#### **CONFERENCE PROCEEDINGS**





#### **ILC Speakers and their presentations**

David Baxter, Executive director, Urban Futures Institute,

**Futurist? Demographer? Economist? All of these words could be used to describe David Baxter. Yet none would fully capture the breadth of his knowledge and insight into today's business challenges.** The executive director of the Urban Futures Institute, Mr. Baxter is one of that rare breed of business thinkers - someone who has both the desire and the ability to conduct original research into business trends, while having the outstanding presentation skills required to deliver the conclusions in and entertaining, engaging, and meaningful way. The results could, without hyperbole, be described as revolutionary. People from dozens of industries and an array of professions have walked away from Mr. Baxter's presentations with a better understanding of the issues facing their company or their organization, and with the tools to effectively meet the challenges ahead. One of the most-quoted business experts in the country, Mr. Baxter's irreverent, witty, and provocative style and brilliant content have made him a favourite with audiences in Canada, the United States, and around the world. David Baxter was recently named the Worldwide ERC Workforce Mobility Expert.

#### What does David talk about?

#### Demographics, Life Cycles & Life Styles: Practical Strategies For Reaching Consumers Today And In The Future

With his extensive knowledge of demographics and economics David can help you know your customer. We have all heard that the age of mass marketing is over; in this compelling talk, David Baxter explains what this means and how to target marketing efforts. Tailoring his research and his discussion to your particular organization, David explains how and why consumers are clustering in niches that seek individualized products and services.

In a fragmented market it is not enough to know about demographic changes in a general sense. To succeed you will need to focus on the demographic, life cycle and life style shifts within your market niches. Other experts can give you the background. David Baxter takes the time to provide the information you need for your business.

#### ILC Topic: Our rural community

- the challenges and the issues that stem from the ageing of the baby boomers: who carries on the family farm as kids move onto professional city and regional centre commercial careers. Generally they do not want to go back to the farm but equally they do not want to sell the farm when they inherit it from Mom and Dad.

- The consequence is a large number of farms, generally well run who have uncertain futures in the current paradigm. At the other end of the equation there are also a large number of farm kids who want to carry on the family business but capital purchase prices are too high for them to buy the farm.

- human resources - the challenges of finding employees for on farm or farm related businesses, how to deal with the competitive work force options and meet quality of life demands

- the demographics are different in the city than in the rural areas: the city follows the baby boomers - in the rural area we are looking at persons 10 years older. What will this mean to the rural demographics.

- the issue of how does the a farming community transition the farm from one generation to the next and build on the corporate memory already existing in the farm business and remain commercially competitive without being saddled with high interest payments on large capital borrowings.

- what does this mean to the producers today? Our rural communities? Employers in the agricultural industries in the rural communities?

#### Professor David Hughes, Imperial College, University of London, UK

Dr. David Hughes is Emeritus Professor of Food Marketing at the Centre for Food Chain Research, Imperial College London, and Visiting Professor at the Royal Agricultural College, U.K. He has lived and worked in Europe, North America, the Caribbean, Africa and South East Asia. Hughes is an international advisory board member with food organizations in three continents; and a Non-Executive Director of KG Fruits – a U.K. farmer-owned berry fruit business (C\$250 million in turnover by 2006). He works closely with senior management of food firms on business strategy development and with governments on food policy

formulation; his focus is on global food industry issues, consumer trends, and building vertical alliances in the food industry.

#### IL Topic: Solutions to Meeting Global Challenges

Do you want your sons and daughters to be in the food industry? - it's seriously tough and not for the fainthearted! Most developed countries have slow or no population growth and, even the iconic food and beverage brands struggle to show real sales and margin growth. Red meat sales are sluggish and there is, often, tension between health professionals calling for us to decrease red meat consumption and the industry and its associations exhorting us to do the reverse! In emerging nations, the meat of first choice is generally white and beef/lamb are minority meats. Increasing incomes in these markets does not automatically translate into strong demand for "Western" premium cuts. Technological advances in industrial white meat production – chicken and fish/seafood - and strong food cultures challenge demand growth for red meats.

In developed country food markets, price is important but, increasingly, attributes other than low price are influential in driving demand for meat products. Retailers across the globe are offering shoppers a three tiered product range – *good* (aka "cheap"), *better*, *best* But, what are these non-price attributes that shoppers value and are willing to pay for? Those exporters who were previously, but are no more, the low cost producers, that can unlock this puzzle have a "Get out of Jail" card.

Clearly, meat protein demand globally is on the increase. Supply will respond accordingly, although there will be hiccups as economic downturns on the demand side, commodity cycles and production cataclysms on the supply side interrupt the smooth upward direction of trend lines. For red meat to have long-term success in the consumer market, it must be the leader in food safety and integrity.

For the global meat industry, the future looks set for continued strong growth. Mind you, whether that be red is another matter! Crucially, it will require us meeting the increasingly rigorous requirements of consumers. On the positive side, there's billions of them and growing. What is more challenging is that they are ever more knowledgeable, pernickety, and differ radically in their wants within and between markets. Never forget, market winners will be those that delight their customers with great tasting food products that are easy to buy, prepare, eat and clean up after. Onwards!

#### Glen Hodgson, Vice-President and Chief Economist, The Conference Board of Canada

Glen Hodgson brings 23 years experience and a specialization in international economic and financial issues to the position of Vice-President and Chief Economist of The Conference Board of Canada. Mr. Hodgson is responsible for overseeing the Board's macro-economic outlook products, tourism, and custom research. He is the Board's chief spokesperson on economic issues, has written extensively on Canadian and international economic and financial issues, and is bilingual.

He play a central role in enhancing the Board's public policy analysis and contributes to The Canada Project, a three-year program of research and facilitated dialogue that seeks to improve Canada's standard of living and its place in North America and the world.

Mr. Hodgson joined the Board in September 2004, after 10 years at Export Development Canada (EDC). He held several senior positions at EDC, including Vice President of Policy and Deputy Chief Economist. He also spent 10 years with the federal Department of Finance. From 1984 to 1988, Mr. Hodgson served as Advisor/Assistant to the Executive Director for Canada, Ireland and the Caribbean at the International Monetary Fund.

Mr. Hodgson has an M.A. in Economics from McGill University and also pursued Ph.D. studies at McGill. He resides in Ottawa with his wife and two sons. He spends leisure time coaching, and participating in, a variety of athletic activities.

June, 2005

ILC Topic: Global economics and your business

#### Prof Bernard Michael BINDON, B.RurSc, M.RurSc (NE), PhD (Syd), D.RurSc(hc) (NE), FASAP, FAAABG

Prof B M Bindon has been a CSIRO livestock researcher for 43 years, retiring in September 2005. He has completed a lifetime of research in physiology and genetics of domestic livestock and has managed research projects in Australia, France, Latin America and southern Africa.

In 1992 Bernie Bindon established the CRC for Cattle and Beef Quality, designed to work in partnership with the Australian beef industry to address the genetic and non-genetic factors affecting beef quality. The CRC was renewed for its third term in 2004 bringing the overall budget for the Beef CRC to \$260 million.

In 2005 the Beef CRC has been recognised as playing a significant role in the transformation of the beef sector from a *"bulk commodity"* culture toward a *"highly differentiated, quality specific"* beef culture. Beef is now Australia's most valuable agricultural export.

Bernie Bindon has been recognised by the Australian beef industry as recipient of the Beef Improvement Association's Howard Yelland Award (2000), Rural Press R&D Award (2001) and the Rural Press/Rabobank Red Meat Innovation "Beef Achiever of the Year" Award (2005). In 2003 the Beef CRC received the CRC Association's Award for Excellence in Innovation, presented by the Prime Minister. He has published 135 journal papers and book chapters and some 200 conference papers and proceedings. He has been elected Fellow of the Australian Society of Animal Production (2000) and Fellow of the Association for the Advancement of Animal Breeding and Genetics (2005).

