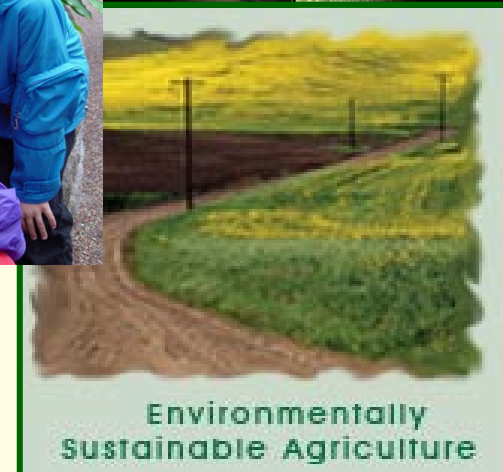


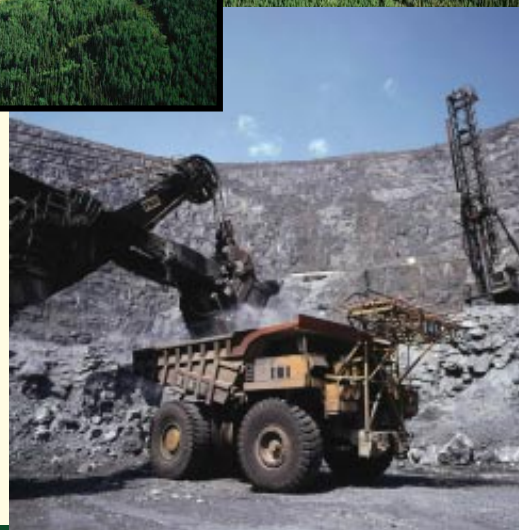
Options and Opportunities – Investing Wisely today to Ensure a Sustainable Future

*John Kennelly,
Ellen Goddard and
Erasmus Okine
University of Alberta
www.afhe.ualberta.ca*



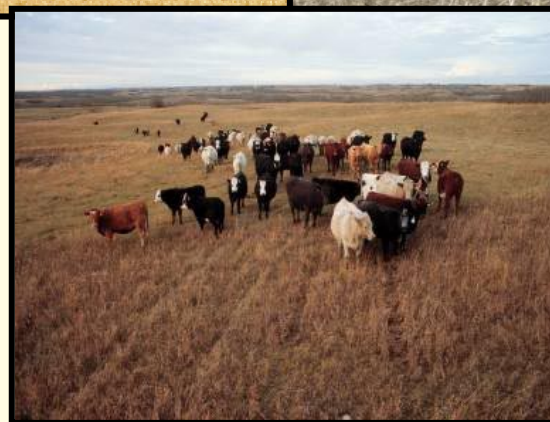
What Legacy will We Leave Future Generations?

The non-renewable resources that fuel our economy today were deposited over millions of years – the prosperity of future generations will depend on how wisely we invest today in our renewable resources

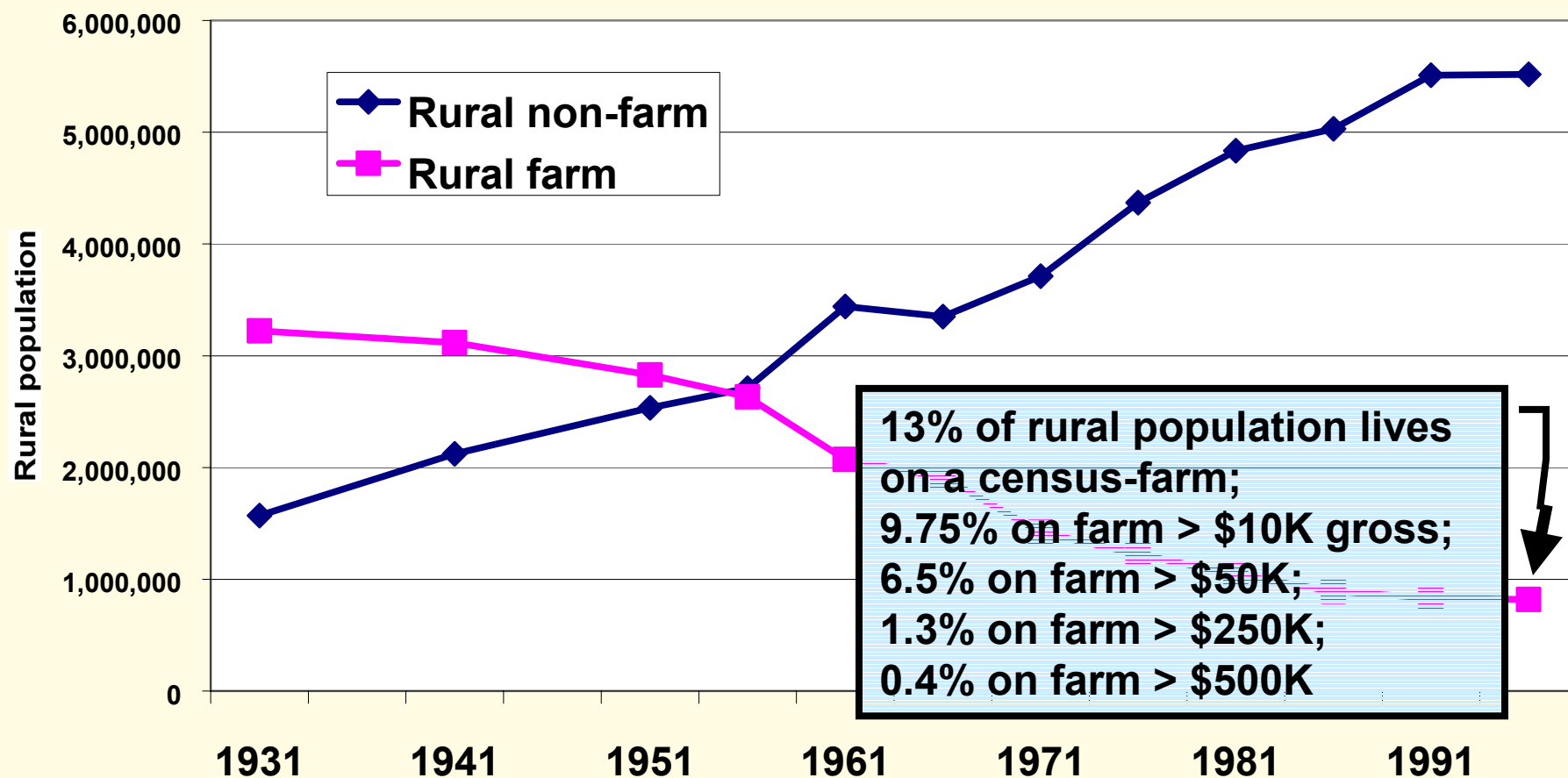


Many challenges facing agriculture and rural communities.....

- Declining rural population
- Commodity focus
- Sustainability
- Environment
- Water
- Maintaining quality of life



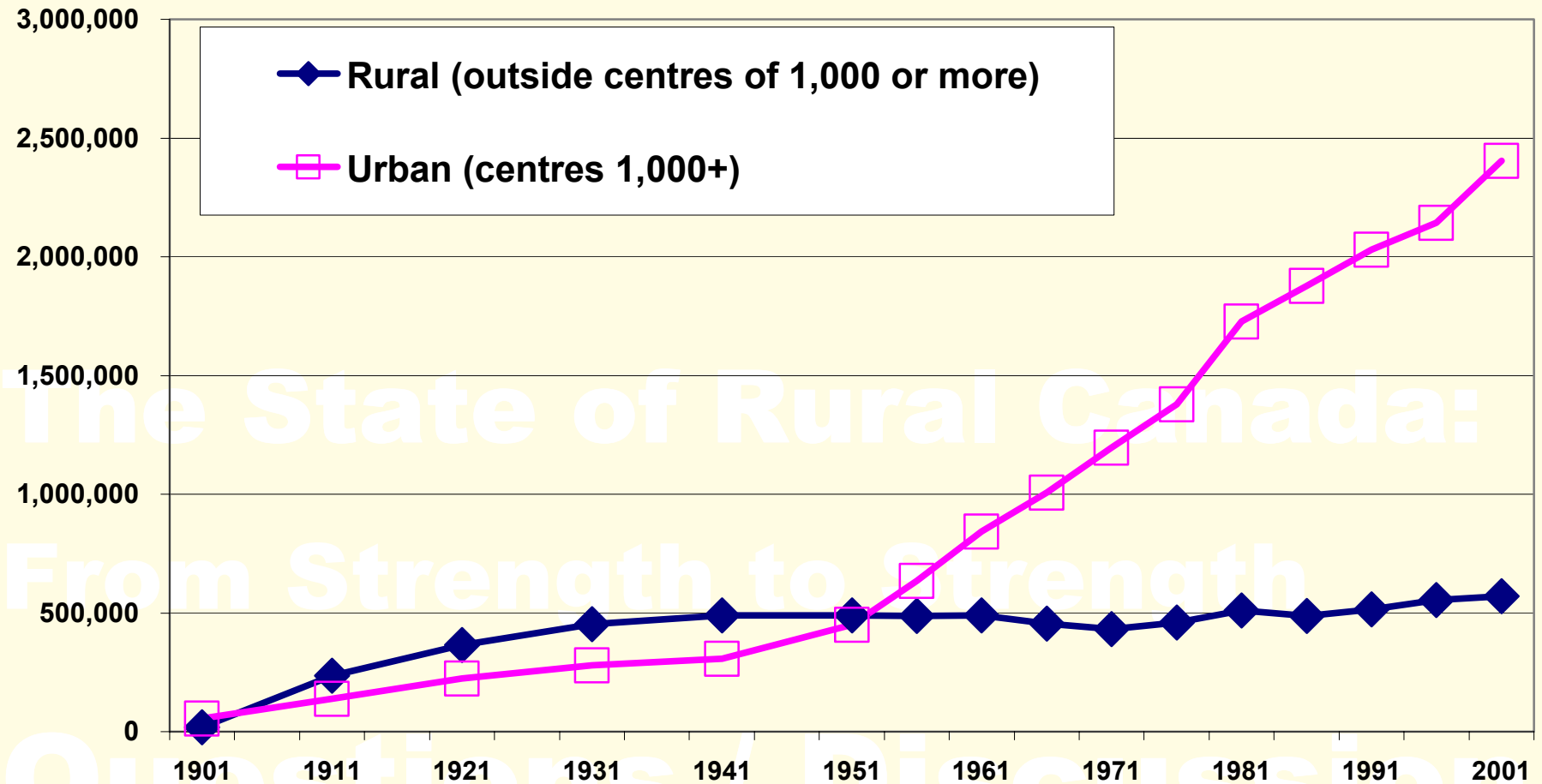
Rural population: Farmer minority in rural Canada in 1956



Source: Statistics Canada. Census of Population, 1931 - 1996.

