, meaning the accuracy of the tests for industry herds, in the absence of other information (e.g. pedigree, phenotypes), will also be low. However when used in conjunction with additional data, and particularly for straight breeds rather than composites or crossbreeds, the use of the prediction equations and 50K genotypes by BREEDPLAN to generate Estimated Breed Values (EBVs) is likely to be cost-effective and add value for industry. CRC's assessment is that prediction equations based on the high-density SNP panels will be more useful for industry than those based on the 50K panel, particularly for cross-breed use (e.g. across Bos taurus or Bos indicus derived breeds) and in general, account for greater proportions of genetic variation per trait. However traits such as feed efficiency and female reproduction may still not be as accurate as carcass and meat quality traits due to the lower numbers of animals with accurate phenotypes for calibration of the prediction equations.
		Breeding objectives (\$ index) including the DNA prediction equations <ul style="list-style-type: none"> • Longfed • Shortfed • Supermarket • Terminal 		As the EBVs become more accurate through use of DNA information it will be possible to more accurately select for the objective traits in the breeding objective (rather than the indirect selection traits that currently need to be used because of lack of direct information on the objective traits)

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	Beef CRC 3 Trial Marker-assisted EBVs for tenderness	New method developed to integrate DNA markers for tenderness and BREEDPLAN EBVs. The new method has subsequently been broadened to include additional traits		Genetic parameters for traits associated with beef tenderness (shear force, MQ4 score, flight time, meat colour) and markers for tenderness were estimated and included in a new method to calculate EBVm in BREEDPLAN for industry use in mid-2008. Officially launched at Brahman week sale in October 2009\8

<p>Improved compliance rates to better meet market specifications</p>	<p>New understanding of the effect of growth rate/path on product quality and profitability</p>	<p><i>BeefSpecs</i>' calculator <i>BeefSpecs</i> Workshop <i>BeefSpecs</i> Drafting Tool</p>	<p>Fact Sheets</p> <ul style="list-style-type: none"> • BeefSpecs - a tool to improve beef cattle market compliance and profitability <p>Presentations</p> <ul style="list-style-type: none"> • Growth path to models • BeefSpecs • BeefSpecs workshop 	<p>The calculator is freely available online at www.dpi.nsw.gov.au/beefspecs. The first validated model for predicting performance of groups of <i>Bos taurus</i> or <i>Bos indicus</i>-derived steers or heifers was commercialised in October 2008 and has been refined for greater accuracy to the current model.</p> <p>A model specifically designed to allow drafting of animals into sub groups (<i>BeefSpecs</i> drafting tool) has been produced and is available to producers after completing a <i>BeefSpecs</i> workshop and training in it's use.</p>
		<p><i>BeefSpecs</i> Optimisation Tool</p>		<p>The optimisation model will include an economic prediction component as well as the animal prediction model, to allow supply chain partners to optimise animal performance (relative to premium market specifications) and profitability of the enterprise. The computer model has been developed with limited testing. Requires remote measurement and automatic data collection capability for widespread adoption which is the subject of further funding submission to MLA</p>
	<p>Muscling research</p>	<p>New knowledge</p>	<p>Fact Sheet</p> <ul style="list-style-type: none"> • Selection for muscling and it's effect on carcass attributes <p>Presentation</p> <ul style="list-style-type: none"> • Effect of muscling on reproduction and growth 	<p>Complete</p>
	<p>Dark cutting research</p>	<p>New Knowledge</p>	<p>Fact Sheets</p> <ul style="list-style-type: none"> • Reducing the incidence of Dark cutting 1 • Reducing the incidence of Dark cutting Dark cutting 2 <p>Presentation</p> <ul style="list-style-type: none"> • Reducing the incidence of Dark Cutting 	<p>Complete</p>
	<p>Genetic and management parameters for meat quality Marbling research</p>	<p>New knowledge</p>	<p>Fact Sheet</p> <ul style="list-style-type: none"> • Effect of supplementation and age of slaughter on marbling <p>Presentation</p> <ul style="list-style-type: none"> • Effect of supplementation and age of slaughter on marbling 	<p>Complete</p>
	<p>DNA markers in Meat Standards Australia</p>	<p>Proof of concept that use of DNA markers for tenderness will improve the compliance particularly of northern</p>		<p>Beef CRC has fulfilled its initial obligations. Further testing of markers and the possible inclusion of them in MSA depends on development of a new phase of an MLA Donor Company and on decisions by the MSA Pathways Team about options for cost-effectively incorporating DNA marker information into MSA. If</p>