ILC Calgary topic, 2006 Prof Bernie Bindon will describe the CRC's research in genetics, nutrition and meat science since 1992 to guarantee beef quality and consolidate Australia's position as World's No. 1 Beef Trader. This required close integration of beef research across scientific institutions, cattle breeders, feedlot operators and meat processors. The project has pioneered genetic evaluation and

gene marker technology to identify cattle with the traits for diverse beef markets. It helped develop a new beef grading system ("Meat Standards Australia") based on eating quality rather than carcass description, leading to guaranteed consumer satisfaction with Australian beef products.

#### Brant Randles, President, Louis Dreyfus Canada Ltd.

Brant Randles first joined Louis Dreyfus Canada Ltd. in 1981 and has been its President since 2000. In 1986 he became the General Manager for Louis Dreyfus Canada Ltd. in Winnipeg, Manitoba. He was the Commercial Manager for Louis Dreyfus Asia in Singapore from 1992 to 1995 and was the General Manager for that office from 1992 to 1995. From 1995 to 1998 Mr. Randles was the Managing Director for Louis Dreyfus Africa in Johannesburg and was Vice-President and General Manager of Louis Dreyfus Canada from 1998 to 2000.

Mr. Randles is currently a board member of the Churchill Gateway Development Corporation, a board member of the Winnipeg Commodity Exchange, executive member of the Western Grain Elevator Association and involved in a community association.

#### ILC topic: Global Feed Grain market and Supply

#### Dennis B. McGivern, Vice President, Informa Economics, Inc.

Mr. McGivern's primary responsibilities include red meat analyses, meat-based project consulting as well as client service. He came to Informa in 1999 from XL Foods Ltd., Calgary, Alberta, where he worked for 16 years in the areas of economic and market analyses, long-term planning, boxed beef pricing, and sales and market strategy development. Prior to his work at XL Foods, Mr. McGivern spent three years as a market analyst for CANFAX (the market information division of the Canadian Cattlemen's Association) and four years as territory manager for Shur-Gain Division, Canada Packers Inc. He received his bachelor's degree in agricultural sciences from the University of British Columbia and his master's degree in economics from the University of Calgary.

Title of presentation: The Effect of Changes in the Exchange Rate on the Canadian Beef Industry

Presentation focus: Examining the implications of an appreciating Canadian dollar on the Canadian cattle and beef industry at the primary production and processing levels, with emphasis on exchange rate impacts on commodity prices and input factors, as well as production, trade and structural trends. The project also explored alternative mechanisms to manage exchange rat.

#### Alanna Koch Vice President, Canadian Agri-Food Trade Alliance

Alanna Koch was elected as a farmer director to the board of Agricore United in February 2003. She is a member of the company's Audit Committee and the Nominating and Governance Committee. Alanna served as Agricore United's representative on the board of the Canadian Agri-Food Trade Alliance (CAFTA) for 6 months and then was elected CAFTA's Vice-President in October, 2005.

Alanna has diverse experience and extensive knowledge from almost 20 years in the agriculture industry. She and her husband Gerry Hertz own a small grain farm and operate a business, KoHert Agri, at Edenwold, Saskatchewan.

Her contributions to agriculture include eight years as Executive Director of the Western Canadian Wheat Growers Association and her continued involvement as an advisor to the organization. From 2000 - 2002, she was a Director of AVAC Ltd., a "virtual" corporation focused on investment in science and innovation to grow Alberta's agrivalue industry. Working with the newly formed Agricultural Development Institute (now AgraPoint International, Inc.) in Nova Scotia in 2001, Alanna assisted in developing innovative extension service delivery through consultation with farmers and farm organizations. In 2002, she served as Chairperson of CARE; a group of farmers from across the prairies promoting the election of farmer-directors who believe in voluntary marketing to the Canadian Wheat Board.

Other accomplishments include: graduate of the first Canadian Agriculture Lifetime Leadership (CALL) program; past director of the George Morris Centre at the University of Guelph; steering committee member for the International Grains Council's Year 2000 World Grain Conference; 1994 and 1999 National Judge for Canada's Outstanding Young Farmers Program; former trade show committee member for Canadian Western Agribition; and, nine years with the Government of Saskatchewan in a number of senior civil service positions. Throughout her career, Alanna has been involved in provincial, national and international policy development initiatives, with particular focus on marketing and transportation reform. In recognition of achievement in and service to the agricultural industry, the Saskatchewan Institute of Agrologists awarded Alanna with an Honorary Life Membership in 1999.

Beyond the agriculture industry, Alanna's community involvement is extensive including Vice-Chair of the Edenwold School Council, children's education Co-Chair at St. Paul's Lutheran Church, Past Chair of the Edenwold Playground Fundraising Committee, and five years as an elected trustee to the Buffalo Plains School Division Board of Education. In 2005, Alanna was awarded the Saskatchewan Centennial Medal for her significant contributions to her province.

Alanna and Gerry have two young daughters. Alanna attended the College of Agriculture at the University of Saskatchewan.

#### ILC Topic: Why International Trade Negotiations are Critical to Your Future

In November 2001, the Doha Round of international trade negotiations was launched, with negotiations for a new World Trade Organization agreement on agriculture front and centre. Agriculture is still front and centre after 5 years of formal negotiations and just as many missed deadlines. Despite the set-backs and the frustrations, the World Trade Organization's 150 member countries are still committed to reaching an ambitious agreement by the end of this year, and they are still looking to agriculture to pave the way. Not only will an agreement on agriculture set the tone for negotiations on services and industrial products and better dispute settlement rules, a new agreement is absolutely critical to livestock and meat producers everywhere. Meat products are the most protected commodities in the world – facing tariffs that soar to well over 100%; tariff quotas designed to keep product out of many potential markets; and competing against products that are still very heavily subsidized. Ministers from WTO member countries were in Geneva at the end of June to negotiate new rules for agriculture trade. What did they accomplish? What does it mean for livestock producers around the world? What is still left to do, and how can producers influence the outcome?



# The Economic Outlook: Well Positioned for Growth

**2006 International Livestock Congress — Calgary Beef 2006: Strategic Thinking for a Changing Industry** 

> Palomino Room, Roundup Centre, Calgary Stampede Friday, July 14, 2006

Glen Hodgson, Vice-President & Chief Economist hodgson@conferenceboard.ca

# The Rise of Emerging Markets

- Fundamental shift occurring in global economic tectonic plates
- Industrial economies -- aging labour force means slower growth potential
- Emerging markets, led by China, are growing in global status
- Driven by much improved economic policies and strong labour force growth

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### Projected Economic Growth in Major Emerging Markets, 2006 (% change in real GDP)



Source: Consensus Economics.

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# U.S. Pressure Points

- United States twin deficits current account and fiscal
- High energy prices
- U.S. property markets
- Yet despite imbalances, U.S. economy should manage a soft landing



### U.S. Current Account Deficit (Billions of US\$)



Source: BEA; The Conference Board of Canada.

#### U.S. Federal Government Balance (Billions of US\$)



Source: BEA; The Conference Board of Canada.

#### Major Global Currencies vs. U.S. Dollar Quarterly 2001(q3)–06 (q2)



Source: Moody's Economy.com.

# Canada's Outlook 2006–07

- Domestic demand carrying Canada's economy
  - GST and PIT cuts will produce large gains in after tax income this year
- Upside risk from latest budget
- Easing resource prices will take some pressure off the Canadian dollar
- But growth will be unbalanced, west to east

Insights You Can Count On



## Interest Rates (90-Day T-Bill) Quarterly 2000–07



Sources: BEA; CBoC; Statistics Canada.

#### Housing Starts (000s) Canada 2000–07



Sources: The Conference Board of Canada; Statistics Canada.