Source Ray D. Bollman and Neil Rothwell

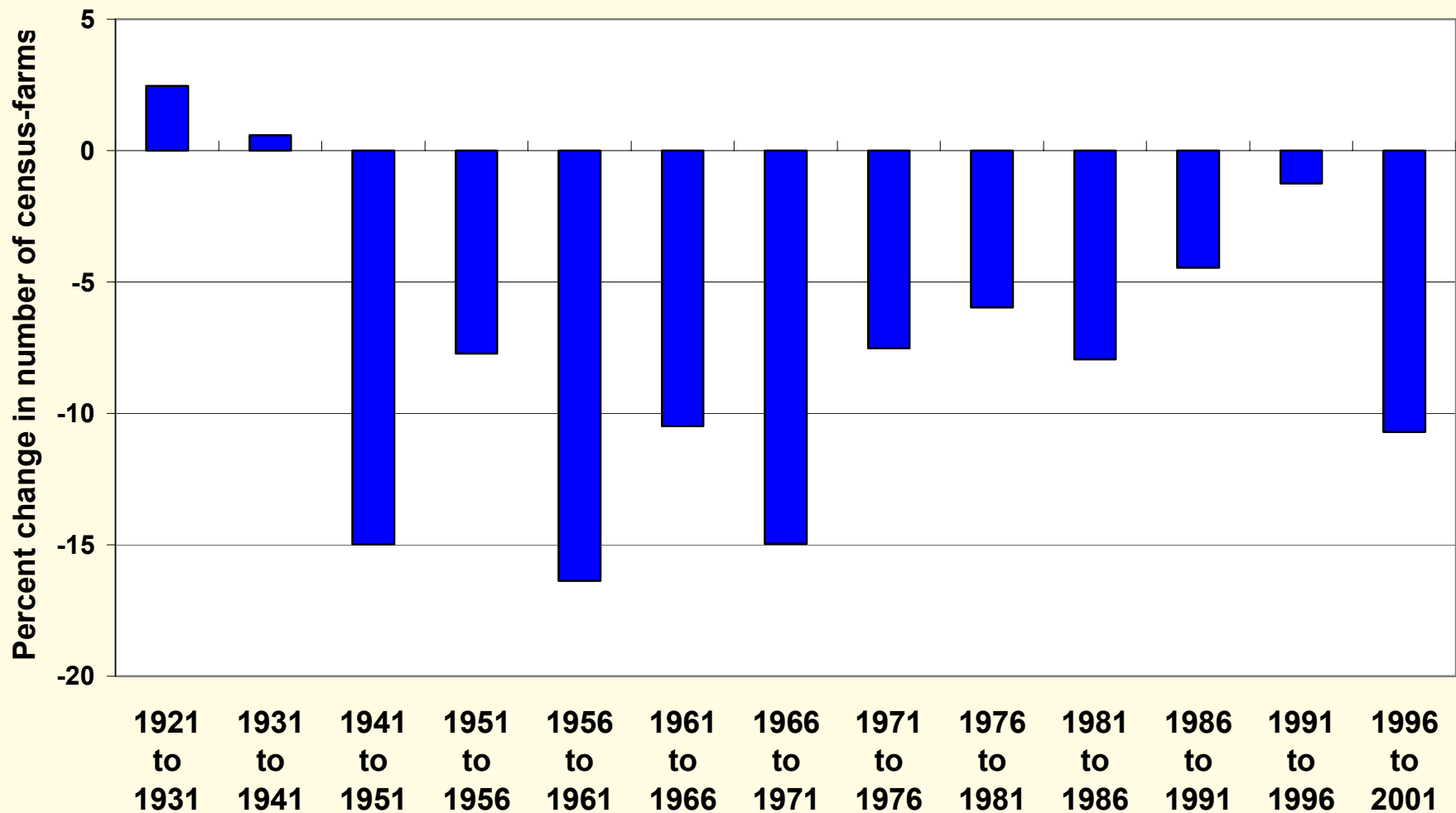
Population trends: Rural minority in Alberta in 1956



Source: Statistics Canada. Census of Population, 1851 - 2001.

Source Ray D. Bollman and Neil Rothwell

Largest drop in number of census-farms since the late 1960s, Canada



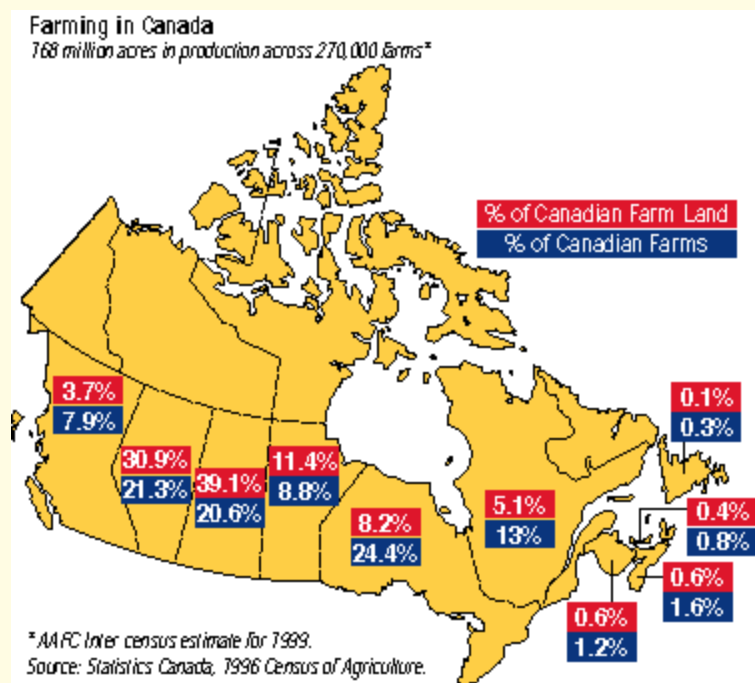
Source: Statistics Canada. Censuses of Agriculture, 1921 -2001.

Source Ray D. Bollman and Neil Rothwell

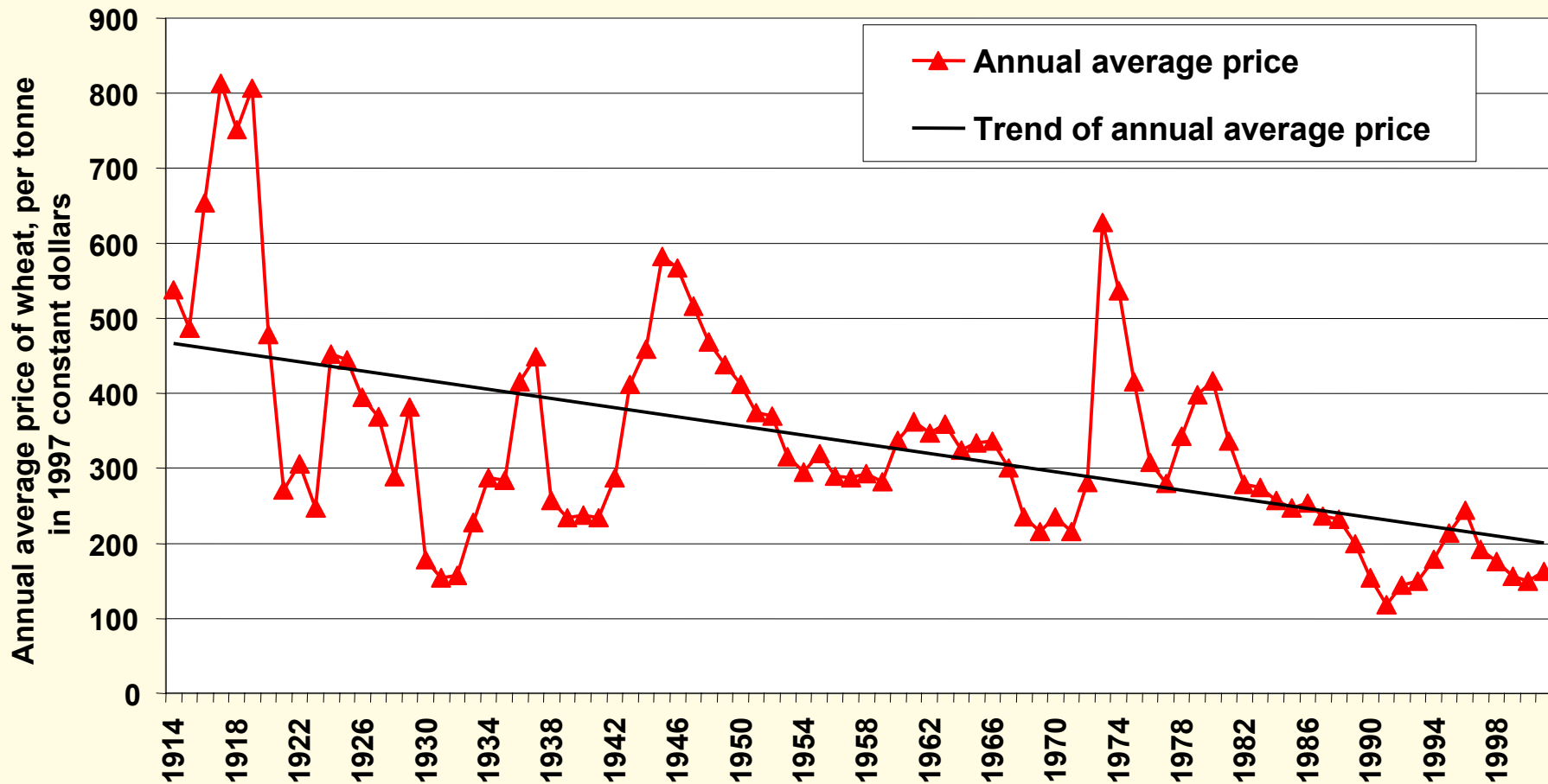
Currently about 200,000 Farmers

In 1935 the average farm fed 11 people and 1/3 of population lived on farms

Today the average farm feeds 121 people and 1 in 40 people live on farms



Commodity prices declining (e.g. wheat)



Source: Statistics Canada. CANSIM. Series D216036 for average farm price of wheat per tonne, updated from 1984 with the wheat (excluding seed) component of the Raw Materials Price Index from CANSIM Series P6508. The adjustment for inflation is the Consumer Price Index, CANSIM Table No. 326-0002, altered to 1997 = 100.

Source Ray D. Bollman and Neil Rothwell

Pressures facing the Ag Sector

- Changing consumer demands
- Advances in science
- Increasingly complex industry
- Intensified international competition



Additional Challenges.....

- BSE
- Drought
- Avian Flu
- Market concentration



On May 20, 2003, Alberta's beef industry changed overnight.

Current Agricultural Policy Framework priorities – beyond production efficiency ...

- Food Safety and Food Quality
- Environment
- Science and Innovation
- Renewal
- Business Risk Management



APF concluded that science offers the potential to...

- Create new products and processes
- Move to renewable from non-renewable resources
- Address environmental challenges
- Protect and advance human health



APF identified science and innovation as being key to achieving...

- World leadership in environmentally responsible agricultural production
- World leadership in food safety and food quality
- Global consumer confidence
- Increased profitability and growth through new economic opportunities and enhanced investor confidence



"Research and innovation contribute to our economic prosperity and are the cornerstones of Alberta's knowledge-based economy,"

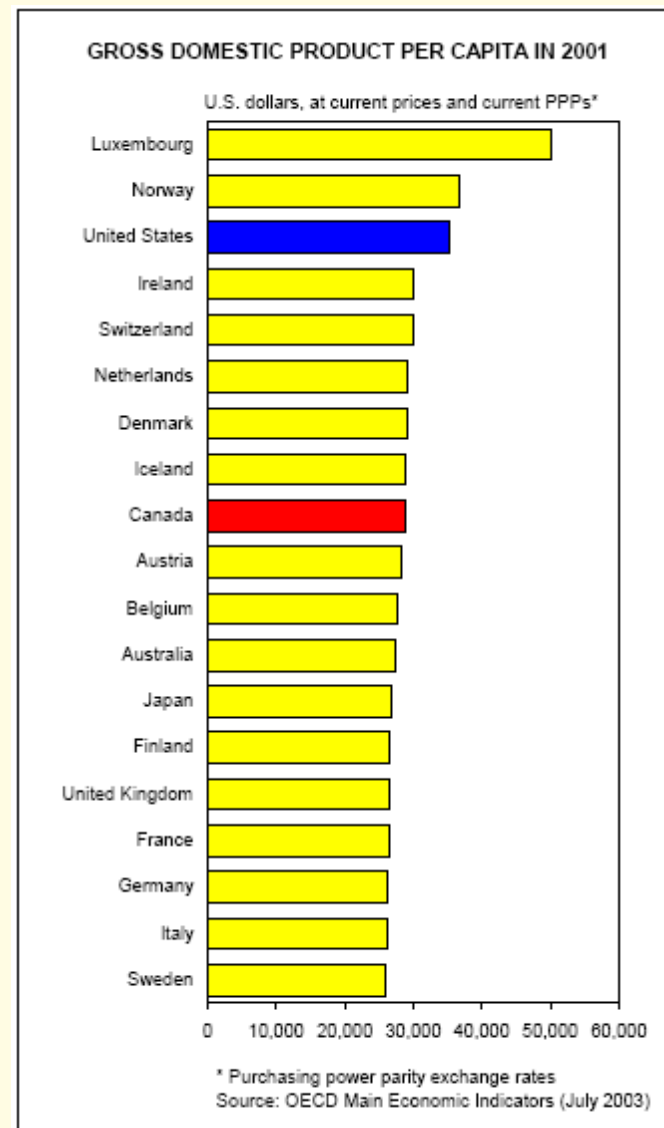
Victor Doerksen, Minister of Innovation and Science



GDP Per Capita

“Canada’s standard of living stands 15% below that in the United States – which translates into an annual income roughly \$7,560 lower for every man, woman and child. The only effective response is for Canada to move further up the value-added economic chain. We must compete by being smarter, not by being cheaper through lower wages”

