DRAFT

Agriculture and Food Strategic Research & Development Plan

For

Alberta

(2002 – 2008 and Beyond)

Vision: *"The Agricultural R&D System is innovative, collaborative, focused, and stimulates sustainable growth and development."*

October 16, 2002

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INTRODUCTION

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INTRODUCTION

WHY AN AGRICULTURE AND FOOD R&D STRATEGIC BUSINESS PLAN IN ALBERTA AND WHY NOW?

This Plan is about **"change"** in Alberta's agriculture and food research and development (R&D) system. The current state of the agricultural R&D system in Alberta has been well analyzed. As a result of this analysis, it is clear that changes are required in the R&D system to help build and enable the agricultural industry in Alberta to achieve its growth goals of $20 Billion by 2010 and that this strategic business plan is in pursuit of research excellence in Alberta. Along with the push for excellence, strong science should underpin industry and provide training opportunities for high quality people that pay additional dividends in the long-term. In addition, this plan will:

- Intersect with other growth and R&D-related plans and strategic initiatives to ensure that Alberta's R&D system is aligned, has strong leadership and accountability, is well resourced, provides for commercial opportunities, and is well recognized locally, nationally, and globally.
- Use Strategic Research Networks to identify and define priorities for Alberta's agriculture and food research endeavors.
- Align with Alberta's commercial and public needs.
- De-fragment and coordinate agriculture research funders in the province.
- Make certain there is accountability, leadership, and defined outcomes for Alberta's agriculture and food R&D efforts.

STRATEGIC BUSIENESS PLAN DEVELOPMENT PROCESS

The Strategic Business Plan for Alberta's agriculture and food R&D system is being developed to define an implementation strategy to achieve the growth goals set out by Alberta Agriculture, Food and Rural Development's (AAFRD's) Growth Strategy and impact on Alberta Science and Research Authority's (ASRA's) Integrated Life Sciences Strategy for Alberta. The plan has evolved through an open, collaborative, and multi-stakeholder consultation process involving hundreds of stakeholders, province-wide.

The Provincial Agricultural R&D System is comprised of numerous stakeholders. These stakeholders include R&D performers, R&D performing organizations, R&D funding organizations, industry, producers, and others in the agricultural industry. Agriculture is a leading life science sector participant that collaborates and interacts with other sectors and industries including Energy, Forestry, Health, Environment, and Information Technology. These linkages and interactions are vital aspects in developing a systemic, interactive agricultural R&D system. **See Appendix X for a complete listing of the research performing organizations and funding organizations that currently form a part of the agricultural R&D system.**

Three focus groups held on June 12th (funders and industry), 13th (technology transfer, commercialization and industry), and 14th (researchers and industry) launched the first stage of business plan development. Approximately sixty stakeholders provided input to questions regarding the current research, development, and commercialization system in Alberta. They also provided their vision of the system and discussed issues and strategies needed to move the industry closer to the desired outcomes. A representative group of stakeholders were identified to assist in developing a draft Strategic Business Plan for the R&D system. Overlapping, three Strategic Research Networks have built a framework for identifying strategic research priorities. This is the first draft of the Provincial Agricultural R&D Business Plan that incorporates the parallel initiatives as outlined above. This plan will be presented to the Ministers of Innovation and Science and Agriculture, Food & Rural Development in December of 2002.

DOCUMENT STRUCTURE

The document comprises four main areas. The first section is an introduction highlighting the development process of the Strategic Business Plan, the benefits of the plan, intersection of the plan with other plans, and an environmental scan. The second section of the document covers the strategic business and implementation plan that will address the strategic priorities. The second section outlines the Strategic Research Network (SRN) Priority process, business cases for the priorities, and identifies targeted, focused priorities. The Fourth section contains appendices and background information important to the business Plan.

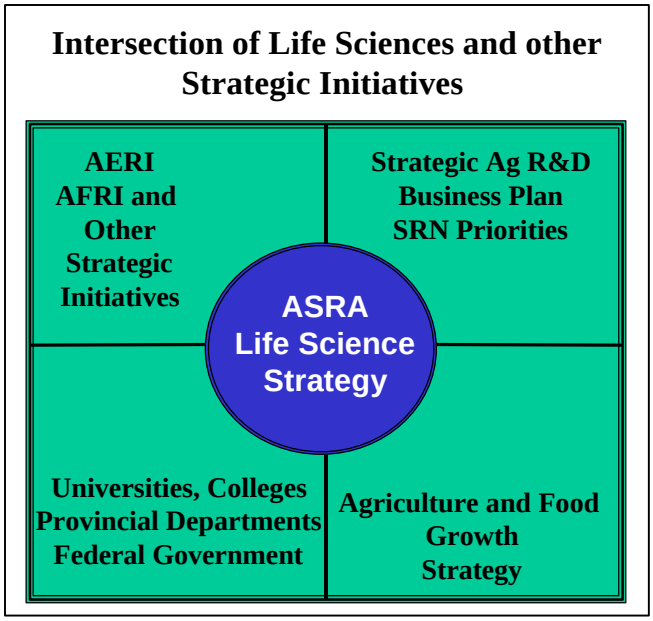
BENEFITS OF A PLAN

The benefits of developing a Provincial Agricultural R&D Strategic Business Plan include:

- Building a shared vision for the Provincial Agricultural R&D system.
- Positioning Alberta as a national/global leader in agriculture and related sciences.
- Establishing accountability in the Provincial Agricultural R&D system.
- Developing the required human capacity for the industry and for R&D.
- Capturing the value of R&D to a commercializable product and knowledge utilization in Alberta.
- Focusing resources on priority areas.
- Aligning and guides investment in the Provincial Agricultural R&D system.
- Serving as a focal point for public policy.

*Please note that throughout this document, the term "R&D system" includes the entire Research, Development, and Commercialization system.

INTERSECTION OF LIFE SCIENCES AND OTHER STRATEGIC INITIATIVES



As highlighted in the adjacent Figure, the R&D Strategic Plan intersects with other strategic initiatives in the province namely, ASRA's Integrated Life Science Strategy for Alberta, the Agriculture and Food Growth Strategy, Alberta Energy Research Institute and Alberta Forestry Research Institute Initiatives, and Universities, Colleges, Provincial Departments, and Federal Government Departments.

ASRA – An Integrated Life Science Strategy for Alberta

The goal of ASRA's strategy is to allow Alberta to accelerate its bio-economy through innovation and bio-products to help provide a sustainable quality of life for Albertans. The Strategy will focus on developing opportunities in bio-materials, bio-energy, health, nutrition, and environmental and climate life sciences.

Agriculture and Food Growth Strategy

The Growth Strategy is intended to capture global market opportunities that offer Alberta the potential to increase its agri-food industry to $10 billion in primary production and $20 billion in value-added processing by 2010. The strategy will focus on key growth opportunities in beef,

pork, cereals, processed meats/ready meals, and nutraceutical/functional foods. R&D will play a key role in the development of new technologies, processes, and products for growth potential.