#### The Loonie and the Oil Price WTI \$US, \$US/\$C



Sources: U.S. Energy Information Administration; Statistics Canada; The Conference Board of Canada.

## Exchange Rate 2000–07 U.S. cents per Canadian dollar



Sources: The Conference Board of Canada; Statistics Canada.

### Real Export Growth Canada 2000–07



Sources: The Conference Board of Canada; Statistics Canada

#### CPI Shows Inflation Risk Rising Jan 2001 – May 2006 (annual per cent change)



Sources: The Conference Board of Canada; Statistics Canada.

### Consumer Price Inflation Canada 2000–07



Sources: The Conference Board of Canada; Statistics Canada.

### Federal and Provincial Gov't Balances (Public Accounts Basis, fiscal year ending, \$billions)



Sources: The Conference Board of Canada; Statistics Canada; various government budgets.

### Real Government Spending on Goods and Services Canada (2000–07)



Sources: The Conference Board of Canada; Statistics Canada.

## Pre-Tax Corporate Profits Canada 2000–07 (\$ billions)



Source: The Conference Board of Canada.

## Real Business Investment Growth (Canada 2000–07)



Sources: The Conference Board of Canada; Statistics Canada.

## Composition of Real Business Investment Growth, Canada (2005–07)



Sources: The Conference Board of Canada; Statistics Canada.

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## Employment Growth Canada, 2000–07



Sources: The Conference Board of Canada; Statistics Canada.

07/06

### Manufacturing Employment (Indexed 1998 = 100)



Sources: BLS; OECD; China National Bureau of Statistics; Statistics Canada.

### Real Disposable Income Growth percent, Canada 2000–07



Sources: The Conference Board of Canada; Statistics Canada.

#### Index of Consumer Attitudes, Canada 1988:1–2001(Qtly); Jan 02–June 06 (Mthly) (1991=100)



Source: The Conference Board of Canada.

07/06

## Real Consumer Spending Growth percent, Canada 2000–07



Sources: The Conference Board of Canada; Statistics Canada



Sources: The Conference Board of Canada; Statistics Canada

#### 2006 Real GDP Growth by Province (per cent, basic prices, 1997 \$)



#### 2007 Real GDP Growth by Province (per cent, basic prices, 1997 \$)



# Conclusion

- Strong structural forces at work in the global economy: aging, emerging markets, U.S. imbalances, oil prices
- Strong income gains support Canadian economy despite lackluster trade performance
- Manufacturers and exporters to suffer through another year of adjustment
- Regional growth disparity will continue in the near term
- Alberta the land of opportunity...

• ... and it can remain so, if the challenges and bottlenecks are managed



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#### 2006 International Livestock Congress – Calgary

#### Beef 2006: Strategic Thinking for a Changing Industry

The Effect of Changes in the Exchange Rate On the Canadian Beef Industry

Presented by: Dennis McGivern

July14, 2006

## Background

Project Commissioned by: National Beef Industry Development Fund

Project Completed by: Kurt Klein, University of Lethbridge Kevin Grier, George Morris Center Dennis McGivern, Informa Economics, Inc.


## **Purpose:**

- Examine the implications of an appreciating Canadian dollar on the Canadian beef industry at the primary production and processing levels
- Provide industry with a quantitative analysis that determines the effects (short term and long term) of changes in the exchange rate
- Demonstrate how changes in the exchange rate affect prices, trade, and overall industry structure



# **Objectives:**

Measuring and examining the impact of the exchange rate on the following areas of the cattle and beef packing sectors:

- **1.** Revenues and prices
- **2. Commodity input costs (particularly grain)**

**3.** Industry production factors such as labour, energy, interest rates, equipment, land and materials

- 4. Investment and capital expenditures
- 5. Asset valuations
- 6. Trade patterns
- 7. **Production**
- 8. Costs of production, margins and profitability
- **9.** Industry structure (size and number of operations)



## Exchange Rate Impacts on Commodity Prices and Input Factors

- To a large degree, Canadian prices (feeder cattle through beef cuts) are determined by US prices due to the ability to arbitrage in an open North American market
- The exchange rate plays a direct role in commodity pricing in Canada
- There is a direct, highly correlated inverse relationship between the exchange rate and cattle/beef prices
- The exchange rate plays a direct and simple arithmetic role in pricing cattle and beef
- Very little relationship between the exchange rate and most agricultural inputs (other than grain in livestock rations)



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# Exchange Rate Impacts on Commodity Prices and Input Factors

- Very little impact on the prices or values of land and farm labour
- Small impact on prices of fertilizer, electricity and diesel
- Relatively stronger relationship between the exchange rate and the prices of capital assets
- Thus, the exchange rate plays a minor role in the price determination or discovery process of cattle industry inputs (with the exception of grain and prices of capital assets)





## Exchange Rate Impacts and Industry Productivity and Competitiveness

- Declining productivity in the overall Canadian economy was primary cause of the depreciation of the currency relative to the US dollar during the 1990s
- Declining productivity may have resulted from declining investment relative to the US
- Currency depreciation was largely result of the lack of competitiveness of Canadian industries in aggregate in comparison to the US and other nations
- •
- Additional factors (political and other) were also at play, but the strong correlation with lack of competitiveness indicates a driving force



## Exchange Rate Impacts and Industry Productivity and Competitiveness

- Notable appreciation of Canadian dollar since early 2003, but not yet sufficient evidence that there has been corresponding increase in productivity
- Gradual increase in investment during 2002/03, widening interest rate spreads and surging oil revenues are likely the key drivers of the appreciation
- Misleading to state that a declining currency helps Canada's competitiveness
- A depreciating currency is a measure of Canada's lack of competitiveness



## Cost and Revenue Structures in Each Component of the Value Chain

- Assessed consequence of appreciating Canadian dollar on thirteen typical cattle enterprises across Canada
- Partial budget analysis revealed an adverse impact, sometimes quite severe, for every cattle enterprise in every region
- Both the cow-calf and feedlot operations incur significant short-term losses, the greatest negative impact is endured by the cow-calf operations
- Long-run, the full burden of exchange rate appreciation expected to be fully borne by cow-calf operators
- Loss in value will be incorporated into the value of fixed assets, namely land



# Cost and Revenue Structures in Each Component of the Value Chain

- In the long-run, feedlot operations would be expected to return to acceptable margins by paying less for feeder cattle
- During 1990s, Canadian packers were very low cost relative to the US, largely due to the cheap dollar
- As of 2006, this low cost, dollar-shield advantage has largely eroded
- Appreciating dollar forces packers to more closely align operating costs, particularly labour with the US



- The simple arithmetic of the appreciation has caused the spread between beef revenue and cattle costs to narrow
- Dollar appreciation is causing and will force Canadian packers to improve their competitive position, or risk failure in the market

## Canadian Cattle and Beef Industry Production and Structural Trends

- Currency depreciation during the 1990s influenced a disproportionate growth in the cowherd
- But, did not result in a disproportionate growth in beef production in Canada
- Still, Canadian beef production did increase faster than US production during the 1990s
- Indirect relationship, in that the expanded cowherd made conditions conducive to expanded beef production in Canada
- Spurt in growth of Canadian packing plant capacity, now close to productive capabilities of the cowherd (probably due to packer margins from mid 2003 through 2005)



## Impact of Exchange Rate on Canadian Cattle and Beef Industry Trade Trends

- Long term annual and shorter-term monthly data assessed for relationship between live and product trade and the exchange rate (1971-2002)
- No confident statistical relationship between exchange rate and cattle imports or cattle exports
- Reasonable relationship between annual beef imports and the exchange rate, but no monthly relationship (annual relationship may be coincidental)
- More significant statistical relationship between beef exports and the exchange rate, both on annual and monthly basis
- As the exchange rate depreciated, exports tended to increase



