final report

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Tropical Beef Technical Services Project

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Executive Summary

Genetic improvement in the north Australian beef industry is largely achieved by genetic improvement in the seedstock industry as an estimated 50 percent of young bulls used by commercial breeders are sourced from seedstock herds.

The Tropical Beef Technology Services (TBTS) project was a joint initiative between nine breed associations represented mainly in northern Australia, the Agricultural Business Research Institute (ABRI) and Meat and Livestock Australian (MLA). TBTS provides the northern beef industry with hands-on technical support to improve the understanding and adoption of BREEDPLAN and related genetic improvement technologies.

The project aimed to achieve its objective to increase genetic gain in the northern beef industry through a range of innovative extension, technology transfer and technical support activities including one-on-one technical support to “influential” seedstock herds (both remotely and on-property), technical support to Breed Association Technical Committees or Boards and facilitation of cattle breeding and genetics workshops and field days. The broad range of extension activities involved both seedstock and commercial producers, however the main focus will be on the “influential” herds within each breed.

The major goal to facilitate an increase in the rate of genetic progress of the Stakeholder Breed Associations by increasing the average BreedObject selection index value of animals by $10 per cow mated between the 2009 drop (base year) and 2014 drop calves was not achieved. An increase of $4.63 or an average of $0.93 per year was achieved over the five year period.

However the average weighted change for the five years to 2014 was **$1.10** compared to the actual average weighted change for the five years to 2009 of **$0.70** representing a significant increase in the rate of genetic progress during the project.

The northern Australian beef cattle industry has traditionally under utilised the genetic technologies available to it both in terms of recording data in their herds and the use of EBVs and selection indexes.

The CRC3 Northern Fertility Project demonstrated the very wide variability in fertility of Bos indicus cattle and that a significant component of this variability was genetic. The heritability of Post Calving Anoestrus and Age at Puberty which both contribute to the Days to Calving trait provide the ability to select more fertile Brahman and Tropical Composite cattle. A genomic test which provides a 25% accuracy for the Days to Calving EBV is now available for Brahman cattle.

An increase of $10 in the average weighted index for the main breeds over five years could be achieved by selection on the Days to Calving trait in herd sires. However the fact that this objective was not achieved despite significant applied research results and a concerted extension program over five years has demonstrated the difficulty of achieving higher adoption of genetic technologies by the northern beef industry.

A new approach to demonstrating the economic value of genetics to the northern beef industry may be required.

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1 Background

Genetic improvement in the north Australian beef industry is largely achieved by genetic improvement in the seedstock industry as about 50 percent of young bulls used by commercial breeders are sourced from seedstock herds.

The Tropical Beef Technology Services (TBTS) project was a joint initiative between 9 breed associations represented mainly in northern Australia, the Agricultural Business Research Institute (ABRI) and Meat and Livestock Australian (MLA). TBTS provides the northern beef industry with hands-on technical support to improve the understanding and adoption of BREEDPLAN and related genetic improvement technologies. The project was initially funded from 1 September 2011 to 31 August 2015 but funding was subsequently extended to 30 June 2016.

The overarching goal of the project was to achieve an increase in the average BreedObject selection index value of the Stakeholder Breed Associations by $10 per cow mated between the 2009 drop (base year) and 2014 drop calves. The increase in the weighted rate of genetic progress in the five years to 2009 was $0.70 per cow mated per year.

Assuming that 50 percent of bulls used in northern Australia's 6 million cow herd, an increase of $10 per cow mated equates to $30 million.

The project aimed to achieve its objective to increase genetic gain in the northern beef industry through a range of innovative extension, technology transfer and technical support activities including one-on-one technical support to "influential" seedstock herds (both remotely and on-property), technical support to Breed Association Technical Committees or Boards and facilitation of cattle breeding and genetics workshops and field days. The broad range of extension activities aimed to involve both seedstock and commercial producers but the main focus was on the "influential" herds within each breed.

2 Project Objectives

1. An increase in the average BreedObject selection index value of the Stakeholder Breed Associations by $10 per cow mated between the 2009 drop (base year) and 2014 drop calves. This equates to $2 per cow mated per year compared to the current weighted rate of genetic progress for the Tropical Breeds of $1.05 per cow mated per year (note that the actual increase in the weighted rate of genetic progress in the five years to 2009 was $0.70 per year).

2. Develop and undertake extension initiatives to extend relevant messages to the Northern Australia seedstock sector based on Beef CRC research outcomes with particular emphasis on R&D outcomes relevant to the genetic improvement of fertility traits in tropical breed cattle.

3. Undertake extension activities and provide technical support to implement both new and existing BREEDPLAN related technologies in Northern Australia seedstock herds e.g. BREEDPLAN EBVs, Internet Solutions, BreedObject Selection Indexes, TakeStock®, Data Quality Herd Audit, Marker Assisted EBVs and Mate Selection

tools. This will primarily involve a focussed approach on extension to key influential herds in each breed and will specifically include at least 40 one-on-one high-level consultations each year.

