CRC BEEF

Beef Bulletin

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How much feed do your cattle really need?

Australia's largest
integrated beef research program

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International agreement benefits Aussie beef producers

After years of competition between Australian and North American beef producers, the Beef CRC is entering into a collaboration with the United States and Canada that promises quantum gains in our understanding of beef cattle genetics.

Heather Burrow, CEO of the Beef CRC, is an avid supporter of collaboration. When the possibility arose to forge research links between Australia and its North American rivals, she pursued the opportunity.

"For every dollar we spend in the area of beef research the Americans are spending seven. Quite simply we were going to be left behind," Dr Burrow said. "It seems crazy; we're all doing the same research into beef genomics but none of us have sufficient resources to give industry the confidence they need to know the technology works. The sensible thing to do is to collaborate with the US and share our resources."

It took more than four years to seal the deal. The idea for an International Collaborative model first arose in 2004, but it wasn't until early 2008, during a meeting in San Diego, that it came to fruition.

The collaboration involves the United States Department of Agriculture (USDA), The National Beef Cattle Evaluation Consortium (NBCEC), the National Beef Cattleman's Association (NBCA), the Beef Improvement Federation (BIF), the University of Guelph (Canada) the University of Alberta, Edmonton (Canada) and the Beef CRC, through its 19 Participants and Supporting Participants.

Dr Burrow said when the entire bovine genome sequence became publicly available it changed the way DNA markers are discovered.

"In CRCII we had scientists and technicians doing the laboratory work and checking each marker for its association with the productive traits of growth, feed efficiency and carcass and meat quality," she explained.

"The scientists would then develop their own set of markers which they'd release to industry. Initially we believed we'd find five to 10 markers for each economically important trait which would account for 50 percent of the genetic variation."

But Dr Burrow said researchers now realise that there are many more markers than they anticipated, each accounting for very small amounts of variation.

"Now we have access to the information across the entire genome sequence we have realised we are dealing with 50,000 markers in a single test. That means we require even more animals to find the genes, and many more on top of that to confirm and validate the results," she said.

The North American collaboration will ensure there are enough resources to test the markers.

"In the past we would have discovered the markers in about 200 cattle, validated them in 1000, and then handed them over to the commercialisation companies," said Dr Burrow.

Now researchers are using the entire bovine genome sequence, that process is inadequate. But it becomes possible when Australia, America and Canada pool their resources.

"We'll now discover the markers in 3,000 animals, confirm them in another 3,000 animals which are totally independent, and then validate them in them in 15,000 before we release them to industry," Dr Burrow said.

She said this will give producers the confidence they need to genetically test their herds.

One big question to be resolved is whether markers found in American cattle will provide the same results in Australian herds and vice versa.

Dr Burrow said she's reasonably confident markers for some traits will work in all three production systems. The US National Beef Cattle Evaluation Consortium validated the 'Gene Star' markers for marbling and tenderness in American cattle and Dr Burrow said the results were remarkably similar to those found in Australian cattle.

"I would expect markers applied to female reproduction in northern Australia will be substantially different to markers which would apply to reproduction in Bos Taurus cattle in temperate America, but we haven't got any data to confirm that yet," she said. That's why we've applied for an International Science Linkage (ISL) grant to look at the interaction between genotype and environment, to see if an animal changes ranking across the different production systems."

While initially the focus will be on the difficult and expensive traits of feed efficiency, carcass and meat quality and reproduction traits, they are not the only traits under consideration. Dr Burrow said in the future the collaborators would like to bring in markers for things like disease, worm or tick resistance common to Canada, New Zealand or America, to see if they have any application in Australian cattle.

Dr Burrow is excited about the opportunities this partnership will bring to Australia, and does not believe it will erode Australia's trade advantage.

"Sure we could have developed our own markers in-house, but it would probably take 10 years to do what we can now do in two. It would also take a vast amount of money which we don't have," she said.

"Alternatively, we could have left the discovery of the markers to the US but then we'd have no idea if they were suitable for Australia. This path is the best one for all concerned."

