



***Alberta Agricultural
Research Institute***

**Strategic Directions for the Agriculture and Food Industry
*Summary of Stakeholder Workshop***

***Boardrooms A & B – J.G. O’Donoghue Bldg.
7000 – 113 Street, Edmonton
August 3, 2000 – 9:00 am to 4:00 pm***

**Prepared by:
The Alberta Agricultural Research Institute**

Participants:

Wayne Anderson	<i>Canadian Feed Industry Assoc.</i>	Steve Morgan Jones	<i>AAFC</i>
David Bailey	<i>AAFC</i>	Ian Morrison	<i>University of Alberta</i>
Dr. Ralph Christian	<i>Innovation and Science</i>	Barbara Nyland	<i>Innovation and Science</i>
Tom Clark	<i>Olds College</i>	Merle Olson	<i>University of Calgary</i>
Walter Dixon	<i>University of Alberta</i>	Roger Palmer	<i>Innovation and Science</i>
Gordon Dorrell	<i>AAFC</i>	Shannon Park	<i>Alberta Barley Commission</i>
Ron Dyck	<i>Innovation and Science</i>	Dr. Richard Perry	<i>Innovation and Science</i>
Peter Dzikowski	<i>Innovation and Science</i>	Fayyaz Qureshi	<i>Alberta Research Council</i>
Brad Guthrie	<i>EDE</i>	Kent Racher	<i>Innovation and Science</i>
Alan Hall	<i>AAFRD</i>	Ed Schultz	<i>Alberta Pork</i>
Marcia Hewitt Fisher	<i>AAFRD</i>	Yvonne Spanton	<i>Support - Equus</i>
John Kennelly	<i>University of Alberta</i>	Norm Storch	<i>Producer</i>
Murray Kerrik	<i>Alberta Cattle Commission</i>	Eric Swanson	<i>IRAP</i>
Cam Klapstein	<i>Crops Development Fund</i>	Yilma Teklemariam	<i>AAFRD</i>
John Knapp	<i>AAFRD</i>	Yvon Therault	<i>Econ. Dev. Partnership</i>
Don Macyk	<i>AAFRD</i>	Darrell Toma	<i>Toma & Bouma</i>
Peter Matthewman	<i>ARC</i>	Gary Villetard	<i>Villetard Eggs</i>
Barry McFarland	<i>MLA</i>	Will Wiens	<i>Alberta Chicken Producers</i>
Bill McMillan	<i>Facilitation - Equus</i>	Greg Wilkes	<i>University of Alberta</i>
Stephen Moore	<i>University of Alberta</i>	Malcolm Wilson	<i>ARC</i>

I. Purpose

This workshop was organized to obtain additional input, especially from the Ag Summit final session, to the strategic direction for research and development. Comments on the proposed guidelines in the draft document entitled Research and Development Strategic Directions for Alberta's Agriculture and Food Sector (Appendix A) will be used to finalize strategic directions and start the collaborative implementation of those directions.

II. Introduction

Dr. Ralph Christian welcomed participants and presented information about the development and nature of the draft strategic directions. The meeting was facilitated by Bill McMillan of Equus Consulting Group.

III. Review of Strategic Directions Document

1. VISION AND MISSION

The vision, along with the research and development mission statements were broadly accepted in terms of direction. The main comments focused on the need to simplify the mission statements, the need for a slogan and inclusion of a reference to the public good. Questions were raised as to the role of AARI and how to resolve the conflict between growth and environmental sustainability.

Discussion/Comments:

- The vision is a good motherhood statement. Who can disagree?
- Vision suggests a trade-off between growth and sustainability.
- Conflict: increase industry vs. environmental sustainability? Rise in environmental conflicts.
- Give on one side to achieve the other.
- A vision should put out a dream. It looks like a dream is a collaborative environment. Or is the dream really the improvements to the industry. The collaboration is how to get to the dream.
- If we can build a vision so that the amount of energy needed is reduced, we will be more successful.
- Mission: deliver new products, etc., is important. Sustainability requires a lot of old technologies. Also need to harvest existing technologies from around the world.
- Mission: need to mention the public good.
- Need to boil the mission to something more simple. A slogan or masthead. Providing value is part of this.
- Is it implied that AARI will become the voice of the industry in this collaborative strategy?
A: Important question. We must ask ourselves how this collaboration and action is coordinated. There is potentially a role for AARI.
- Concern that this discussion could be repeated by every agency.
- I assume that AARI will take on a strong coordination and catalytic role. Does everyone share this assumption? Also let's contemplate the possibility for major institutional change.
- Have we clarified what AARI is doing and what the industry is doing? Is collaboration the first word?
- Note that this strong role will not happen unless institutions and organizations buy in and encourage it to happen.
- There is a need to collaborate and put your resources into the collaboration. This is essential to the R & D environment.
- There is already collaboration. The funding agencies can be big drivers of collaboration.
- There are aspects of research that do not require collaboration.
- Funding can act as a way to encourage or discourage collaboration.
- Where are we going to? This collaborative model is part of the vision. It is able to influence the allocation of funding, time, energy. We will have to spend more time building the consensus. Need to understand what the needs of each of the silos are. Building consensus will take a great deal of energy.

2. STRATEGIC DIRECTIONS

A strong need to invest in human resources was identified.

Discussion/Comments:

- Note that people capacity is a serious limitation. Need to invest in people.
- Complement to this direction: build people capacity to teach and develop the leading edge technology. Need to think about retraining people to allow them to use some of the technology going out there.
- There are HR initiatives, but a shortage of support for the initiatives and skilled people that are created.
- Market trend analysis needs to be highlighted as part of the strategic direction.
- Prefer that the example in point 4 is dropped.

3. INVESTMENT PRIORITIES

In reviewing Table 1: R & D Investment Portfolio, participants agreed that the focus areas require more definition, specifically basic platform technologies. There was some disagreement as to whether proteomics is a basic platform technology. Environmental sustainability and socio-economics should be separate categories, not lumped together. The recommended portfolio amount of \$300M was considered to be an aggressive

target not yet supported by inventory. It was felt that the table should not include specific allocations at this point.