4. Undertake regular extension initiatives to inform the seedstock and beef breeding industry in general on the relevance and application of DNA technology for accelerating genetic progress in economically important production traits.

5. Maintain and support the Selection Indexes published by Stakeholder Breed Associations to ensure they remain relevant to current and future markets and production systems. Where possible, also develop and publish Selection Indexes for stakeholder Breed Associations not currently doing so.

6. Provide high-level technical support to Beef Information Nucleus (BIN) projects in Northern Australia.

3 Methodology

3.1 An increase in the average BreedObject selection index value of the Stakeholder Breed Associations by $10 per cow mated between the 2009 drop (base year) and 2014 drop calves. This equates to $2 per cow mated per year compared to the weighted rate of genetic progress for the Tropical Breeds of $1.05 per cow mated per year for the five years to 2009.

The average weighted Selection Index value for the stakeholder Breed Associations was calculated based on the latest BREEDPLAN genetic evaluation results available on 30th June 2016 for each Breed Association with Selection Indexes published. This included Selection Index values for Brahman, Brangus, Belmont Red and Santa Gertrudis.

3.2 Develop and undertake extension initiatives to extend relevant messages to the Northern Australia seedstock sector based on Beef CRC research outcomes with particular emphasis on R&D outcomes relevant to the genetic improvement of fertility traits in tropical breed cattle.

TBTS continued to extend messages to the seedstock sector based on Beef CRC research outcomes (and associated outcomes from other research bodies e.g. Animal Genetics and Breeding Unit - AGBU) with an emphasis on genetic improvement of fertility traits in tropical breeds through a mix of targeted and broad extension initiatives.

3.3 Undertake extension activities and provide technical support to implement both new and existing BREEDPLAN related technologies in Northern Australia seedstock herds e.g. BREEDPLAN EBVs, Internet Solutions, BreedObject Selection Indexes, TakeStock®, Data Quality Herd Audit, Marker Assisted EBVs and Mate Selection tools. This will primarily involve a focussed approach on extension to key influential herds in each breed and will specifically include at least 40 one-on-one high-level consultations each year.

The TBTS team developed an influential herd target list based primarily on herd size and general knowledge of their “influence” on the breed at a seedstock and/or commercial level. Statistics provided by the Animal Genetic and Breeding Unit (AGBU) were also utilised to formulate this list including factors such as the herds rate of genetic progress, average Selection Index and number of progeny bred by sires in the breed with the herds prefix. The target list included 64 herds with an average herd size (calves per calving year) of 293.

3.4 Undertake regular extension initiatives to inform the seedstock and beef breeding industry in general on the relevance and application of DNA technology for accelerating genetic progress in economically important production traits.

TBTS to actively update the seedstock and beef breeding sector on the relevance and application of DNA technology.

3.5 Maintain and support the Selection Indexes published by Stakeholder Breed Associations to ensure they remain relevant to current and future markets and production systems. Where possible, also develop and publish Selection Indexes for stakeholder Breed Associations not currently doing so.

Selection Indexes to be kept current and breeds without Selection Indexes were encouraged to adopt them.

3.6 Provide high-level technical support to Beef Information Nucleus (BIN) projects in Northern Australia.

The Australian Brahman Breeders Association (ABBA) undertook a Beef Information Nucleus (BIN). High level technical support was provided to this project.

4 Results

4.1. An increase in the average BreedObject selection index value of the Stakeholder Breed Associations by $10 per cow mated between the 2009 drop (base year) and 2014 drop calves. This equates to $2 per cow mated per year compared to the weighted rate of genetic progress for the Tropical Breeds of $1.05 per cow mated per year.

The average weighted Selection Index value for the stakeholder Breed Associations based on the BREEDPLAN genetic evaluation results available on 30th June 2016 for those Breed Associations with Selection Indexes including Brahman, Brangus, Belmont Red and Santa Gertrudis.

The average weighted Selection Index ($) for the 2014 calving year was **$21.18** compared to the 2009 calving year (base year) of **$16.55** (see table below). This represents an increase of **$4.63** between the 2009 and 2014 calving years or an average increase of **$0.93 per year**.

Calving Year	# Animals	Av. Weighted Selection Index ($)	Av. Weighted ΔG ($)
2009 (Base)	29321	16.55	-
2010	27555	16.85	0.29
2011	26339	17.66	0.82
2012	25650	18.48	0.82
2013	22506	19.96	1.48
2014	20885	21.18	1.22
2015	14993	21.97	0.79

Importantly, the weighted Selection Index trend shows there is an increasing rate of genetic progress being achieved. The average weighted change for the five years to 2014 was **$1.10** compared to the average weighted change for the five years to 2009 of **$0.70** representing a significant increase in the rate of genetic progress.

