

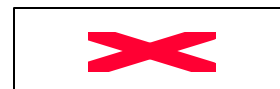
**Alberta
Agricultural
Research
Institute**

ACCELERATING SUSTAINABLE GROWTH THROUGH RESEARCH AND DEVELOPMENT

April 10 and 11, 2000

Facilitated By:

Marilyn Stecyk





SUCCESS CRITERIA

To be Considered as a Strategic Priority R & D Initiatives Must:

- Meet customer needs
- Have the potential enhance competitive advantage
- Demonstrate the practice of excellent science
- Have a Human Resources Plan that will build the human resource capacity in Alberta
- Contribute to an attractive research environment in Alberta
- Demonstrate collaboration, integration and multi-disciplinary action
- Ensure that the benefits accrue largely to Alberta
- Be sustainable
- Have the potential for commercial incrementalization or utilization
- Demonstrate that the risk assessment is calculated and balanced
- Promote health

STRATEGIC PRIORITIES

The Broad Areas That Ag & Food R&D Should Focus its Efforts and Investments Are:

1. *Creating and/or enhancing an attractive research environment based on research excellence.*
2. *Investment in value-added research projects and programs that increase the returns to processors and producers, and result in commercially viable opportunities in functional food and feed, and industrial uses.*
3. *Continue and secure investment in basic research.*
4. *Investment in Genomics.*
5. *Encourage investment in environmental sustainability – inputs (soils), outputs (manure, GHG, etc) integrated issues (cumulative effects). All research should have an economic and environmentally sustainable components.*
6. *Creation of an agri-health initiative in support of food safety, nutraceuticals, functional foods and well-fare. Enhancing agricultural and food products to improve human and animal health.*
7. *Invest in research and industry linkages and bridges.*
8. *Focus on global competitiveness.*
9. *Support for integrated/collaborative initiatives.*

WHAT NEEDS TO HAPPEN TO MAKE THIS WORK

Clarity of Vision

- We need to clarify what we are really trying to accomplish - is the \$20 B our vision.
- Four Pillars or Core Values (in the absence of a vision statement):
 - Create an attractive environment for R and D and commercialization investment in Alberta.
 - Human Resource Development is critical.
 - Support commitment to basic research.
 - Applied research with a good chance of commercialization and development.
- Who is the champion? Who owns the vision? Is there a role for a championship from industry?
- Need to clarify and/or confirm AARI's "new" role as the champion of Ag and Food Research.
- Need to identify a mechanism (structure, belief, system) to make this work. To bring all of the stakeholders together. Need to ensure there is evidence of these things going on.
- Strategy must include trade-offs - to accomplish this we will do less of or stop doing to achieve objectives within our current resource base.

Securing Investment

- Is there enough investment to achieve the vision?
- We would know we are moving in the right direction if we could show that we are working together, a seamless process – evidence of collaboration. (MOU of funders).

Accountability and Benchmarking

- We would like a report back in a year from now with some criteria to demonstrate what has been done.
- Accountability and benchmarking as a continuing role. How does industry account back to itself.

Human Resource Development

- Need to balance HR development with recruiting expertise and supporting Albertans who are developing research capacity.
- Provide scholarships for undergrads.
- Training opportunities for grad. Work
- Fund internal development on HR side.

MESSAGES TO BOARD/ASRA

Ag and Food Research needs an identified visionary leader or a champion (not necessarily government) who accepts responsibility to make sure this happens.

AARI/ ASRA need to:

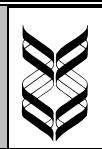
- Establish a solid relationship
- Secure/commit to long term funding
- Work to align processes

Don't limit this partnership and don't let this partnership limit other partnerships.

WAYS TO SEND THIS MESSAGE TO AG SUMMIT

Message to AG SUMMIT- Agriculture, Food and Rural Development needs a vision of the future in which research knows what role it plays in that context.

- Need a one-page summation of key points from this process. Make sure the people from this session have a copy of it.
- Gather information from new technology table and review it.
- Dr. Ralph Christian will coordinate action.



PURPOSE OF THE WORKSHOP

- Explore global market opportunities for sustaining our agri-food industry
- Examine capacity, availability and effectiveness to support expected growth
- Develop AARI Board recommendations
- Develop AG SUMMIT 2000 recommendations

PROCESS

The “Accelerating Sustainable Growth through Research and Development” workshop was attended by approximately eighty representatives of the agriculture and food production and processing industry, and members of the research and development community.