## Impact of Exchange Rate on Canadian Cattle and Beef Industry Trade Trends

- Weak relationship on cattle trade or beef import raises question about causal relationship with exports
- 1971-2002, Canadian dollar trending mostly downward
- 30 percent appreciation of Canadian dollar from 2002-2005
- Yet beef exports very strong in 2004-05 (record in 2005)



- Consider volume of live cattle exports since the border re-opened, despite the appreciated dollar
- Record hog exports in 2004 and near record numbers in 2005



## Impact of Exchange Rate on Canadian Cattle and Beef Industry Trade Trends

- "Conventional wisdom" would argue that a depreciating currency results in greater exports and an appreciating currency would result in less exports
- For commodity markets, changing exchange rates become directly reflected in prices in the domestic market
- The depreciated (appreciated) dollar may result in higher (lower) Canadian cattle and beef prices
- But a depreciated (appreciated) dollar does not necessarily mean that more (less) product will trade with the US



# **Concluding Remarks**

- Declining relative productivity in the overall economy was a primary cause of the currency depreciation during the 1990s
- The depreciating currency was a measure of Canada's lack of competitiveness
- Exchange rates appear to have very little impact on the prices or values of land and farm labour and a small impact on the prices of fertilizer, electricity and diesel
- Grain costs and the prices of capital assets have stronger relationships with the exchange rate
- With open borders and ability for market arbitrage, Canadian cattle and beef prices react to changes in US cattle/beef prices and changes in exchange rate



# **Concluding Remarks**

- Margins in all sectors can be negatively impacted by an appreciating dollar
- Long-term burden will be ultimately borne by the cow-calf sector
- Feedlot sector will return to acceptable margins in the longrun by bidding less for feeder cattle
- Appreciating currency will force Canadian packers to improve their competitive position, or risk failure in the market
- Contrary to "conventional wisdom", a depreciating (appreciating) dollar does not necessarily mean that more (less) product will trade to the US







## 2006 International Livestock Congress – Calgary

## Beef 2006: Strategic Thinking for a Changing Industry

The Effect of Changes in the Exchange Rate On the Canadian Beef Industry

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## Alberta & US Fed Steer Prices



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an AGRA informa company

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## Alta Fed Steers Vs. Exchange Rate



## Alberta & US Steer Calf Prices



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## Farm Labor Price Index - Exchange Rate



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## **Total Capital Expenditures Canada/US**



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Value Added Per \$ Spent on Wages and Salaries



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Change in Gross Margins of Cow-Calf and Feedlot Enterprises from 28.5% Increase in CDN\$/US\$ Exchange Rate, \$/head



	Cow-Calf Enterprise		Feedlot Ei	Feedlot Enterprise	
	Small	Large	Small	Large	
Alberta	-210	-228	-76	-93	
Saskatchewan	-207	-229	-75	-113	
Manitoba	-202	-225	-111	-137	
Ontario	-180	-194	-143	-178	
Commercial (AB)				-118	

Based on 2001 prices and costs Calculations do not include fixed costs or the returns to labour



Projected Impact of Exchange Rate Appreciation on Packer Labor Costs (\$/hd) (based on estimated pre-BSE costs)

	<u>C\$1.548=US\$1</u>	<u>C\$1.204=US\$1</u>
Canadian dollar terms	C\$125	<b>C\$125</b>
US dollar terms	<b>US\$81</b>	<b>US\$104</b>





informa economics

## **Cdn vs US Production and Cowherd**



### **Canadian Dollar and Beef Exports**



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Achievements of the Beef CRC – A platform for the next 10 years

### Abstract

The CRC for Cattle and Beef Quality was established in 1993 to identify the genetic and non-genetic factors affecting Beef Quality and other production traits of economic importance. Since 1993 there have been great advances in biology, particularly in the understanding of genes that regulate health and performance of animals, including man and domestic livestock.

At the 2005 Gympie Carcass Classic the Beef CRC will summarise its major achievements to date and present an overview of the new CRC for Beef Genetic Technologies (which commenced on 1 July 2005). The idea will be to paint a picture of how genomics research will influence cattle breeding and management technologies in the next 10 years.

### Introduction

The Beef CRC was established in 1993 to address the major emerging beef issues of the early 1990s - the impending liberalisation of the north Asian markets and the worldwide change in consumer attitudes to beef quality. These forces demanded a radical new research focus to concentrate on the genetic and non-genetic factors influencing beef quality, moving away from a beef commodity focus to one of quality-driven beef products designed to meet the exacting standards of beef consumers in Australia and the 110 countries that import Australian beef. The Beef CRC was a complex undertaking, requiring a vision to establish and complete a comprehensive beef quality progeny test program. It required the proportional contributions of more than 100 Australian scientists from 10 different institutions (including 4 CSIRO Divisions) across 12 research locations in most states. It required industry collaboration and resources on an unprecedented scale: to breed, grow, slaughter, measure and evaluate some 12,000 pedigreed progeny at a cost of \$32 million. The CRC established and managed 2 new research facilities, including Australia's premier Cattle Research Feedlot Facility. Total cash and in-kind resources invested in the two successive terms of the Beef CRC amount to \$146.4 million. Most importantly, the Beef CRC integrated molecular and quantitative genetics, meat science and animal nutrition and health to understand the complex interacting forces that influence growth, development and beef quality to ensure Australia's ability to guarantee the eating quality of its beef. Planning for the Beef CRC's scientific Bernie Bindon, Chief Executive Officer

program commenced in 1991 and was a result of collaboration between scientists from CSIRO, UNE, NSW Agriculture and DPI Queensland.

The second term of the Beef CRC will be completed in June 2005, to be followed by the commencement of the new "CRC for Beef Genetic Technologies" on 1 July 2005. That is to be an exciting new venture, recently funded by the Commonwealth and announced on 22 December 2004.

### Achievement Highlights of the Beef CRC

#### (a) Genetic Improvement of carcase, beef quality and feed conversion efficiency

The market forces of the early 1990s demanded that the Australian beef industry improve the consistency of eating quality of its product. In genetics terms this meant a shift from emphasis on cattle growth and adaptation to concentrate on the genetics of consumer-driven carcase and beef quality traits. To do this we set up two progeny test programs (Straightbreeding and Northern Crossbreeding) covering 7 of the major Australian



cattle breeds or composites and a Brahman based outcrossing study with 9 terminal sire breeds. In all this meant joining 20,000 pedigree recorded cows to generate some 12,000 slaughter progeny, measured for many live-animal, growth, carcase, beef quality and feed efficiency traits. This is described on the previous page:

The outputs of this part of the CRC program are many and diverse. In simple terms they include:

- Genetic parameters (heritabilities (h2) and genetic correlations (rg's)) which define the limits of genetic improvement of beef quality and efficiency traits and their inter-relationships.
- A blueprint for straightbreeding and (Brahman based) crossbreeding to improve:
  - \* Retail beef yield (RBY%)
  - \* Marbling or IMF%
  - \* Tenderness
  - \* Eating quality
  - \* Meat colour, fat colour, cooking loss etc
  - \* Net feed efficiency
  - Indirect selection opportunities for difficultto-measure traits, arising from known genetic correlations between traits. Examples are:
    - \* Measurement of "Flight Time" to improve temperament and beef tenderness
    - \* Insulin-like Growth factor (IGF-I) to improve Net Feed Intake.