Strategic Research Networks

The Strategic Research Networks will support the growth goals of the agriculture and food industry through ongoing collaborative prioritization of research endeavors in the province. Working through a Strategic Network Team three networks have currently been developed, they include Sustainable Production, Agri-Health and Value Adding, and Bio-Products. The Strategic Research Networks (SRNs) will be discussed in detail, further in the document.

Alberta Energy and Forestry Research Institute Initiatives

Information is currently being developed.

ENVIRONMENTAL SCAN

This environmental scan identifies emerging trends, issues, and opportunities in Alberta agri-industry and then relates these to overall agri-industrial R&D requirements.

Industry Trends

- Number of Alberta commercial farmers declined (sales > $100,000/year) to about 17,000; farms expected to become increasingly bimodal and diverse.
- Number of lifestyle/retired farmers approximately10,000, another 20,000 acreages.
- Total number of Census farms (2001) is 53,652; down from about 59,000 in 1996.
- 44 percent of all farm operators are over 50 years old.
- Parallel consolidation of the farm supply industry.
- Average agri-industry annual gross sales are about $8 billion; average value-added $2.8 billion/annum.
- Agri-processing sector $10 billion in shipments, employs 22,000 people, generates additional $3.4 billion value-added.
- Ratio of Alberta agri-processing receipts to farm receipts approximately: 2.66 for irrigated area, 1.05 rest of Alberta, 1.25 for all Alberta, as compared to Oregon at 1.7 and Washington State at 2.1

Change Agents

Over the next decade, there are six over-arching trends that will likely continue to drive changes to the structure, conduct, and performance of agri-industry in Alberta:

- Globalization of our culture, commerce, and communications is, increasingly all pervasive resulting in accelerated growth, change, as well as adjustments to change.
- Continued but dispersed urbanization/suburbanization.
- Growing consumer demand for natural, wholesome, safe, high-quality food products.
- Growing concerns about the sustainability of our ecosystem.

- Increased risk and uncertainty, especially due to physical phenomena, political instability, complex and highly calibrated technologies and increasing slow/ineffective institutional response times.
- Accelerated developments in science and technology to try to successfully balance growth with environmental sustainability and quality-of-life objectives.

The Competitive Environment

- Traditional factors, e.g., proximity to markets will continue to decline in importance while technology, social capital, and market infrastructure will continue to increase in importance.
- Multinational corporations increasingly have growing impact on private R&D investment patterns in the province.
- Alberta's competitors generally far ahead of Alberta in changing R&D systems to reflect demands of new global marketplace and related change agents.
- Key elements of new systems approach to agri-R&D are strong. World-class research-based universities and related institutions will continue to generate new technologies, attract investment and a critical mass of highly trained, highly motivated people who know where they are going and how to get there.

Challenges

There are two overriding and inter-related longer-term challenges: 1) can Alberta agri-industry establish and/or maintain a competitive advantage in select agriculture-based sectors in the national and international marketplace? 2) can Alberta agri-industry aggressively and successfully adapt to the ever-changing environmental and social agenda?

The following related pressures on the agricultural sector would generally increase total public and private costs of production, potentially making them less competitive in the international marketplace:

- Capturing more value-added in the rural sector on a sustainable long-term basis.
- Intensifying international competition for bulk commodities, accompanied by the continued contraction of traditional importers.
- Growing urban-driven social-environmental concerns in Alberta expected to make future broad-based agricultural growth even more difficult.

Opportunities

- Fully prepared gate-to-plate foods.
- Development of identity-preserved commodities, functional foods and nutraceuticals.
- Natural health products from biological sources.
- New environmentally friendly cost-reducing production technologies.
- Increased emphasis on sustainable agriculture/multiple-use resource management.
- Increased custodial responsibility by the rural community for environmental amenities.
- Development of bio-fuels, bio-diesel, bio-lubricants, and bio-plastics.
- Production of bio-mass for industrial uses and carbon credits.

Alberta Research and Development System Challenges

Alberta's R&D system faces a number of challenges, such as rationalizing expenditures, setting priorities, addressing requirements, and managing data and information.

- Rationale - Publically-funded research is typically mandated by three limitations: 1) to address intergenerational equity; 2) to deal with externalities; and, 3) to manage structural imbalances.
- Priorities – Further upstream processing and identity-preserved tracking, Pharmaceutical/medical-related products made from food and fibre inputs, new environmentally-friendly crops and cost-reducing production technologies, urban agriculture, bio-fuels, bio-lubricants, and bio-mass products.
- Requirements: Annual agri-industry funding increases between 13 – 44 percent ($14 - $50M) to catch up to other highly developed jurisdictions. Annual increase in R&D funding of about 9 percent (or $22M) per annum, with a total R&D funding level required in 2010 of $355 million per year. Increased accountability, due diligence, and hard empirical data collection. Baseline data, consistent with newly established Strategic Research Networks.
- Data/Information and Knowledge Systems - Existing database are inadequate for effectively tracking/monitoring R&D outputs, outcomes, and impacts over time.

STRATEGIC BUSINESS AND IMPLEMENTATION PLAN

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VISION FOR THE R&D SYSTEM

"*The Alberta Agriculture and food R&D System is innovative, collaborative, market focused, and stimulates sustainable growth and development for Alberta's benefit*."

GUIDING PRINCIPLES FOR THE R&D SYSTEM

The following six principles should guide the R&D system performance and conduct:

1. Market driven towards end products that meet the 2010 goal.
2. Focused on fostering research, development, and commercialization in Alberta.
3. Collaborative outcomes to provide sustainable environmental, social, and economic benefits to Albertans.
4. Optimizes use of Albert's R&D resources.
5. Future-focused and builds on Alberta's strengths and comparative advantages.
6. Encourages collaboration across geographic, sectoral, institutional, and disciplinary boundaries.

KEY CRITICAL COMPONENTS OF AN EFFECTIVE R&D SYSTEM

To establish an effective R&D system, stakeholders identified the following critical components:

- Leadership, direction, and agreement on priorities for the R & D system.
- Enhance collaboration and partnerships throughout the R&D system.
- Alignment of R&D system with industry goals and needs.
- Skilled human resource capacity in alignment with strategic direction.
- Strategies and actions that address the full R&D system.
- Need for increased public and private investment over the long-term.
- Public/private mechanisms for action, i.e., networks, teams, organizations, etc.
- Public sector funding for priorities and private sector funding for commercialization.
- Effective communication with other global knowledge providers relative to our strategic priorities.

GOALS, OUTCOMES, STRATEGIES, AND ACTIONS

GOALS

1. Alignment: Alberta's R&D system is focused and guided by industry and public needs, Alberta's comparative advantage, and market opportunities.
2. Communication: Agricultural R&D system communication excellence.
3. Commercialization: An agricultural innovation system that delivers more products, practices, and processes – more Alberta-based companies.
4. Accountability and Leadership: Governance and leadership in Alberta's R&D system is transparent and accountable.