The intent of the workshop was to identify strategic priorities for Ag and Food Research and Development in Alberta. These priorities will be used to define the role of Ag and Food R & D in the Alberta Science and Research Authority Strategy, at Ag Summit 2000, and for the AARI Board as it sets its strategic directions. The process was a mixture of presentations interspersed with small group and plenary works sessions. The result was the identification of defined areas of strategic focus and preliminary action strategies.

PRESENTERS

The Provincial Perspective

“Accelerating Sustainable Growth through Research and Development” requires identification of the research and development priorities that will support industry growth and the ability to compete in world markets.

Barry McFarland, MLA, Chair
Alberta Agricultural Research Institute

Opportunities for collaboration and growth in an expanding research and development environment

Hon. Lorne Taylor
Minister of Innovation and Science

Research and Development as a capacity builder for Agriculture, Food and Rural Development

Hon. Ty Lund
Minister of Agriculture, Food and Rural Dev.

Establishing Research Context

Understanding the mosaic of research performers and funders in Alberta

Dr. Ralph Christian, Executive Director
Alberta Agricultural Research Institute

Agriculture and Food Research and Development Opportunities in Alberta

An overview of the AARI report “Growth Strategies and Research Investment in Agriculture and Food in Alberta”

Stewart Campbell
S.J. Campbell Investments Ltd.

Exploring the Capacity of Research and Development in Agriculture and Food

The Implication of World Market Trends on Research and Development

Barry Mehr
ADM, Alberta Economic Development

The Impact of Research and Development on the Agriculture and Food Industry: Results and Opportunities

Norris Hoag, Chair
Canadian Agri-Food Research Council

Needed: New Knowledge, New Skills, New Infrastructure, New Partnerships

Dr. Bob Church, Chair
Alberta Science and Research Authority

SUCCESS CRITERIA

The process of establishing strategic priorities for Agriculture & Food Research & Development activity included identifying an evaluation framework, or establishing some indicators by which a proposed initiative could be assessed for investment potential. The following list represents a preliminary effort of generating indicators by the workshop participants. This list was not prioritized or ranked in any way but was merely used as a way of focusing the many recommendations for Ag and Food Research and Development strategic areas that were put forth as potential priorities:

To be considered as a strategic priority R & D initiatives must:

- Meet customer needs
- Have the potential enhance competitive advantage
- Demonstrate the practice of excellent science
- Have a Human Resources Plan that will build the human resource capacity in Alberta
- Contribute to an attractive research environment in Alberta
- Demonstrate collaboration, integration and multi-disciplinary action
- Ensure that the benefits accrue largely to Alberta
- Be sustainable
- Have the potential for commercial incrementalization or utilization
- Demonstrate that the risk assessment is calculated and balanced
- Promote health

Other criteria put forth in the papers of the workshop presenters were:

- Respond to market opportunities: global, Canadian, Alberta
- Demonstrate potential for collaboration
- Demonstrates potential for leveraging resources
- Leverage past successes
- Be a new opportunity that responds to a market gap
- Demonstrate that adequate investment is available
- Enhance industry competitiveness
- Support environmental sustainability

FOCUSED RECOMMENDATIONS

The following list represents the first effort to identify strategic areas for research and development focus. This list was tested against the draft criteria and discussed in the plenary sessions.

- Focus on research to develop innovative, consumer driven products for health promotion and disease prevention
- Agri-health initiative - i.e.: nutraceuticals/functional foods human and livestock
- Research supporting global competitiveness and emerging market opportunities
- Create an attractive research environment - infrastructure, HQP/Funds/ incentives
- Research in support of environmental sustainability
- An environment of R& D excellence; infrastructure /human resources.
- Encourage value-added developments- streamlined funding processes, new money in value added, private/public collaboration
- High relevance to AB. Resources/opportunities
- Potential for development: utilization and commercialization
- Improving animal, plant, and environment and food
- An integrated approach to developing a sustainable animal industry
- Investment in research driven by human resources. E.g. value added
- Crop diversification animal health & welfare, food safety, food quality
- Packaging/ Processing -innovative - whole meal replacement
- Energy-Agriculture Interface: agro-forestry,
- Climate change (C. offset)
- Long term secure funding for basic research (to recruit scientific excellence)
- Functional Foods, GMO's and the environment

STRATEGIC PRIORITIES – AREAS OF STRATEGIC FOCUS

The following nine areas of strategic focus represent the recommendations for priorities for strategic action in Agriculture and Food Research and Development. These strategic priorities were considered to have potential to support global market opportunities for sustaining Alberta's agri-food industry, and expanding the capacity and effectiveness of the industry to support expected growth.