		cattle to MSA standards		agreement can be reached on these issues, it is possible DNA markers for tenderness could be included in the MSA model by December 2011.
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<p>Increased reproduction rates and maternal productivity</p>	<p>Genetic parameters for herd reproduction and efficiency</p>	<p>Genetic parameters for use in BREEDPLAN</p> <ul style="list-style-type: none"> i) Female reproductive traits for northern herds ii) Maternal efficiency traits for southern herds and iii) Male and female indicator traits to improve reproductive performance in northern herds 	<p>Fact Sheets</p> <ul style="list-style-type: none"> • Females - selection to improve fertility (1) Felicity • Using Bulls to Improve Herd <p>Presentations</p> <ul style="list-style-type: none"> • Performance Selecting females for maximum reproductive performance • Breeding bulls to maximise reproductive performance • Bull selection strategies to improving female reproductive performance • Relationship between fertility and production traits • Association between BREEDPLAN rib and rump EBV's with cow body composition 	<p>Genetic parameters for traits and indicator traits (e.g. age at puberty, post-partum re-conception interval, lifetime reproductive performance and early-life indicators of lifetime female reproductive performance) in northern Australian herds and the associations between those traits and steer traits (growth, feed efficiency and carcass and beef quality attributes) will be estimated and included in BREEDPLAN by August 2011.</p> <p>Genetic parameters for traits and indicator traits such as conception and weaning rates and days-to-calving in first and second-calf heifers and their associations with body composition and feed efficiency in southern Australian breeding herds will be estimated and included in BREEDPLAN by June 2012.</p> <p>Identification of male indicator traits for industry use depends on results of data analyses to commence after data collection is complete (December 2011). Early life predictors of fertility in the male will greatly improve the efficiency of selection of sires for reproductive performance. There are genetic and economic advantages in identifying new traits in the male (i.e. sires used for breeding purposes) to indirectly improve the fertility of both female and male relatives. Cost: benefit analyses are now underway to determine the feasibility of including 'Percentage normal sperm' as a new trait in BREEDPLAN. Assuming feasibility, genetic parameters for this trait will be estimated and included in BREEDPLAN for northern Australian herds by April 2012.</p>
	<p>Best combination of genetics and management for maternal efficiency</p>	<p>Genetic and Management Tools 'Maternal Productivity' and 'Lifetime Reproductive</p>	<p>Fact Sheets</p> <ul style="list-style-type: none"> • Managing the maiden heifer • Genetic and nutrition effects on reproductive rate in cows • Effect of muscling on reproduction and growth <p>Presentations</p> <ul style="list-style-type: none"> • Managing the maiden heifer • Genetic and nutritional effects on reproduction rate in cows • Understanding muscling on reproduction and growth 	<p>Analysis of data collected from CRC experiments still being conducted and results expected December 2012</p>
	<p>Maternal model</p>	<p><i>BeefSpecs</i> Maternal Model</p>		<p>The maternal model is being designed to optimise maternal herd performance (defined as kilograms of calf weaned per mega-joule of energy per cow and calf unit), efficiency of feed utilisation and end-product traits such as carcass and beef quality attributes. It is the most scientifically challenging of the CRC's prediction models and its development is still at an early stage. It will be based on the existing fat prediction model ('BeefSpecs') but will be enhanced to accommodate the much wider range of production / nutritional environments experienced by breeding herds. Data to support the model's development are available from the earlier CRCII Project 2.3 and</p>