- Estimation of genetic correlations between certain traits studied by the CRC set important guidelines for future breeding directions of Australian beef cattle. An example is shown below, confirming that cattle selected for marbling in a pasture-fed environment will produce progeny that also perform highly on feedlot diets. This means we don't need two separate breeding schemes for grain- and grassfinishing production systems.
- The CRC's progeny test program yielded EBVs for some 600 sires across 7 breeds for many traits. This information has been delivered to industry for adoption by:
  - \* Initial release to cooperating breeders
  - \* Delivery to seedstock sector via breed societies and BREEDPLAN
  - \* A CD called "Genetics Findings and Outcomes of the Beef CRC" widely distributed
  - \* Many (1,500) scholarly research papers and extension articles frequently presented at CRC industry forums. An example below shows beef eating quality (MSA) assessment from Brahman-cross progeny of the CRC's Northern Crossbreeding project.
- (b) Outcomes from Molecular Genetics and Gene Marker Investigations

The Beef CRC invested heavily in molecular genetic studies from 1993, building on foundation gene



IMF%	Pasture	Grain
Pasture	.31	1.0
Grain		.42
Greater gene     No re-rankin     Beefmeeting consumer spe	etic expression in ng of sires across offeations	n grain finish finishing
Greater gene     No re-rankin     Beefmeeting consumer spe re breed and f	etic expression in ng of sires across effications finish effects on	n grain finish finishing IMF%



marker (cattle) families set up in 1990 by CSIRO and MLA. Although in its infancy at that time the field has grown in popularity and potential since then. The CRC's results have been more productive than expected and in 2005 we have been responsible for five patented "Gene Marker Tests" for marbling and tenderness that are beginning to be adopted by Australian and international seedstock breeders. Their commercial impact will depend on their size of effect and on the development of methods to incorporate gene marker and quantitative genetic information to produce an "enhanced" EBV or genetic evaluation for the traits in question. The products are delivered by Genetic Solutions Pty Ltd.

### (c) Growth & Nutrition Outcomes

Growth and nutrition investigations coordinated the CRC's work on Net Feed Intake genetics and its biological basis, on prolonged steroid growthpromotant effects on growth and beef quality in northern crossbred cattle, on nutritional intervention strategies to manipulate marbling and on growth path effects on carcase and beef quality. Together with results of CRCII research on marbling these strategies have achieved some distinct scientific and industry outcomes. But many remain unfinished and require more analyses to exploit the experimental results completely. Some highlights are:

- The "Tullimba" Net Feed Intake recorder, commercialised by Ruddweigh (Australia).
- "Net Feed Intake" has been confirmed as a heritable trait in British and tropically adapted cattle, with feed efficiency of feedlot cattle a practical end result. EBVs for the trait have been released to industry. Some 300 industry (British) sires have been recorded and results released. Favourable economic evaluation of the technology has been completed. Further work in CRCII, now completed will lead to comparable industry recommendations for tropically adapted cattle.
- Insulin-like-growth Factor (IGF-I), based on a patented hormone blood test owned by PrimeGRO Pty Ltd has been shown to be genetically correlated with Net Feed Intake and is being used in industry for screening large numbers of sires for NFI, especially in the Angus breed.
- Repeated implants of northern crossbred cattle with steroid growth promotants (HGPs) for up to 300 days achieved continued growth benefits. There was a small but significant negative effect on beef eating quality of these animals, compared to comparable cattle without HGPs.
- Attempts to increase marbling in British cattle fed a dry-rolled barley diet by careful modification of the diet using canola oil, calcium supplementation, the use of "protected" canola products or by radical modification of the protein level of the diet were not successful. These strategies were put aside in favour of a more thorough theoretical review of adipocyte (fat cell) development. Regrettably, a consistent, novel industry recommendation to improve feedlot performance in marbling has not been possible.
- Growth path effects on carcase and meat quality, including tenderness from many CRC cattle studied in CRCI and II, have not been fully analysed. A general conclusion, however, is that even radical weight loss during grow-out does not lead to irreversible effects on beef quality, provided that nutritional rehabilitation occurs prior to slaughter.

### (d) Animal Health and Welfare Outcomes

 "Pre-boosting" feeder steers to minimise sickness

Dr Lloyd Fell's work in this area during CRCI was most successful. Hist strategy was to compare radically-weaned (abrupt paddockseparation of calves from their dams) calves with those submitted to yard-weaning and/or yard "training" over five days with or without vaccination with crude respiratory disease antigens. Subsequent feedlot performance of

Π ധ (۵ М ຝາ  these calves when they entered feedlots some months later showed the following:

- \* yard-weaned calves had significantly better (+25%) weight gains in the feedlot for at least 11 weeks.
- \* Vaccination of calves prior to feedlot entry improved subsequent weight gain throughout the feedlot finishing period.
- \* Yard weaning resulted in significantly lower morbidity (sickness-induced removal of cattle from the feed-yard) during feedlot finishing than paddock-weaned calves.
- \* Overall, yard weaned and vaccinated cattle returned \$30 per head more than their paddock-weaned contemporaries.

Commercial Bovine Respiratory Disease (BRD) Vaccines

Two BRD vaccines developed in CRCI have now been commercialised. Killed vaccines against pestivirus (Bovine viral diarrhoea) and Mannheimia haemolytica, a significant cause of feedlot pneumonia, have now been registered for sale in Australia through the Australian Pesticides and Veterinary Medicines Authority (APVMA) and marketed by Pfizer Animal Health Australian and Intervet Pty Ltd, respectively. Pestivirus is a serious cause of cattle infertility and a pre-disposing cause of BRD in feedlot cattle. The vaccine "Pestigard" will offset these effects. BRD is a \$60 million per year problem for the Australian feedlot sector.

"Bovilis MH" vaccine will be a major force in reducing BRD amongst the 2 million cattle fed each year in Australian feedlots.

FOR ANIMAL TREATMENT ONLY

Intervel

Bovilis M

Bovilis<sup>®</sup> MH

RE ANIMAL TREATMENT ON

2

250 ml

Bovilis<sup>®</sup> MH



2

250 mL

#### (e) Meat Science Outcomes

Meat Scientists in CRCI and II, led by Prof John Thompson and his colleagues have been major contributors to CRC success. These include:

- Processing of CRCI and II carcases
- Supervision of slaughter and measurement of more than 12,000 carcases from progeny test cattle to provide base data for genetic analyses.
- Laboratory analyses of beef samples from these animals.
- Pre-slaughter live animal measures, including scanning for fat depth, eye muscle area and marbling.
- MSA Grading Scheme ~ CRC Meat Scientists carried out much of the underpinning science for the MSA model, including definitive measurements on over 4,000 CRC progeny test animals. The database from some 400,000 MSA consumer taste panel tests resides at UNE and its systematic analyses and interpretation is under John Thompson's control.
- Best practice for pre and post slaughter management of carcases ~ The CRC had a major role in defining these procedures to enhance eating quality of grain and grass finished cattle.
- HGP effects on beef eating quality ~ The CRC co-ordinated many experiments to define the conditions under which HGPs cause negative effects on beef tenderness and eating quality. Where such effects were confirmed strategies were developed (eg Tenderstretch) to minimise or eliminate such effects.

### (f) Education and Training Outcomes

The CRC's undergraduate and postgraduate and industry training programs have had a material effect on the skills of the meat industry workforce. These include 60 PhD and Masters students, probably some thousands of undergraduates and TAFE students and many more industry people targeted in diverse CRC courses and schools. It is impossible to quantify the benefits. The CRC was responsible for industry funding of three Chairs at UNE (Meat Science, Animal Breeding Technologies and Meat Marketing) worth \$400,000 per year for five years.

### (g) Feedlot Waste Management Outcomes

Although not widely publicised, CRCI engineers carried out some excellent research to underpin the feedlot sector's responsibility to minimise environmental impact of the 850,000-head capacity of Australian feedlots. It cannot be detailed here but a good example of the outcomes is:

Feedlot waste recycling in marginal soil types ~ At Tullimba, which is based on fragile duplex soils,

### CRC for Cattle and Beef Quality

prone to penetration by feedlot effluent, the CRC showed that recycling of manure and liquid effluent onto irrigated soils for forage crops achieved organic matter (soil carbon) build-up to allow the re-capture of high levels of phosphorous and nitrogen in feedlot effluent. The work showed that forage sorghum crops are capable of high yields to maximise nutrient utilisation and to minimise runoff of soil nutrients.