Dr Burrow believes Australia's trade advantage is getting people to make better use of the marker technology, which is why the Beef CRC is placing emphasis on the way the markers are commercialised.

Dr Burrow said the first task is to increase confidence in the markers, secondly to drive down the cost of genotyping.

"Currently seed stock breeders are paying up to $1000 per animal to calculate their merit. We're planning on releasing the markers under a non-exclusive licensing arrangement which will mean greater competition. That will hopefully keep prices low."

She said it's quite feasible that within five years the majority of cattle in Australia will be selected on genetic performance rather than visual appraisal.

"We're aiming to include about 1500 markers for beef and carcass quality, feed efficiency, female reproduction and growth traits on a single chip for less than $50. Breeders will then be able to take a tail hair or a blood sample at branding, send it off to a genotyping laboratory and receive a gene marker profile of each animal. That should then allow them to identify the best cattle for particular markets, or the best replacements to go into their breeding herd."

But it's not only stud breeders who will benefit, according to Dr Burrow.

"At the commercial level we want producers to DNA test their cattle for less than $10 each. We envisage they would end up receiving a premium for those cattle with particular genes for the economically important traits of carcass and beef quality and feed efficiency," she said.

Tenderness markers work!

Once dismissed as tough and lean, more meat from Bos indicus cattle and their crosses is making its way onto butcher shop shelves across the country, courtesy of Beef CRC research.

Sitting in his office at the New South Wales Department of Primary Industry's Beef Centre in Armidale, Dr Paul Greenwood looks content. Experiments he's been working on for the past couple of years are finally over, and he can now let the public know he's got the results he, and industry, had been hoping for.

"Tenderness markers work, and they work very well," he said.

His research built on earlier findings by the Beef CRC and others, which showed that cattle of pre-dominantly Bos taurus genotypes tend to meet with consumer acceptance more often than those from Bos indicus genotypes.

"Part of the rationale behind our work was to look at whether there are other ways we can achieve a greater level of consumer acceptance of beef from Bos indicus cattle. I think we've managed to show that selecting cattle with tenderness markers is one way of doing that," he said.

Dr Greenwood and his team looked at two tenderness markers based on the calpain system, which is responsible for the breakdown of the muscle during ageing and therefore can make the meat more tender if it is stored before consumption.

He said that at the start of the experiment 2500 cattle from New South Wales, Queensland and Western Australia were sampled to find those with contrasting gene markers required for the design. From those sampled in NSW and QLD the experimental group were sent to Glen Innes while the experimental group from the WA steers were sent to Vasse Research Station.

"There were four groups in NSW, one group had two copies of the two favourable markers for tenderness, one group had the two copies of the two unfavourable markersfor tenderness and then there were two intermiate groups each with two copies of one favourable and of one unfavourable gene," he said. "The cattle in Western Australia also had the extremes but we also included other groups of cattle with one copy of the markers for tenderness."

The cattle were weaned, backgrounded and then went into a feedlot. The cattle in Western Australia stayed on feed for 70 days; the groups in NSW were fed for 100 days.

The carcasses were then subjected to different processing treatments. Some were hung the conventional way, by the Achilles tendon, others were tender stretched. Aging rates were also compared to see to what extent the markers had developed over time.

"If we compare the two sites, we found the cattle which had no copies of the two tenderness markers produced meat that was a full kilogram of shear force tougher than the meat from those that had copies of the two favourable gene markers," Dr Greenwood said.

Shear force is a mechanical measure of the amount of force needed to cut through a cooked piece of meat. The lower the shear force the more tender the meat.

"The size of the markers' effect was biggest in the traditionally hung animals aged for seven days. We still saw a significant difference in those that were tender stretched, although the size of the effect wasn't quite as big."

Often, selecting for a particular trait can negatively influence other economically important production traits. The tenderness markers, fortunately, don't appear to have any negative impacts on other traits.

"We found across a range of production traits including Net Feed Intake (NFI), growth, carcass characteristics and temperament there was no adverse effect of the markers," Dr Greenwood said. "So generally speaking, the effects of the markers were quite specific to the tenderness of the meat."

Dr Greenwood said this work could have a number of potential spin-offs.