Discussion/Comments:

- Does this imply that industry support is necessary for every project? No; it is intended as a concept and as an overall direction, not as a limitation for every project. AARI has embraced an approach that requires matching industry support funding. This is often valuable, but there should always be room for projects undertaken for the public good, and that respect the good ideas of researchers.
- What is meant by basic platform technologies? This needs to be clarified.
- The description of risk is not entirely accurate and should be taken out.
- We should ensure there is room for creativity and innovation.
- Need principles that give some guidance about how these focus areas would be applied. Important for people to know the terms of what is acceptable. Principles provide guidance and also help gain matching funding and industry participation.
- Tripling the budget and changing the allocation is proposed. What is the response to this proposal? The Board has had some difficulty with the \$300 million proposal. We are not there yet. Nationally, most of the investment is a combination of public-private. Provinces are doing smaller amounts and targeting their investment. The shift in portfolio allocation reflects what is happening throughout the world. This is a carbon copy of our competitors.
- Need to make the portfolio responsive to our provincial attributes. Need to respond to world community expectations.
- Need actual numbers that describe the financial targets for each focus area.
- It would be nice to have brief case studies that tell us what is going on around the world.
- Governance: we will need a made-in-Alberta model, but much of the research in Alberta has a national or western mandate. There needs to be a comment about the mandate beyond Alberta.
- The conflict between environmental sustainability and growth is not reflected in the table. * Concern: we should not lump socio-economic with environmental sustainability. Also remove the world technology from these categories. Socio-economic factors are cross-cutting.
- Note that a segment of the public will try to “shoot down” whatever is included. Need to clarify what “socio-economic” implies. Examples of socio-economic: e.g., understanding trade, economics, societal shifts in demand. It is an important forecasting application. It is very important.
- Market research is important. We are going to require market research to help create value-added exports.
- Missing: the area of training qualified people.
- Concern that Table 1 could be misinterpreted.

IV. Identification of Research Needs and Collaborative Opportunities

Participants identified specific research needs and then indicated which needs their organizations were most likely to see as collaborative opportunities. The following list of research needs was compiled by participants of the workshop. The theme areas were identified later by the consultant as a means of grouping the research needs.

Theme	Needs	Potential Contributors
Water Quality	Water quality issues - 3*	UA, AP, AFRD, NRC, AAFC, ARC, ARA, ACC, UC, ACP, OCCI, PFRA, ACPC
Genetic Research	Proteomics research (gene expression, medical cross-over)	UA, ARC, AAFC, I&S, UC, FFACE, NRC
	Animal production with minimal antibiotics	AAFC, UA, NRC, AP, ARC, ARA, ACC, AFRD, UC, OCCI, ANAC, ACP

	Livestock genomics/proteomics centre (improve breeding stock, disease and stress resistance)	AAFC, UA, ACP, NRC, AFRD, I&S, ARA, ACC
	Disease resistance in crops	UA, UC, ABC, AAFC, AFRD, ARA, ARC, ACPC
	Xeno transplants (human transplant research)	UA, NRC, ARC, I&S, UC
Food Safety Guarantee	Consumer acceptance of GMOs	AAFC, UA, AP, ARC, ABC, I&S, ARA, AFRD, NRC, ACPC
	Food safety guarantee (enhanced technology that assists marketability, GMOs, data for new technology) – 4	UA, AP, NRC, OCCI, ANAC, ARC, UC, AFRD, ARA, ACP, I&S, ACPC
	Specialty foods and new food products	NRC, AAFC, ABC, ACC, UA, ACP, AFRD, ACPC
	Markers/measure to assist impact/efficacy of functional foods	UA, ARC, ABC, NRC, I&S, FFACE, ACPC
Enabling Technologies	Process technology robotics	UA, ARFC, ARC, NRC, OCCI, UC
	Enabling technologies for production and processing (diversification)	NRC, UA, ARC, AFRD, ARA, I&S
	Developing Alberta's process engineering capacity (extraction, production, testing) of value added ingredients	UA, OCCI, I&S, NRC, FFACE, ABC, AFRD, ARC, ACPC
	Develop and showcase agri-biotech, nutraceuticals and advanced technology enterprises – clusters	UA, ABC, ARC, EDE, FFACE, I&S
	Anti-body farming or immune powered foods	UA, ARC, ABC, NRC, FFACE
	Assisted reproduction technologies	UA, OCCI, UC, NRC, AFRD, ACC
Environmental Best Practices	Use of microbes – waste and health management	UA, ARFC, NRC, ACC, OCCI, ARC, UC, ARA
	Animal waste management (health and environment)	AAFC, OCCI, ARC, NRC, UA, UC, AP, AFRD, ARA, ACC, ACP
	Whole system management practices (for livestock breeding, nutrition, range management, GPS)	AAFC, OCCI, ACC, ANAC, UA, ACP, ARA, AFRD, UC
	Farm animal welfare/behavioural management	AAFC, UA, AP, OCCI, ACC, ARA, AFRD, ACP
	Environmental best practices in food production (e.g. reduce external inputs) – 2	UA, AAFC, AP, ARA, OCCI, ARC, ACC, AFRD, ACP, ACPC
	Manure/odour management	UA, AAFC, OCCI, AP, UC, AFRD, ACC, ARC, ARA, ACP
Non-food Uses of Agricultural Products	Health benefits of barley (high serum cholesterol, type II diabetes) – 2	UA, UC, FFACE, AFRD, ARA, ABC
	Extraction methods to remove high value components from agricultural products	AAFC, OCCI, ABC, ARC, NRC, UA, AFRD, ACC, ACPC
	“Industrial” crops (fibre, fuel)	NRC, ARC, UA, ABC, AFRD, ACPC