5. Human Resources: Alberta optimizes human resource capacity to support R&D and commercialization activities.
6. Investment: The Provincial R&D system attracts private and public investment.

Goal 1. ALBERTA'S R&D SYSTEM IS FOCUSED AND GUIDED BY INDUSTRY AND PUBLIC NEEDS, ALBERTA'S COMPARATIVE ADVANTAGE, AND MARKET OPPORTUNITIES.

Outcomes:

- R&D priorities are aligned to industry and public needs.
- Strategic priorities provide clear direction for building resources, capacity, and investment.

Strategy 1. Develop a competitive intelligence (CI) center for the R&D system province-wide.
Actions:

- Develop an R&D Intranet knowledge management (KM) site to strengthen the R&D system's efficiency and capability in harvesting, storing, managing, and sharing information.
- Develop a skills database for you by Alberta's R&D system participants.
- Provide CI and KM training opportunities to R&D system participants,

Strategy 2. Have a process in place to establish and renew priorities for the R&D system.
Actions:

- Implement an ongoing system for collecting information and knowledge concerning Alberta's comparative advantage, market, and public needs to be utilized in the R&D system decision-making process.
- Build a mechanism to annually review and set priorities through a transparent and inclusive process.

Strategy 3. Ensure R&D resource allocations support due diligence processes.
Actions:

- Develop due diligence processes that support sound funding and resource decisions that are consistent with the strategic plan.
- Develop and expand the R&D funders round table.
- Develop an R&D research performers round table.
- Align the R&D system with the Alberta's technology transfer/innovation/commercialization capacity.

Goal 2. AGRICULTURAL R&D SYSTEM COMMUNICATION EXCELLENCE.

Outcomes:

- R&D system participants are well informed and aware.
- More informed public, stakeholders, shareholders, research performers, and investors.
- Engaged and knowledgeable stakeholders.
- Enhanced public trust in R&D.

Strategy 1. Increase awareness of the Agricultural R&D system research successes and activities.

Actions:

- Regularly (quarterly) publish Alberta R&D success stories using a variety of communication methods.
- Showcase Alberta R&D locally, nationally, and internationally.
- Recognize and meaningfully reward research excellence.
- Annual stakeholder bear pit sessions to share success, share emerging priorities, and identify gaps.
- Develop public relations plan including media relations.

Strategy 2. Create mechanisms to build industry and science partnerships/alliances for investment, communication, and efficiency.

Actions:

- Facilitate think tanks for all stakeholders in the R&D system to encourage innovative thinking and identify technology and market opportunities and possibilities.
- Conduct research conferences and discussion forums to showcase research, development, and commercialization successes.

Goal 3. AN AGRICULTURAL INNOVATION SYSTEM THAT DELIVERS MORE PRODUCTS, PRACTICES, AND PROCESSES.

Outcomes:

- The R&D system collaborates or aligns to produce more impactful commercial endeavors.
- Commercial partners actively seeking benefit from Alberta's research performing capacity.
- More opportunities are seized, new products and processes are developed at a faster pace.
- R&D is a larger economic engine for the Alberta economy.

Strategy 1. An aggressive commercialization sector delivers technologies from within Alberta and beyond.

Actions:

- Utilize competitive intelligence to "harvest the world" for technology opportunities.

- Review research already undertaken in Alberta to determine commercialization potential.
- A collaborative feasibility process is implemented that includes industry partners.
- Provide opportunities for global networking among scientists and technology specialists.

Strategy 2. Improve access to capital for pre-commercialization and early development R&D activities.
Actions:
- Develop angel investor networks.
- Link pre-commercialization/early development activities to actions under goal 6.

Goal 4. ALBERTA'S R&D SYSTEM IS TRANSPARENT AND ACCOUNTABLE.

Outcomes:
- Stakeholders support a leadership framework resulting in increased system productivity, efficiency, and investment.
- System focused on priorities and identified outcomes for investment.
- Collaboration and partnerships create new and enabling capacity.

Strategy 1. Establish a leadership model that meets the needs of the R&D system.
Actions:
- Develop a suitable governance model for Alberta's R&D system.
- Design an accountability system with clear agreed upon measures that are regularly updated and monitored and design due diligence processes that support sound funding and resource decisions.
- Build and facilitate partnered funding mechanisms that support the funding consortium and aligns system with the strategic priorities.
- An annual review of the Strategic Business Plan is conducted that engages all system stakeholders in the discussion.
- ASRA to establish a clear and uniform policy for Intellectual Property management across Alberta's R&D system.

Strategy 2. Facilitate the development of collaborative partnerships that maximize efficiency and effectiveness.
Actions:
- Develop new reward and recognition systems that encourage collaboration, partnerships, and networking.
- Develop and engage R&D stakeholders in a networking/leadership program.

Goal 5. ALBERTA'S HUMAN RESOURCE CAPACITY SUPPORTS R&D, COMMERCIALIZATION, AND INNOVATION ACTIVITIES.

Outcomes:

- Human resources aligned with strategic priorities and future needs.
- New R&D personnel attracted to Alberta.
- Additional highly qualified personnel (scientists, technicians, commercialization, and innovation staff) are working in the Alberta R&D system by 2005, e.g., 300.

Strategy 1. Align HR capacity with strategic priorities and future agricultural R&D needs.
Actions:

- Conduct a needs assessment on human resource requirements and determine where there are gaps in system (align with strategic priorities).
- Actively fill HR gaps in Alberta's R&D system in alignment with strategic priorities.
- Assess human resource requirements on a biannual basis.

Strategy 2. Attract and retain scientific and business capacity in key strategic areas.
Actions:

- Design innovative recruitment programs to attract new personnel including scientists, technologists, etc. to Alberta.
- Create an infrastructure package, operational, and human support along with new research chairs in key strategic areas.
- Provide opportunities for secondment in outside jurisdictions across the R&D system (inter-institutional, funders, performers, stakeholders, research/technology/commercialization specialists).
- Implement training programs to address key research, technology, and industrial competencies.
- Implement programs for leadership, networking, commercialization, innovation, and team building competencies.
- Increase funding opportunities for training in technology transfer and commercialization activities.
- Establish attractive IP policies for researchers.

Goal 6. THE PROVINCIAL R&D SYSTEM ATTRACTS PRIVATE AND PUBLIC INVESTMENT.

Outcomes:

- New companies formed each year.
- Increase in start-up companies.
- Alberta's R&D system will attract ($40 million) in extra-provincial private and public investment each year.