"For producers, if one of their objectives is to produce more tender meat, then they can be confident these markers will have a positive effect. Potentially, if we see more people testing and selecting for these markers the meat should gain more acceptance among consumers."

But it could also mean greater efficiencies for the processing sector, Dr Greenwood added.

"Of course this would need to be looked at in more detail by people within the sector, but it could lead to potential efficiencies due to improvements in the aging rates of meat to get to a required level of tenderness. If the aim is to produce meat of similar quality to current production systems then carcasses that have these markers, may not have to be aged as long as they are now."

Beef grading system gets a makeover

Meat Standards Australia (MSA), the world's best meat grading system, is about to be upgraded to allow genetic linkages to the attribute most prized by consumers: tenderness.

Since its release in 2000, MSA has gone from strength to strength. The system is now used on more than a million carcasses a year, adding more than $200 million to the value of the Australian beef industry and significantly improving the reputation of Australian beef.

"In a very short time MSA has had a huge impact on the Australian industry. It's now being rolled out overseas and is set for release in Korea and the US," said Professor of Meat Science John Thompson from the University of New England.

MSA is a system where the quality of the meat is predicted using a host of production, processing and value adding parameters.

"These can include the breed of the animal, whether it's had an Hormonal Growth Promotant (HGP) implant, its' growth path, how the animal is treated in lairage to minimise stress, chiller conditions, hanging, aging and how the meat is cooked. All of these things can impact on eating quality," Professor Thompson said.

Above all else, consumers rate beef on its tenderness. However until now, there has been no way to link the MSA model with gene markers for tenderness.

That's now changing, Professor Thompson said, thanks to the work of Paul Greenwood and his team of researchers at the Beef CRC, who confirmed the effect of the tenderness genes on shear force (the force required to cut through a cooked piece of meat).

"Meat samples were put aside during Paul's experiment, so there's an opportunity now to get those samples tested by a taste panel and quantify the gene markers impact on sensory scores. This will be the first step in incorporating them into the MSA model," said Professor Thompson.

He anticipates that details of the animals gene marker status will probably be incorporated into the vendor declaration forms producers use when selling cattle.

"Some documentation will be needed to ensure that animals have the tenderness gene markers. This will then give the producers the benefit of a certain number of palatability points in the MSA model," he said.

Professor Thompson is confident an increase in the MSA score will create an incentive for producers to test their cattle for the presence or absence of gene markers for tenderness.

"The current cost of genetic testing may preclude some people from doing it, but we all expect the cost of testing to come down in future. Depending on the size or magnitude of the effect of the markers and the premium people are receiving for producing high quality meat, then there will come a time when we would expect it to be economic to test cattle destined for slaughter. This will effectively create a pull effect on the use of gene markers for tenderness"

Professor Thompson said the biggest benefits could come for breeders of Bos indicus type cattle.

"The effect is likely to be less for some of the Bos taurus breeds where the gene frequency of the 'tenderness genes' is very high, so there is little gain to be made," he said. "But certainly in the Brahmans there is enormous gain to be made. This could improve their grading under the MSA model."

Truly Tender Beef

by Grace Taylor, SARDI

Placing juicy, tender, high quality beef on the plates of consumers every time is the focus of a visionary genomics project underway at SARDI.

The project is part of a Beef CRC program which is striving to add more than $50 million to the value of the beef food chain within four years.

Working with other agencies, SARDI molecular biologist, Dr Greg Nattrass hopes to shed light on ways to optimise the expression of genes linked to favourable meat quality traits.

This involves getting to the crux of how and when cattle, carrying genes for tender beef, deliver the expected quality and product integrity - and when they don't.

"It's one thing to breed cattle that have the genetic predisposition for tender meat, but it's another to try and understand how the critical genes are switched on," he said.

"There are often many genes involved and everything from climate to feeding regimes and breed type can influence gene activity.

"From the consumer's perspective, we are trying to maximise the chance of them purchasing a consistently high quality piece of beef – which comes from improving the compliance rate of cattle with Meat Standards Australia (MSA) requirements."