	Functional foods (production - marketing) – 2	AAFC, OCCI, ARC, ABC, NRC, UA, UC, AFRD, FFACE, ARA, I&S, ACPC
	Use of agricultural fibre, starches, proteins (construction, paper, etc.) – 2	UA, OCCI, ABC, AAFC, ARC, ARA, NRC, AFRD, ACPC
	Manure as a fuel source	UA, ARA, AP, ACC, ARC
	Agri-health products (disease prevention, transplants)	UA, I&S, ABC, NRC, ARA, ACP, FFACE, UC
	Development and retention of value-added agriculture businesses	UA, OCCI, ARA, AFRD, ACC, I&S, ACP
	Convergence of food components and health/medical research	UA, NRC, AAFC, OCCI, ABC, ACC, AFRD, UC, FFACE, I&S, ACPC
Marketing/Socio-Economic Trends	Socio-economic trends (identify perceptions and expectations of urban population)	UA, OCCI, ACC, I&S, AFRD, ACP
	Internet use in agricultural marketing (business to business, business to consumers)	UA, ANAC, I&S, AFRD, ABC, ARA, ACP, ACPC
	Competitive strategies in global markets	AP, ANAC, OCCI, AFRD, I&S, ABC, ACP, ACPC, UA
	Support for companies - competitive, intelligent marketing	CTN, OCCI, ABC, AFRD, I&S
	Find research areas not already being done elsewhere	AFRD, I&S, ARA, ACP
	A value-added marketing research institute	UA, NRC, OCCI, AG TEAM-LEDUC EDA, I&S, AFRD, ACC, ABC, ARA, ACP, ACPC
Developing People	Developing people (train, re-train, skills) – 2	NRC, UA, OCCI, ABC, AAFC, ARC, UC, AFRD, I&S, ACPC
Miscellaneous	Development of an innovation system (Kansas Tech. Enterprise Co.)	AG TEAM-LEDUC EDA, EDE, ABC, OCCI, CTN, AFRD, I&S
	Increased core funding to research institutes	UA, ARA, I&S, UC, ACC, ACP

* Number indicates that this need was identified more than once.

Abbreviations Used:

AAFC	Agriculture and Agrifood Canada	ARC	Alberta Research Council
ARFC		AG Team-Leduc	EDA
ABC	Alberta Barley Commission	CTN	Canadian Technology Network
ACC	Alberta Cattle Commission	EDE	Economic Development Edmonton
ACP	Alberta Chicken Producers	FFACE	Functional Foods Alberta Centre of Excellence
ACPC	Alberta Canola Producers Commission	I & S	Innovation and Science
AFRD	Agriculture Food and Rural Development	NRC	National Research Council
ANAC	Animal Nutrition Association of Canada	OCCI	Olds College Centre for Innovation
AP	Alberta Pork	UA	University of Alberta
ARA	Applied Research Association	UC	University of Calgary

V. Centres of Excellence and Other Approaches

Discussion focused around the idea that although there is value in having one or two internationally recognized centres of excellence in Alberta, this is only one approach to collaboration. A suggested alternate approach is to create logical research “clusters.” It will be important to develop a made-in-Alberta model.

Discussion/Comments:

- Need to think about having two centres that are internationally recognized. These are needed to attract investment.
- Focus on 10 (or so) clusters. AARI should lead the process of holding focus sessions on each of these clusters. This would allow the parties to find an applied way to work forward.
- AARI can productively focus on programs instead of experiments. The nature of the funding will support collaboration.
- Value in documenting existing collaborative agreements, to find out what has already been done, identify gaps. Then identify strengths and decide in which areas to proceed.
- Too much research time is spent on project, funding administration.
- Are we talking about geographic or virtual centres of excellence?
- Can be institutionalized without centres of excellence.
- What works for one industry may not work for another.
- It is more about building synergies and relationships rather than “bricks and mortar.”
- How do we position ourselves?
- What is the scale/level of excellence we are looking for? provincial, national, international?
- What constitutes excellence?
- If we are benchmarking against an international standard of excellence, we can probably only support one or two.
- Is this the direction we want to go in?
- Look at areas in which work is not already being done and concentrate on those areas e.g. centre of excellence for bison can be easy to achieve as no one else is doing this.
- Centres of expertise can also be effective.
- Applied environmental microbiology would be a good example for Alberta.
- With the trend toward convergence of health and agriculture there is an opportunity for Alberta to reach excellence in these areas - build on existing strengths.
- Important to reduce overlap and duplication with other institutions, provinces.
- Need to look at potential impact of collaboration on economics.

VI. Networking and Governance

Participants described the conditions they would want in place to support effective collaboration. Working in groups, participants focused on the areas of principles, communication, accountability and monitoring and evaluation. The following ideas were brought forward:

1. Principles

- There must be a common written vision with universal buy-in and trust.
- Clear ongoing communication within and between.
- Clearly defined milestones and equal roles in the partnership.
- Agreement on intellectual property and freedom to publish.
- Adequacy of funding to achieve milestones.
- A mechanism for conflict resolution.
- A mechanism for managing the agreement.
- Regular review of the agreement.
- Communication: openness, transparency, sharing of results.

- Shared rewards and recognition related to accomplishment.
- Understanding of roles, complementary disciplines.
- Understanding the focus of the competition.
- Exit strategy for all partners, predetermined.
- Infrastructure support (political and institutional).
- Parents of partnership should not micro-manage the partnership.
- Accountability that is shared.
- Customer capital. A user for the product of the partnership.

2. Communication

- The funding agencies have a role in communication. The agreements lay out deliverables and research schedules.
- A workshop around a cluster every second year. Move around geographically within the province (e.g., north-south).
- Need to bring people together to openly discuss their insights, findings.
- Web sites and newsletter may not work. Need management. The associations could perhaps provide this support.
- Workshops: assign someone to organize the workshops. Help people get excited. Need an industry-led workshop.
- Need meetings to get things started.
- Need an ongoing communication process. Need commitment, cooperation and willingness to share. Trust is essential.
- Intellectual property can be a barrier to communication. This will be an important topic. Otherwise, you cannot get into proprietary information.
- Sort out the issues early, and make them part of the agreement.
- Priority setting and involving people helps create consensus and communication.
- Electronic communication: cannot guarantee that people will read the communication. Need a communication management process.
- Write things down.
- Someone to champion the communication.
- Make sure that communication is not micro-managed. There must be a trust.
- Use meetings as a way to consolidate the communication and activities that have occurred.
- A common language. The infrastructure for delivering electronic information.
- Pre-planning: who is the audience. What do they really want to know?

