Key Messages
for commercial breeders in Southern Australia
The Beef CRC was established with a Commonwealth grant in 1993 with four core parties – CSIRO, NSW Agriculture, Queensland DPI and the University of New England. They had a seven-year charter to develop strategies to capitalise on the potential for producing higher quality beef. The program was renewed in 1999 to continue the research and continue fine tuning and implementation. A new seven year program began in 2005 with a wider range of participants, to develop and implement new genetic technologies for the benefit of the beef industry.

Acknowledgements

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Since the first Beef CRC began in 1993, the Australian beef industry has generated the ability to become the major supplier of high quality grain-fed beef to the lucrative markets of Japan and Korea. Our domestic consumers are benefiting from better meat quality through improved management of animals and processing.

The Beef CRC has worked with the Australian beef industry to improve its competitive position relative to other nations and other protein products. Its main achievements include:

- BREEDPLAN with new EBVs for carcase and meat quality traits and Net Feed Intake.
- BREEDPLAN with greater accuracy for existing traits.
- A detailed understanding of factors affecting eating quality, from conception to cooking methods, used to underpin the MSA program.
- The Meat Standards Australia (MSA) grading program, developed jointly with MLA, delivering a consumer guarantee of eating quality from a wide range of production systems.
- The blueprint for producing beef to meet the specifications of local and international markets.
- New ways to improve the quality of beef from sub-tropical and tropical production systems.
- Teams of scientists capable of underpinning on-going development of the Australian beef industry.
- A huge database of cattle with full pedigree, DNA and performance records, that will enable validation of new gene markers, not yet discovered.
- Training and education programs across the industry.
CRC research has given us a range of methods to improve the quality of beef products and the efficiency of many of our production systems. This leaflet outlines the ones that you will find most useful.

Apart from these, there are many factors that help determine the profitability of your herd. To maximize profit it is important to get the basics right first - having healthy cattle, adapted to their environment and producing marketable progeny.

Ask yourself these basic questions:

- Breeds – is my breed or breeds the best adapted to low cost breeding, growth and market suitability my environment?
- Breeding system – could I be more productive with a crossbreeding or composite system that combines higher female productivity with higher turnoff rates and market suitability?
- Feed utilization – do I have a fertile herd that calves at the best time of year to turn the available feed into beef? Do I have the best balance between breeding and growing stock? How well does this system handle drought?
- Age and weight of turnoff – am I adding the most value to my progeny by making best use of the growing season and suiting market demand?
- Market suitability – Do my turnoff stock match buyer requirements for breed, age and weight and time of year? What other markets are available or likely to become available?

Many of the suggested actions in this leaflet will then add to your profit and set the direction for on-going improvement in the future.
CRC began with a huge program of testing the progeny of selected sires in seven mainstream breeds, and a crossbreeding experiment. An overlay of experiments in nutrition and others in animal behaviour and meat processing helped define exactly what determines the carcase and meat quality characteristics.

CRC Findings and principles:

- **BREEDPLAN EBVs** work – and with CRC research, they predict the performance of progeny with more accuracy.

- **BREEDPLAN** has new carcase traits – fat depth, eye-muscle area, retail beef yield and marbling.

- **SCANNING** produces good EBVs for carcase traits and is much cheaper and more practical than testing the carcases of steer progeny.

- The same EBVs can be used for grass or grain production systems and for domestic and export markets.

- EBVs are calculated for all traits, but they are more accurate if all traits are measured in all animals.

- **TENDERNESS:**
  - (a) has a low heritability in British and European breed types – concentrate on factors other than genetics to improve tenderness.
  - (b) has a moderate heritability in tropical breed types – there is potential to use genetic techniques to improve it – use gene markers and EBVs calculated from flight time.

- **MARBLING** is moderately heritable and varies between breeds. For marbling markets, choose suitable breeds and select sires using EBVs and gene markers.

- **TEMPERAMENT** has a moderately heritability but is hard to select for because seedstock breeders usually give fractious bulls extra handling to quieten them. Culling females doesn’t work either in the long term.
  - (a) The best approach is to measure temperament in all animals (flight time, crush score or yard test) and use the data to produce EBVs.
  - (b) EBVs are especially good for selecting AI sires.

- **FLIGHT TIME** in tropical breeds is genetically correlated to tenderness. These breeds can use flight time measurements on young stock to produce EBVs for tenderness. (First of these EBVs due in 2007).

- **NET FEED INTAKE (NFI)** is a moderately heritable measure of feed efficiency and EBVs are now available in some British breeds.
  - (a) The level of blood protein IGF-1 is correlated to NFI and is easier to measure, so it is used to help calculate EBVs.
  - (b) The correlation with IGF-1 may not be as strong in tropical breeds and this is being studied further.
  - (c) Testing for NFI must be done in each breed to ensure the same genetic principles apply, and enable calculation of EBVs.
(d) EBVs from actual testing are more accurate and will always be needed.

(e) CRC is developing gene marker tests for NFI and in future this will make selection easier and more accurate.