The results have been used by regulatory authorities to set realistic guidelines for Australian feedlot conditions. In the past such figures were adopted from USA dry-land farming situations that would have had unnecessarily restricted effects on Australian feedlots.

#### (h) Northern Crossbreeding Outcomes

The CRC's terminal crossbreeding experiment at "Duckponds", Blackwater based on 1,000 Brahman cows donated by QDPI and industry has given us the best understanding of breed effects on beef quality traits for modern markets. The cows were joined over three years to some 96 sires of Brahman, Angus, Belmont Red, Hereford, Charolais (Charbray), Limousin, Santa Gertrudis and Shorthorn breeds. Progeny were either grain or grass finished to domestic, Korean or Japanese market weights. Progeny of each sire were finished either on pasture at Duckponds, on grain at Goonoo Feedlot, Comet or on grain at CRC Feedlot "Tullimba", Armidale. All growth, RTUS-scanned, chiller-assessed traits and laboratory measured meat quality traits were measured (see "Crossbreeding Program" design).





Table 1. Least-squares mean (± s.e.) effect of sire breed on meat quality attributes in steers and heifers. Trait means adjusted to a common HCWT.

Sire breed	No.	AGE	HCWT	RBY	RTPM	HOT P8	IMF
		(days)	(kg)	(%)	(kg)	(mm)	(%)
Angus	151	726 ± 2	292 ± 2	65.9 ± 0.3	62.1 ± 0.3	13.7 ± 0.6	3.25 ±
							0.08
Belmont Red	379	715 ± 2	255 ± 1	66.4 ± 0.2	63.0 ± 0.2	12.9 ± 0.3	3.02 ±
							0.05
Brahman	320	713 ± 2	242 ± 2	66.3 ± 0.2	62.9 ± 0.2	12.6 ± 0.3	2.35 ±
							0.06
Charolais	225	711 ± 2	296 ± 2	67.2 ± 0.4	64.3 ± 0.4	10.2 ± 0.7	2.53 ±
							0.07
Hereford	134	724 ± 3	292 ± 2	66.0 ± 0.3	62.8 ± 0.3	12.7 ± 0.6	2.85 ±
							0.09
Limousin	291	713 ± 2	286 ± 2	68.4 ± 0.3	65.0 ± 0.3	9.7 ± 0.5	2.47 ±
							0.06
Santa	142	722 ± 3	272 ± 2	66.1 ± 0.3	62.6 ± 0.3	13.4 ± 0.4	2.28 ±
Gertrudis							0.08
Shorthorn	115	730 ± 3	289 ± 3	65.9 ± 0.4	$62.3 \pm 0.4$	11.9 ± 0.8	3.05 ±
							0.09
	1757	P<0.0001	P<0.0001	P<0.0001	P<0.0001	P<0.0001	P<0.0001

23 July 2005

AGE = slaughter age, HCWT = hot carcase weight, HOTP8 = hot p8 fat depth, RBY = adjusted retail beef yield, RTPM = retail primals, IMF = intramuscular fat percentage.

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Sire breed results:

- (i) Growth (HCWT) Age at slaughter (day); P8 fat (mm); Retail Beef Yield (RBY%); Retail primal cuts (kg); IMF% (marbling).
- There were significant sire breed effects on all these traits (see Table 1).

Heaviest carcases were produced by Charolais sires and the lightest by Santa Gertrudis, Belmont Red and Brahman sires. These differences are the expected result of reduced heterosis in their progeny of Brahman cows. Charolais and Limousin sires produced the leanest lowest (P8 fat) carcases, as expected.

### (ii) Marbling

From Figure 1, it can be seen that highest marbling (IMF%) was recorded in progeny of Angus, Shorthorn and Belmont Red Sires. Heifer progeny had consistently higher marbling than their steer half-sibs.



Figure 1

As expected (Figure 2) progeny finished on pasture at Duckponds had lower marbling than those finished on grain at Goonoo or "Tullimba". It is interesting that there was consistently higher marbling in the "Tullimba" finished animals.



- (iii) Laboratory-measured tenderness (shear force)
  - Figure 3 shows that pure Brahman steers had on average less tender beef as measured by "shear force", (in which higher shear force represents less tender).



Figure 3.

(iv) MSA sensory analyses of eating quality

Figures 4 and 5 show the MSA taste panel method (MQ4) as applied to samples of all sire breed cross progeny. Figure 5 contrasts progeny finished on pasture and the two feedlot environments. In the pasture finished cattle all crosses except Angus x Brahman failed to meet the 3-Star MSA grade. Those crossbred animals grain finished at Goonoo and "Tullimba" comfortably achieved 3-Star grading, with some "Tullimba cattle approaching 4-Star MSA grading. Purebred Brahmans finished on grain did not reach 3-Star grade. (Note however, that these carcases were not "tenderstretched".)



Figure 4.





(v) Ossification index

Ossification score (OS) is a component of MSA grading. Higher OS reflects the difficulty of the finishing environment and is associated with reduced tenderness of beef. From Figure 6 it is clear that pasture finished cattle (at "Duckponds" had higher OS scores, confirming their lower MSA eating quality (MQ4) grade (as in Figure 5). Similar OS scores were seen in both feedlot environments.





These results are generally a favourable result for beef quality of tropically adapted crossbreds. When compared to the pure Brahmans, breed of sire had large effects on most traits of economic importance. The fact that all crossbred animals finished on grain reached 3-Star MSA grade without "tenderstretch" is reassuring for producers seeking to target higher quality domestic and export markets. Results from this research have been unincorporated in economic cost : benefit analyses carried out by Garry Griffiths (NSW DPI) and Bill Holmes (QDPI&F) to demonstrate opportunities to move from purebred Brahman enterprises to grass- or grain-finished enterprises running composite breed cattle in central Queensland.

### Delivery of CRC Outcomes to Beef Industry End-Users

The CRC is committed to seeing adoption of CRC results by Australian beef producers. To this end we have deployed additional CRC funding to QDPI&F during 2005/2006 so that their staff can continue their excellent series of industry workshops and seminars designed to increase profitability of Queensland beef producers.

From 1 July 2005 we will see the start of the new CRC for Beef Genetic Technologies which promises new opportunities for genetic improvement of Australian beef cattle.

### What do these achievements mean to the beef industry, beef consumers (and taxpayers)?

These are summarised in Table 2 by examining seven examples where the CRC's science has helped solve a beef industry problem. Some examples (e.g. No 5) are relatively straightforward: CRC vaccines against Bovine Respiratory Disease address a \$60 million per year problem for which there was only one vaccine against causative organisms. The CRC vaccines will reduce the impact of the disease, save treatment costs, reduce antibiotic residues, improve efficiency of feed conversion and improve feedlot profitability. The vaccines will also generate royalties for the CRC and make a profit for the Australian manufacturer. Other examples are more obscure. Genetic improvement of Feed Efficiency (No 4) will (gradually) increase the efficiency of conversion of grass into beef or grain to beef (in a feedlot). A small increase in efficiency of 12 million breeding cows in Australia will yield extraordinary benefits although difficult to measure.

Table 2 Examples (7) of CRC achievement	s industry impact and major beneficiaries
Table 2. Examples (7) of elle achievement	industry impact and major beneficiarie.