The work

Dr Nattrass' speciality is in gene expression studies. He is looking to see when and how genes are actively being switched on and the complex pathways that regulate gene expression. This entails understanding the molecular detail of messenger RNA molecules (mRNA), increasingly recognised as the cutting edge of gene research. RNA molecules decode gene libraries -. ie DNA - spitting out proteins that function in biological pathways, in this case those that influence meat quality.

"There are the genes that generate the proteins that influence meat quality. There are desirable traits which make the meat tender or undesirable traits which make meat tough. Sitting behind all of that are the genes that modulate biological pathways and control these processes," he explains.

"My research will provide insight into how genes that promote tenderness are switched on and if this translates into positive effects for the eating attributes of meat."

So far, Dr Nattrass has demonstrated that the commercially-available GeneSTAR® DNA markers for tenderness alter messenger RNA levels of several genes involved in tenderising meat.

The project compared the predicted breeding merit of cattle raised in two distinct production systems with 400 cattle selected from an original pool of 6,000 animals. Selected animals carried none, one or two sets of the GeneSTAR® DNA markers.

The cattle were raised on pastures and finished in feedlots in two states to see how the genes performed under different environments. Dr Nattrass' found benefits generally increased with increasing `dosage' of genes, with some differences between environments. This has provided an incentive for the project to push ahead with further gene expression studies.

Researchers hope to further fine-tune breeding programs to optimise the expression of tenderness genes under particular climatic and feeding regimes and rearing systems.

The collaborative effort brings together quantitative geneticists, meat scientists and molecular biologists from across the country, all conversant with the Meat Standards Australia (MSA) approach to deliver specified product of guaranteed eating quality.

Beef CRC scientists interstate are handling the `bioinformatics' side of the research using technology that gives them the ability to scan 50,000 changes in the DNA in one assay and to use this information to pinpoint additional genes involved in producing tender, juicy meat.

With approximately 30,000 genes in the bovine genome and three billion base pairs to sift through, the task is no mean feat. As new meat trait genes are identified by his colleagues, Dr Nattrass will also examine how and when they are switched on.

"It comes down to a complex series of events, being driven by a tiny proportion of subtle genetic differences, which make all the difference to putting better beef on everyone's table," he said.

Making meat more marketable, Dr Greg Nattrass works from SARDI's gene function laboratories at both the Waite Campus and Livestock Alliance at Roseworthy.

Calculating producer profits

There are a few unavoidable variables in the business of beef production, but a new tool unveiled by the Beef CRC aims to take some of the guess work out of the process.

Beef producers have long relied on experience, and some rough calculations, to tell them how long they will need to keep stock on a feed regime to meet a particular market specification. That process is about to get more scientific with the development of the 'growth calculator' .

Pulling together 20 years of research in Australia and overseas, the growth calculator will help producers meet market specifications more often by better predicting cattle growth rates, according to Bill McKiernan from the New South Wales' Department of Primary Industries, leader of the Beef CRC's Phenotypic Modelling project.

"Whether you're supplying the local trade market, the butcher trade, supermarkets or even the export market, you get paid on weight and fatness," said Mr McKiernan. "Buyers want to know how heavy the carcass is and how fat it is. There are significant penalties for animals which are over fat. If they're too fat there's a lot of waste, and if they're too lean, people won't buy them."

Mr McKiernan said the tool uses a number of inputs - including the animal's frame score, its weight, current fat score and the quality of the feed available - to determine how much fat it will put on by the time it is ready for sale. Alternatively, producers can calculate the type of feed needed, and for how long, to get the animal to a certain weight and fat score.

"People can use that information to make better management decisions. They might put a self-feeder in the paddock to make their animals grow faster, or put the cattle in a paddock of oats. They might let them grow out gradually so they don't get too fat."

The growth calculator comes under the Beef CRC's 'High quality beef for global consumers' program, which aims to add $43 million each year to the value of the Australian beef industry from 2012.

Mr McKiernan believes the calculator could boost profits by five to 10 per cent, but acknowledges more work needs to be done to improve the tool's accuracy.

"At the moment we're using very crude data," he observed.