The broad areas that Ag & Food R&D should focus its efforts and investments are:

1. Creating and/or enhancing an attractive research environment based on research excellence.

Actions essential for success:

- Inventory of what is existing
- Reinvest in projects based on new priorities.
- Recruit a champion
- Commitment of new dollars
 - Highly trained people
 - Research
 - Equipment
- Check the tax environment
- Incubators on several levels

2. Investment in value - added research projects and programs that increase the returns to processors and producers, and result in commercially viable opportunities in functional food and feed, and industrial uses.

Actions essential for success:

- Coordinated action by funders: a Memorandum of Understanding between all major funding agencies
- Mentoring to produce excellent programs and projects
- Attract more investment in agriculture research
- Change in structure of the Wheat Board.
- Need to ensure we produce more quality projects
- Macro level – case for increased investment in R& D
- Maximize what we already have
- More researchers and technicians for university and centers
- Support researchers- “chairs”
- Benchmark what other people have done around the world – investment and venture capital
- Communicate the benefits of value added around the world.
- Investment in environment and venture capital

Some examples:

- Grains
- Meats (conventional and alternate)
- Test facilities at pilot plant level
- Industrial non-food uses e.g. strawboard, marine oil out of canola
- Value added in functional foods/neutraceutical food
 - Long term support financing for functional food
 - Multi-disciplinary project – market driven and basic.
 - Hire critical mass in functional food
 - Encourage ASRA- broad based scientific innovation programs
 - Establish four University Chairs
 - Kick start three projects starting May 1, 2000
 - Identify priority areas for building excellence in science.
 - Link between functional food/health. Bring in industry early.

3. *Continue and secure investment in basic research*

4. *Investment in Genomics*

5. *Encourage investment in environmental sustainability – inputs (soils), outputs (manure, GHG, etc.) integrated issues (cumulative effects). All research should have an economic and environmentally sustainable components.*

Actions essential for success:

- Climate change central - support and muscle
- Sustainable development coordinating council
- ASRA funding and commitment
- Commitment to long term, high cost incremental funding
- Commitment to train/attract the human resource
- A communication information strategy

Some examples :

- Bio diversity
- Greenhouse gases
- Waste management
- Air quality
- Soil remediation
- Organic research
- Socio-economic sustainability
- Effect of technology on the environment
- Soil Quality
- Water Quality

6. *Creation of an agri-health initiative in support of food safety, nutraceuticals, functional foods and well-fare. Enhancing agricultural and food products to improve human and animal health.*

Some examples:

- Identifying characteristics of food quality
 - Efficacy testing and clinical trials
 - Extraction technologies and processes
 - Identifying “health” promotants in agriculture commodities,
 - Market distribution
 - E-commerce research
 - Testing measurement technologies for food safety
7. *Invest in research and industry linkages and bridges*
 8. *Focus on global competitiveness*
 9. *Support for integrated/collaborative initiatives*

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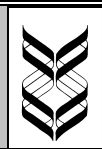
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- Secure/commit to long term funding
- Work to align processes
- Don't limit this partnership and don't let this partnership limit other partnerships.

Strategic Thinking Worksheets



Strategic Thinking for Strategic Priorities

The Strategic Priority

The broad area that Ag & Food R&D should focus its efforts and investments:

- **Enhancing agricultural and food products to improve human and animal health**

Which of the success criteria does this priority most closely align with?

- Customer Need
- Excellent Science
- Collaboration
- Potential for Commercialization

How? Elaborate on Alignment

- Public concerns in health, health care, and food safety
- Efficacy - testing major challenge, requires top notch human resources
- Bring together ag, health pharmacy, medicine
- \$20 B market in N. America today in functional foods alone. Can help draw major public and private investment.

Is this?