Strategy 1. Build high quality scientific investment opportunities.
Actions:

- Funders and research performers work together to create high quality scientific program submissions aligned with strategic priorities.
- Proposals are examined through a robust scientific and industry peer review process.
- Engage industry in priority setting to ensure submissions meet industry and public needs and reflects profitability focus.
- Develop mechanisms to assess return on investment (i.e., whole cost accounting).
- Provide ongoing monitoring and analysis of Alberta's R&D competitiveness in investment attraction relative to other jurisdictions (i.e., CI functions).
- Develop competitive incentives for investment and commercialization, e.g., research tax credits, flow-through shares.
- Address public policy issues, e.g., endowment fund, intellectual property and regulatory barriers.
- Assist researchers and small businesses in identifying and attracting industry funding and support.

Strategy 2. Align infrastructure capacity with strategic priorities and future R&D needs.
Actions:

- Carry out gap analysis of current infrastructure and prioritize direction.
- Optimize use of present resources.
- Create new business incubators and locate close to R&D facilities.
- Create analytical and business capacities within incubator facilities.

Strategy 3. Improve Alberta's Ability to access key federal resources.
Actions:

- Focus resources in accessing NSERC, NRC, AAFC, and CFI funding.
- Partner with BioProducts Canada on specific bioproducts research opportunities.
- Establish and MOU with AAFC's new Bioproducts and Bioprocesses Research Program.

Strategy 4. Increase commercial investment in Alberta new products, practices, and processes.
Actions:

- Showcase Alberta's R&D performing capacity to potential commercialization partners.
- Link commercialization priorities and opportunities with research priorities.
- Resolve receptor capacity issues.

H. RESOURCES (under development)

I. MEASURES - (under development)

STRATEGIC RESEARCH NETWORKS AND STRATEGIC PRIORITIES

STRATEGIC RESEARCH NETWORKS AND STRATEGIC PRIORITIES

BACKGROUND AND PRIORITY-SETTING PROCESS

Strategic Research Networks (SRNs) were established in 2002 by AARI to link industry needs and economic opportunities to good science for the growth and sustainability of the agriculture and food industry. The Strategic Research Networks support the goals of growth, continued excellence in food safety, improved environmental stewardship, and strengthened rural communities. Strategic Research Networks represent the research continuum, from basic research to technology transfer and innovation. Networks work to connect the "dots" in the continuum.

The networks identified the long-term strategic focus to research investments and partnerships in Alberta. As of May 2002, three research networks were identified and organized to work on priorities in:

- Agri-health and value added products.
- Bio-based products.
- Sustainable production.

Purpose

The purpose of the SRNs are to:

- Lead/catalyze the definition and review of strategic direction within each network.
- Define outcome, measures, and research priorities.
- Reflect on stakeholder input and market needs.
- Act as a point of contact and communication.
- Advocate for a collaborative R&D system.

Overarching Issues that Affect Each Network

Aside from developing priorities for the R&D system, the SRNs focused on the following overarching issues when developing their priorities.

- Developing and supporting a systematic communications system that connects funders, researchers, and industry players.
- The shift from researcher driven to industry driven research.
- Environmental sustainability.
- Profitability.
- Public confidence and communication.
- Cross-industry research, identifying systemic opportunities that will affect and benefit a variety of sectors and the industry as a whole.
- Defining the value and relevance of proposed research.
- Access to technologies necessary to enhance competitiveness.
- Preserving Canadian research results to provide a competitive advantage to Canada and Alberta.

THREE STRATEGIC RESEARCH PRIORITY AREAS FOR ALBERTA

As highlighted, three Strategic Research Networks were formed to develop strategic research priorities. The Networks developed the following priorities, after numerous meetings and discussions by the Network Teams and with the R&D Strategy Team.

Agri-Health and Value-Added Strategic Research Network Priorities

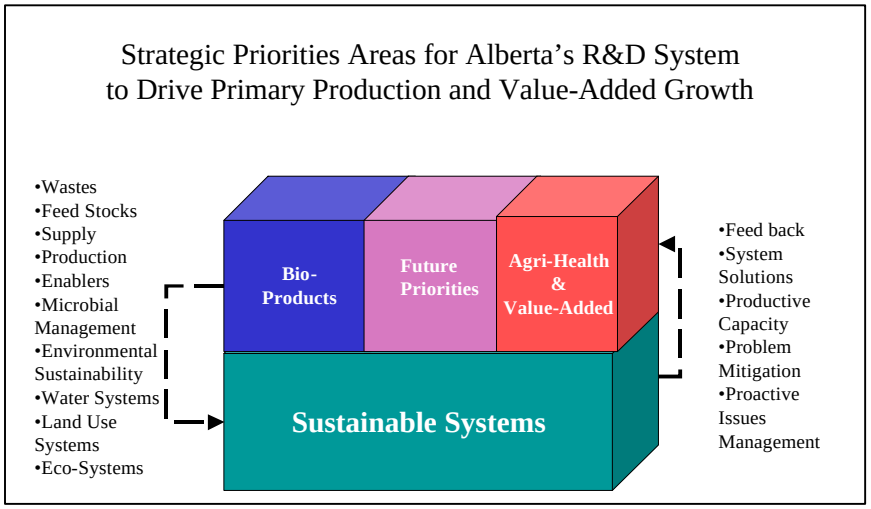
- Food ingredient and fermentation products from crops.
- Value-enhanced meats and meat products.
- Health, wellness and performance products.

Bio-Products Strategic Research Network Priorities

- Bio-based materials technologies and products.
- Bio-based energy technologies and products.
- Bio-based industrial chemical technologies and products.

Sustainable Production Strategic Research Network Priorities

- Sustainable production systems for specific traits in crops and livestock.
- Nutrient efficient systems in crop and livestock production.
- Microbial management systems to mitigate health and food safety risk.