Figure 1 shows the average weighted Selection Index from the 1990 to 2015 calving year. This increased from $6.87 per cow mated in 1990 to $21.97 per cow mated in the 2015 calving year.

To achieve this objective the average weighted Selection Index needed to increase from $16.55 per cow mated in the 2009 (base year) calving year to $26.55 in the 2014 calving year.

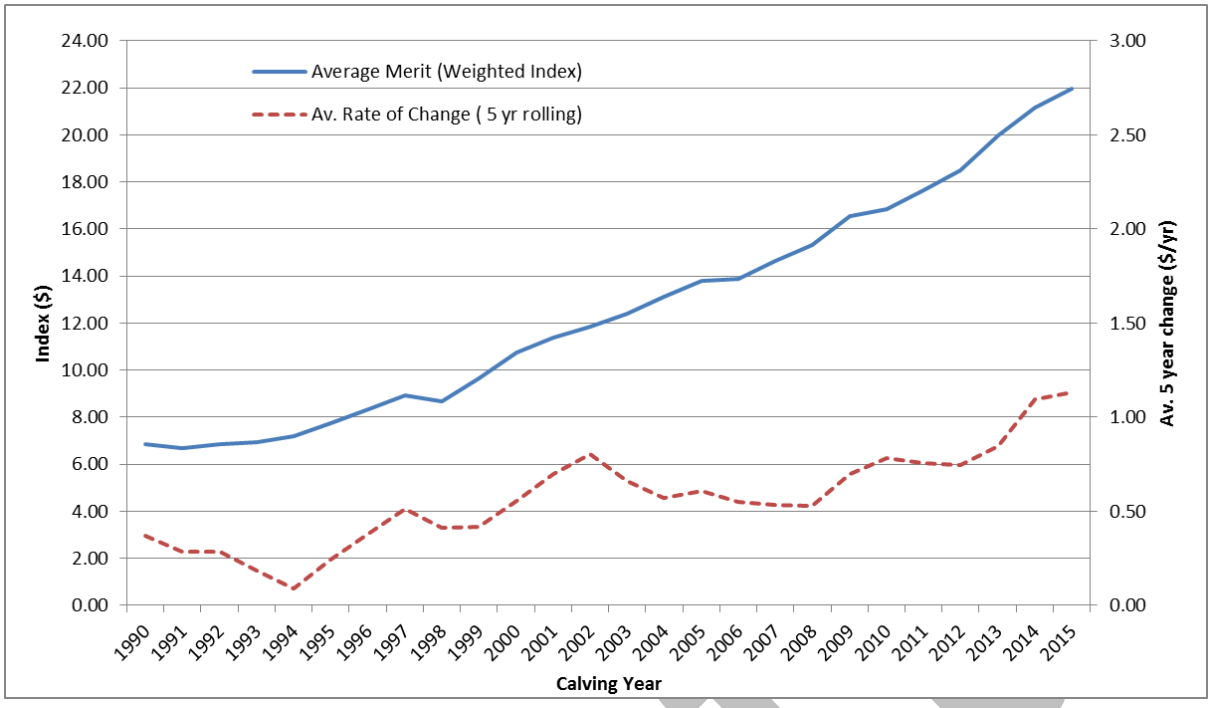

Fig. 1: Average Weighted Selection Index ($) for Tropical Beef Technology Services Stakeholder breeds with Selection Indexes published.

4.2 Develop and undertake extension initiatives to extend relevant messages to the Northern Australia seedstock sector based on Beef CRC research outcomes with particular emphasis on R&D outcomes relevant to the genetic improvement of fertility traits in tropical breed cattle.

TBTS has and will continue to extend messages to the seedstock sector based on Beef CRC research outcomes (and associated outcomes from other research bodies e.g. Animal Genetics and Breeding Unit - AGBU) with an emphasis on genetic improvement of fertility traits in tropical breeds through a mix of targeted and broad extension initiatives.

On–property consultations with influential seedstock herds – Discussion on this topic were undertaken during the consultations with the "influential" herds. This has particularly focused on recording performance data for the current fertility EBVs being Days to Calving and Scrotal Size. An example of the impact of this initiative is tabled below.

This shows the number of performance records **submitted Brahmans, Santa's and Belmont Reds for Days to Calving EBV analysis since the 1st January 2014**.