- | | |
|--|--|
| <input type="checkbox"/> <i>A new initiative or focus (or)</i> | <input type="checkbox"/> <i>Building on a current investment</i> |
| <input type="checkbox"/> <i>An AARI initiative</i> | <input type="checkbox"/> <i>Something for a specific R&D stakeholder</i> |
| | <input type="checkbox"/> <i>Something for the larger R&D community</i> |

Specific Examples of R&D initiatives that would be included in this priority:

- | | |
|---|---|
| ▪ Efficacy testing and clinical trials | ▪ Extraction technologies and processes |
| ▪ Market distribution, e-commerce research | ▪ Identifying “health” promo ants in agriculture, commodities |
| ▪ Identifying characteristics of food quality | ▪ Testing measurement technologies for food safety |

Enablers: Shared assumptions that support action:

-
-
-

Detractors: Shared assumptions that need to be addressed:

-
-
-

Three actions that are absolutely essential to the success of this priority:

-
-
-

Details:

-
-
-



Strategic Thinking for Strategic Priorities

The Strategic Priority: The broad area that Ag & Food R&D should focus its efforts and investments:

- *Encourage investment in value added research-*
- *Value added that addresses emerging customer demands*
- *Projects and programs that increase returns to producers and processors which result in commercially viable opportunities in functional food (traditional food and feed) and industrial uses.*

Which of the success criteria does this priority most closely align with?

How? Elaborate on Alignment

- | | |
|--------------------------------|---|
| ▪ Meet market needs | ▪ |
| ▪ Builds on natural advantages | ▪ |
| ▪ Commercialization | ▪ |
| ▪ HR | ▪ |

Is this:

- | | |
|--|--|
| <input type="checkbox"/> <i>A new initiative or focus (or)</i> | <input type="checkbox"/> <i>Building on a current investment</i> |
| <input type="checkbox"/> <i>An AARI initiative</i> | <input type="checkbox"/> <i>Something for a specific R&D stakeholder</i> |
| | <i>XXXSomething for the larger R&D community</i> |
- Name: _____

Specific Examples of R&D initiatives that would be included in this priority:

- | | |
|--|---|
| ▪ Grains | ▪ |
| ▪ Industrial non food | ▪ |
| ▪ Meats (conventional and alternate | ▪ |
| ▪ Test facilities at pilot plant level | |
| ▪ Industrial non-food uses eg strawboard, marine oil out of canola | |

Enablers: Shared assumptions that support action:

- The money is available
-
-

Detractors: Shared assumptions that need to be addressed:

- Lack of buy in and shared \$20 B vision
- Lack of coordinated investment
- Need to mentor for better quality projects

Actions that are absolutely essential to the success of this priority:

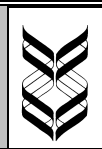
- Coordinated action by funders – MOU between all major funding agencies
- Mentoring to produce excellent programs and projects
- Attract more \$\$ to agriculture research

Details:

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- Change in structure of the Wheat Board. ▪
- Need to ensure we produce more quality ▪
 projects
- Macro level – case for increased investment in ▪
 R& D

- Maximize what we already have
 - More researchers and technicians for university and centers
 - Support researchers- “chairs”
 - Benchmark what other people have done around the world – investment and venture capital
 - Communicate the benefits of value added around the world.
 - Investment in environment and venture capital



Strategic Thinking for Strategic Priorities

The Strategic Priority: The broad area that Ag & Food R&D should focus its efforts and investments:

- *Value added in functional foods/neutraceutical food*

Which of the success criteria does this priority most closely align with?

- Value added
- Meets 9/10 criteria
-
-

How? Elaborate on Alignment

-
-
-
-

Is this:

- A new initiative or focus (or)* *Building on a current investment*
 - An AARI initiative* *Something for a specific R&D stakeholder* *Something for the larger R&D community*
- Name: _____

Specific Examples of R&D initiatives that would be included in this priority:

- Long term support financing for functional food _____
- Hire critical mass in functional food
- Chairs – establish four chairs
- Multi-disciplinary project – market driven and basic.
- Encourage ASRA- broad based scientific innovation programs
-

Enablers: Shared assumptions that support action:

Detractors: Shared assumptions that need to be addressed:

Three actions that are absolutely essential to the success of this priority:

- Do it starting May 1, 2000
- Kick start three projects
- Identify priority areas for building excellence in science. – link between functional food/health—bring in industry early

Details:

-
-
-



Strategic Thinking for Strategic Priorities

The Strategic Priority: The broad area that Ag & Food R&D should focus its efforts and investments:

- *Enhance an attractive research environment built on excellent science*

Which of the success criteria does this priority most closely align with?