"We're describing the maturity pattern of the animal, rather than using the breed itself. For example, a late maturing European breed will have a frame score of about 7 or 8, whereas early maturing British breeds might be about a 2 or 3 frame score. Eventually we'd like to acknowledge these breed differences in the model and include the breed and the dimensions of the body. We could then incorporate certain EBVs from various breeds. Eventually, we'll be able to input genetic knowledge using DNA markers."

He envisages the model being of particular benefit to the feedlot sector, The tool has the potential to be sophisticated enough to determine how different animals will lay down fat – whether subcutaneously (outside fat), intra-muscular (marbling) or inter-muscular (between muscles).

"We're currently in the process of finding producers who are keen to test-drive this tool in their enterprise," Mr McKiernan said. "But I think within another 6 months the accuracy will have improved to the stage where we'll have a model which will be readily available for use by producers. Anything which helps a producer improve their ability to meet market specs is a boon."

Bill McKiernan

Has the bubble

The grain fed cattle bubble hasn't burst, according to Malcolm Foster: it's simply taking a breather after three years of record growth.

The president of the Australian Lot Feeders Association said that despite some of the most difficult trading conditions in years, the feedlot industry is well placed to capitalise on the increased demand for protein from the US, Asia and Europe.

"In my view, the current downturn in numbers of cattle on feed is merely a transitory situation and the industry will return to steady growth sometime during next year," Mr Foster said.

He delivered his forecast while presenting an industry overview at the 13th Feeder Steer School in Armidale. The school is run by the Beef CRC, New South Wales Department of Primary Industries and Angus Australia.

From the mid 1990s until 2006, the Australian lot feeding industry experienced steady growth, Mr Foster said, with numbers on feed nearly doubling and feedlot capacity increasing by more than 30 per cent.

When Bovine Spongiform Encephalopathy (BSE) was discovered in the United States cattle herd four years ago, the US lost its lucrative Asian markets and the Australian lot feeding industry stepped into the breach.

"Demand for Australian grainfed beef was greater than the industry's ability to supply and the numbers on feed grew 40 per cent from June 2003 to June 2006," Mr Foster said.

But what goes up tends to come down. The factors which led to the extraordinary growth in Australian lot feeding started to unravel, one by one.

With no further cases of BSE to taint its market image, the US has begun re-establishing its presence in the Japanese and Korean markets. While demand for US beef is still a long way from pre-BSE levels, Mr Foster commented that just having the US back in the market is dampening prices for the Australian product.

The continuing strength of the Australian dollar in comparison to the US dollar has also further depressed returns for Australian exporters.

But it has been surging grain prices that have delivered the biggest hit to lot feeders.

"In the middle of 2006, international grain prices suddenly doubled as a result of artificial demand for corn in the USA from the burgeoning ethanol industry spurred on by government mandates," said Mr Foster. "A serious drought in 2006 saw Australian grain production drop to 40% of normal levels, and a $100/t drought premium was quickly added to the already inflated international grain prices."

The drought continued, and the 2007 winter crops once again failed. In combination with Northern Hemisphere crop failures, this led

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to another doubling of cereal prices. Lot feeders were confronted with the highest grain prices on record.

Feedlots were forced to offload cattle, pushing numbers on feed to the lowest levels since 2000. According to ALFA figures, there were just under 585,000 head of cattle on feed in December 2007; 83 per cent less than in December 2006.

But despite all that's being thrown at feedlotters, Mr Foster believes the fundamentals which led to the growth of the industry are still present.

"Asian beef demand is forecast to increase by 1.9 million tonnes by 2020, according to a report recently released by the Australian Farm Institute. Our experience in Asia suggests that much of this increased demand will be for grain fed beef."

"Beef consumption in Japan is still 10% lower than before the banning of US beef," he said. "There is scope for this to recover if the age restrictions on US beef are relaxed sometime in the future and beef becomes more available."

But it's not only Japan which has become an important market for Australian beef exports. Mr Foster said demand from Korea is also strong.

"Initially Korea was considered a market primarily for lower quality beef compared to Japan. But as the market becomes more sophisticated, there has been an increasing demand for grain fed product."