	Brahman	Santa	Belmont Red
Natural	**31298**	**4,988**	**1725**
AI (Observed Heat)	**65**	**3**	**194**
AI (Fixed time)	**930**	**24**	**31**

Pregnancy Test	**5,808**	**1,662**	**966**
Total	**38,036**	**6,677**	**2,916**

In addition:

- An EBV for Days to Calving was implemented for the Belmont Red breed.
- Nearly 50,000 Brahman mating records since 1/1/2013 were received by Brahman BREEDPLAN.
- For the Santa Gertrudis breed, since 1/1/2013 there have been over 10,000 mating records received by Santa Gertrudis BREEDPLAN.
- Mating Records have also been recently submitted to BREEDPLAN for Brangus and Droughtmaster, however these breeds do not currently undertake a Days to Calving EBV analysis.

Breeding for Fertility Web Page – A web page dedicated to breeding for fertility has been added to the TBTS website (http://tbts.une.edu.au/Fertility.htm). This web page currently includes a range of tip sheets related to genetic for fertility and several recorded webinars covering "*Genetics for Reproduction – The Male Influence*", "*Genetics for Reproduction – the Female Influence" and "Understanding and Recording Information for the Fertility Traits".*

Incorporation of Direct Genomic Values (DGV) blending into BREEDPLAN –The addition of blended female reproduction DGVs into the current Days-to-Calving (DTC) EBVs as part of the routine monthly BREEDPLAN analysis. Overall EBV accuracy for DTC increased by 10% with the range between 0 to 33% with largest change in accuracy was associated with those animals with the lowest pre blending accuracy. Importantly there is no flow on effect of the DGVs to other correlated traits or to close relatives.

BREEDPLAN Analysis Enhancements and Reportability Changes – TBTS assisted Brahmans with implementing the changes to BREEDPLAN 6.2. This involved discussions with the Technical committee and Brahman Staff on enhancements changes. This resulted in a change in accuracy threshold for DTC enabling substantially more animals with DTC EBVs. EBV's for Flight Time and Shear Force were also implemented. TBTS was responsible for communication to Brahman members informing them of changes that occurred with new version of BREEDPLAN.

Technical Advice to Breed Society Technical Committees – TBTS continued to discuss and advise Breed Society Technical Committees on the relevance of Beef CRC outcomes at a breed level. This involved discussion on the incorporation of the Beef CRCs genomic prediction equations into the BREEDPLAN analyses for Brahman on the fertility component of these prediction equations which includes scrotal size, post-partum anoestrus period from first calf and age to first corpus luteum.

Involvement in Research projects - TBTS assisted the Brahman BIN, MLA Repronomics and QAFFI Next Gen Beef Breeding Strategies projects in setting protocols for the collection of fertility traits such as post-partum anoestrus at first calf and age to first corpus luteum data.

Bi-annual SBTS & TBTS Update – Messages continued to be extended in the bi-annual SBTS and TBTS Update newsletter. In the Summer 2013 edition this included relevant articles titled "*Variation in Lifetime Annual Weaning Rate in Tropical Cattle*". In the Winter 2013 edition this included relevant article titled "*Relationship between Male and Female Reproductive Performance in Tropical Cattle"* (See objective 3 for further detail).

General Workshops and Industry events – TBTS presented Beef CRC outcomes focusing on fertility results as introduction to presenting BIN female fertility results.

Involvement in Industry meetings and projects – TBTS was involved in the review and update of the "BreedingEdge" Workshop focusing on the Genetics component of the program.

General Articles – A TBTS article titled "*Variation in Lactation Anoestrus in First Calf Cows in Tropical Cattle*" and "*Variation in Lifetime Annual Weaning Rate in Tropical Cattle*" was published in the Brahman News. It is also available to view on the Brahman website. The article,*"Recording mating details for female reproduction*" was published in the Australian Brangus magazine.

4.3 Undertake extension activities and provide technical support to implement both new and existing BREEDPLAN related technologies in Northern Australia seedstock herds e.g. BREEDPLAN EBVs, Internet Solutions, BreedObject Selection Indexes, TakeStock®, Data Quality Herd Audit, Marker Assisted EBVs and Mate Selection tools. This will primarily involve a focussed approach on extension to key influential herds in each breed and will specifically include at least 40 one-on-one high-level consultations each year.

A range of extension activities and technical support initiatives to implement both new and existing BREEDPLAN related technologies in North Australian seedstock herds were undertaken including the following:

On-Property Consultations with Influential Seedstock Herds: The TBTS team developed an influential herd target list based primarily on herd size and general knowledge of their "influence" on the breed at a seedstock and/or commercial level. Statistics provided by the Animal Genetic and Breeding Unit (AGBU) were also utilised to formulate this list including factors such as the herds rate of genetic progress, average Selection Index and number of progeny bred by sires in the breed with the herds prefix. The target list included 64 herds with an average herd size (calves per calving year) of 293. These were completed with 60 of the 64 herds visited and 4 declining the offer.