How? Elaborate on Alignment

- Excellent Science
- Contribute to an attractive env.
- Must be a collaborative
- Competitive incentives

-
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- A new initiative or focus (or)*
- Building on a current investment*

- An AARI initiative*
- Something for a specific R&D stakeholder*
Name: _____
- Something for the larger R&D community*

Specific Examples of R&D initiatives that would be included in this priority:

- Special funds to grad students
- Incubators (several levels)
- Dedicated capital funds for basic and development equipment

-
-
-

Enablers: Shared assumptions that support action:

- Established facilities

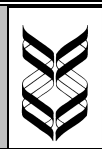
Detractors: Shared assumptions that need to be addressed:

- Regional Pressures
- Inefficient communications

Three actions that are absolutely essential to the success of this priority:

- Inventory of what is there
- Reinvest in projects based on new priorities.
- Recruit a champion
- Commitment of new dollars
 - N Highly trained people
 - N Research
 - N Equipment
- Check the tax environment
- Incubators

Details:



Strategic Thinking for Strategic Priorities

The Strategic Priority: The broad area that Ag & Food R&D should focus its efforts and investments:

- *Encourage investment in environmental sustainability – inputs (soils) , outputs (manure, GHG, etc) integrated issues (cumulative effects).*
- *All research should have an economic and environmentally sustainable components*

Which of the success criteria does this priority most closely align with?

- Health
- Multi-disc
- Sustainable
- Benefits Alberta
- Collaborative
- Risk assessment

How? Elaborate on Alignment

- Driving force for the concern
- Cross cutting issue
- Self evident
-
-
-

Is this:

' A new initiative or focus (or) ' Building on a current investment

- An AARI initiative*
- Something for a specific R&D stakeholder*
Name: _____ ASRA _____
- Something for the larger R&D community*

Specific Examples of R&D initiatives that would be included in this priority:

- Bio diversity
- Greenhouse gases
- Waste management
- Air quality
- Soil remediation
- Organic research
- Socio-economic sustainability
- Effect of technology on env.
- Soil Quality
- Water Quality

Enablers: Shared assumptions that support action:

- Public concern
- World wide scope
- Growth scenario will not be achieved without sustainability
- For the public good

Detractors: Shared assumptions that need to be addressed:

- Complex Fed/Prov. Env.
- Lack of Commitment
- Cost/willingness to pay
- Urban/ rural imbalance
- Lack of scientific data
- Globalization of disinformation
- Articulation of need for research

Three actions that are absolutely essential to the success of this priority:

Details:

- Climate change central- support and muscle
- Sustainable development coordinating council
- ASRA funding and commitment
- Commitment to long term, high cost incremental funding
- Commitment to train/attract the human resource
- A communication information strategy

Raw Data

APPENDIX ONE: RAW WORKSHOP INFORMATION

Underlying Assumptions about Agriculture and Food Research and Development

- Research is essential to success in knowledge based economy
- Consumer is not part of research agenda setting
- Need to take a value chain/systems approach
- Build on inherent strengths as producer of plant and animal commodities (oilseeds, cereals, beef, pork)
- More top researchers, double research infrastructure market driven
- Research efforts (\$ and skills) must be focused and targeted
- Leverage relevant expertise. Collaborate with other research institutes around the world
- Greater convergence of Health - Nutrition - Food (life sciences)

Draft Success Criteria

- Market Research & Market Driven
 - Market research part of research funding
 - Market research - public information (?)
 - Identifying real opportunities
 - Takes us out of primary producer mind set (I produce, you take it from me)
 - Industry a value chain partner (identify)
- Build on natural advantages
- Linked to health outcomes
- Must have an HR plan
- High socio-economic rate of return
- Sustainable Research based on strengths
 - Human resources, plant floor - research
 - Commercialization - “incubators”
 - “Development funding”
 - “Venture capital”
 - Focused technology platforms
- Locally developed commodity process able into food needs for differing cultures
- Focus on potential (winners - relevant to Alberta)
- R & D continuum functions
 - Private sector investment increases
- Ensure a ‘value’ chain or systems approach
 - Multi disciplinary / integrated research (does not have to be invented here)
- Are we or can we create ‘exceptional’ global competitiveness ? (Focus on where we have true long term competitiveness)
- Early stage collaboration with target market (link research with customer/market)
- Risk assessment = calculated or balanced
- Potential for commercial incrementalization or utilization
- Benefits should “largely” accrue to Alberta
- Is sustainable
- Promotes health
- Must be collaborative, integrated, multidisciplinary
- Excellent science
- Meeting customer needs (emerging)