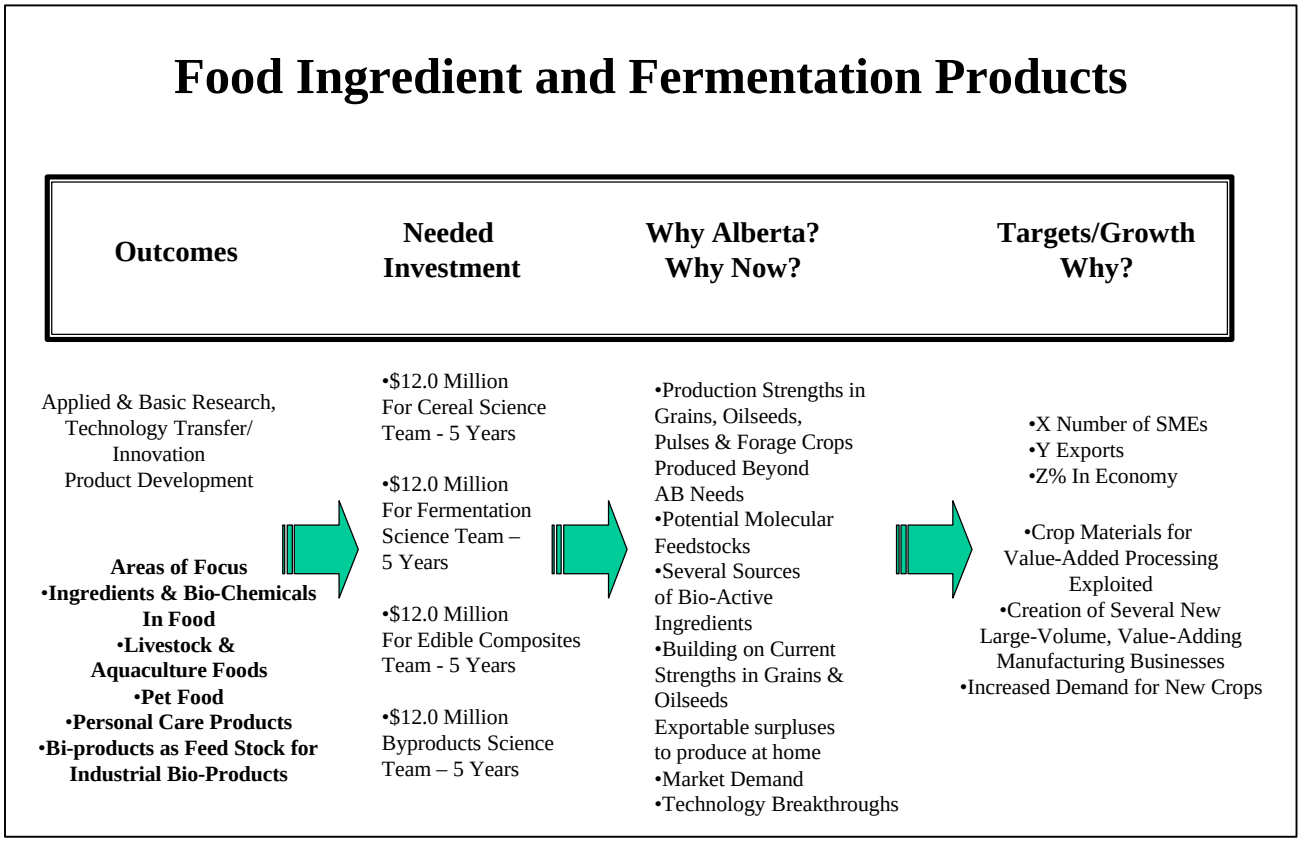


These broad priorities set the strategic focus for R&D in the province with an ongoing process to keep the priorities current and to guide future resource development and investment initiatives. In addition, in the documentation that follows, the broad priorities will be further refined to provide specific strategic focus for Alberta new investment dollars – R & D.

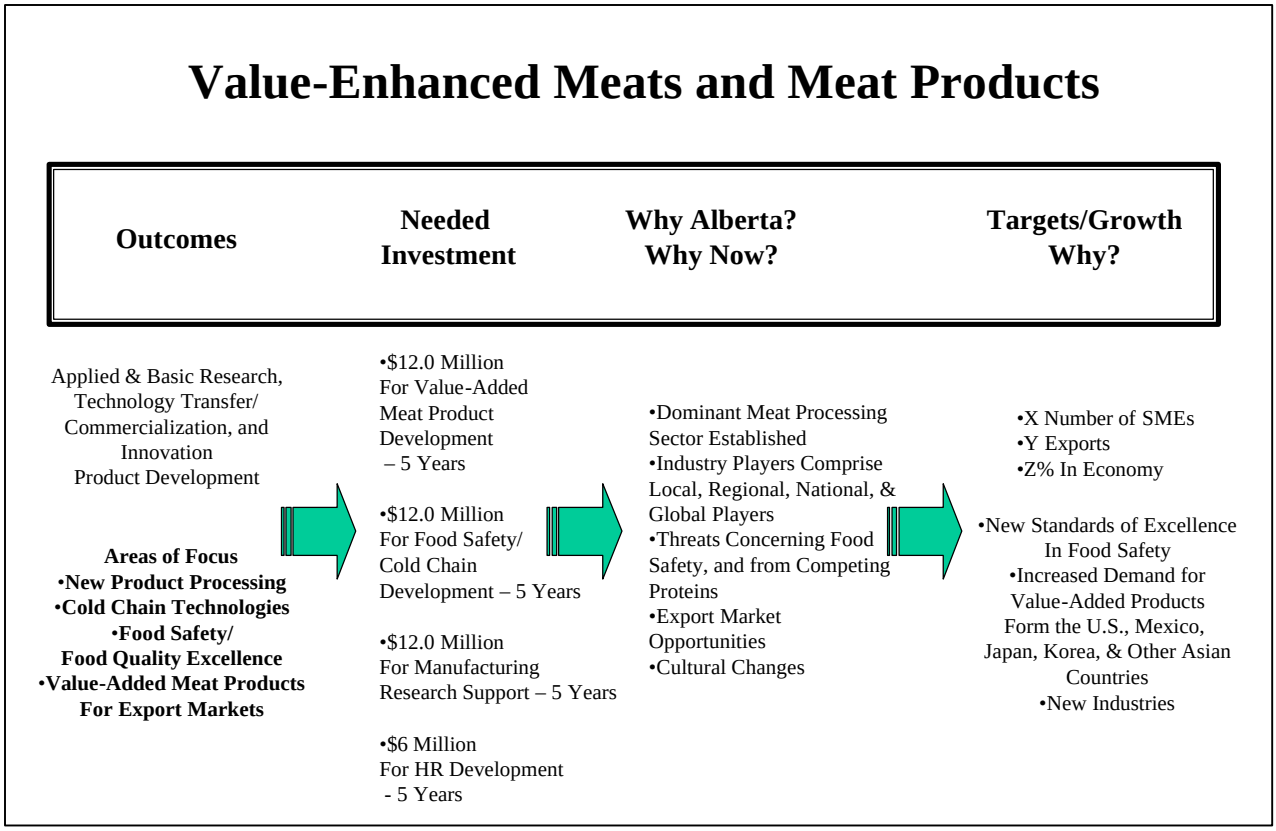
STRATEGIC RESEARCH NETWORK BUSINESS CASES

The summary of the business cases presented below provides a snapshot and rationale for the strategic research priorities for Alberta's research system in the areas of sustainable production, agri-health and value added, and bio-based products. The complete and detailed business cases are located in APPENDIX XX.