3. Accountability and Monitoring

- There must be financial accountability (independent).
- Scientific or producer-oriented publication.
- Student training.
- Patents.
- Presentations.
- Government reports.
- Interim report.
- Accountability reflects on the funding of the next project - percentage holdbacks ensure accountability.
- Tough to get accountability on one year projects.
- A final report that gets filed away is not as valuable as electronic transmission and availability.
- Accountability should relate to the agreement that established the partnership.
- Accountability to the institutions is different than accountability to the partnership.

4. Evaluation

- There is well-documented theory on program evaluation.
- There is a booklet by Alberta Treasury that documents the science and process of program evaluation.
- Need clear objectives up front.
- Must be benchmarks: where are we today?
- How are we going to measure?
- What targets are we going to achieve?
- Evaluation of a major program almost requires an independent assessment of the users or receivers. The evaluation centers on the adoption of the learning. Changes. Wealth creation. Document outcomes, not just outputs.
- Need specific examples that funders can relate to.
- There needs to be some sort of process by which the advisory or managing board's guidance is evaluated. Is the guidance strategic?

VII. Summary and Next Steps

It is intended that workshop participants review this summary with their organizations and return their comments to Peter Dzikowski at AARI.

Dr. Ralph Christian summarized the meeting and thanked participants for their input. He noted that he had heard general support from stakeholders to move ahead and that collaboration was the way to achieve this. There was also agreement that the Research and Development Strategic Directions document was taking things in the right direction.

Participants indicated what they thought the next steps should be:

- AARI needs to be the facilitator to sustain the discussion.
- There is a need for someone to crystallize this discussion down to a concise statement so that the larger group can react to it.
- Cluster-building workshops that develop real partnerships would be advisable.
- We would like to see the AARI board move this agenda forward. The need to increase support in the value-added area has been discussed for five years. Encourage the board to take an aggressive stance and move the agenda forward.
- Do we need a larger core group plus the board? Other players must be supportive.
- Will the commodity groups support AARI if the amount of emphasis on primary production research is reduced over some period of time?
- The Strategic Directions for the Agriculture and Food Industry needs to be completed within a couple of months. It will then be continually reviewed and renewed.
- Suggestion: take the list of priorities to the rest of the industry and see if their selections mirror the list we created.
- Need to bring together the producer/commodity groups to improve understanding.
- Need a process to identify who should be involved.

Participants were asked if they wanted to be involved in moving ahead. The following groups voiced their desire to be involved:

- Olds College
- AAFRD
- ACC
- ACP
- NRC

- EDE
- UA
- ABC
- ARC
- AAFC
- AP
- I&S

It was recognized that some groups wishing to be involved may not be represented at the workshop. These included:

- 15 boards and commissions, plus dairy and wheat,
- AVAC,
- Supply side of industry – Monsanto, etc.,
- Applied Research Associations, and
- 10 Forage Associations

Appendix A.

**Research and Development Strategic Directions
for
Alberta's Agriculture and Food Sector**

Draft 7.3 - for input

Alberta Agricultural Research Institute

Draft 7.3 - for input

**Research And Development
Strategic Directions For
Alberta's Agriculture And Food Sector**

EXECUTIVE SUMMARY

Introduction

Research and Development represents a critical set of tools to assist the further development and sustainability of the agriculture and food industry. The **vision from AG Summit 2000**, which represents the future vision of the industry, is **“to create a collaborative environment which supports continued growth of a healthy, productive and sustainable agri-food industry in Alberta.”** World market opportunities have been interpreted to indicate that Alberta's agriculture and food sector could grow substantially from its current \$6.5 Billion production sector to \$10 Billion and from its current value-added sector of \$ 7.3 Billion to \$ 20 Billion by 2010.

Research and Development Mission to Support Agriculture and Food Sector

The research and development system must focus on priority areas of importance to Alberta and support the continuing competitiveness of the industry. Key strengths required include:

- leadership, collaboration, coordination,
- internationally recognized excellence in science,
- enabling technologies, such as genomics, proteomics, bioinformatics, ICT, and
- effective, adequate and strategic funding.

The research and development system must be effectively coupled to a strong innovation system in order for commercialization and utilization, of knowledge and technology from research, to take place.

Strategic Directions for Alberta's Agriculture and Food Sector

The Strategic Directions recommended for further development and sustainability of the Alberta industry include:

- A highly attractive research and development environment;
- New value-added technology platforms in applications;
- Increased focus on the relationship between food and human health;
- Building innovation and sustainability into primary agricultural production for improving competitiveness; and
- Protecting and improving environmental resources.

Strategic Investment Priorities

A shift in relative investment into various areas and an increase in total investment are proposed to take place through collaboration amongst the research performers and funders if Alberta is to have the new knowledge and technology it needs for industry growth and sustainability. Relatively increased emphasis is recommended for Life Science technologies, value added technologies and environmental sustainability research. An absolute increase in investment by all funders and performers, from \$100 million now to \$300 million by 2007, is required in all strategic areas.

Toward Implementation

In order to achieve the desired results a provincial implementation plan will be developed. Some important topics for consideration are:

- A more integrated innovation system is needed,
- Increased collaboration through centres and networks is required,
- AARI will champion and facilitate change,
- New research themes are required to meet the needs and opportunities of future markets and of sustainability, and
- New governance approaches should be explored to effectively manage collaboration centres and networks.

**Research and Development
Strategic Directions for
Alberta's Agriculture and Food Sector**

Draft 7.3 - Revised - July 26, 2000

(Prepared by AARI Strategic Task Force; with input from AARI Board and Ag Summit)

Vision for Alberta's Agriculture and Food Sector

To create a collaborative environment which supports continued growth of a healthy, productive and sustainable agri-food industry in Alberta (Ag Summit 2000 vision, June 2000). The future includes:

- A globally competitive agriculture and food sector which is sustainable in economic, health and environmental terms;
- An industry which provides integrated approaches to related health and environment issues;
- A \$30 billion sector by 2010 - including \$10 billion in primary production and \$20 billion in value added.