- **BREEDPLAN EBVs** are not comparable across breeds, but eventually all breeds will move to a common base. As a step towards this, research has produced a set of adjustment factors for some traits in some breeds.

- **GENE MARKERS** for marbling and tenderness represent the beginning of a new era of gene discovery.

(a) Gene markers are useful for improving marbling and, in tropical breeds, for improving tenderness.

(b) In future, BREEDPLAN will add knowledge about GENE MARKERS to improve the accuracy of EBVs. This will be known as “marker-assisted selection”.

(c) In the next few years it is expected that hundreds of genes and gene markers will become available to improve the accuracy of genetic analyses.

**What to do**

- Select the appropriate breed(s) and breeding system to suit your property and markets.

- Get to know BREEDPLAN and use it with confidence to select sires for growth and carcase traits.

- If you are aiming at markets requiring marbling, use gene marker information as well as EBVs to help choose bulls.

- Encourage bull breeders to measure all traits rather than rely on BREEDPLAN to predict them, to increase the accuracy of EBVs.

- Encourage seedstock producers and their breed organizations to measure and produce EBVs for temperament (docility).
A series of experiments has examined the effects of normal and restricted growth before birth (during pregnancy), from birth to weaning, around weaning time and in the growout (backgrounding) period before entering finishing on grass or grain. Studies have included the effects on subsequent growth and compensatory gain, and the ultimate effects on carcase and meat quality.

CRC findings and principles:

- Overall, cattle can tolerate quite a wide range in nutrition in early life without serious adverse effects on meat quality, but severe restriction can reduce their future growth potential.

- Cows restricted during pregnancy will give birth to lighter calves that have reduced ability to grow during pre-weaning, backgrounding and finishing.
  
  (a) Cows calving 100kg lighter would have calves weighing about 5kg lighter.
  
  (b) A 10kg reduction in birth weight flows on to become 30kg at weaning, 40kg at yearling and 55kg at finishing.

- Calves restricted in early life, between birth and weaning, will only partly catch up when returned to good feed.

- Early weaning requires quality feed or supplements for the calves. They must gain at least 0.6kg/day to achieve adequate growth and meat quality later.

- Calves restricted for 4 months at weaning (200kg, 9 months) will only partly compensate when returned to good feed – their growth potential is reduced.

- Eating quality of meat is virtually unaffected by a period of growth restriction, except for a slight reduction due to increased age at slaughter.

**What to do**

- Ensure cows are adequately fed during pregnancy, to ensure cow fertility and future growth potential of the calf.

- Ensure cows and calves are adequately fed so calves grow at a minimum of 0.6kg/day (to reach a minimum of 140kg at 6 months, 180kg at 9 months).

- If weaning calves early, make sure they continue to gain at least 0.6kg/day to preserve their future growth potential. This may require specialized feed supplements.

- Set market targets for growing stock and manage their growth to achieve targets and maximize pasture utilization.

- If supplements are needed, make sure they complement the available feed and are cost effective and practical.

- Manage weaners to achieve target weights for feedlot entry/finishing before reaching market limits for dentition/age.
• For maximum marbling, aim for an uninterrupted growth rate of around 0.8kg/day from weaning to feedlot entry.

• If backgrounding growth is slower than about 0.7kg/day, they will show faster, more profitable compensatory growth in the feedlot. See if you can get paid for this.

• Beware of buying weaner or yearling cattle that have had an early growth check as their potential for growth may be reduced and they may reach market limits for age (dentition) before they reach weight targets.
At Weaning

Weaning is a critical time for calves. Continuing satisfactory growth is important to retain their potential for growth during backgrounding and finishing. It is also a key time for learning experiences that will help them adapt to production systems that take them toward a domestic or export markets. These experiences will affect their future growth, health, meat quality and profitability.

CRC findings and principles:

• Earlier weaning allows more efficient use of pasture. Cows can recover quicker and can do so on lower quality feed, so your best feed can be targeted to weaners.

• You can wean after the youngest calf is 100 days old, and the lightest calf is 100kg. HIGH QUALITY PASTURE OR SUPPLEMENTS will be needed, to ensure they gain at least 0.6kg/day after weaning.

• Weaning is an ideal time to carry out HEALTH TREATMENTS according to local recommendations.

• DEHORNING should be done by weaning at the latest, or preferably earlier (2-3 months). Better still, use a polled bull.

• YARD WEANING is a simple practice that improves the performance of cattle when they enter a feedlot later in life:
  (a) Disease in feedlots is strongly related to poor immunity resulting from high levels of stress.
  (b) Yard weaning is a learning experience that reduces stress when they later enter a feedlot.

  (c) Essential requirements are to confine weaners in strong, well-drained yards (not small paddocks) at high density (4 sq m per beast) for 5-7 days on good hay/silage and good quality water, preferably in troughs.

  (d) Replacement females will become quieter and are trained for feeding and yarding.