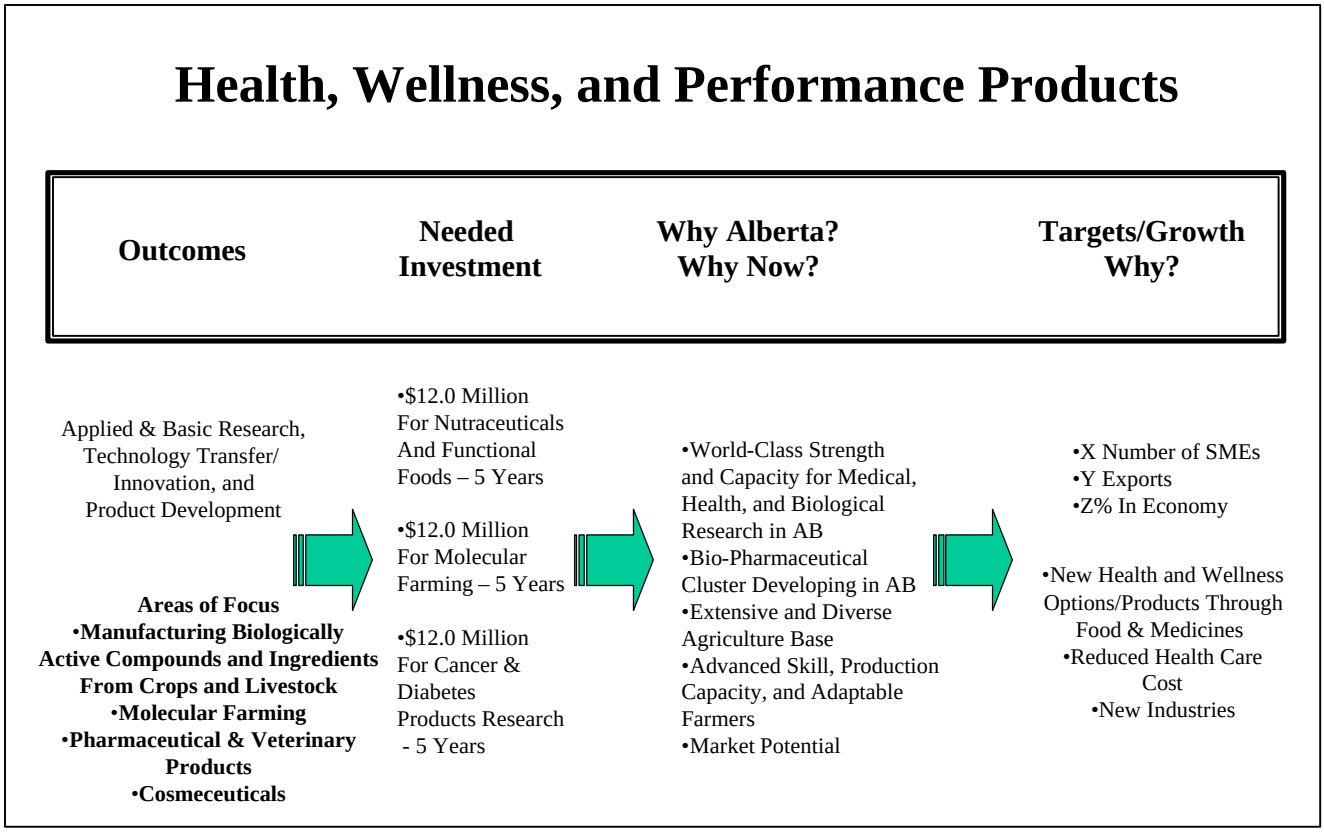
Food Ingredient and Fermentation Products



Value-Enhanced Meats and Meat Products



Health, Wellness, and Performance Products



Bio-Materials Products

Bio-Materials Products
(Bio-Based Composites/Fibres Science)

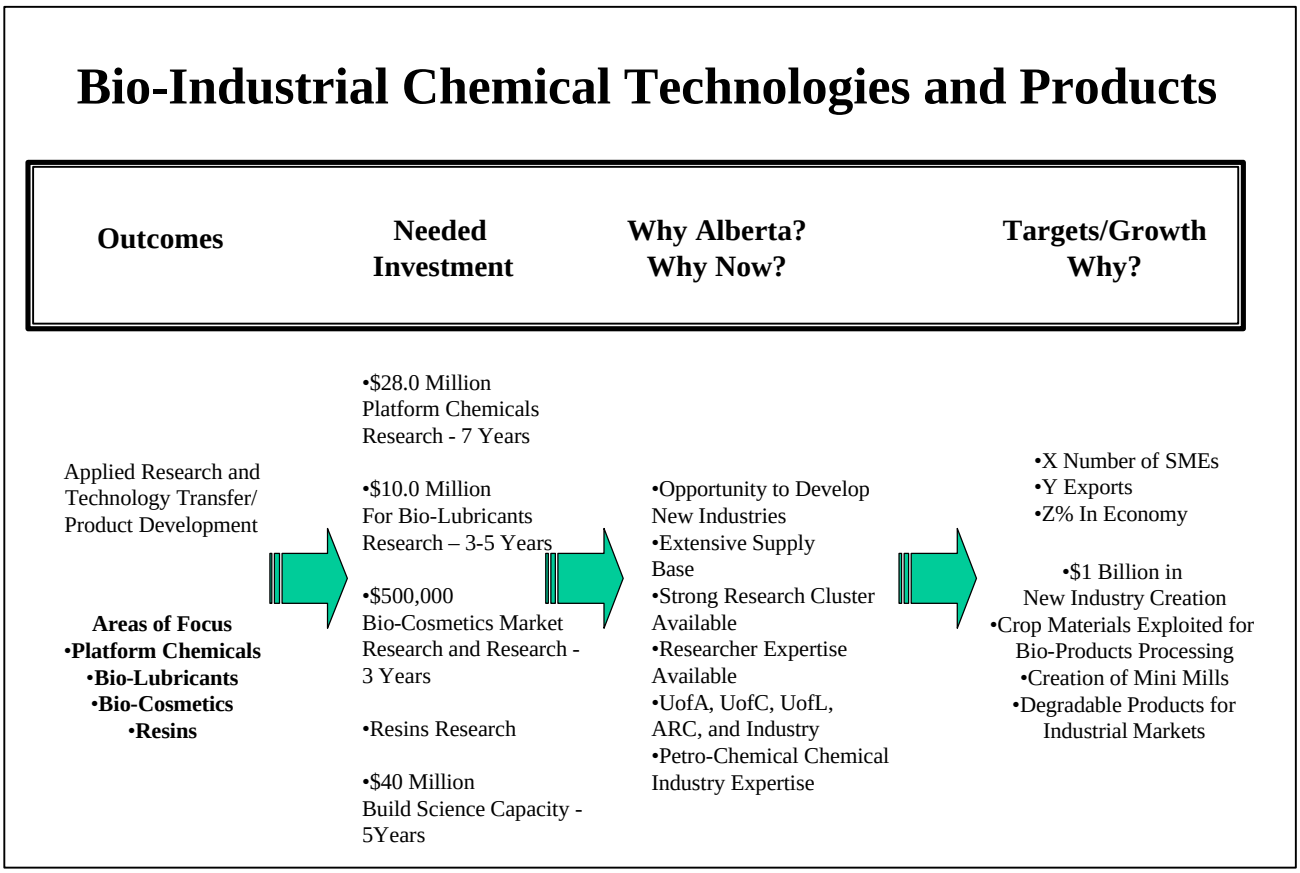
Outcomes	Needed Investment	Why Alberta? Why Now?	Targets/Growth Why?
Applied & Basic Research, Technology Transfer/ Product Development **Areas of Focus** **•Bio-Based Composites And Bio-Polymers** **•Building Products** **•Molded Products** **•Specialty Papers**	•$3.0 Million For Bio-Based Composites/ Fibres - 3 Years •$10.0 Million For Bio-Polymers & Bio-Plastics – 5 Years •$20 Million For Advanced Composites – 10 Years	•Ag Resource/ Forestry Base •Interested Players •Available Expertise •Market Demand •Industry Requires Support •ARC, UofA, UofL, •UofC, and AAFRD •Renewable Land base	•X Number of SMEs •Y Exports •Z% In Economy •$1 Billion in New Industry Creation •Creation of New Mini-Mills •Dedicated Supply Base •Sustainable and Renewable Products