To ensure the on-property consultations were effective, a standard Phase 1 "Herd Consultation Kit" was utilised which includes comprehensive information regarding both the performance recording being carried out by the herd and the genetic progress being made by the herd. This involved a 2-3 hour consultation with individual seedstock herds utilising

the standard phase 1 “Performance Recording & Genetic Progress” consultation kit. This kit included the following reports:

- “Completeness of Performance”
- Contemporary Group Summary
- Calving Spread
- Genetic Trend Graphs
- TakeStock

On a herd level, “Completeness of Performance” reports were provided to all BREEDPLAN herds on an annual basis. Additionally, for breed societies on an ILR2 database platform, therefore monthly BREEDPLAN analyses, the Completeness of Performance reports and associated star ratings are updated on a more regular basis (i.e. if the herd has submitted data to BREEDPLAN is the previous month their report will be automatically updated).

A valuable addition to the “Completeness of Performance” product was the trait diagnostic report. This reporting process allows the data recording of individual breeders to be quickly and efficiently interrogated to identify individual animals with gaps in their performance trait profile.

Phase 2 - The Phase II Genetic Improvement Benchmarking reports were finalised in June 2015 and this comprehensive herd level report includes numerous benchmarking statistics in relation to genetic improvement and progress. The statistics are displayed in several sections being:

- Current Genetic Position
- Genetic Trends
- Genetic Improvement Key Drivers
    - Selection Intensity
    - Genetic Variation
    - Generation Length
- Phenotypic Trends

The Genetic Improvement Benchmarking report formed the basis of the Phase II on-property consultations with influential seedstock herds. For these, the Genetic Improvement Consultation kit included:

- Genetic Improvement Benchmarking Report
- Completeness of Performance Report
- And reference documents:
    - “Maximising Genetic Improvement” TechNote
    - “Understanding Selection Indexes” Tip Sheet
    - “A Guide to Performance Recording” Booklet

TBTS personnel undertook 20 individual Phase II on-property consultations (representing 20 individual seedstock herds) with seedstock breeders.

❑ SBTS & TBTS Update: Technical Update newsletters for seedstock producers were developed and distributed in Summer and Winter each year as a joint initiative with SBTS.

The Technical Update was an effective extension avenue for keeping seedstock producers informed on current developments in the genetic progress technology area and upcoming related extension initiatives. With regard to distribution, the Technical Update was:

- Mailed to all BREEDPLAN members of the SBTS and TBTS stakeholder Breed Societies (approximately 2100 businesses).
- Electronically distributed via email or e-news mail list to BP and non BREEDPLAN members of the SBTS & TBTS stakeholder Breed Societies (approximately 5,500 businesses),
- Electronically distributed via email or e-news mail list to a list of personnel working in the beef industry (eg. Ultrasound scanners, staff from AGBU, MLA, SGA, DPI, Pfizer, UQ, private consultants).
- In addition, a copy was provided in electronic form to each Breed Society stakeholder for wider distribution.

In this reporting period, the Summer 2014 and the Winter 2015 e-news version have been viewed 320 times by people on the TBTS distribution list.

The Summer and Winter Editions of the SBTS & TBTS Update can be accessed from the TBTS website (http://tbts.une.edu.au).

- Technical Support to Breed Societies: Technical support was provided on a day to day basis to staff, boards and technical committees/representatives from participating Breed Societies. Examples of technical support provided to Breed Societies include:
  - Representation of participating Breed Societies at BREEDPLAN Technical Liaison Group (BTLG) meetings held four times per year and provision of associated reports.
  - Review of preliminary results from GROUP BREEDPLAN analyses for participating Breeds Societies and provision of associated permission to release the results on behalf of the Breed Society.
  - General liaison and advice with members from participating Breed Societies' staff, technical committees and Boards.
  - Presentations and involvement in Technical Committee/Board meetings of Brahman, Santa Gertrudis, Brangus, Belmont and Droughtmaster. Items discussed included:
    - BTLG recommendations,
    - Changing to new version of BREEDPLAN,
    - New genetic parameters,
    - Flight time EBVs,
    - Days to Calving analysis,
    - Selection Index development/revision
  - Compilation of technical articles for Breed Society magazines.

- Technical Support to Breed Society Members: Members of all participating Breed Societies have had access to ongoing assistance in the use and understanding of the different genetic tools that are available. This is primarily provided through phone and email consultation. As mentioned above, TBTS has also provided "high-level" technical support through phase 1 on-property consultations to 60 influential seedstock herds and 20 Phase 2 consultations.

- Support of UQ / QLD DAFF Queensland Government funded project: During the reporting period TBTS was involved in the protocol design for the collections of BREEDPLAN performance data including the new fertility data based on research outcomes from the Beef

CRC. This project was titled the “Next Gen Beef Breeding Strategies” project. TBTS assisted by supplying performance recording and genetic progress reports on participating herds and assisted research staff in interpreting those reports.