Beef consumption in Korea dropped 25% following the suspension of US beef imports in 2003. But it's generally recognised that beef consumption in Korea will grow further as the standard of living improves, Mr Foster said. "An increase of 50% from pre-2003 levels is not out of the question."

Domestically, demand for grain fed beef has also increased significantly over the past 10 years.

Much of this has been driven by supermarkets and the food service area wishing to provide their customers with more consistent product.

"The market share of grain fed beef in the supermarket sector was estimated to be around 90%. Increasingly, more highly marbled product has been winning acceptance in the food service area of the domestic market, and the roll out of Meat Standards Australia has strengthened the demand for grain fed beef as the importance of growth and marbling on eating quality are better understood."

But Australia should not only set its sights on Asia, according to Mr Foster. Russia and the USA also show considerable potential.

"Grain fed beef sales have grown by 60% in the last 12 months in the USA. Russia is now the world's third largest beef importer and Moscow is the most expensive city in the world in which to live. This growing affluence is leading to a growing demand for higher quality beef."

The challenges to these possibilities remain a competitive US beef industry, and ongoing grain shortages.

"Whenever the Eastern States of Australia have a grain shortage there is a premium of around $100/t added to the price. This premium represents the cost to bring grain into the Eastern States from Western Australia or overseas," he said.

Mr Foster also claims the recent government assistance to an otherwise unprofitable ethanol industry is a concern for lot feeders, as it could lead to annual grain shortages that are the equivalent of permanent drought conditions.

"ALFA is working hard to convince politicians that there are no sound reasons to subsidise ethanol production. To the contrary, subsidies will only damage cattle producers by artificially forcing down cattle prices," he said.

In view of the competitive challenges it faces, Mr Foster argued that the Australian grain fed beef industry must continue to supply the quantities and quality required at competitive prices.

Advances in genetics and animal management delivered through the Beef CRC's research programs play a key role in Australia's competitiveness.

"Genetics determine the potential of an animal to develop particular carcass characteristics and meat quality," Mr Foster said. "Background factors can also influence animal performance in the feedlot, and carcass characteristics."

He added that a steady supply of consistent quality cattle enables processors to develop branded products that can build a reputation in the market place not just for their brand, but for Australian beef in world markets.

How much feed

The feedlot industry is set to benefit from a new tool, now in development, which has the potential to significantly reduce feed costs by more accurately predicting the ability of an animal to turn feed into beef.

Beef CRC Masters student, Andrew Slack-Smith, is mapping a supply chain scenario which will help lot feeders determine the optimum time to keep individual animals on feed.

Mr Slack-Smith, from Meat Science at the University of New England, said with feed costs now pushing $300-$400 a tonne it's increasingly important for feedlotters to know how long they are going to have to feed an animal before it reaches desired specifications.

"Over a feeding period an animal reaches a point where its net value is optimised. But if this point is over-reached, then its net value begins to decline again," said Mr Slack-Smith. "Basically, it means animals are eating the same amount but putting on less saleable product. That's costing the feedlot money."

By correctly allocating animals to a feed regime based on their ability to meet certain market specifications, rather than using generic observations such as breed type, feedlots can potentially get more value from their cattle purchases.

"In the past, lot feeders have relied on generic information, such as who produced the animals and the breed," he said. "This can be an extremely inaccurate way of determining growth rates and how long to keep feeding them. A black animal isn't always an Angus."

"Using these types of predictors in the long-fed market can lead to a 70 per cent drop-out rate. That means only 30% of animals looking to achieve high marble scores (3+) ever get there," he said.

Mr Slack-Smith said lot feeders collect several other valuable statistics during induction. These include weight, HGP implant status and frame score.

Working with the Beef CRC's Phenotypic Prediction project (led by Bill McKiernen, NSW DPI), Mr Slack-Smith has developed a model that uses the information to provide a predicted carcass weight and marble score for individual animals. The results give lot feeders a better idea of how long they will need to feed an animal to gain the best economic advantage.

"For example, in the short-fed market you could take a group of animals and feed them for a period of 70 days as opposed to 80 or 120 days," he said. "Feedlots do lose money on some animals, and hopefully this tool will minimise that to some degree."