Research & Development Mission for Alberta's Agriculture and Food Sector

- Focus the research and development (R&D) system in strategic directions to deliver new products, technologies and knowledge to help achieve the Alberta agriculture and food sector vision through:
 - leadership, collaboration and coordination;
 - internationally recognized excellence in science;
 - enabling technologies such as genomics, proteomics, bioinformatics, ICT; and
 - effective, adequate and strategic funding.
- Ensure the research and development system is effectively coupled to a strong innovation system, which results in commercialization and use of knowledge and technology in Alberta. Help Alberta producers and processors meet global market needs through commercialization and use of science and technologies which are next generation, integrated and innovative.

Strategic Directions for Alberta's Agriculture and Food Sector

The strategic directions provide the focus for key research and development needed to further diversify the Alberta economy by delivering new knowledge and technologies to the innovation system, which will enable producers and processors within the food, fibre and life sciences value chains to **capture expected national and international market opportunities**.

1. A **highly attractive research and development environment** for sustained world-class research excellence in selected areas, complemented by an equally responsive and seamless development and innovation system leading to increased technology commercialization and use in Alberta. New

collaborations and research approaches will be a key feature to improve efficiency of, and enhance the current R&D system and to attract and retain leading-edge people and projects.

2. **Value added technology** platforms and applications developed through research for use by Alberta's producers and processors to capture commercial opportunities in food, feed and industrial uses. Alberta must increase the ratio of value-added production to primary production, from 1:1 to greater than 2:1. This is the next economic wave for the sector.
3. **Agri-health initiative** to produce new discoveries and enhanced agriculture and food products to improve human and animal health and wellness, increase food safety, prevent disease and enhance overall quality of life, through new products like nutraceuticals and functional foods and new and enhanced technology like proteomics, extraction and process control. This offers a direct integrated sector approach for vast benefits.
4. **Build on** Alberta's competitive and resource **strengths in primary agricultural production and science**, by delivering leading- edge knowledge (such as **information on soil and rumen microflora**) and technology to develop innovative practices and sustainable production systems and to capture value added and diversification opportunities for primary production.
5. Maintain or improve **quality of our environmental resources**, through stewardship and use of best practices within an expanding sector by developing leading-edge, integrated solutions across sectors. This may include ethical, legal, policy and socio-economic research to help avoid adverse effects on the environment and respect the needs of future generations.

Strategic Investment Priorities - Alberta's Agriculture and Food Sector

Life Sciences are the next economic wave. The agriculture and food sector, depending heavily on biotechnology, has the greatest potential to expand and effectively compete for the national and international market opportunities. Therefore, the Alberta agriculture and food sector vision signals a change in direction and size, and consequently different knowledge and technology needs to meet a more specialized and diverse future sector. The investment in R&D has to adjust to ensure the knowledge and technology will be developed and delivered for the future Alberta agriculture and food sector. Investments by the private and public sectors need to be made now as a lead-lag relationship exists in research and commercialization processes. A challenge is to develop a portfolio of R&D investments that reflects the strategic directions identified as the key focus areas to achieve the agriculture and food sector vision.

The investment strategy expected to address the change in focus and approach is reflected in Table 1 (also see figs. 1A & 1B at end), which presents the R & D investment portfolio by technology area. The current amount of \$102 million annually invested by all funding agencies is seen to be too low relative to our competitors such as Ontario, USA, Australia. The **recommended amount is \$300 million annually by 2007** from all sources, with a direct link to the strategic directions. The public sector will need to be the catalyst.

Table 1: R & D Investment Portfolio - By Research Focus Area

Research Focus Area	Current Portfolio	Recommended Portfolio by 2007	Recommended Funding Ratio- Public : Private	Link to Strategic Direction	Comments
Basic Platform Technologies (eg. Biotech, proteomics)	15% \$15 M	30%	5:1	1,2	high risk, public role is key
Value Added Technologies (eg. Processing, fibre, nutraceuticals, new uses)	15% \$15 M ----- \$7 B industry	30% ----- \$20 B industry	2:1	1,2,3	mid risk, shared with industrial partners
Primary Production and Enhancement Technologies (eg. Crop & livestock innovations)	65% \$65 M ----- \$6.5 B industry	30% ----- \$10 B industry	1:1	1,4	low-mid risk, shared with industry and commodity partners
Environmental Sustainability/ Socio-economic Research (eg. water, soil, air, ethics, trade, policy)	5% \$5 M	10%	5:1	1,5	emerging issues, multi-sector, long term, indirect benefits, mainly public role
Total – Alberta agriculture & food sector	\$102 M all sources	\$300 M all sources			

The strategy is also expected to address the required investment allocations in the technology development and commercialization continuum. Table 2 (also see fig 2 at end) provides the current levels of investment by

R&D and commercialization stages in Alberta. It is expected that more emphasis will be placed on the development of technology and products which will effectively be commercialized.

Table 2: Agriculture & Food Technology Development and Commercialization Continuum in Alberta

R&D & C Stage	Operating 198/99 \$ Millions	Percent of Total Investment
Basic Research	16.3	14
Applied Research	51.2	45
Technology Development	20.9	19
Technology & Knowledge Transfer	17.2	15
Commercialization & Utilization	4.1	4
Unallocated	2.9	3
Total	112.6*	100

** This value is greater than \$102 in Campbell 1999 report because additional investment in commercialization has been identified.*

The **basic life sciences** leading to new discoveries (for example: the understanding of evolution, biodiversity or capabilities of soil and rumen microflora) and new platform technologies (such as **genomics, proteomics, bioinformatics**) will benefit agriculture and food, and also other Alberta sectors such as health, forestry and the environment to maximize returns and benefits to the province. Joint platform and technology discoveries can be accomplished more quickly with a collaborative and integrated approach. This can be accomplished by specific research themes and integration of research organizations in mutual projects and collaborative ventures.

Specific **applied technology** areas such as: extended shelf-life, logistics and materials handling, advanced materials, data mining and precision farming, e-commerce, trace back systems, value chain management, fractionation and designer foods have the potential to provide market opportunities in many new product and technology collaborations. Markets will include domestic and export interests in foods, food for health, ingredient and industrial materials.