				CRCIII Maternal Productivity and Lifetime Fertility projects. Biological model developed Prototype of farm ready model available May 2012 for further development and testing
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Improved animal welfare standards	Cattle welfare objective measures	Objective measures for cattle welfare	Fact Sheet <ul style="list-style-type: none"> Objective measures in cattle welfare 	incorporate outcomes in welfare protocols/standards and guidelines (they were incorporated in draft guidelines in 2011 but now the guidelines need to go through the bureaucratic processes for incorporation in standards and legislative requirements)
	Poll gene marker	Poll gene marker	Fact Sheets <ul style="list-style-type: none"> Poll Gene Test Poll Gene Transitioning to a polled herd Presentations <ul style="list-style-type: none"> Poll Gene Genomic tools – poll gene test Transitioning to a polled herd 	Beef CRC identified a diagnostic DNA marker that accurately identifies homozygous polled bulls in >90% of cases in the breeds tested. The marker was licensed non-exclusively to the University of Queensland's Animal Genetics Laboratory in March 2010 for commercial development and inclusion in its DNA parentage testing panel of markers and further field testing in additional breeds of cattle. Result have been published allowing other genomics companies to include the test in their commercial products.
	Improved temperament	Improved temperament	Fact Sheet <ul style="list-style-type: none"> Selection for improved temperament and associated benefits 	Complete
Improved adaptation and whole herd efficiency	SNP discovery from sequencing	New SNPs in tropically adapted cattle breeds relevant to Australian beef production systems incorporated into new high density commercial SNP panels	Fact Sheet <ul style="list-style-type: none"> Adaptation – relationship of adaptive traits to weight, reproduction and meat quality 	Illumina and Affymetrix which incorporated new SNPs into their high-density commercial SNP panels + use of those high-density panels by researchers world-wide to discover new associations between SNPs and economically important traits
	DNA prediction equations for feed efficiency	Enhanced EBVs that include the DNA prediction equations for: <ul style="list-style-type: none"> NFI 	Fact Sheet <ul style="list-style-type: none"> Understanding Net Feed Intake (NFI) – is there a more efficient animal? Presentations <ul style="list-style-type: none"> Understanding Nett Feed Intake (NFI) – is there a more efficient animal 	As per genomic prediction equations
	Cattle tick vaccine -	14 tick vaccine candidates that will have been through incomplete animal trials by June 2012		Identify tick vaccine candidates complete, currently testing candidates as singletons. Initial discussions with commercialiser complete and responsibility likely to be transferred to DEEDI/MLA through wind-up
	Test for acaricide resistance -	Simple, quicker and less expensive diagnostic test to identify ticks that are resistant to synthetic pyrethroids used to control them		Identifies cattle ticks resistant to the synthetic pyrethroids used to control them during interstate and international cattle movements. <ul style="list-style-type: none"> Commercialised in 2008 – test routinely used by Qld regulatory authorities
	Products to reduce methane emissions	Practical management strategies to reduce		Candidate protein targets for methanogen antagonists. Microbes producing anti-methanogen compounds and/or providing alternative H2-

		methane emissions associated with improved productivity and feed efficiency		using pathways. Viruses that infect methanogens. Further testing and development of these products is contingent on new funding beyond Beef CRC's term. All data have been collected and analysed. Papers will be published by June 2012
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Improved beef producer understanding and uptake of technology	Beef Profit Partnerships	A system of partnerships between beef businesses, value chain and the broader beef industry designed to accelerate improvements, innovations and adoption for sustainable impact on business profit - Proven methodology to promote quicker adoption of technology		Once all the impact assessments of the latest round of data provided for the BPP workshop (week beginning 12 th March) are complete, should plan for new press releases and case studies on the effectiveness of BPPs. Actual value-add of BPPs to November 2011 is \$28.76 million excluding New Zealand and South Africa and the new reporting should add to that total before the CRC winds up
	Education and training courses to create a more skilled beef industry workforce	Courses	Courses <ul style="list-style-type: none"> • 'More beef from breeding' • 'Breeder herd management' • 'Continuous Improvement and Innovation' 	Complete
	Comprehensive beef cattle databases of fully pedigreed cattle recorded for a very wide range of hard- or expensive-to-measure traits with matching genotypes	Database		Complete
	Livestock Library	Electronic compendium of hard-to-access publications – licensed to Sheep CRC and will be managed on an ongoing basis by the Australian Wool Education Trust (AWET)		Complete