- General Industry Events: During the reporting period, TBTS was involved in numerous industry events, with the main involvement being presenting on genetic improvement technologies such as BREEDPLAN EBVs, Selection Indexes, genomics, BIN outcomes and Beef CRC outcomes (Examples of recent activities shown in Table 2).

Table 2 – General Industry Events Involving TBTS Personnel in final 12 months. (to be updated)

Date	Activity	Description	Venue	Attendance
18/08/2014	GYRANDA Santa Gertrudis Open Day	Discussion on Bull Selection & Helmsmen Auction	Theodore	70
14/03/2015	Brahman BIN Field Day	Update on BIN carcase and fertility results	Banana	100
4-8/5/2015	BEEF Australia	Trade Stall	Rockhampton	
4/05/2015	Beef Australia Beef Tour (Belmont)	Discussion on breeding in Northern Australia	Belmont	70
7/05/2015	MLA Why Genetics Underpin Performance	Update on Northern Fertility Project	Rockhampton	60
8/05/2015	MLA Why Genetics Underpin Performance	Update on Northern Fertility Project	Rockhampton	40
23-25/05/2015	Tour with South African LRF board	Update on BIN carcase and fertility results and tour leading CQ BREEDPLAN herds	Central Queensland	13
29/7/2015	Repronomics Team Meeting	Update on Brahman BIN	Townsville	25
31/7/2015	Repronomics Seedstock Producer	Update on Brahman BIN	Rockhampton	40
			Total	**418**

❑ Monthly Technical Article- "TechTalk": An article, known as TechTalk, is being produced and circulated on a monthly basis that discusses a topic of interest regarding the application of genetic technologies and their utilisation within a breeding program. This initiative, in conjunction with SBTS commenced in May 2013.

TechTalk is circulated via the TBTS website and social media network. The articles will also be provided to participating Breed Societies for distribution throughout their networks. The articles which are available from the XSBTS ewebsite http://sbts.une.edu.au/ include:

- "Utilising DNA Technology to Change Coat Colour" (August 2014)
- "The Importance of Whole Herd Recording" (September 2014)
- "A Commercial Breeders Guide to Using BREEDPLAN Information"(November 2014)
- "Performance Recording _Getting it Right" (February 2015)
- "Understanding BREEDPLAN Contemporary Groups" (March 2015)
- "Customising Your Internet Solutions Search Results" (April 2015)
- "The Importance of Genetic Linkage" (May 2015)
- "Breeding for MSA Compliance and Increased MSA Index Values " (June 2015)
- Performance Recording Birth Weight (July 2015)
- Performance Recording Mature Cow SWeight (August 2015)
- Guide to using BREEDLAN Information in Animal Selection" (September 2015
- "Managing Inbreeding in a Seedstock Breeding Enterprise" (October 2015)
- "Making Bull Selection Decisions for Heifer Mating" (February 2016)
- "Performance Recording in a Drought" (March 2016)
- "Collecting Abbatoir Carcase Information"(June 2016)

- Social Media: In May 2013, SBTS in conjunction with TBTS implemented a strategy to utilise social media as an additional communication stream for genetic technology updates. This involves two social media platforms being Twitter and Facebook. This is additional to the SBTS and TBTS YouTube channel which has been utilised for the past 12 months to upload recorded webinars and other related videos. The Social Media links are:

  www.facebook.com/SBTSTBTS

  www.twitter.com/SBTSTBTS

  www.youtube.com/sbtstbts

Additionally:

- Facebook – There have been 5 posts on the SBTS and TBTS page in the reporting period to date which equates to a post every 30 days. The average

post reached 45 people. The number of "page likes" is currently at 428, compared to 162 at the same time in 2015.

- Twitter – There have been 7 "tweets" undertaken which equates to a tweet every 21 days. The twitter account currently has 192 "followers", compared to 128 at the same time in 2015.
- YouTube – The SBTS & TBTS YouTube channel includes 47 videos. This includes both recorded webinars and specifically developed videos. In the last 5 months there have been no new videos uploaded to the YouTube channel, 1,329 video views, and 5 people subscribe to the YouTube channel.
    - Additionally, TBTS facilitated the communication and promotion of MateSel and INSolutions App through the TBTS Breed Society network.

Changes to TBTS Website were made with a dedicated section to Breeding for Fertility with links to relevant Tip Sheets and Webinars

4.4 Undertake regular extension initiatives to inform the seedstock and beef breeding industry in general on the relevance and application of DNA technology for accelerating genetic progress in economically important production traits.