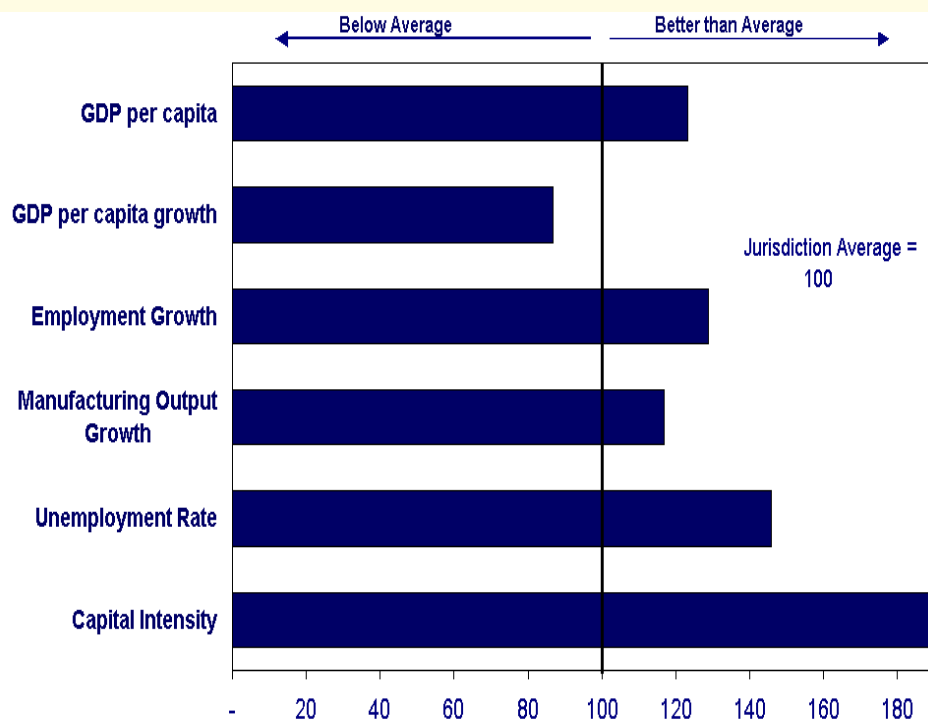
TD Bank Financial Group, Special Report, Time to Wise-Up to Post-Secondary Education in Canada. March 2004



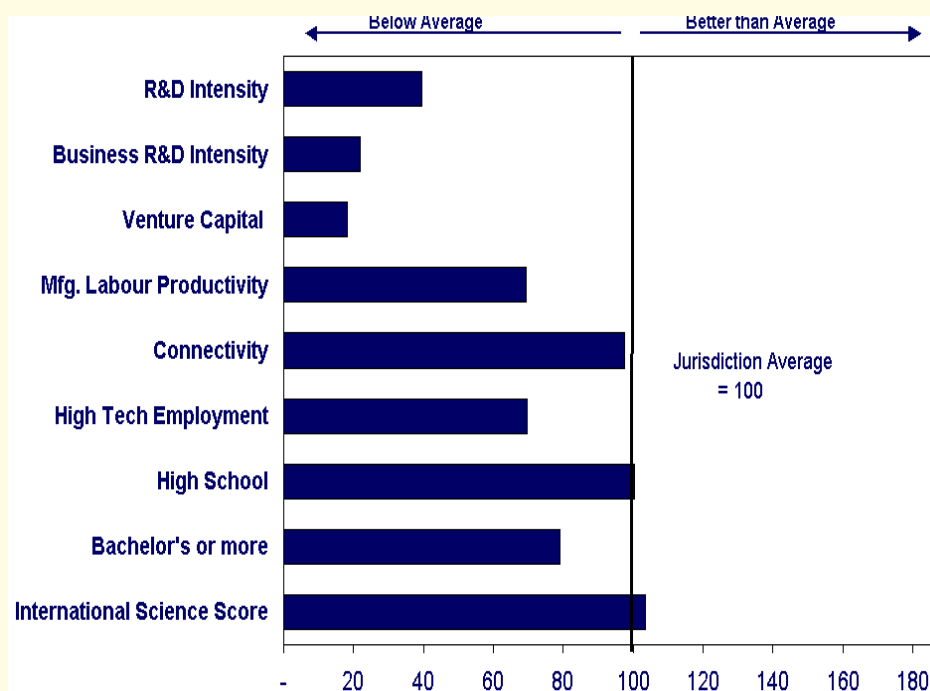
ALBERTA'S INNOVATION CHALLENGE – How do we fare?

“Alberta is a player in an intensely competitive global economy. Improving Alberta’s innovation capacity is critical in ensuring the province’s long-term economic competitiveness and quality of life”
Alberta Innovation and Science Strategic Plan 2005 – 08

ECONOMIC INDICATORS



INNOVATION INDICATORS



Returns to a University Education

A University education has a high rate of return to the individual as well as society

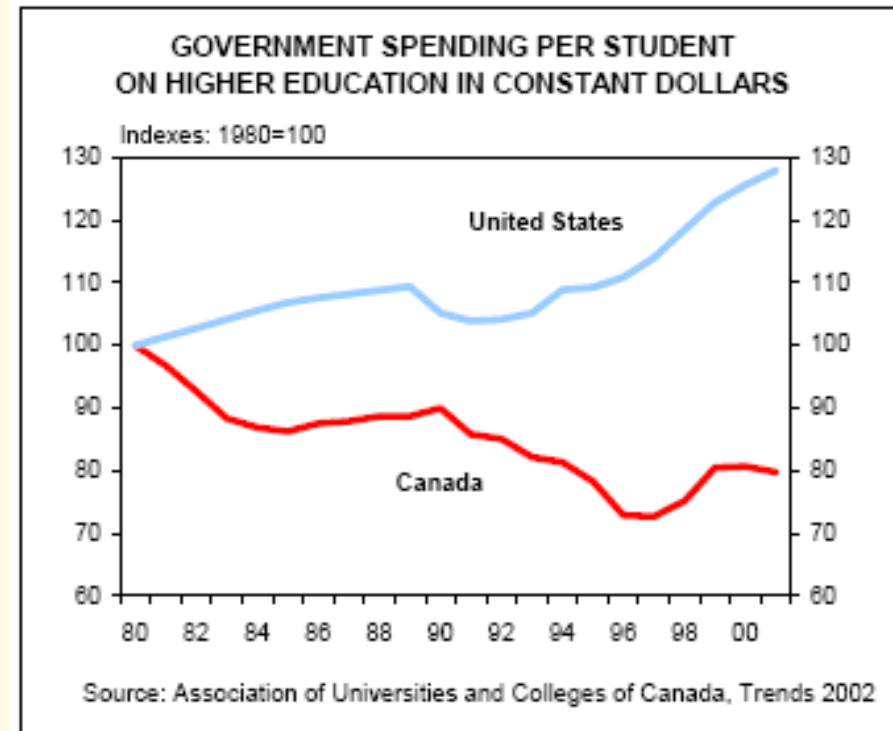
| | |
|-------|--------|
| Men | 12-17% |
| Women | 16-20% |



Source TD Bank Report

Government Education Spending - US vs. Canada

“Over the past twenty years, Canada has cut real public funding per student by 30 percent, while the U.S. has increased its funding by 20 percent.”



**TD Bank Financial Group, Special Report, Time to Wise-Up
to Post-Secondary Education in Canada. March 2004**

Towards a knowledge-based economy

“Post-Secondary education is at the heart of Canada’s economy and society. Knowledge has become the most valuable resource and the prime determinant of the wealth of nations. And, education has always been the great social equalizer.”

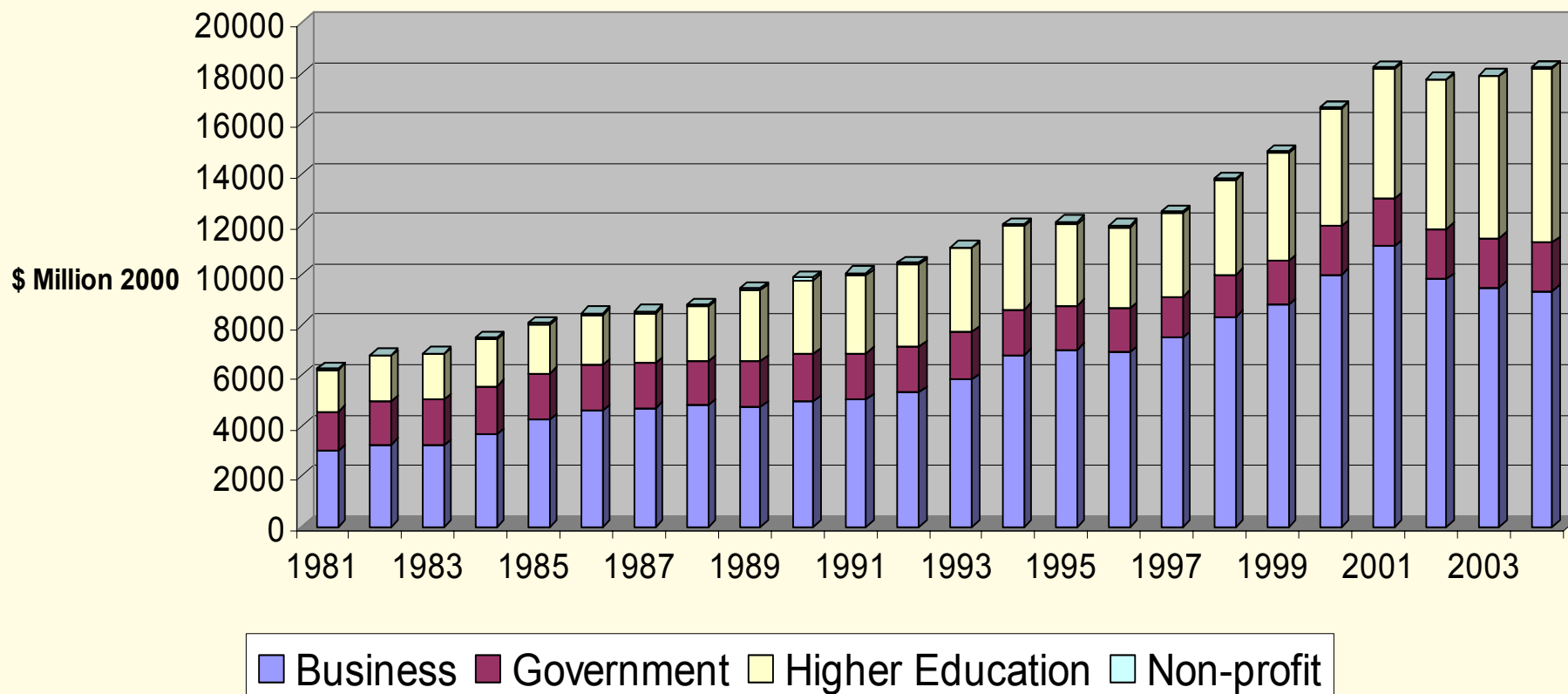
TD Bank Financial Group, Special Report, Time to Wise-Up to Post-Secondary Education in Canada. March 2004

Government Research Funding

- Over the last twenty years
 - shift in funding sources
 - shift in location of funding
 - trends not the same across countries