Current investments in crops, livestock, sustainable practices and niche products **research areas for primary production** are essential and critical to meet the vision. To maintain and enhance the production capacity in a sustainable manner, these investments will also need to increase in this vision.

Environmental stewardship and socio-economic considerations are important components of sustainable development of the industry. The industry's ability to wisely handle consumer related issues and manage natural resources and wastes are important to the maintenance of a globally competitive and environmentally responsible industry. Major emphasis is on maintaining or improving the quality of air, water and soil, and issues related to ethics, trade and marketing policies.

Alberta's Agriculture and Food R&D and Technology Development System

Alberta has a capable, collaborative and responsive agriculture and food research and development (R&D) system which has to date served the agriculture and food sector well. This system has evolved over time and has been now evaluated as requiring changes to improve efficiency and massive enhancement and expansions to meet the R&D needs of the future and to provide world class state of the art R&D support to the

expanding industry in Alberta. The current **R & D system faces new challenges** and will need new approaches in adjusting to meet the 21st century's needs and opportunities.

The Alberta agri-food research and development system has some strengths to help the sector moderately meet the global markets. New and aggressive investment will be required for meeting the industry's vision. This investment will help to improve and enhance R&D and technology development infrastructure such as facilities, equipment and collaboration "backbones" - information, communications and shared databases and new specific skill sets which are not in the province, including new applications and other technologies (eg. fractionation). The investments strategies should lead to increased funds with industry partners. Commercialization and innovation system partners will also be needed. Past investments indicate tremendous returns to Alberta from all levels of the value chain. Strengthening the provincial innovation system will increase commercialization opportunities and returns to the province. Removing intellectual property barriers to new discoveries will stimulate the international industry interest in and attraction to the strong science base in Alberta.

The integrated innovation system ensures that science, knowledge and technology lead to either commercial products or industry use for competitive advantage or other benefits. Provincial and federal economic development departments, along with regional economic development agencies are the main facilitators of the innovation system, with a focus on business skills, access to capital and related commercialization topics. They work closely with many R&D system partners, industry and entrepreneurs.

As noted, the total investment in Alberta from all sources was about \$102 million in 1998/99. The source of funds was 78% from public sector and 22% from private sector. Agriculture and food R&D in Alberta is funded primarily by:

- Alberta Government Departments and agencies,
- Federal Government Departments and agencies, and
- Industry - a wide variety of companies and agricultural sector organizations.

Agriculture and food R&D in Alberta is carried out at a variety of facilities, which are mostly public sector:

- Agriculture and Agri-Food Canada, (44%)
- Universities of Alberta, Calgary, and Lethbridge, and some Colleges, (24%)
- Alberta Agriculture, Food & Rural Development, and Alberta Research Council, (24%)
- Industry (11%).

(Note: The numbers above in brackets indicate the percent of research funding performed. Public sector facilities conduct 89% of the research funding invested annually.)

Alberta has nationally and internationally recognized R&D expertise in many areas (Table 3), however, R&D competencies need to be up graded to develop world class science base in the emerging disciplines of **Environmental and Life sciences**. This is a fundamental requirement for developing and supporting an environmentally sustainable agriculture and food industry.

Table 3: R&D Organizations and Areas of Expertise in Alberta

Organization	Areas of Expertise
Agriculture and Agri-Food Canada-AAFC Research Centres, Lethbridge and Lacombe	<p>Animal Sciences: beef production, cattle genetics, feed biotechnology and nutrition, livestock parasitology/insects/pests, animal behaviour</p> <p>Crop Sciences: agronomy, crop breeding and pathology (cereals, canola, potatoes, peas, forages)</p> <p>Microbiology: molecular genetics and biology</p> <p>Renewable Resources Management: soil/air/water quality, soil conservation, manure management</p>

Alberta Agriculture, Food and Rural Development-AAFRD	<p>Livestock: production practices</p> <p>Agronomy: crop breeding and pathology (cereals, canola), minor/special/horticultural crops development</p> <p>Value-added processing and product development</p> <p>Renewable Resources Management: irrigation management, soil/air/water quality, soil conservation, manure management</p>
Alberta Research Council-ARC	<p>Animal Sciences: animal health care products including vaccines, biotechnology and impact of pollutants on livestock (toxicology)</p> <p>Crop Sciences: integrated weed and pest management, biocontrol, speciality and transgenic crops development, native plant development</p> <p>Renewable Resources Management: greenhouse gas mitigation, air emissions, waste and landscape management, aquaculture and water management</p> <p>Bioinformatics: data mining and system development and management</p>
University of Alberta	<p>Animal Sciences: dairy, beef, swine and poultry production, cattle genetics, feed biotechnology and nutrition, livestock parasitology/insects/pests, animal behaviour</p> <p>Crop Sciences: agronomy, crop breeding and pathology (cereals, canola, forages and vegetables)</p> <p>Food Science: Functional and health food product development</p> <p>Microbiology: molecular genetics and biology (biotechnology)</p> <p>Renewable Resources Management: soil/air/water quality, soil conservation, waste management</p> <p>Rural Economy: resource and production economics and marketing</p>
University of Calgary	Plant biotechnology, vaccine development and health linkages with agriculture production and food safety
University of Lethbridge/AAFC	Proteomics, beef production
Olds College (OCCI)	Horticulture, composting and agri-equipment development

The best expertise will likely need to lead specific research theme areas to enable Alberta to cluster expertise and labs, marshal scarce resources and achieve new breakthroughs within shorter time frames.

Rationale for New R&D Investment Strategy

The agriculture and food industry is a science based business. Research and technology is essential for a modern industry and offers the potential to increase industry efficiency, improve productivity, diversify output and enhance environmental quality. The best R&D and technology development & commercialization capability and expertise will certainly be **needed to effectively compete in national and international markets.**

Life Sciences is the wave of the future. The agriculture and food sector, which together with health depends heavily on biotechnology, has the greatest potential to effectively compete in the global market. World class facilities and expertise in ag-biotechnology is required to capture market opportunities in the expanding sector of genetically modified products including functional foods, nutraceuticals and other industrial ingredients and materials.