Mr Slack-Smith claims preliminary results have shown a significant cost saving to industry.

"The scenarios have been run without any constraints. But in some cases there's been a 50% reduction in costs," he said.

However, Mr Slack-Smith said the highest profitability comes from limiting variable costs, such as feed.

"In one particular case where the purchase price of the cattle was $1.40 per kilogram and feed costs were $350/tonne we found a 300% increase in the value of the animal," he said.

do your cattle need?

Mr Slack-Smith said his model now needs to be tested against certain market specifications such as fat score, marbling and carcass weight.

"The reaction I've had from industry is quite positive. Lot feeders have been collecting data for the last 20 years so they can make predictions just like this," said Mr Slack-Smith

Meet Dr Manuel Rodriguez Valle

It may be small, but the damage the cattle tick wreaks on the Australian cattle industry belies its size.

Rhipicephalus (Boophilus) microplus is estimated to cost the northern beef industry $175 million dollars a year in lost beef and milk production.

If infestation levels are severe enough it can even cause death. But the biggest costs associated with the tick relate to the diseases it transfers to cattle. These diseases are *Babesia bovis* (´red water´ or babesiosis), *Babesia bigemina*, (red water) and *Anaplasma marginale*, (anaplasmosis).

But now Australia has a new weapon in the fight against the cattle tick. He comes all the way from Cuba.

Dr Manuel Rodriguez Valle has been seconded to Australia to help researchers develop a single, annual vaccination which provides strong immunity to cattle ticks.

He is working through a project funded by the Beef CRC and led by Queensland Department of Primary Industries & Fisheries. It includes collaborators from the University of Queensland, WA's Centre for Comparative Genomics at Murdoch University and the United States Department of Agriculture.

Dr Rodriguez Valle has plenty of experience in combating cattle ticks.

In 1994 he and a team of Cuban scientists were successful in developing their own vaccine, now being used extensively in the Cuban, Brazillian, Columbian and Mexican cattle industries.

Called GAVAC™, the vaccine reduced the cost of tick control in Cuba by 85 per cent.

The introduction of GAVAC™ was a boon for the Cuban cattle industry, which is predominantly made up of Holstein cattle, a breed not usually adapted to tropical countries.

"Cattle ticks are a big problem for Cuba given our hot climate," said Dr Rodriguez Valle. "Since the collapse of the Soviet Union we have been introducing more *Bos indicus* content into our cattle, cross breeding Holsteins with the African Zebu. This is working, but there is no doubt the tick vaccine has had a massive effect in reducing tick borne diseases."

Although he's been working with ticks for the past 15 years, Dr Rodriguez Valle began his scientific career in Tokyo, Japan, working on a vaccine for the cancer-causing human papilloma virus.

On his return to Cuba, he switched his focus to developing a vaccine to control ticks.

"Most of the cattle in Cuba are owned by the government," he said. "There are a few private cattle owners, but even then, all the cattle are produced for the government. So you can see the government was spending a lot of money on tick control. It was no wonder they wanted to find a vaccine."

More than 500,000 cattle were vaccinated with GAVAC™, which interrupts the egg stage of the tick.

"Initially we vaccinated the cattle. We then gave them another vaccination four weeks later. The cattle would then receive a booster shot every 6 months," he said. "In the 16 years between 1986 and 2002 we reduced tick control chemicals from 480 metric tonnes to 70 metric tonnes."

While GAVAC™ has worked in Cuba to reduce the impact of cattle ticks, a similar vaccine in Australia called 'TickGARD' hasn't been adopted to the same extent.

"I don't know why Australian cattle producers haven't embraced TickGARD," said Dr Rodriguez Valle. "Perhaps it has something to do with the fact people want an economical vaccine which only needs to be used once a year rather than having to vaccinate animals several times a year."

That's why he's excited to be working on the Beef CRC project.

"TickGARD was a very good step but we need to develop a stronger vaccine against cattle ticks. There are some very talented people working on this project, and I hope to share my experiences and bring fresh ideas to the table," he said.