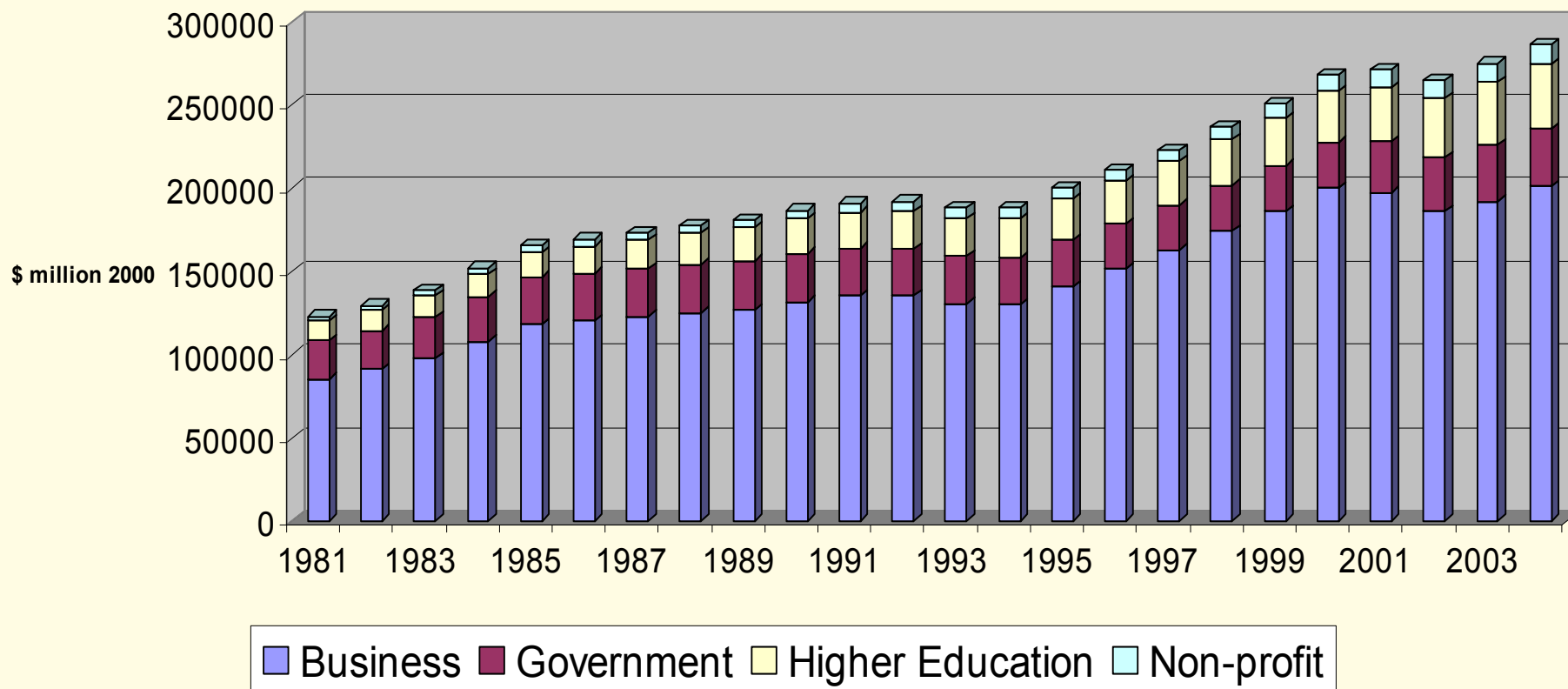
Funding for Research

Canada R&D Funding by Sector and Source



Funding for Research

US R&D Funding by Sector and Source



Universities and Research and Development

*“The connection between universities and colleges and the quality of the labour force is clear. **What is likely less well understood is the importance of universities to research and development.** And, the latter is particularly critical, as Canada relies more on universities as a source of innovation than other G7 countries.”*

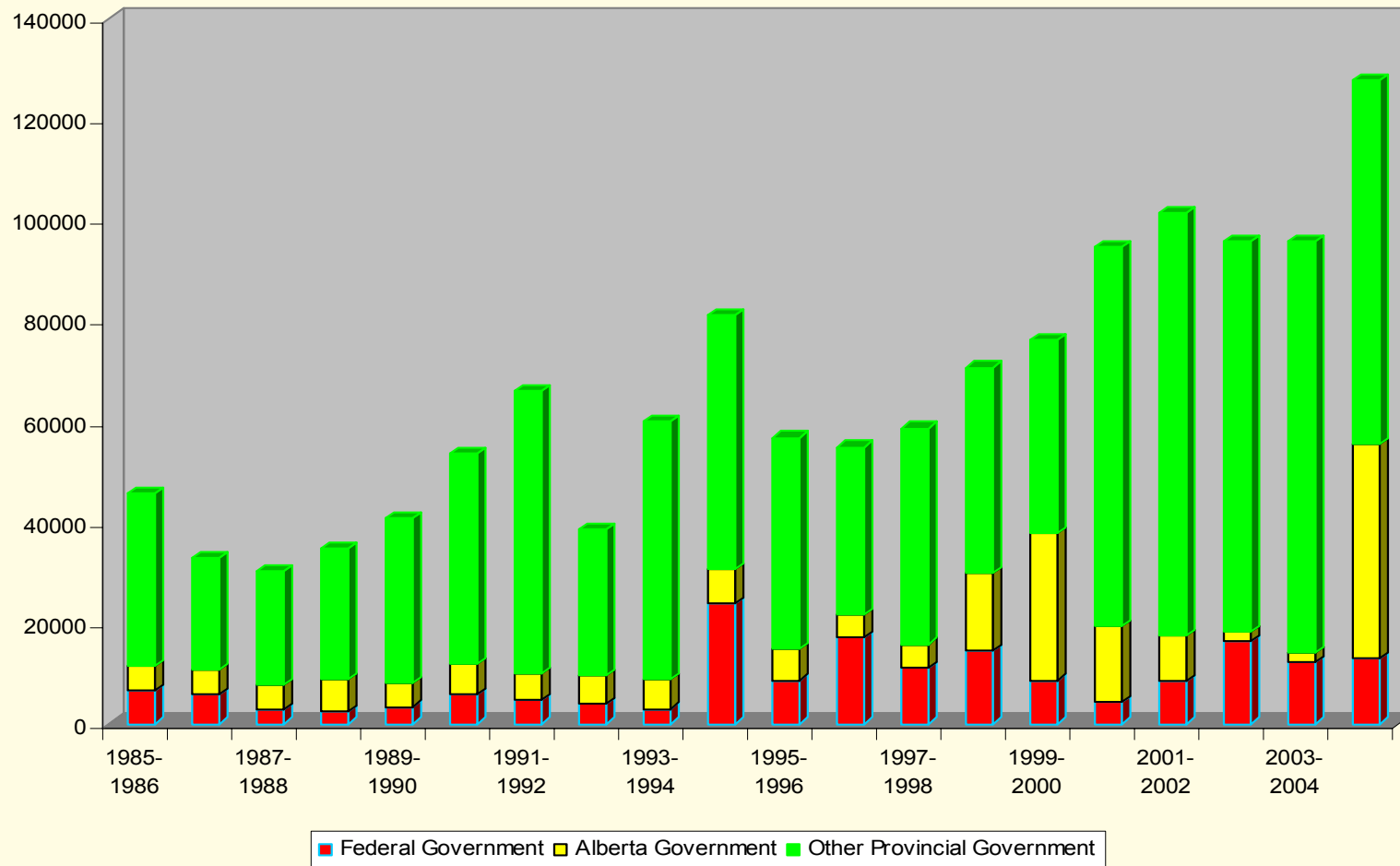
TD Bank Financial Group, Special Report, Time to Wise-Up to Post-Secondary Education in Canada. March 2004

Government Research Spending Priorities

- “Over the 1990’s crop research investment exhibited a continued shift in breeding research from public to private institutions.
- The introduction of Plant Breeder’s Rights (PBR) legislation in 1990 catalysed this institutional shift.
- Universities and government were given the mandate to cooperate with private institutions, in order to avoid competing with private companies.
- AAFC created the Matching Investment Initiative whereby the AAFC provides research resources for up to 50% of the cost of a project when matched by private firm and industry group investments in crop research.” (Gray et al)

Canadian Ag Research Spending

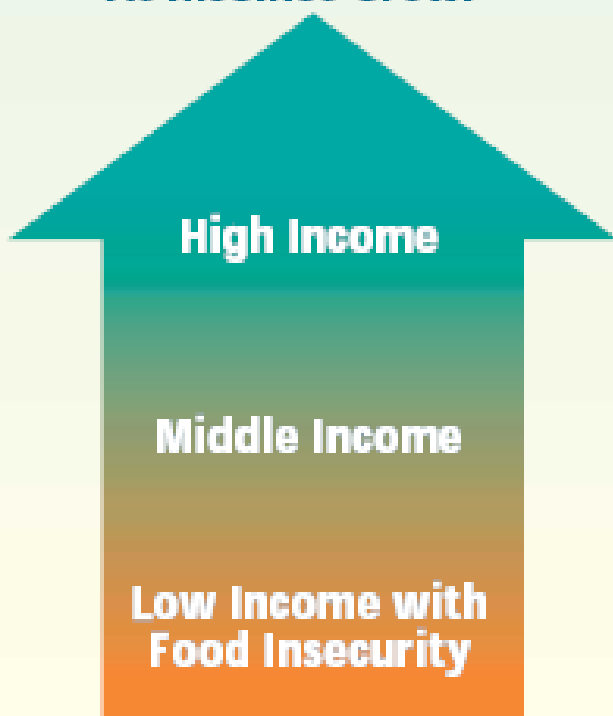
Agricultural Research Expenditures



Changing Agricultural Research Priorities as Economic Growth Occurs

As Incomes Grow:

Research Priorities Change



Private Research—focuses on varied, fresh, convenient foods.

Public Research—focuses on food safety and improved environmental quality.

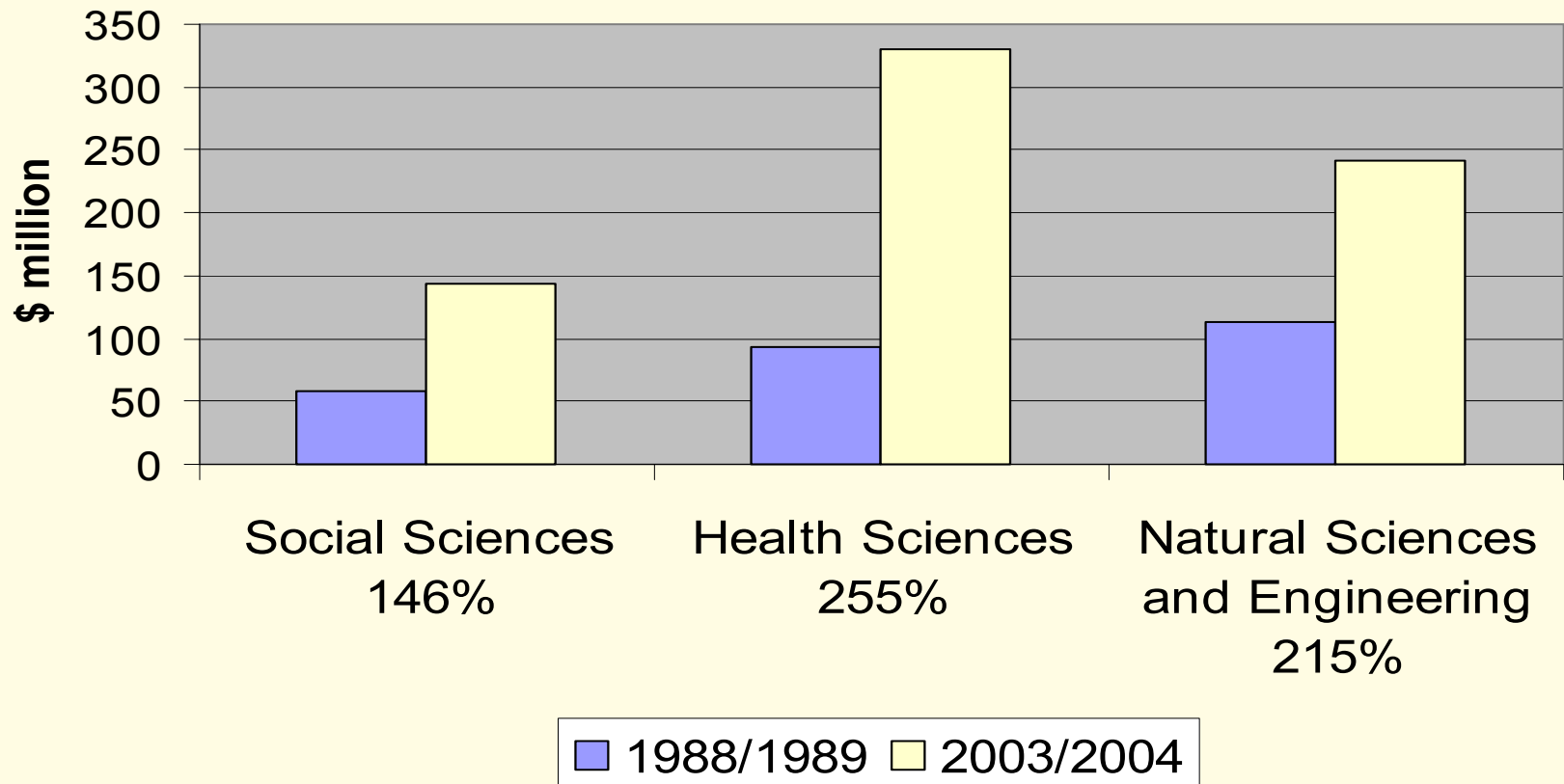
Private and Public Research—focuses on high nutrition and increased production efficiency.