TBTS actively updated the seedstock and beef breeding sector on the relevance and application of DNA technology. This included:

The Summer 2015 and Winter 2015 editions of the SBTS & TBTS Update included a range of articles outlining the relevance and application of DNA technology. Such as articles titles as "*Incorporation of Genomic values into Brahman BREEDPLAN EBV's"*

- IN September 2014, the Animal Genetics and Breeding Unit (AGBU) provided a report on Incorporation of Genetic Values into Brahman BREEDPLAN to Australian Brahman Breeders' recommending the implementation of DGV's for post weaning weight and new days to Calving be blended into the current 200 day weight and Days to Calving EBV's.
- November 2014 Updated Brahman members on the relevance and application of the changes to the Days to calving and 200 day weight EBVs with the Incorporation of Genetic Values into BREEDPLAN.

4.5. Maintain and support the Selection Indexes published by Stakeholder Breed Associations to ensure they remain relevant to current and future markets and production systems. Where possible, also develop and publish Selection Indexes for stakeholder Breed Associations not currently doing so.

By the end of the project four TBTS Breed Associations have a total of eight Selection Indexes (see following table). New Indexes were developed for Brangus and Belmont Red during the project. Droughtmaster currently have 2 trial Selection Indexes (Jap Ox and Live Export) with the assistance of TBTS which were used within the herds in the Smart Futures Project.

Breed	No.	Selection Indexes

Brahman	2	Jap Ox, Live Export
Santa Gertrudis	2	Domestic Production, Export Production
Brangus	2	Domestic Steer, Export Steer
Belmont Red	2	Domestic Steer, Export Steer

For each of the Selection Indexes, TBTS maintains a detailed set of technical documentation that provide details on the key profit drivers, EBV weightings and response to selection that can be expected when selecting animals using the Selection Index. They are available on the BREEDPLAN website (http://breedplan.une.edu.au) within the technical area.

6. Provide high-level technical support to Beef Information Nucleus (BIN) projects in Northern Australia.

The Australian Brahman Breeders Association (ABBA) is undertaking an initiative known as a Beef Information Nucleus (BIN). The Brahman BIN is a well-structured progeny test program undertaken with co-funding assistance from Meat & Livestock Australia (MLA). Young bulls of high genetic merit are joined by AI or naturally to a commercial cow base to produce progeny which are managed commercially as one cohort and measured for a range of economically traits. The high quality performance data provides head-on-head comparison between the young sires progeny which is analysed through BREEDPLAN for the respective breed. This in turn provides high accuracy Estimated Breeding Values (EBVs) on relatively young sires which will assist in finding the up and coming “Super” Sires earlier than would be possible through standard performance recording undertaken in the seedstock sector.

TBTS has provided high-level technical assistance to the ABBA is a range of areas regarding the Brahman BIN. This includes:

- Update on results from round 1,2 and 3 Sires at Brahman BIN Field Day at Banana Station and to the board of South African Livestock Registering Federation (LRF)
- Input into sires selected from a range of nominated sires.
- Recommendations on traits recorded including appropriate age ranges and contemporary grouping to maximise the effectiveness of the performance information collected.
- Assistance with the set-up of the herd recording databases which is used to store all pedigree and performance data and communicate electronically with the Breed Association and BREEDPLAN.
- Assist in reports to the owners of the sire used in Round 1.
- Article in Brahmans News on the Round 1 and round 2 results regarding EBV changes and outcomes.

To date, the Brahman BIN has contributed a significant amount of birth, weaning, yearling and 600 day performance data to the Brahman BREEDPLAN analysis. This includes over

200 birth weight records and approximately 1800 each of AI dates (for gestation length), weaning weight, yearling weight, final weight, ultrasound carcase scanning data and flight time records.

Additionally:

- Direct abattoir carcase data has been collected and analysed on 529 steers from the 2012 (Round 1) and 2013 drop (round 2) steers.
- Over 900 heifers have been measured for the onset of puberty by ovarian scanning during the last 24 months on the round 1 (2012 drop), 2 (2013 drop) and 3 (2014 drop) heifer progeny.

Summary of Data Collected on the Brahman BIN Animals and Analysed through Brahman BREEDPLAN (Round 1 – 2012, Round 2 – 2013 and Round 3 - 2014)

BIN Herd	Calving Year	# Animals	Birth Weight	AI Date	200 Day Weight	400 Day Weight	600 Day Weight	Flight Time	Carcase Scanning
Belmont	2012	109	109	109	109	109	103	109	101
Barranga	2012	202	0	202	197	195	188	195	188
Banana	2012	193	0	193	190	189	188	190	188
Belmont	2013	107	107	107	107	107	105	107	105
Barranga	2013	268	0	268	257	251	246	257	246
Banana	2013	249	0	249	245	245	245	245	245
Barranga	2014	272	0	272	268	264	264	268	264
Banana	2014	426	0	426	420	420	420	420	420
Total		**1801**	**216**	**1801**	**1793**	**1780**	**1759**	**1793**	**1757**

5 Discussion

5.1 Meeting Project Objectives

5.1.1 An increase in the rate of genetic progress of the Stakeholder Breed Associations by increasing the average BreedObject selection index value of animals by $10 per cow mated between the 2009 drop (base year) and 2014 drop calves. This equates to $2 per cow mated per year compared to the current weighted rate of genetic progress for the Tropical Breeds of $1.05 per cow mated per year.