State of the art R&D capabilities and world class expertise are also required to develop and maintain a globally competitive and environmentally responsible industry. It is also important to carefully

respond to consumer demands and market needs through competent management (based on scientific findings and facts) of our natural resources and industry wastes **to maintain an environmentally sustainable industry.**

Toward Implementation - Turning Strategy into Action

Agriculture and Food R&D is performed by a number of research agencies and centres geographically distributed across Alberta. This contrasts with other jurisdictions in Canada and elsewhere. Development of the Alberta implementation plan needs to consider whether the distributed system can be more efficient through collaboration or whether a more centralized, cluster approach is needed. A few approaches and models are proposed to achieve the desired outcomes of the strategy.

Collaboration and Networks

To achieve the industry vision, Alberta R&D system partners need to jointly embrace the new sector vision and coordinate their R&D efforts and their roles. The sector vision and strategies need to be aligned with the overall provincial vision and R&D strategy, especially the Life Sciences Strategy.

To meet the investment priorities, will mean effectively agreeing on roles and responsibilities, coordinating allocation of resources and leveraging resources with R&D partners. Alberta has a long established and networked research delivery approach involving many public and private sector collaborators. Although the sector has its roots in primary agriculture, the sector is now realizing many new and vital linkages to other Alberta sectors, including value added products and other directly related sectors of information systems, telecommunications and health.

Alberta R&D agencies will need to coordinate and align their research goals to meet this aggressive agenda. Criteria to consider in priority setting include: risk/ return of the research investment; infrastructure, research investment levels and timing; current investment mix; science and technology personnel, and collaboration approaches to minimize duplication. Research investments will be performed by different players in the Alberta system aligned with the strategic directions for R & D.

Currently, AARI provides R&D funds to several R&D performers for research projects in identified priority areas. These projects are of various sizes and durations. Although most projects involve several researchers, there is room for improving and enhancing collaboration among the grants recipients. Several collaboration agreements are in place with AAFRD, AAFC, ARC, universities, Olds College and industry.

Collaboration with national and international partners will be also be needed, for example, the emerging Agriculture and Agri-Food Canada Life Sciences (Biotechnology) Strategy. Further, the benefits of alliances, cooperation and coordination are not limited by jurisdictional and institutional boundaries, but by our willingness to work together for mutual benefit.

New Governance Approaches Will Be Needed

Collaboration and creating new networks which have formal structures will be needed. Several options are possible - centres of excellence or “research clusters”, a stronger innovation system, and employing specific research themes under joint management.

Centres of excellence with specific expertise are flexible structures which bind researchers and labs together through specific research themes. A centre of excellence approach needs long term dedicated public funds under a public-private board. However it is possible to start several new centres building on specific Alberta research strengths. A network hub is needed and it is very useful to consider industry associations as a partner for priority setting and partial funding.

AARI will need to define major areas and develop portfolios for R&D investment, with advice from industry and research performers. AARI may then encourage funding for agreed major multidisciplinary goal specific/oriented projects such as Centres of Excellence. Some possible examples, which have emerged from the Ag Summit process, are:

- Functional Food Alberta Centre of Excellence (a model)
- new- Precision Agriculture Alberta Centre of Excellence
- new - Agriculture Fibre Alberta Centre of Excellence
- new - Industrial Crops Alberta Centre of Excellence
- new - Minor/Niche Crops Development Alberta Centre of Excellence
- new - Livestock Diversification Alberta Centre of Excellence
- new - Integrated Pest Management Alberta Centre of Excellence
- new - Agriculture Processing Technology Development Centre of Excellence.

A much stronger research and innovation system is needed. Some successful models developed and employed by Kansas, Austin and others to start new industries and sustainable industry partnerships are well recognized and known. This “systems” approach includes agreements with university partners, creation of incubators for new spinoff companies, development of venture capital corporations and industry partners for commercialization. This approach moves the R&D system into a strong public-private partnership in an integrated and sustainable manner.

AARI will “Champion” Implementing the Sector R&D Strategy

AARI will champion developing the provincial implementation plan for the agriculture and food sector R&D strategy to achieve the vision. AARI will provide on-going leadership on strategic priorities for Alberta through consultation processes. A name change should also be considered to fully reflect the changing sector, from AARI to perhaps the Agriculture and Food Research Institute (AFRI).

Alberta needs a “champion” for the sector to achieve the vision and implement the strategic directions. The champion will strive to help others understand and endorse the vision and the research and development strategic directions in Alberta and identify their role to help achieve the strategy and the vision. Fostering new approaches, building collaborative linkages and seeking opportunities for additional **resources for people, infrastructure and operating** will be important roles.

AARI has led the sector for over 20 years through coordination, research administration, grant and matching grant programs, and industry conferences. Its operating authority derives from an Act under which it now reports to the Alberta Science and Technology Research Authority (ASRA). AARI has managed several thousand research projects, many of which have resulted in break through intellectual property and commercial benefits to the industry (for example, canola research for USA market acceptance, shelf-life extension, “hirudin” production, water quality, nutraceuticals). Other research and technology programs have addressed risk management, loss prevention and use of research results by industry.

Another approach can be employing specific research programs under AARI co-management direction to achieve strategic goals. It would be a minor mandate adjustment to the current system and may not create as many impacts as the above models. Further, funding may not be as easily leveraged from industry partners. The charts over indicate examples of each system.

Potential Topics for Future Research and Development

As noted earlier to achieve the vision will require both new approaches for maximizing the utilization of the current R&D resources and more resources to improve and enhance our R&D capability and competence. The future will have new characteristics, including: distributed intelligence and knowledge, complex technologies, continuous innovation, global economic forces, infrastructure renewal, life-long learning and scientific breakthroughs. To meet these dynamic changing events, Alberta will need priorities and specific research themes.