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CRC R&D outputs	Industry Outcomes	Major Beneficiary
<ol> <li>Improved beef tenderness via genetic and processing technologies.</li> </ol>	<ul> <li>Consistently tender beef.</li> <li>More satisfied beef consumers.</li> <li>Increased beef sales (or a reduction in decline of beef consumption).</li> <li>Increased export earnings.</li> </ul>	<ul> <li>Beef producers</li> <li>Beef processors</li> <li>Beef consumers</li> <li>Australian taxpayers</li> </ul>
2. Genetic improvement of Retail Beef Yield.	<ul> <li>More valuable beef carcases (without increase in production costs).</li> <li>More profitable domestic and export beef trade.</li> </ul>	<ul> <li>Beef producers</li> <li>Beef exporters</li> <li>Australian taxpayers</li> </ul>
3. Improved achievement of Japanese B3 export targets.	<ul> <li>More valuable Japanese export carcases.</li> <li>Increased profit for feedlotters.</li> <li>Increased export earnings.</li> </ul>	<ul> <li>Beef feedlots</li> <li>Beef exporters</li> <li>Seedstock beef breeders</li> <li>Australian taxpayers</li> </ul>
4. Improved Net Feed Efficiency of Australian cattle.	<ul> <li>More profitable pasture and feedlot finished cattle.</li> <li>Increased efficiency of production.</li> <li>Increased domestic and export earnings.</li> <li>Enhanced sustainability.</li> </ul>	<ul> <li>Beef producers</li> <li>Beef feedlotters</li> <li>Seedstock beef breeders</li> <li>Australian grazing resource and feed supplies</li> </ul>
5. CRC vaccines against Bovine Respiratory Disease (Mannheimia hemolytica and Pestivirus).	<ul> <li>Less sickness in feedlot cattle.</li> <li>Increased efficiency of production.</li> <li>Less antibiotic use.</li> <li>Less trade barriers.</li> <li>Increased export earnings.</li> </ul>	<ul> <li>Beef feedlotters</li> <li>Beef exporters</li> <li>Australian taxpayers</li> <li>CRC Core Partners</li> </ul>
6. Gene Marker technology to identify cattle with meat quality traits.	<ul> <li>Identification of cattle with genetic merit for marbling and tenderness.</li> <li>Sales of DNA tests to Australian and overseas cattle breeders.</li> </ul>	<ul> <li>Seedstock beef breeders</li> <li>Beef breeders and exporters</li> <li>Beef consumers</li> <li>Australian biotechnology industry</li> <li>CRC Core Partners</li> <li>Australian taxpayers</li> </ul>
7. A more skilled meat industry workforce (from CRC education strategies).	<ul> <li>Increased efficiency at the levels of beef production, beef processing, beef retailing.</li> <li>Increased profitability of the beef business.</li> <li>Increased export earnings.</li> </ul>	<ul> <li>All beef sectors</li> <li>Australian taxpayers</li> </ul>

### The Next 10 Years

What do we mean by Genomics? Genomics refers to:

- "the study of genes and their functions", or
- "the study of the structure and function of genes", or
- "the mapping and sequencing of all the genetic material in the DNA of a particular organism as well as the use of information derived from genome sequence data to further elucidate what genes do, how they are controlled, and how they work together".

### Human and Bovine Genome Projects

The reason genomics is in the news is that scientists have now identified the biochemical structure (ie DNA) sequence of every gene in the human "genome" - meaning every gene on every chromosome in the human cell. This was completed in 2003, just 50 years after the discovery of the double-helix model of DNA which explained how the information encoded in our genes is copied from one generation to another. As one expert said ... "this means we are able to interrogate what is, in effect, the instructional map of life".

Now in 2005 scientists have complete the "Bovine Genome Project", meaning all the DNA sequences of cattle genes in every bovine chromosome are know.

In both species the problem is we do not know the function of most of the genes now coded. This means in the case of cattle we don't understand which particular trait or productive process each genetic sequence controls. The priority now for cattle researchers is to link all this new genetic information to the traits of interest to the beef business: growth; retail beef yield; carcase and meat quality; feed efficiency; disease resistance; reproduction; profitability.

### Australia's Competitive Advantage

The information from the Bovine Genome Project is publicly available. Its real value can only be

realised by having DNA from pedigree cattle populations carefully measured for all the traits of interest. Scientists can then begin to link the known DNA sequences (from the Bovine Genome Project) to these traits in the hope of showing consistent associations between a DNA sequence (or a variant referred to as a "Single Nucleotide Polymorphism (SNP)" and a specific cattle trait (like marbling, tenderness or disease resistance).

The Beef CRC is fortunate to have a database of the following cattle populations which should provide some early advantages in the search for these genetic links. These pedigree populations are:

- (a) The CRCI straightbred Progeny Test experiment involving 7 Australian cattle breeds in which some 10,000 progeny were measured for growth; carcase (eg Retail Beef Yield); meat quality (ie tenderness, marbling, meat colour, fat colour etc); Feed Efficiency (measured as Net Feed Intake).
- (b) CRCI Northern Crossbreeding Project involving Brahman cows joined to 8 sire breeds, with around 1,800 progeny measured as for (a) above.
- (c) Trangie Angus lines selected for divergent Net Feed Intake - approximately 2,000 bull, heifer or steer progeny measured.
- (d) CRCII Brahman and Composite cattle with some 2,400 steers measured for grain-fed beef quality and NFI and 2,400 heifer half-sibs measured for age at puberty and subsequent fertility.

The Beef CRC and its partners have DNA on all the above cattle, ready to apply to whatever new opportunities arise from the Bovine Genome Project and related advances in technology.

### Recent Beef CRC Gene Marker Products

A major advantage for Australia is that the CRC, MLA and CSIRO formed a consortium in 2,000 to deliver the first Gene markers for beef production traits to the Australian industry. By that time, the consortium had already invested 10 years of background research in molecular genetics to






Discovery".

The consortium has licensed an Australian commercial partner, Genetic Solutions Pty Ltd to turn the research results into commercial DNA tests for sale in Australia and overseas. The best known of these the "TG5" (Thyroglobulin gene variant) marketed as GeneSTAR Marbling and the "CAST 3" (Calpastatin gene variant) marketed as GeneSTAR Tenderness have been well publicised. These are directed at the seedstock sector primarily to increase the frequency of sires carrying the favourable genes for marbling and tenderness to bring about gradual improvement of these traits in the sectors of the breeding herds where the traits are considered important.

Other gene marker products developed by the consortium (shown below) are either being evaluated prior to commercial release or are already incorporated in other GeneSTAR tests.

## New Opportunities in the new CRC for Beef Genetic Technologies

The new Beef CRC to commence on 1 July 2005 for a 7 year term will focus on "gene discovery and expression". The gene discovery part will deal with more of the gene marker research described above but with emphasis on some different cattle production traits, as shown in the right, centre diagram.

New Gene Marker tests for:

- Beef Quality (tenderness, flavour, juiciness, fat content, fat quality)
- Feed Efficiency (cattle eat less for same gain, reduced feeding costs)
- Disease resistance / welfare (cattle best suited to each production system)
- Cow reproduction (age at puberty, re-breeding efficiency)

New (non-genetic) "treatments" to switch key genes on and off

- Beef meeting consumer specifications

Youcansee that the CRC, following recommendations from industry, has directed its focus on the traits that are of highest economic importance but which are the most difficult to improve by traditional genetic improvement procedures. That applies particularly to feed efficiency (very expensive to measure), adaptation and disease resistance (expensive and complicated by disease control procedures) and cow reproductive performance (low heritability and takes a long time to evaluate individual females).

### What do we mean by Gene Expression?

In beef production terms "Gene Expression" could

#### CRC for Cattle and Beef Quality

refer to cattle which have the genes for (ie the genetic merit for or known genes which regulate) marbling, but which for some environmental reason (eg being fed on the wrong diet) are unable to display or express the marbling trait. This reflects the fact, already well known to cattlemen, that in some years (such as in droughts) cattle of known previous performance are not able to produce because the unfavourable environment can suppress the genetic potential of these cattle.