Bio-Energy Technologies & Products

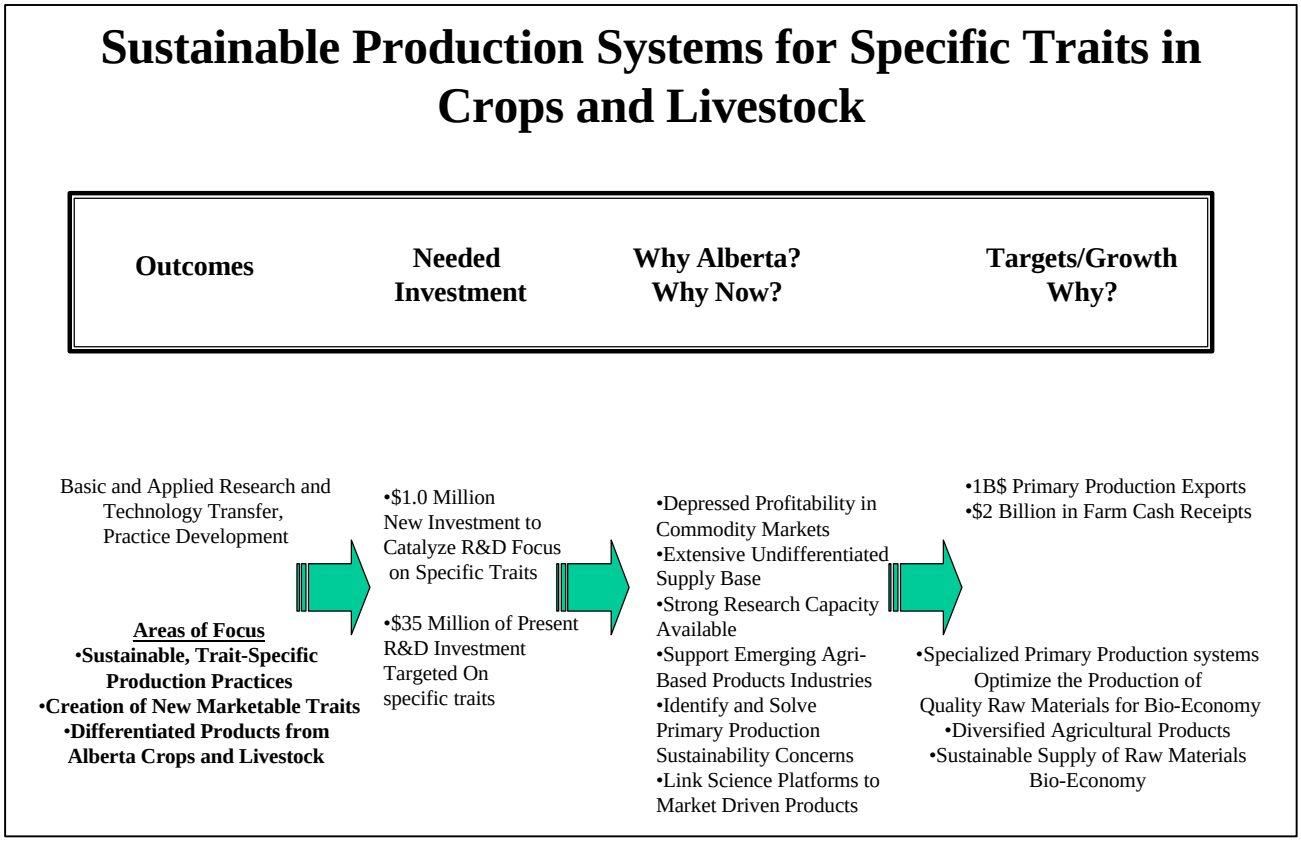
Bio-Energy Technologies & Products

Outcomes	Needed Investment	Why Alberta? Why Now?	Targets/Growth Why?
Applied Research and Technology Transfer/ Product Development Program. **Areas of Focus** **•Co-Generation** **•Bio-Diesel** **•Bio-Fuels**	•$10.0 Million For Co-Gen Science & Engineering - 3 Years •$10.0 Million For Bio-Diesel & Bio-Fuels – 5 Years •$2.0 Million CO2 Offsets, Legal, Policy, Lifecycle - 5 Years	•Deregulated Energy Markets •Utilizing Industry Waste Products •Favorable Legislative Drivers •Extensive Research May Be Harvested •Potential in the Bio-Energy Market •Strong ARC Ties with The Energy Industry Ag-Based Materials Supply Base •Improvements in Air, Soil, & Water Quality with Technological Solutions	•X Number of SMEs •Y Exports •Z% In Economy •$0.5 Billion Industry •Crop Materials Exploited for Bio-Products Processing •Creation of Several New Rural-Based Manufacturing Businesses/Industries •Cost-Reducing Technology and New "Green" Products