• TEMPERAMENT is related to feedlot performance and meat quality, not to mention safety to you and your staff or family.
  (a) To achieve on-going improvement in temperament, you must use genetically docile bulls. Culling temperamental females doesn’t fix the problem.
  (b) Bull breeders can hide the genetics of poor temperament by giving fractious bulls extra handling – but they will still breed fractious progeny.
  (c) EBVs for temperament identify the quiet genetics – use EBVs, or encourage your breed to introduce EBVs for temperament (docility).
  (d) Weaning is a good time to address temperament. Measure flight time, crush score or yard test.

What to do

• In southern Australia, WEAN EARLIER (5-6 months) rather than later. This maximizes cow fertility and lets you target the best pasture to the weaners.

• Wean down to 100 days of age or 100kg liveweight for maximum feed efficiency
but it is critical feed the weaners a high quality diet to ensure growth of 0.6kg/day.

- Yard wean by confining calves for 5-7 days at 4sq m per head on good quality hay/silage and water.
- Be particular about health – drench, and if necessary, use fly control to reduce pink-eye.
- Dehorn well before weaning if possible.
- Measure temperament on all calves. Cull any with unacceptable temperament.
Growing Out and Backgrounding

The period of growing out after weaning and before entering a grass or grain finishing system is known as backgrounding. The CRC has identified significant effects of backgrounding growth on feedlot performance and meat quality. It is also a time when cattle can be given special vaccines to prepare them for optimum feedlot performance.

CRC findings and principles:

• Adequate growth is required to meet feedlot entry weight before reaching market limits for age (dentition).

• Faster growth during backgrounding results in earlier feedlot entry, fatter carcases, slower feedlot growth and maximum marbling.

• Slower growth during backgrounding results in faster, more efficient finishing growth, leaner, yielding carcases but not as much marbling.

• Vaccines against respiratory disease (Bovilis-MH™) given during backgrounding will reduce sickness and improve performance in the feedlot.

• If cattle are not yard weaned, an equivalent experience early during backgrounding is better than nothing.

What to do

• Define target markets (e.g. feedlot entry or slaughter specifications).

• Set target growth rates and manage feed quality/quantity to achieve them.

• Develop a relationship with your markets - seek feedback on growth and compliance to key carcase specifications (yield, fatness, marbling).

• Understand the differences between breeds with respect to growth, carcase yield and marbling, and market preferences, so you can target the right markets.

• If the cattle are not yard-weaned or their history is unknown, give them a “yard weaning” experience for 5-7 days.

• Discuss the use of vaccines and other pre-feedlot health treatments with your feedlot buyer.

• Consider retaining ownership (custom feeding) if your stock are above average performers.
Beef output per hectare is a key profit driver for commercial beef producers. In both breeding and growing enterprises, producers can accept lower performance per head to achieve higher stocking rate and total beef output.

The Beef CRC has focused mainly on meat quality rather than grazing management in its research so far, but has helped define the effects of different growth rates in the early life of steers on achieving market targets.

**Principles:**

- Pasture growth follows a seasonal pattern. Cattle production is most efficient if animal requirements peak when feed is most plentiful and vice-versa.
- Cows generally eat a lot more than weaners but can utilize lower quality feed.
- After weaning, cows are very efficient at using lower quality feed.
- Cow fertility declines if cows slip too low in body condition.
- It is more efficient to maintain a high stocking rate by using supplementary feeding to fill short term feed gaps, compared to reducing cow numbers.
- Feed supplements are best if they complement the available feed by supplying missing nutrients, rather than replace available feed.
- Cost of the limiting nutrients and practicality for feeding out are important considerations when choosing feed supplements.

**What to do:**

- Maintain a restricted joining/calving period and calve when it best fits seasonal pasture growth.
- Wean calves early and ensure they receive priority pasture or suitable high quality supplements to achieve growth targets.
- Manage the nutrition of cows and feed them if necessary to ensure fertility.
- Buy feed supplements according to their suitability, cost and practicality.
The new CRC for Beef Genetic Technologies will run from 2005 until 2012. It is developing and implementing new tools to help produce high quality beef products efficiently and keep our industry competitive.

Using these tools we will be able to identify and breed animals with better carcase traits such as yield of saleable meat, tenderness and marbling, while at the same time improving the basic herd productivity traits such as fertility, adaptation, parasite resistance and temperament.

**Programs under way include:**

- Genetic and other technologies for improving beef yield and quality in commercial supply chains.
- Genetic studies linking maternal efficiency in the breeding herd with improving carcase and meat quality traits and feed efficiency.
- Improving tick resistance and defining animal welfare.
- Genetic improvement of fertility in the northern environment.
- A major program with supply chains and producer groups, working to achieve faster adoption of new technologies.

Progress is already impressive, and if research targets are met and the industry adopts the findings, benefits are estimated to be worth an additional $179m per year to the Australian beef industry.

To take advantage of the opportunities, breeders will need to stay in touch with changing markets, keep an open mind and be prepared to modify some traditional practices.
Livestock Library
A new searchable database of livestock research information:
www.livestocklibrary.com.au

BREEDPLAN
http://breedplan.une.edu.au

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