The average weighted annual rate of genetic progress in the five years to 2009 was $0.70. For the five years to 2014 the average weighted rate of genetic progress was $1.10 and for the five years to 2015 the average rate of gain was $1.13. The goal of achieving a rate of gain of $10.00 per cow mated in the five years to 2014 or $12.00

in the six years to 2015 was not achieved although there was a significant increase in rate of gain over the period of the project.

5.1.2 Develop and undertake extension initiatives to extend relevant messages to the Northern Australia seedstock sector based on Beef CRC research outcomes with particular emphasis on R&D outcomes relevant to the genetic improvement of fertility traits in Bos indicus cattle.

A wide range of extension activities were developed and implemented to extend the relevant messages based on Beef CRC research outcomes relevant to the genetic improvement of fertility traits. The results from the Brahman BIN demonstrating the genetic variation for fertility of Bos indicus cattle were used to demonstrate these messages in a forceful way

5.1.3 Undertake extension activities and provide technical support to implement both new and existing BREEDPLAN related technologies in Northern Australia seedstock herds e.g. BREEDPLAN EBVs, Internet Solutions, BreedObject Selection Indexes, TakeStock®, Data Quality Herd Audit, Marker Assisted EBVs and Mate Selection tools. This will primarily involve a focussed approach on extension to key influential herds in each breed and will specifically include at least 40 one-on-one high level consultations each year

One on one consultations with influential Bos indicus herds included 60 Phase1 consultations and 20 Phase 2 consultations.The objective of 40 one on one high level consultations per year was not achieved because there were not sufficient influential herds with which to undertake this level of consultations .

5.1.4 Undertake extension initiatives to inform the seedstock and beef breeding industry in general on the relevance and application of DNA technology for accelerating genetic progress in economically important production traits.

The blending of genomic test results for Days to Calving and 200 Day Weight into the Brahman BREEDPLAN analysis was used to demonstrate to Bos indicus breeders the relevance and application of genomic technology to genetic evaluation of economically important traits.

5.1.5 Maintain and support the Selection Indexes published by Stakeholder Breed Associations to ensure they remain relevant to current and future markets and production systems. Where possible, also develop and publish Selection Indexes for stakeholder Breed Associations not currently doing so.

Selection Indexes published by Stakeholder breeds were monitored to ensure they were relevant to current markets and production systems. New Indexes were developed for the Brangus and Belmont Redbreeds during the project. Two trial Indexes were developed for the Droughtmaster breed.

5.1.6 Provide high level technical support to Beef Information Nucleus (BIN) projects in Northern Australia.

Extensive support was provided for the data collection, formatting and submission of data from the Brahman BIN to the Brahman Association database for analysis in BREEDPLAN.

5.2 General Discussion

The northern Australian beef cattle industry has traditionally under utilised the genetic technologies available to it both in terms of recording data in their herds and the use of EBVs and selection indexes. As demonstrated in the study of "Barriers to adoption of genetic improvement technologies in northern Australian beef herds (MLA project B.NBP.0753) stud and commercial breeders still rely heavily on phenotypic assessment when making selection decisions.

The CRC3 Northern Fertility Project demonstrated the vey wide variability in fertility of Bos indicus cattle and that a significant component of this variability was genetic. The heritability of Post Calving Anoestrus and Age at Puberty which both contribute to the Days to Calving trait provide the ability to select more fertile Brahman and Tropical Composite cattle. A genomic test which provides a 25% accuracy for the Days to Calving EBV is now available for Brahman cattle.

6 Conclusions/Recommendations

An increase of $10 in the average weighted index for the main breeds over five years could be achieved by selection on the Days to Calving trait in herd sires. However the fact that this objective was not achieved despite the significant applied research results and a concerted extension program over five years has demonstrated the difficulty of achieving higher adoption of genetic technologies by the northern beef industry.

Some of the large pastoral companies have recognised the potential of genetic selection for fertility to increase profitability of their herds and a small number of seedstock breeders have made demonstable genetic gains for fertility in their herds. Only a small number of commercial breeders seem to recognise the economic value of buying genetically superior young bulls.

A new approach to demonstrating the economic value of genetics to the northern beef industry is required.

7 Key Messages

There is huge potential to increase the productivity and efficiency of the northern beef industry by the use of genetic selection especially for fertility traits. However achieving the adoption and belief in the power of genetics in northern Australia is a huge challenge.

8 Bibliography

MLA Project B.NBP.0753 Final Report