Public Research—focuses on productivity of local staple products.

21st Century Agriculture: A Critical Role for Science and Technology

Growth In R&D Spending By Field

Alberta Universities



Exceptional Returns to Agricultural Research Investment

| Commodity Orientation | Number of Studies | Mean Rate of Return % | Mode Rate of Return |
|--|--------------------------|------------------------------|----------------------------|
| <i>Multicommodity</i> | 436 | 80.3 | 58 |
| All Agriculture | 342 | 75.7 | 58 |
| Crops and Livestock | 80 | 106.3 | 45 |
| Unspecified | 14 | 42.1 | 16.4 |
| <i>Field Crops</i> | 916 | 74.3 | 40 |
| Maize | 170 | 134.5 | 29 |
| Wheat | 155 | 50.4 | 23 |
| Rice | 81 | 75.0 | 37 |
| <i>Livestock</i> | 233 | 120.7 | 14 |
| <i>Tree Crops</i> | 108 | 87.6 | 20 |
| <i>Resources-Fisheries and For.</i> | 78 | 37.6 | 7 |
| Forestry | 60 | 42.1 | 7 |
| <i>All Studies</i> | 1772 | 81.2 | 46 |

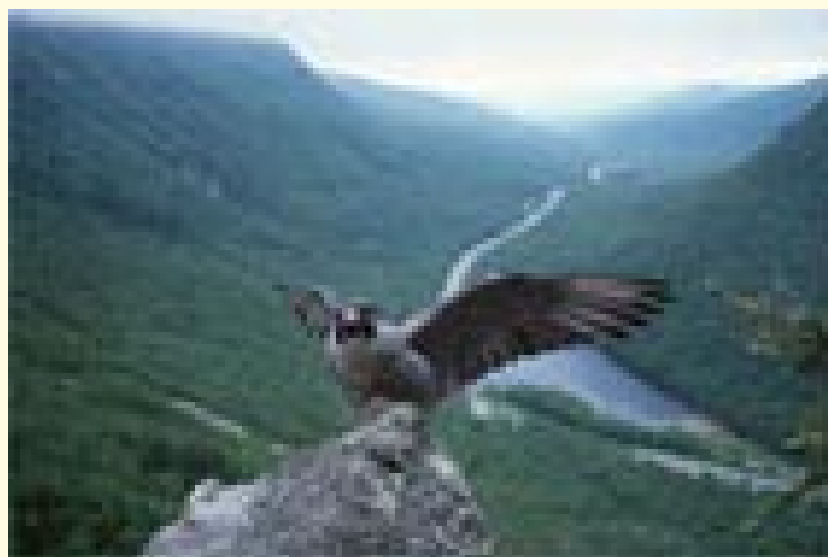
Source: Alston et al, 2000, A Meta Analysis of Rates of Return to Agricultural R&D *Ex PedeHerculum?*, IFPRI Research Report #113.

Overall

- Although there has been significant growth in Alberta university research spending in nominal dollar terms, in real dollars research spending in Canada is stagnant
- In comparison to the US more research is done in Canada in universities and less is paid for or conducted by business (do foreign owned companies conduct more research in country of head office and export technology?)
- Growth in research funding in Alberta has been focused on the health sciences sector (the importance of AHFMR?)

Alberta's Vision for the Future

- **Unleashing innovation**
- **Leading in learning**
- **Competing in a global marketplace**
- **Making Alberta the best place to live, work and visit.**



ALBERTA'S OPPORTUNITY

- Alberta's prosperity today gives it the opportunity to build the key infrastructure for its future:
The people infrastructure
- Alberta has the opportunity to *brand* itself as the jurisdiction of choice for key innovators in areas of provincial opportunity
- A bold statement of support for innovators will amplify Alberta's opportunity for success

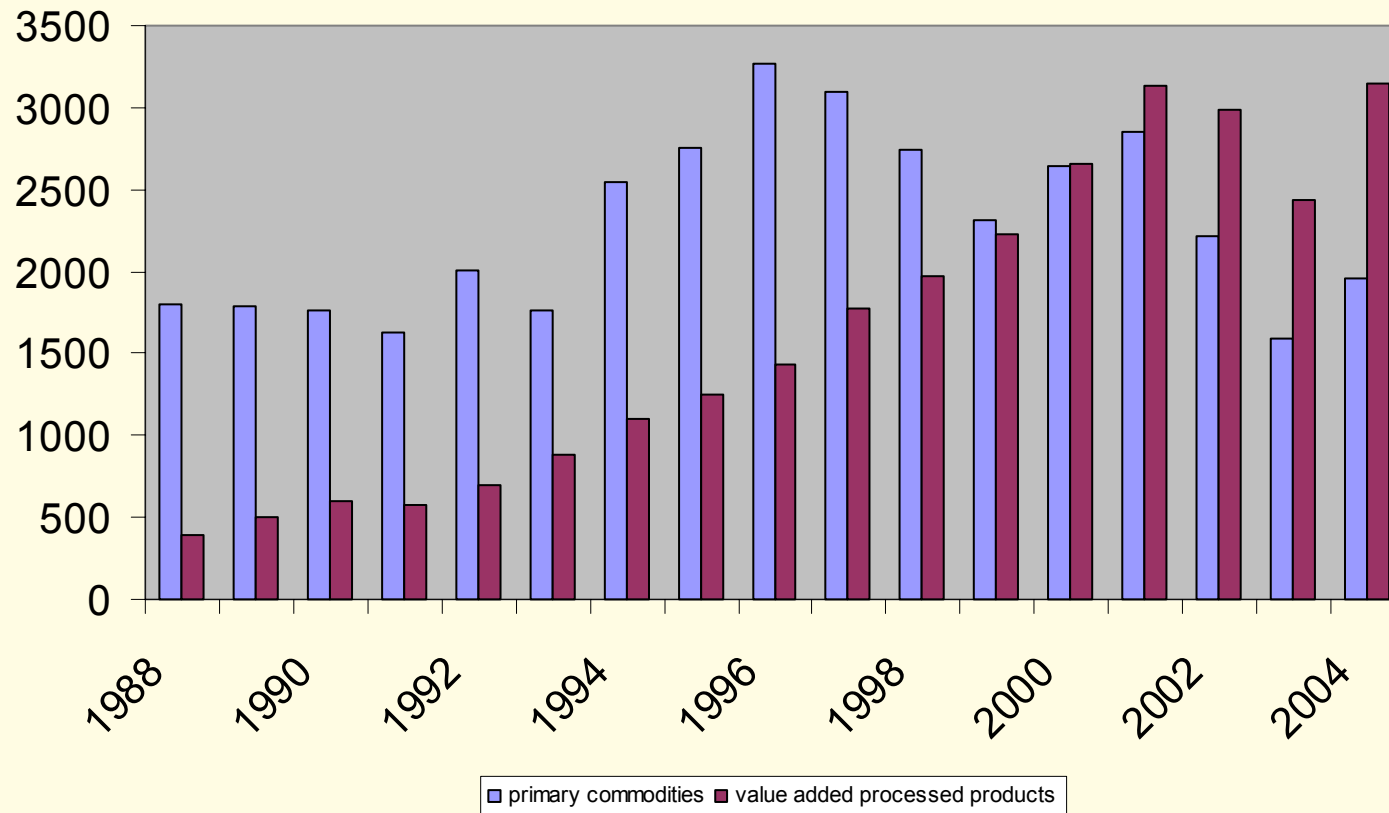
Overarching issues affecting the achievement of Alberta's growth targets

- Global Trade and Market Development
- Policy – development of new industries, interprovincial trade, domestic regulation
- Research and Development
- Technology Adoption and Commercialization
- Management/Labour Supply and Training
 - » (Alberta's Agriculture Growth Strategy)

Growth Strategy: \$20B/\$10B by 2010

How are we doing?

Alberta Agricultural Exports, \$ 000



Value of Shipments & Exports, 2003p

| Product Category | Shipments (\$000,000) | Exports (\$000,000) |
|----------------------------|------------------------------|----------------------------|
| Meat/Meat Products | 4,131.5 | 1,470.8 |
| Dairy Products | 1,205.6 | 10.2 |
| Grains & Oilseeds | 824.4 | 171.3 |
| Beverage Products | 813.2 | 66.4 |
| Animal Food Mfg. | 597.7 | 173.6 |
| Baked Goods/ Tortilla Mfg. | 313.8 | 19.2 |
| Other Food Products | 818.3 | 294.5 |
| Total | 8,789.4 | 2,206.0 |

Key Value-Added Players: Lakeside Packers (IBP), Cargill Foods, XL Foods, Centennial Food, Olymel, Maple Leaf Foods, Parmalat Canada, Saputo Milk, Lamb-Weston, McCain Foods, Lilydale Foods

Alberta's Research Investment

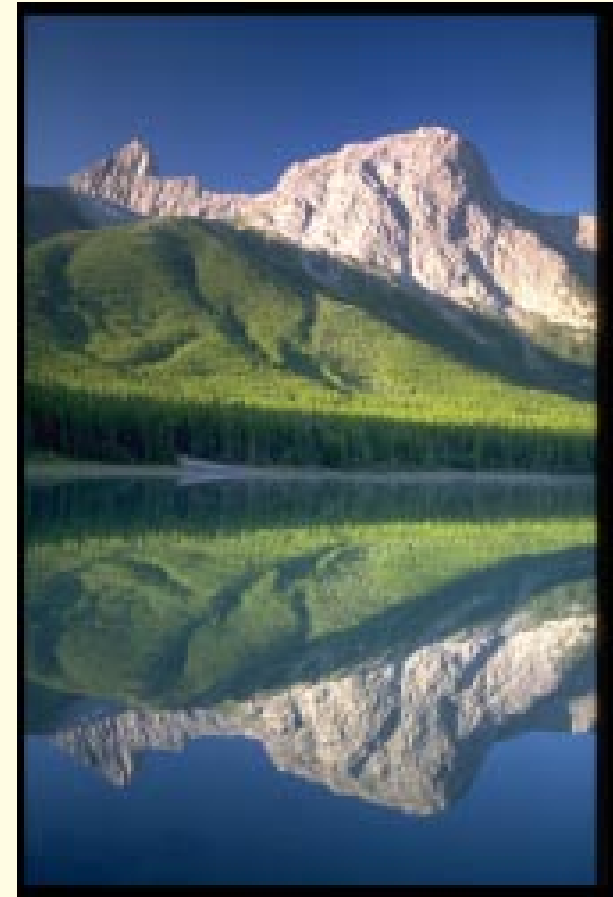
- Alberta Ingenuity
- Alberta Funding Consortium
- Institute for Food and Agricultural Sciences
Alberta

Dr Peter Hackett, President and CEO, Alberta Ingenuity Fund

“Alberta’s future will be determined by its attractiveness as a home for creative and ingenious people *and* by their ability to build an innovative value-added economy in the Province”

“The development of highly qualified entrepreneurial people in key areas of provincial opportunity is an absolutely key success factor for Alberta. Excellent successful people attract other excellent people”

Success today attracts success in the future



ALBERTA INGENUITY STRATEGIES

Build the Value-added Economy in Alberta by:

- Attracting Key Talent to Alberta
- Training Graduate Students in Science and Engineering
- Building Centres of Excellence
- Supporting Knowledge-based Companies

ALBERTA PRION RESEARCH INSTITUTE

- A \$35 million investment of the Government of Alberta
- Delivered by Alberta Ingenuity
- Will build an integrated research capacity to address the challenges of BSE and other TSE related diseases
- Will attract international research leaders to Alberta



Agricultural Funding Consortium

- Attempt to reduce duplication
- Encourage larger team based research projects
- Provide one stop window for research funding applications
- Agricultural industry input to priority setting and research project selection

Agriculture Funding Consortium

[Home](#)[Applications](#)[reach&discover](#)[Contact Us](#)[Agriculture
Funding
Consortium](#)

The **Agricultural Funding Consortium** is comprised of the following sixteen organizations:

- [Alberta Agricultural Research Institute \(AARI\)](#),
- [Alberta Crop Industry Development Fund \(ACIDF\)](#),
- [Alberta Livestock Industry Development Fund \(ALIDF\)](#),
- [Diversified Livestock Fund of Alberta \(DLFOA\)](#),
- [Agriculture and Food Council \(AGFC\)](#),
- [AVAC Ltd.](#),
- [Climate Change Central \(CCC\)](#),
- [Alberta Barley Commission \(ABarleyC\)](#),
- [Alberta Pulse Growers Commission \(APGC\)](#),
- [Alberta Canola Producers Commission \(ACPC\)](#),
- [Alberta Chicken Producers \(ACP\)](#),
- [Alberta Milk \(AM\)](#),
- [Alberta Pork \(AP\)](#),
- [Alberta Egg Producers \(AEP\)](#),
- [Potato Growers of Alberta \(PGA\)](#),
- [Alberta Beekeepers Commission \(ABeeC\)](#)

These organizations have partnered in creating a one-window approach for agricultural research funding and development funding. Contact these agencies separately for information on applying directly to each.