- Contribute to an “attractive” research environment (demonstrates commitment)
 - Build capacity
 - Alberta advantage
- HR plan
 - Builds human resources
- Centralized, up-to-date. Accessible database of research projects and outputs
- Growth of value chain
 - Alliances, partnerships
 - Funding and commercialization
 - New business models - I-net
 - Accessing technologies N.I.H.
- Builds/strengthens critical mass
- Capitalize on the convergence of ideas, resources & infrastructure creating an Alberta research advantage. Research linkages outside Agriculture/Alberta
- Must have significant potential for commercialization in Alberta, subject to:
 - 1) Environmental sustainability
 - 2) Consumer acceptance
- Must prepare us to respond to emerging market needs such as health & wellness products
- Applied research must be market driven (Discovery research funded as fixed % of Industry Rev.)

Focused Recommendations

- Enhance attractive research environment
- Differential. Take the high road: good science
 - Focus on research to develop innovative consumer oriented products for health promotion and disease prevention “from medicine cabinet to kitchen cabinet”
- Crop diversification. Animal health & welfare. Food safety. Food quality
- An environment of R & D excellence - infrastructure
 - Human resources
- Potential for development - utilization
 - commercialization
- Research supporting global competitiveness & emerging market opportunities
- Long term secure funding for basic research (to recruit scientific excellence)
- High relevance to AB resources / opportunities
- Encourage Value-added Developments
 - Streamline funding processes (ARA, AVAC, ARI)
 - New money for Value Added
 - Private / public collaboration
- Create an attractive research environment
 - Infrastructure - funds
 - HOP (HQP / H & P)? ? - Incentives
- Research in support of agricultural environment sustainability
- Energy - agriculture interface - agro - forestry
 - climate change (c offset)

- Packaging / processing - innovative
 - whole meal replacement
- Agri-health Initiative i.e.: nutraceuticals / functional foods - human and livestock
- Investment in research driven by human resources e.g. Value Added
- An integrated approach to developing a sustainable Animal Industry
- Improving animal Plant, environment, and food (health & wellness)
- Functional foods, GMS's, & the environment

Strategic Priorities

- Development
- Sustainability & returns
 - Platform technologies
 - Land base (sustainable)
 - Environment
- Genomic Research
 - Capture the Prairie Genomic Research Centre in Alberta
- Secure long term funding basic research
- Continue basic research - focused
- Establish significant, long-term funding for Discovery Agriculture Research.
- Invest in research excellence
- Excellence in research & researchers
- Challenge R & D organizations to coordinate intellectual property management
- Expand and strengthen Alberta's Agricultural Research Infrastructure
- Create world class research environment
- Collaborate to create an environment of R & D excellence. Re: supporting & developing our infrastructure, human resources, research effectiveness, efficiency **(4 & 6)**
- Critical Infrastructure
 - HR
 - Equipment
 - Excellence
- Research - market driven & basic
 - Ownership of intellectual property
- Ag Summit
- Integrated efficient system / process - partnership - collaboration
- Coordination Funding Agencies
- Commercialization - market focused - \$ \$ \$ \$ \$
- Global Competitive - in areas where we have natural competitive advantages
- Research in emerging market opportunities / consumer trends (to enhance competitiveness) **(3)**
- Strong links - Industry to science
- Movement of Research: create bridges to industry
- Development - functional and nutraceuticals (human and animal)
- Value Added Agri-Industry
- Encourage value-added development e.g.: processing, new uses, etc. **(7)**
- Value added food & non food
- Genomic research
- Meeting customer needs - food/health
- Measurable commercial benefit
- Health

- Agri-Industry in Alberta. Strong links to Life Sciences
- Agri-Health Initiative e.g. Nutraceuticals/functional foods (2)
- Research to develop innovative consumer driven product for . . . health/nutrition
- Creative Agri-health initiative consumer in support of food safety, nutraceuticals, functional foods and well fare
- Focus applied research and development
 - new uses - agri-health (function foods)
 - food safety - environment sustain ability
- Environmental sustainability
- Sustain ability - Environment
 - Economic
- Promote development of energy/agriculture interface to enhance environmental sustain ability
- Research in support of environmental sustainability (5)