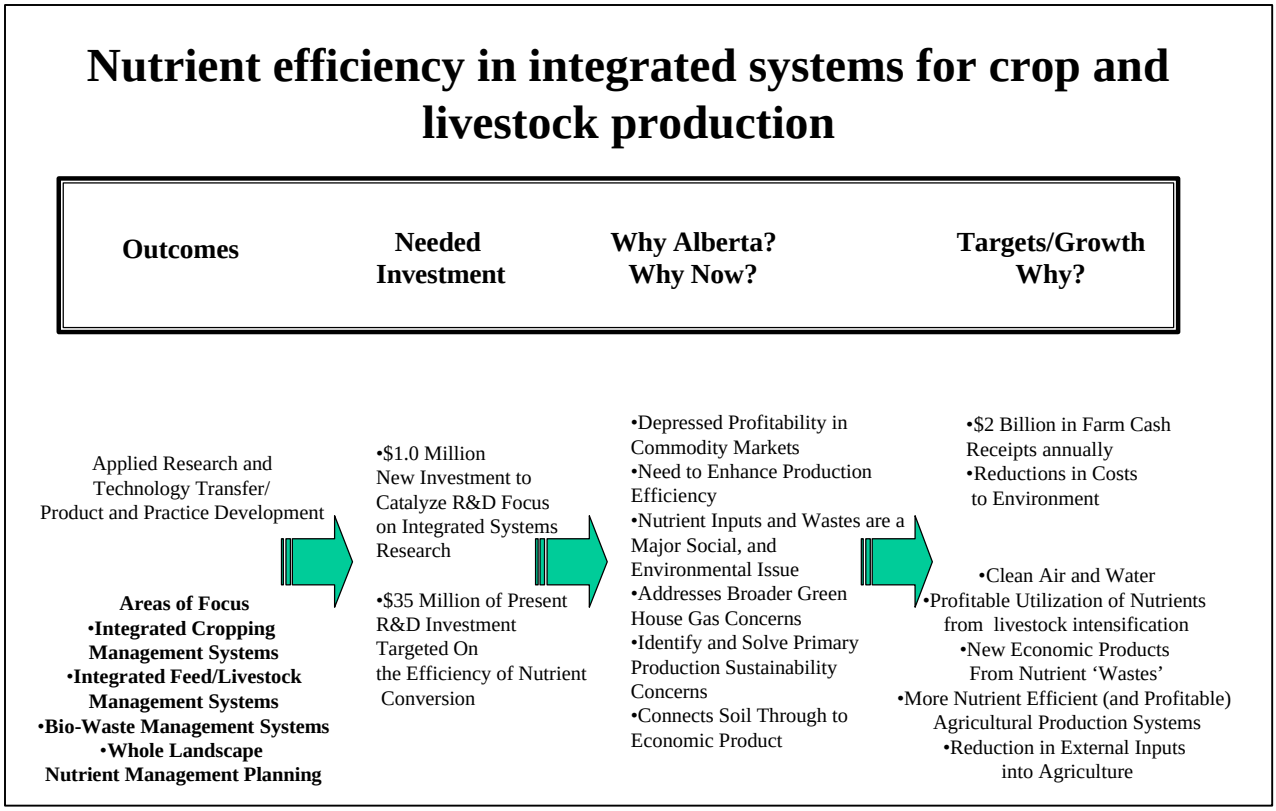
Bio-Industrial Chemical Technologies and Products



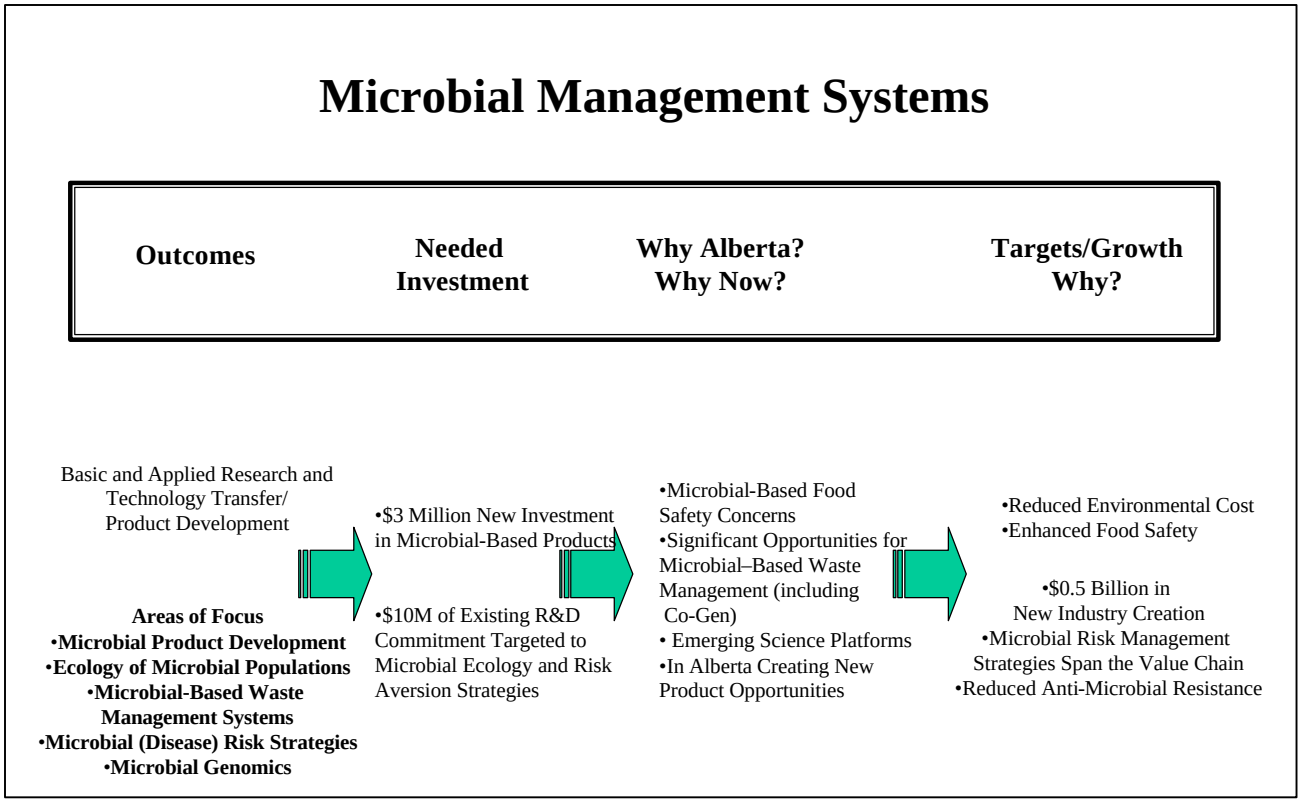
Sustainable Production Systems for Specific Traits in Crops and Livestock



Nutrient Efficient Systems in Crop and Livestock Production



Microbial Management Systems



Infrastructure and Other Investments for the R&D System

Infrastructure and Other Investment Requirements for Strategic Priorities

Outcomes	Needed Investment	Why Alberta? Why Now?	Targets/Growth Why?
Applied Research and Technology Transfer/ Product Development Infrastructure Applied Research and Technology Transfer/ Product Development Infrastructure **Areas of Focus** **•All Priority Areas Identified**	•$10.0 Million Pre-Pilot and Clinical Infrastructure •$6.0 Million Meat Manufacturing Infrastructure •$15 Million Bio-Based Extraction And Fractionation Infrastructure •$3.0 Million Market Research, Regulatory, Due Diligence, IP	•Build on Current Infrastructure Resources •Fill Infrastructure Gaps •Infrastructure Linked to all Priority Areas	What are the specific Infrastructure Needs, i.e., buildings and equipment? Where will they be located?