If you have questions regarding the joint application process, please do not hesitate to contact any of the

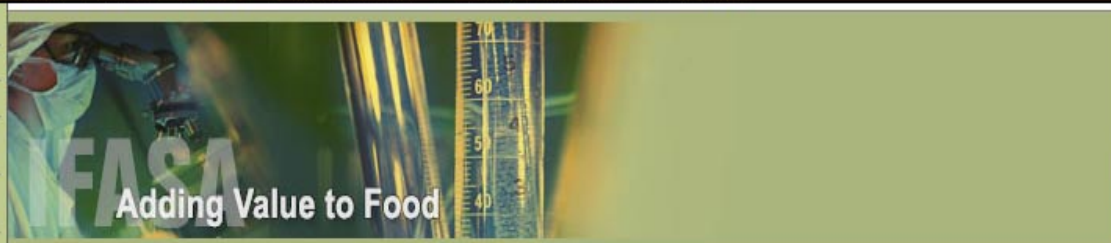
IFASA The Institute for Food and Agricultural Sciences, Alberta

 Search


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- About IFASA
- Media
- Ask IFASA
- Publications & Reports
- Research Framework
- Research Programs
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- Learning Opportunities
- Members Area



Why IFASA?

The vibrancy of today's agriculture and agri-food markets and changes in consumer expectations put new demands on Alberta's agriculture and agri-food industries. When consumer preferences change, producers and processors must be ready to respond. The Alberta Government has recognized the urgency to prepare our industry to meet the new challenges of today's modern markets. After a consultation with industry and other stakeholders, the Alberta Government set an agriculture industry target of \$20 billion of value added and \$10 billion of primary production on a sustainable basis to be reached by the year 2010. In March 2003, the Government endorsed an R&D [Agriculture Strategy](#) to meet the challenges of reaching the industry targets and in 2004, committed 65 million dollars as an initial investment in research and development in areas of high strategic importance to the future of Alberta's agri-food industries.

In response to the new strategic directions, in May 2003, the Institute for Food and Agricultural Sciences, Alberta (IFASA) was initiated when three major research and development providers in Alberta signed a [memorandum of understanding](#). Alberta Agriculture, Food and Rural Development (AAFRD), the University of Alberta (UofA) and the Alberta Research Council (ARC), agreed to contribute and coordinate resources within Alberta's food and agricultural sector to deliver high-impact research and development programs in areas of strategic importance to Alberta's agri-food industries.

[Organizational View - Click Here](#)



[Newsletter Archive](#)

[IFASA - News Archive](#)

Building Partnerships - IFASA Overview

In May 2003, the three major R&D provincial providers in Alberta, AAFRD, the UofA and ARC, signed a MOU with the intent to:

- link resources within the Alberta food and agricultural sector and
- work together for the collaborative management and delivery of agriculture, agri-food and agri-industrial programs.

....The Vision for IFASA

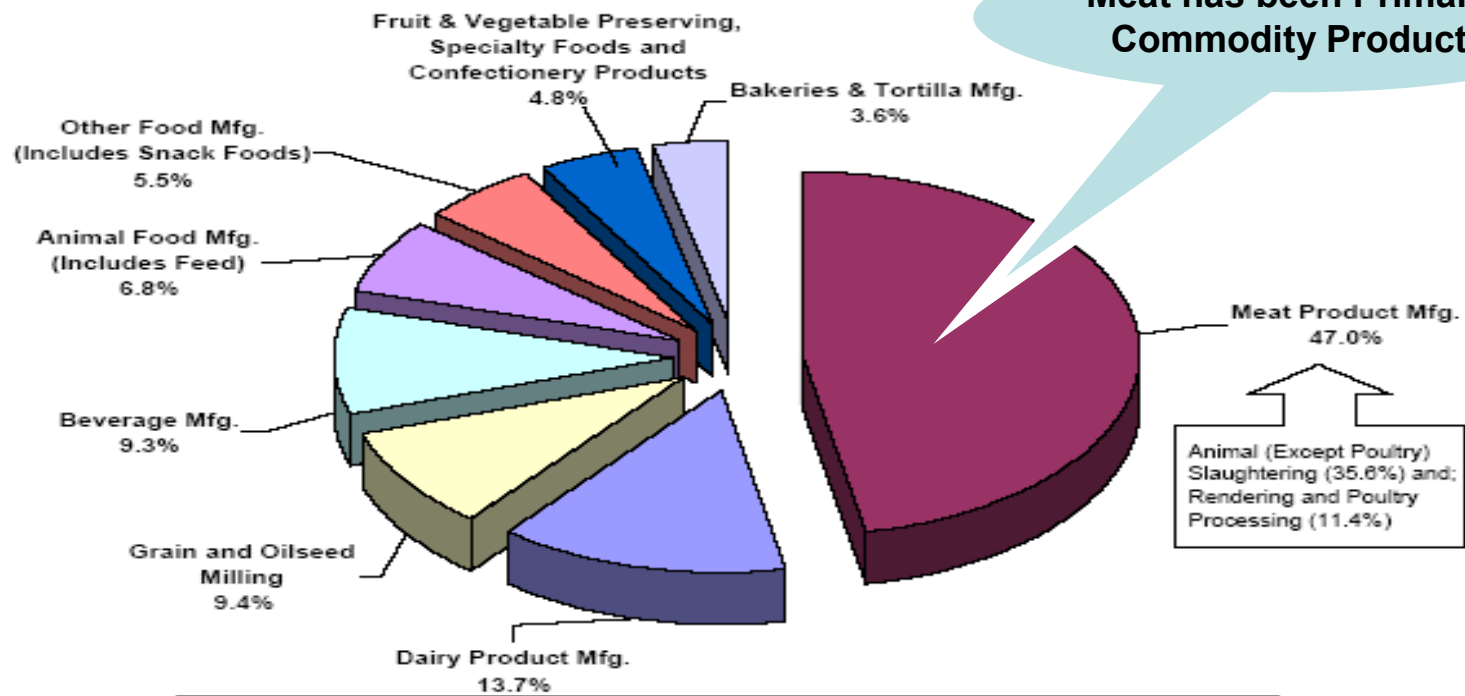
An internationally recognized agriculture and agri-food research & development institute that adds value to the economic, social and environmental well being of Alberta.

IFASA will be recognized as:

- An international centre for research
- A technology development and commercialization centre
- A centre for learning and knowledge transfer