Ag Summit workshop and other professional discussions have proposed several critical and new areas requiring R&D support. Most of these suggestion are categorized in the following themes or focus areas:

- **Basic Life Sciences Platform Technologies.** These includes enabling technologies such as genomics, proteomics, natural and organic genetic banks - crop and animal - for global markets; and bioinformatics, data mining and ICT applications in agriculture and food sector including agri-equipment technology interface with ICT.
- **Value-added Technologies.** Assisting to develop industrial and new uses of agriculture products including functional foods, agri-health platforms and new industrial ingredients and materials.
- **Primary Production and Enhancement Technologies.** To build on Alberta's competitive and resource strengths in primary agricultural production and science, by delivering leading-edge knowledge (such as **information on soil and rumen microflora**) and technology to develop innovative practices and sustainable production systems and to capture value added and diversification opportunities for primary production.
- **Environmental Sustainability/Socio-Economic Research.** This focus area covers communications, ethics, legal, policy and environmental issues.

These research investment areas need comments. Further, lead researchers and agencies and supporting agencies need identification to crystalize the delivery strategy, be it centres, new innovation systems or specific research themes. Developing a limited but strategic number of new initiatives will help build on the current R & D system in Alberta.

Measures of Progress

It is important to understand the potential outcomes and to measure the progress after implementing this R&D investment strategy. The measures of progress may include:

Next Steps

A stakeholders meeting has been scheduled for August 3, 2000.

Please send your comments to:

Dr. Ralph Christian
Executive Director, AARI
Phone: 422-1072
Fax: 422-6317
e-mail: ralph.christian@agric.gov.ab.ca

Thank you for your advice.

Figure 1A

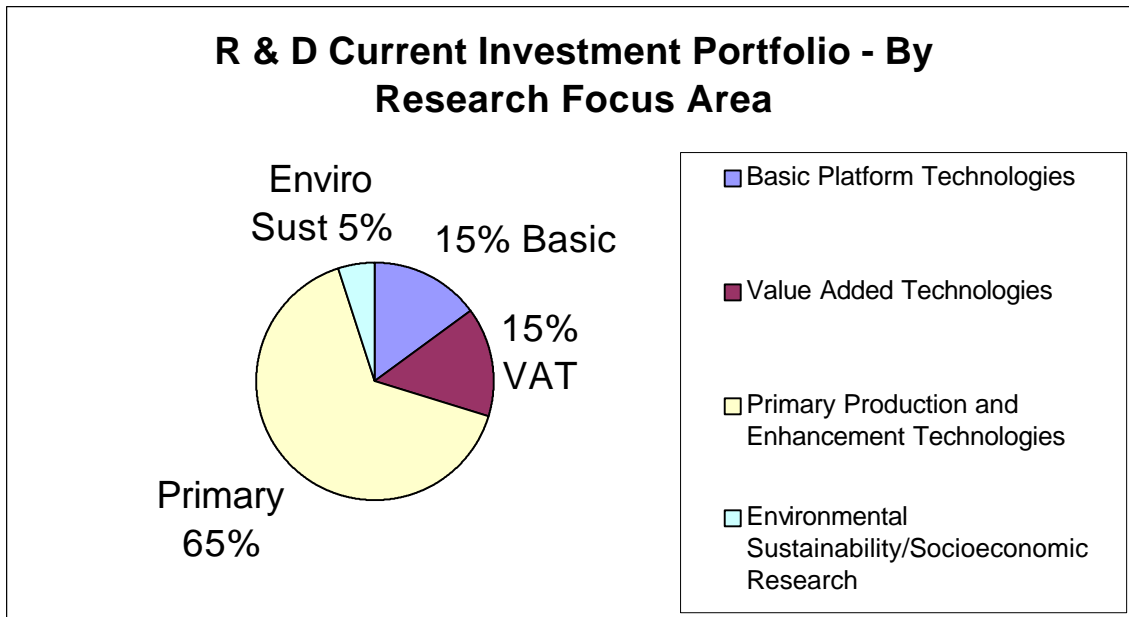


Figure 1B

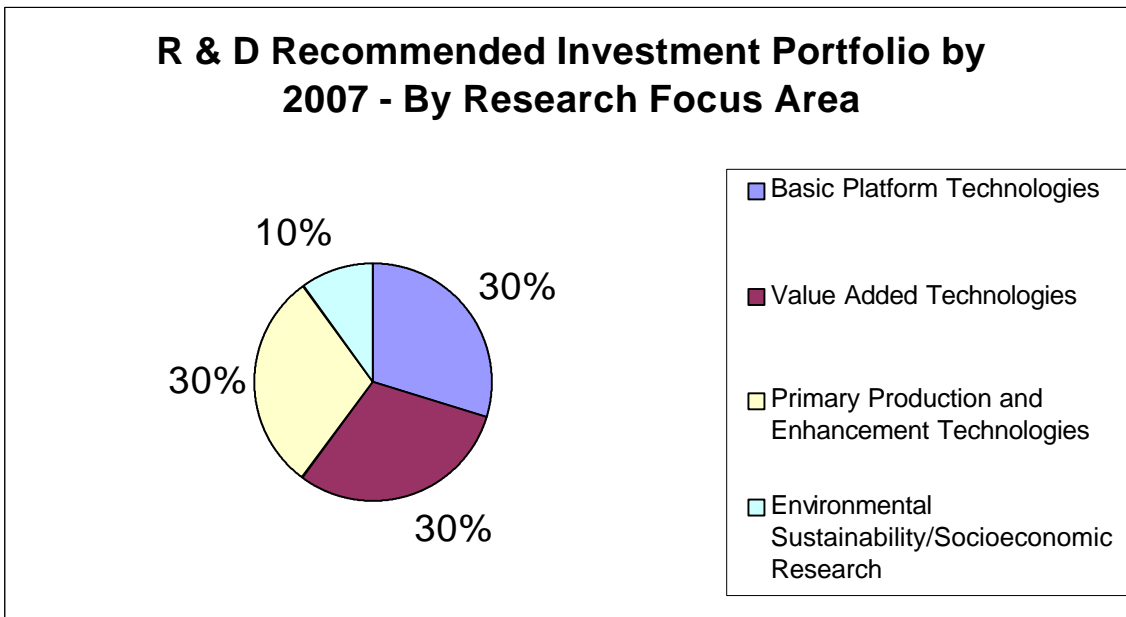


Figure 2: Distribution of 1998/99 Alberta Investment in Agriculture and Food R& D and Commercialization by Technology Continuum, from all sources (Campbell, July 2000)