So the study of "functional genomics" concentrates on genes and gene networks and how they are modulated over time or under different conditions such that the expected impact of the genes on the animal's biology (eg in cattle their productive performance) does not reflect the animal's genetic potential.

In the Beef CRC scientists have studied "functional genomics" in cattle with known propensity for marbling by sampling muscle and DNA during the feeding period to observe which genes in a network called a "microarray" are being switched on, or off (see below):



The potential of this research is that it may lead to new non-genetic methods to improve cattle performance. For example a specific diet or feed additive might be used at key times in the life of the animal because we know that intervention "switches on" a particular gene or suppresses some unfavourable gene affecting animal performance.

# "Whole Genome Scanning" - a new opportunity arising from the Bovine Genome Project

As the science advances, new opportunities will arise to speed up the search for genes associated with important cattle traits. The "whole genome scan" is an example. This is based on the availability of many (eg 10,000) SNPs (ie "Single Nucleotide Polymorphisms") spread evenly across all bovine chromosomes. These SNPs are spaced close enough to be in proximity with most chromosome regions likely to contain genes that cattle researchers are seeking. Technology allows individual animals' DNA to be rapidly tested (ie "genotyped") against those 10,000 known SNPs. Evidently commercial genomics firms are able to do this at greatly reduced costs and with quick (one or two months) turn-around. Previously this might have taken many months or years to complete in-house in a CRC laboratory.

Australia's competitive advantage here is that we have populations of measured, pedigree cattle as previously described. DNA from cattle of known divergence in a trait (eg Marbling, Tenderness or Feed Efficiency, measured as Net Feed Intake (NFI)) can therefore be sent to a commercial firm for "whole genome scan". The results which come back to the CRC will enable our scientists to see if cattle of known performance for a trait have a different pattern of SNP frequencies, across the chromosomes than other cattle of known divergent performance. The procedure should thus show up the "HOT" regions of the genome where the genes responsible for the trait of interest are located.

The CRC has invested in just such a procedure, with two of our cattle populations in the last month.

# Incorporating Gene Marker Information into BREEDPLAN

Advances in Genomics in future years can best be applied for cattle industry benefit by combining traditional genetic evaluation information (ie Estimated Breeding Values, EBVs) with molecular genetic information (ie gene markers for various traits). Such combined information will provide the best estimate of a bull or cow's genetic merit for delivery to industry via BREEDPLAN. This has not been possible yet because of the lack of sufficient results on cattle genotyped for existing commercialised gene markers. Scientists at UNE's Animal Genetics and Breeding Unit (AGBU) and the Agricultural Business Research Institute (ABRI) are ready to do this when the data become available.

#### What are our chances of success?

The revolution in biology, including functional genomics will occur during the next 10 years whether we approve or not. For example, the USA Government is presently spending more on biology than all other science fields and research combined. Examples provided in this paper confirm that "Gene Discovery and Expression" actually works in the case of human health and to a small extent in cattle biology. The only question is how fast it will all occur.

In the Australian beef business we must be prepared to invest in genomics technology. Our success in domestic and export beef marketing depends, in large measure, on Australia's ability to produce specific beef products with guaranteed quality for each of the 110 countries to which we export. To the extent that genetics is a major contributor to alit

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cattle productivity, unless we participate forcefully in beef genomics in the next 10 years we will fail to meet our goals of "Quality, Efficiency and Profit". We have the resources and expertise to achieve these goals:

## Planned industry outcomes (Quality, Efficiency and Profit)

- More cattle meeting market specs for quality (more precise prediction of performance) - More Profit
- ➤ More efficient breeding cows and steers for grass & grain finishing → Reduced Costs
- Fewer sick cattle, welfare considerations & treatments -> Reduced costs, greater market access
- ➢ Better turn-off rates → more profit (or reduced breeding herds ≅ + costs)
- Beef industry better equipped to meet the (changed) global beef landscape by 2012 CRC for Berf Grantin Technologies

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# **2006 ILC Calgary Registrants**

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Anne Loyd John Howard Ron	Anderson Andruchow Arnold Asmussen Axelson	Director Director - Strategy & Business Vice President Commercial markets CEO	Foundation Alberta Agriculture Planning RBC Royal Bank Loomis Cattle Co Alberta Cattle Feeders' Association
Jeff Tim	Banister Barnes	Director of Business Integration	J.D. Sweid CL Ranches Ltd Alberta Agriculture, Food & Rural
Jonn David Denis	Basarab Baxter Beaulieu	Speaker	Informa Economics Inc. Diamond V Ranch
Arron	Best	Development Officer	Alberta Agriculture, Food & Rural Development
Bernard Curtis Diane Mark	Bindon Boyd Boyd Brand	Speaker Student Admin	Bernie Bindon Cattle Research University of Alberta Alberta Cattle Feeders' Association Brand Farms
Brenda Andrea	Brindle Brocklebank	General Manager Research Analyst Manager Agricultural Services -	Alberta Grain Commission Canadian Cattlemen's Association
Dale	Brown	Alberta	TD Canada Trust International Stockman's Education
Crystal Wayne Jay	Buckner Burns Burrows	Student General Manager Finance	University of Nebraska Western Feedlots Ltd. Western Feedlots Ltd.
Rick Erik Brent Rod	Burton Butters Carey Carlyon	Director Vice Chairman Director Branch Head	Alberta Beef Producers Alberta Beef Producers Alberta Beef Producers AAFRD
Kevin Avril Clay Brian	Chanut Chattaway Chattaway Chomlak	Manager, Livestock Finance President President Director	Unifeed Financial Bar S Ranch Bar S Ranch Alberta Beef Producers
Bob Allan Andrea Don	Christie Church Church Church	Chairman District Veterinarian	Fund Caiton Satton Beef & Barley Caiton Satton Beef & Barley Candian Food Inspection Agency
Ron	Clarke		Alberta Agriculture & Rural Development

Cody	Cockwill	Account Manager	CIBC
Dave	Copithorne	President	Designer Gene Cattle Co Inc
John	Copithorne	President	3J Farms Ltd
Marshall	Copithorne	President	CL Ranches Ltd
Neil	Copithorne	Secretary Treasurer	Designer Gene Cattle Co Inc
Ryan	Copithorne Copithorne-	CFO	CL Ranches Ltd
Cherie	Barnes	Cattle Manager	CL Ranches Ltd
Denis	Cote	Senior Manager Lending	Agriculture Financial Services Corp
John	Cox	Director	GP Cattle Pty Ltd.
Bill	Cross		Diamond V Ranch
			Alberta Agriculture, Food & Rural
Cody	Cunningham	Development Officer Director, Finance & Livestock	Development, Livestock Products Branch
John	Dakers	Programs	Unifeed Financial
Genevieve	D'Amours	Student	University of Calgary
Paul	Darby		Pricewaterhouse Coopers
Kate	Davies	Student	University of Saskatchewan
Darcy	Davis	Chairman	Alberta Beef Producers
Cindy	Delalove	General Manager	Canadian Beef Grading Agency
Dannis	Deneiko	Student	Olds College
Garner	Deobald	Field man	Candian Charolais Association
Grant	Diamond	MSR Supervisor	FBC
Brent	Difley	Sales Manager	Elanco Animal Health
Bill	Dorgan		Pricewaterhouse Coopers
Barbara	Duckworth	Reporter	Western Producer
Wendy	Dudley	Journalist	
Darcy	Eddleston		Canadian Cattlemen's Association
Paul	Eggert		Eggert Farms Ltd.
Garth	Elgie	Western Sales Manager	Merial Canada Inc
Paul	Engler	Chairman of the Board	Cactus Feeders
	Ū		Alberta Agriculture, Food & Rural
Dale	Engstom	Head, Livestock Products Branch	Development
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