Value-Added Opportunities are Abundant

Fig. 6 Distribution of Alberta Food and Beverage Manufacturing Shipments in 2003

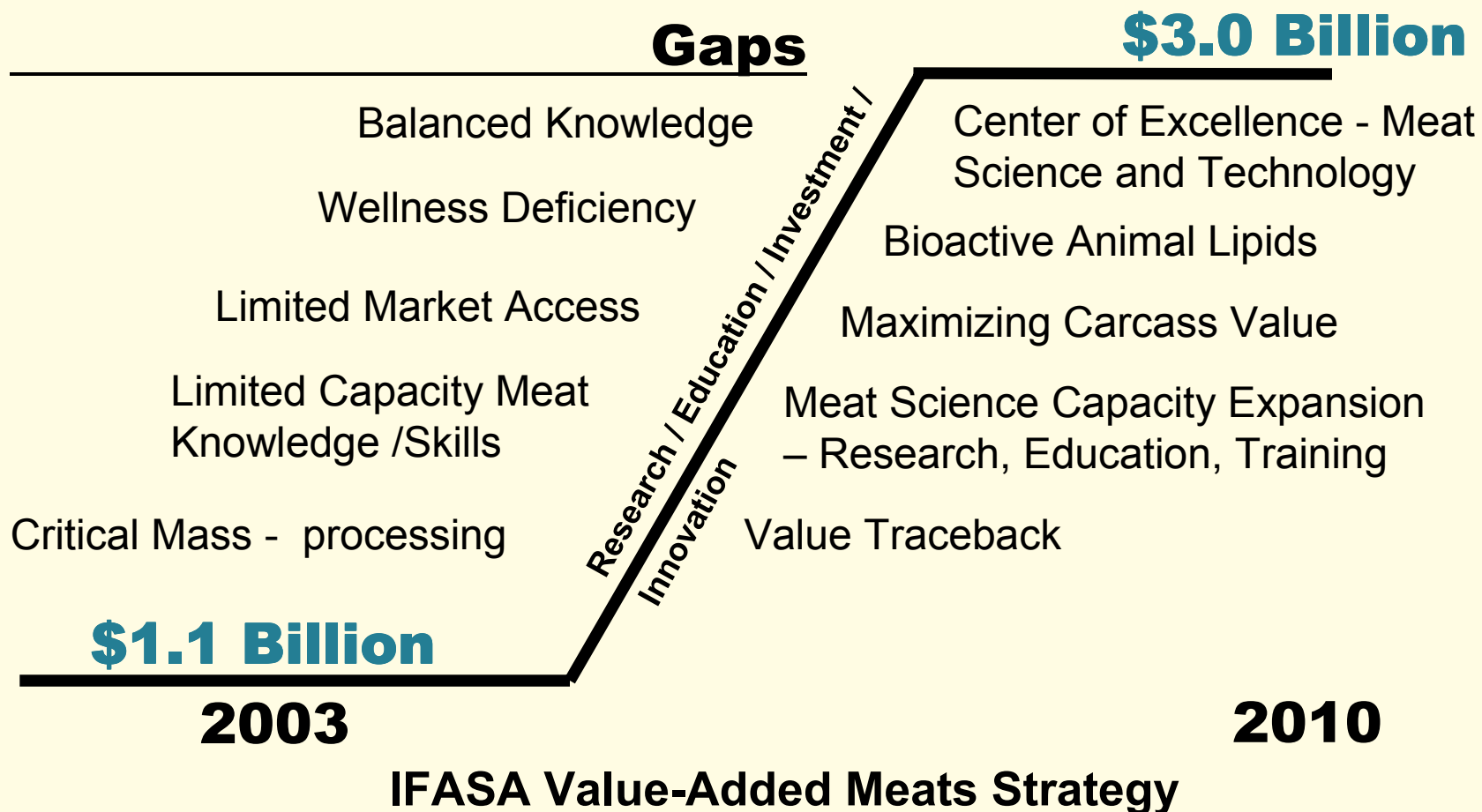


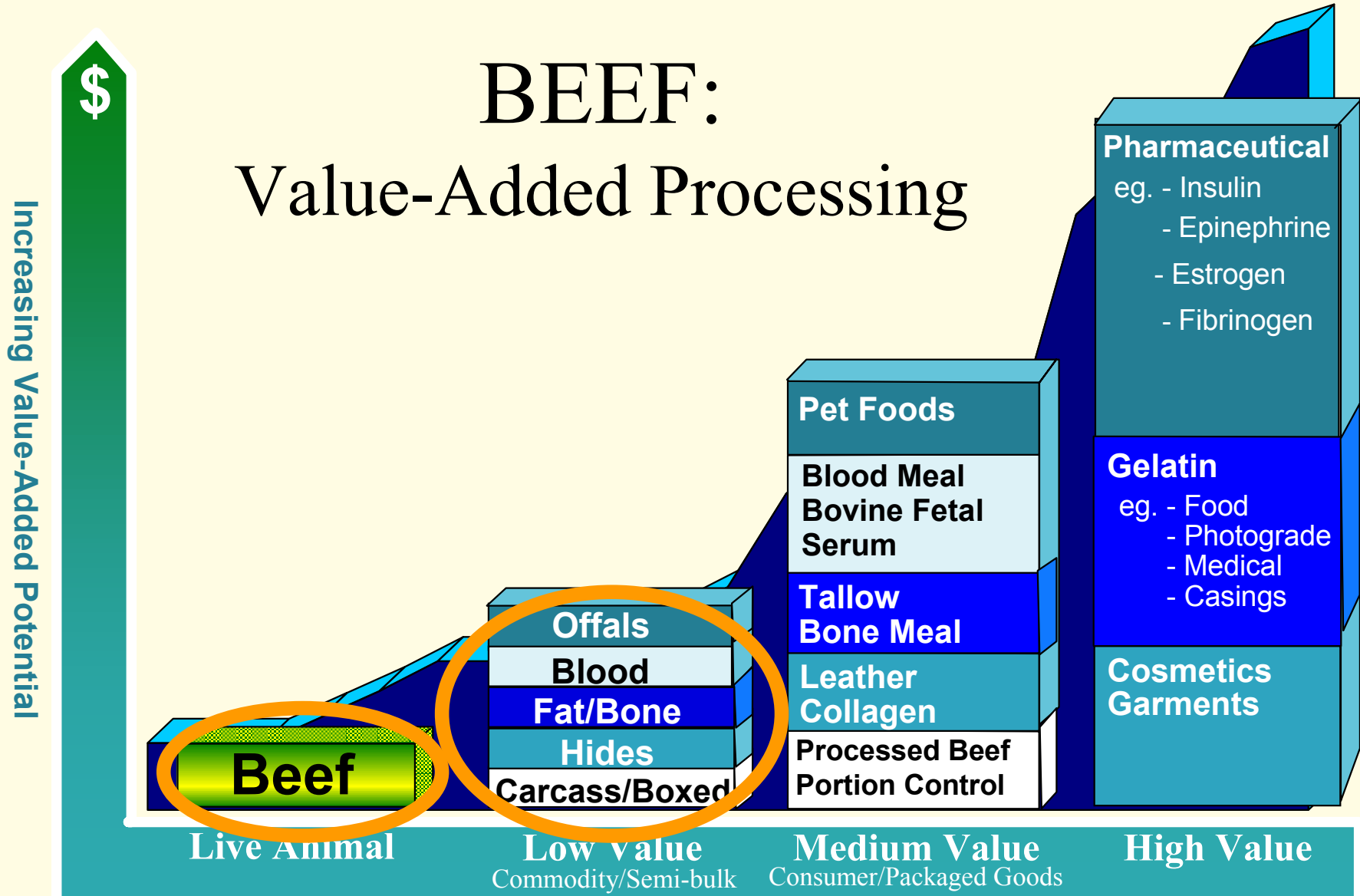
Meat has been Primarily Commodity Products

2003 Total Food and Beverage Manufacturing Shipments = \$8.8 Billion (p)

p - preliminary, subject to revision
 Source: Statistics Canada Cat. 31-203 and Cat. No. 31-001

Moving Towards A Knowledge Based Economy





Darren Chase, AAFRD

Innovation Chain - Crop Science

2010 – \$ 5 .75 Billion Secondary

Platform Technologies

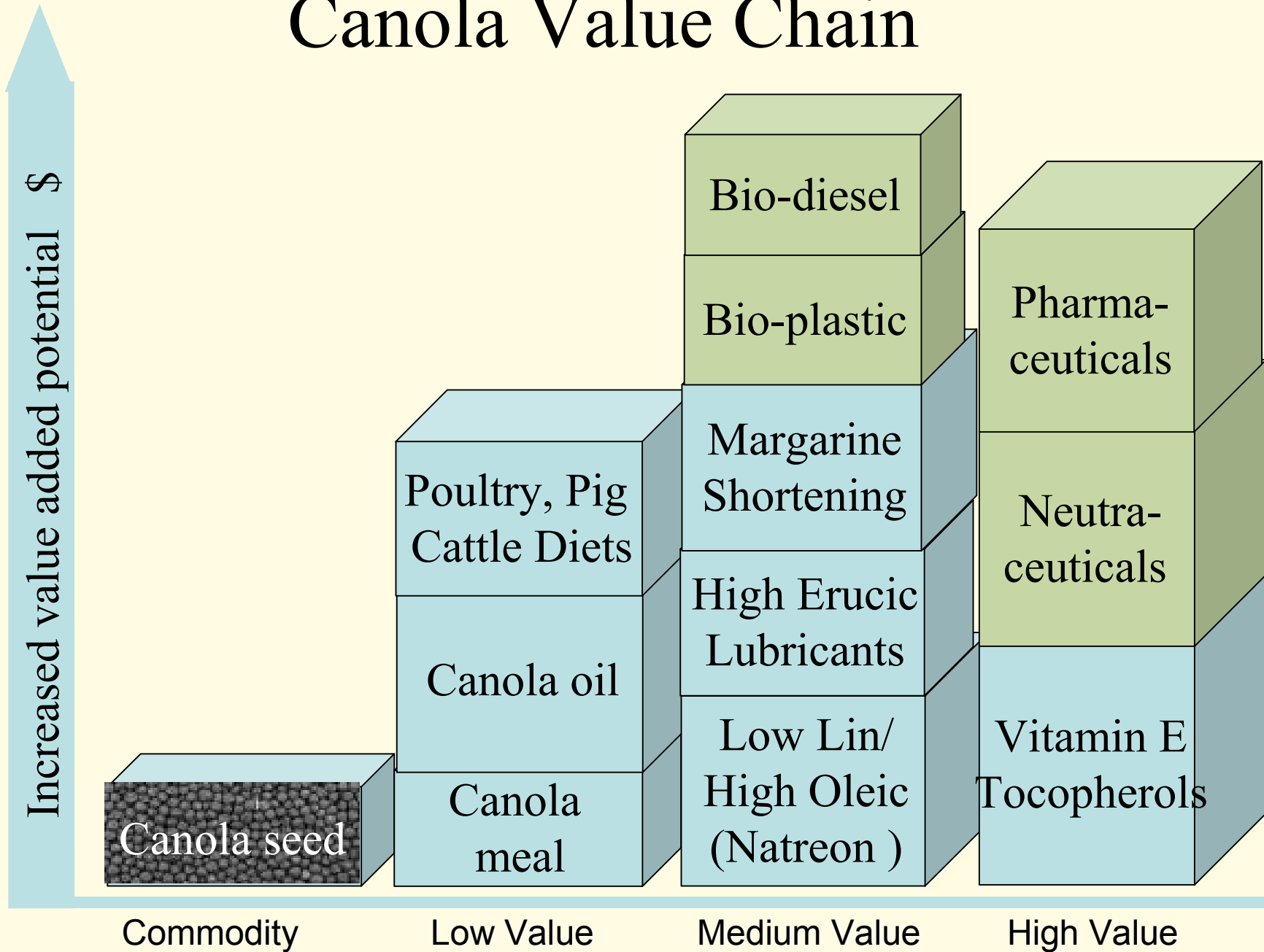
Plant Biotechnology
Proteomics
Genomics
Plant/Crop Physiology
Molecular Biology
Crop Protection
Plant Breeding

Products

Plant-Made Industrials
Plant-Made Pharmaceuticals
Designer Feed
Stress-Tolerant Crops
Oils with health attributes
Roundup Ready Canola
Quantum Canola

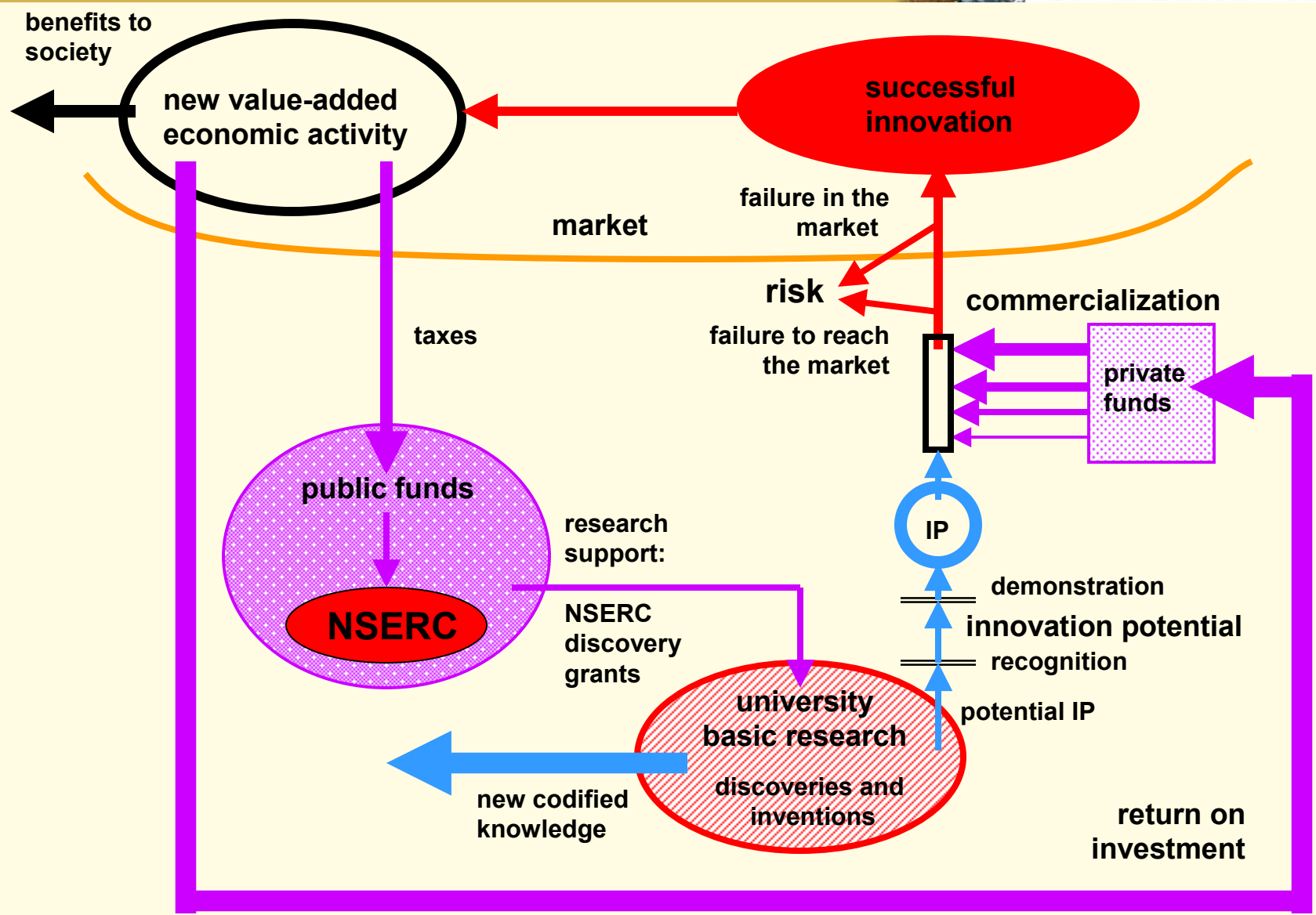
2000 – \$2.2 Billion Primary Production Crops

Canola Value Chain



Innovation U: New University Roles in a Knowledge Economy. Tornatzky et al. 2002

“We seem to be observing the emergence of a new 21st century model of the research university: one that aggressively partners with regional economic development interests, exhibits and encourages entrepreneurial behavior, and champions these new directions in its public pronouncements and internal values”



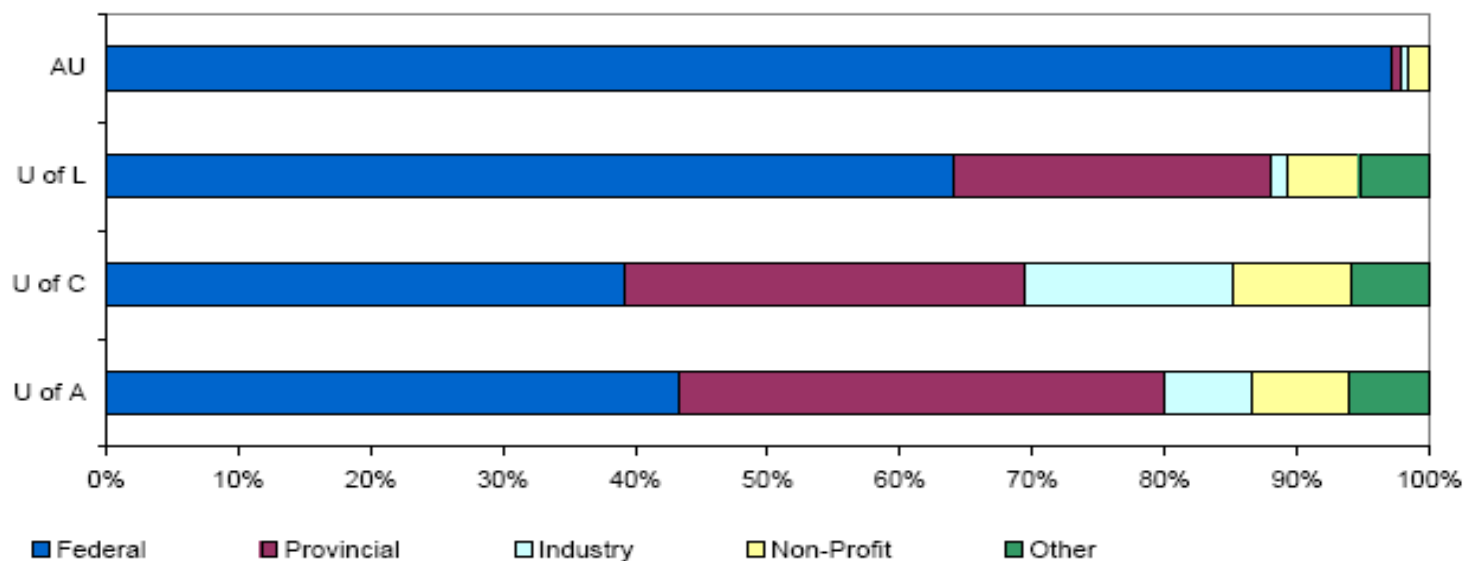
Commercializing the results of university basic research

Source Dr. Tom Brzustowski
President, NSERC

Alberta University Funding By External Source

Sponsored Research Revenue at Individual Universities by Source 2003/04

FIGURE 5



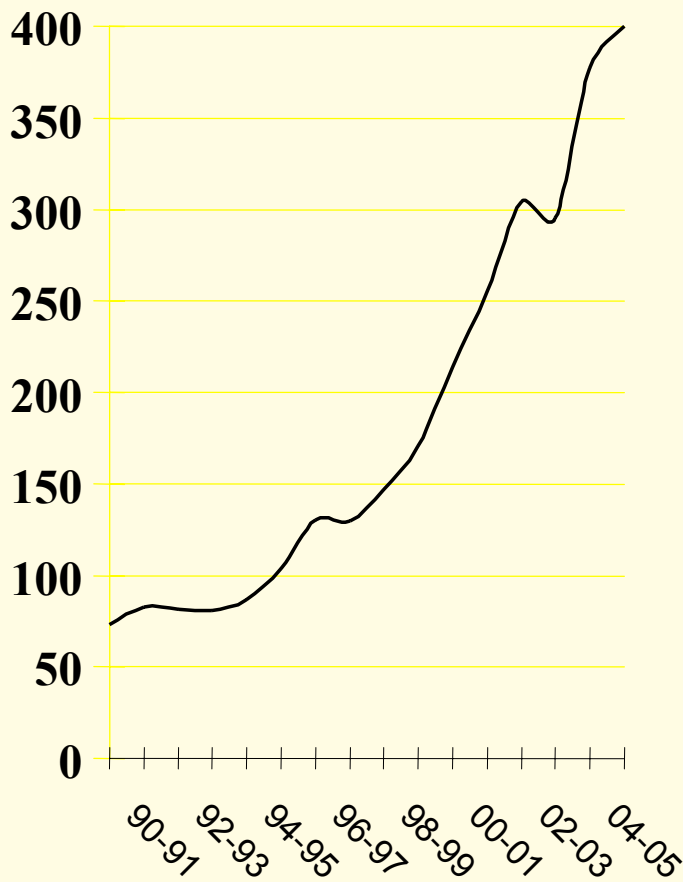
Other includes governmental and non-governmental funds

Sources: University of Alberta: Research Services Office; the University of Calgary: Financial Services; The University of Lethbridge: Financial Services; Athabasca University: Office of the Vice-President, Academic.

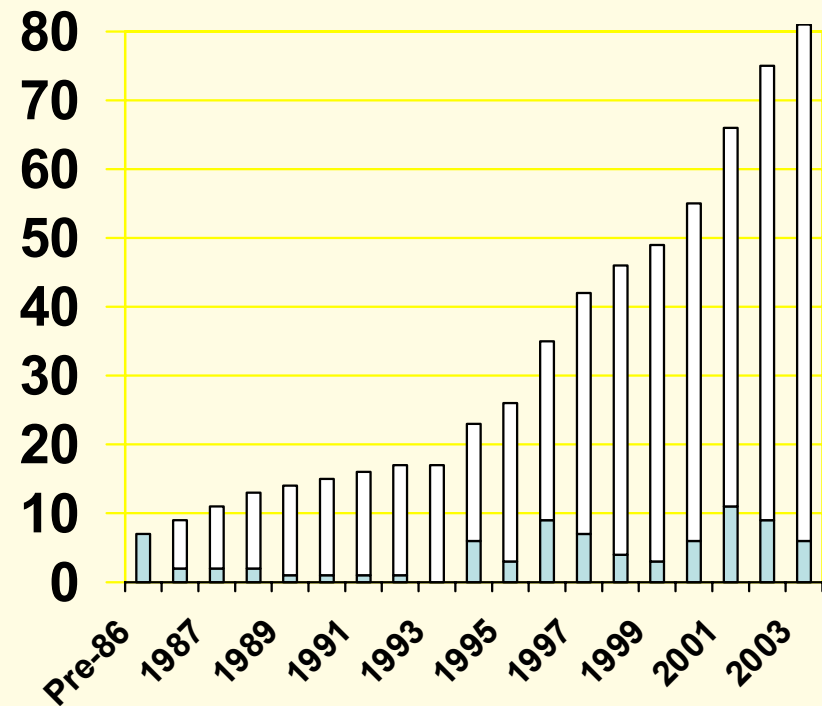
University Spin-off companies — increased research

investment matched by growth in spin-off companies

**University of Alberta
Research Expenditures (\$M)**



**University of Alberta
of Spin-off Companies**



UofA Spin-off Companies

- Based on 2003 data, 44 surveyed spin-off companies attracted over \$150 million in private investment, compared with about \$15 million from the public sector. This represents a leverage of 10 to 1 private to public sector support.



Our Faculty is committed to providing the human resources and R&D to support the Agri-Food growth strategy

- **20/10 by 2010**
- **Create 125 new products/technologies**
- **Create 70 new companies**
- **Attract national and international science leaders**
- **Over 300 new Highly Qualified Personnel**
- **\$272 million private investment**
- **Attract \$234 million federal/international investment**

Partnering with industry and government to leverage core budget

Research Funding by Department

| Department | Total Research Revenues | Base Operating Budget | Budgeted Faculty | Per Capita Funding | Funding Ratio* |
|-----------------------|-------------------------|-----------------------|------------------|--------------------|----------------|
| AFNS | 23,400,280 | 6,519,706 | 37.5 | 624,008 | 3.59 |
| Ren Res | 5,668,921 | 4,108,687 | 27 | 209,960 | 1.38 |
| <i>Biological Sci</i> | <i>12,563,026</i> | <i>11,484,997</i> | <i>69</i> | <i>182,073</i> | <i>1.09</i> |
| Rural Economy | 998,919 | 1,620,525 | 10 | 99,892 | 0.62 |
| Human Ecology | 1,514,416 | 1,691,352 | 11 | 137,674 | 0.90 |
| <i>Economics</i> | <i>146,012</i> | <i>3,075,635</i> | <i>23.8</i> | <i>6,135</i> | <i>0.05</i> |
| <i>Sociology</i> | <i>324,062</i> | <i>3,941,934</i> | <i>29.3</i> | <i>11,060</i> | <i>0.08</i> |

* Total Research Funding/Operating Budget

Sponsored Research Funding by Faculty

| Faculty | Research Revenue | Net Operating Budget | Funding Ratio |
|-------------|------------------------|----------------------|---------------|
| | ----- \$ million ----- | | |
| Medicine | 85.2 | 32.1 | 2.65 |
| AFHE | 31.7 | 16.2 | 1.97 |
| Pharmacy | 2.3 | 3.6 | 0.64 |
| Engineering | 47.2 | 22.6 | 2.09 |
| Science | 56.5 | 60.2 | 0.94 |
| Business | 4.4 | 12.4 | 0.35 |
| Nursing | 4.3 | 9.1 | 0.47 |
| Rehab Med. | 3.5 | 6.5 | 0.54 |
| Phys. Ed. | 2.6 | 6.6 | 0.39 |
| Education | 3.9 | 19.8 | 0.20 |
| Arts | 6.3 | 50.1 | 0.13 |

UofA Spin-off Company - Cevena Bioproducts Inc.,

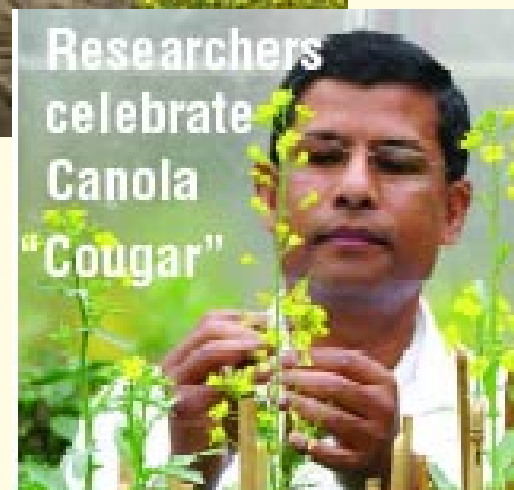
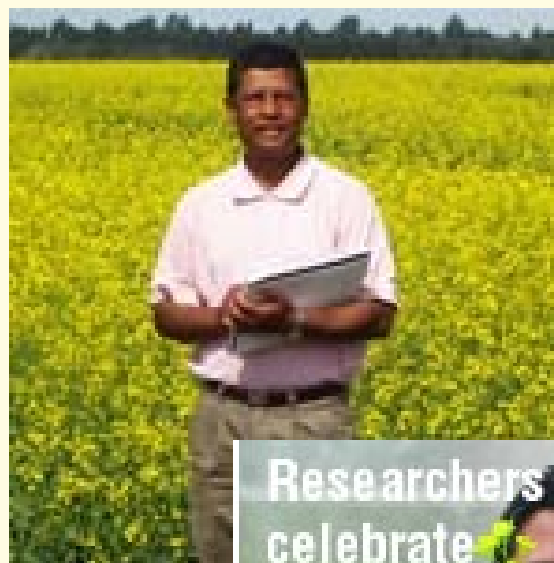
"If Cevena is successful, it could anticipate the establishment of a \$40 to 50 million dollar processing facility for beta-glucan, which could generate revenues in the order of \$80 million a year."

*Keith Jones, President and CEO of
AVAC*



UofA Canola Breeding Program

Farmers have purchased more than 12,175 tonnes of seed for Quantum, a canola cultivar created at the U of A. This translates to roughly 4.88 million acres of land seeded with Quantum on the Canadian prairies.



Other Examples of K Based Economy

- Fractionation technology (*Cevena Inc; Thava and Feral*)
- Biopolymers (*Suresh and Partners*)
- Probiotics (*CanBiocin; Stiles/McMullen*)
- *Bovine Genomics (Moore)*
- *CLA Milk and Beef (Okine, Kennelly, Field, Vera, Spencer, Randy, Moore & CLA-network)*
- Swine Nutrition area (*research collaboration w/Medicine; transplants-transgenic animals*)
- Plant Pathology (*Strelkov; Nat*)
- Genetics of Lipids and enhancing Oilseed Productions (*Weselake*)
 - ETC ETC ETC

A Note of Caution

“Other countries are ramping up their innovation at lightening speed, in good part by making substantial investments in their education systems. To use a poker analogy, we must not only see their advances, but raise them. That means training more qualified workers and investing more in research and development”

TD Bank Financial Group, Special Report, Time to Wise-Up to Post-Secondary Education in Canada. March 2004

Overall

- Alberta has lofty goals for growth in the agri-food sector
- Recently growth has stalled due to trade disputes in the meat sector, drought
- Growth requires significant investment in research: IFASA and the Prion Institute evidence that the province recognizes the need for research
- In spite of abundant research identifying the high social and private payoffs from investment in agricultural research little evidence of growth in public investment in the sector over the past ten years
- As countries develop there is a natural progression from publicly funded research to blended privately funded and publicly funded strategies: Alberta needs more investment from both sectors to achieve targets

