

APPROVED AGENDA
Professional Studies Faculty Council

Friday, October 18, 2013
10:00 am – 12:00-noon
Room A261, Abbotsford Campus

<i>Package Pages</i>	
Pg. 1, 2 Pg. 3 - 8	<p>1. Items for Approval</p> <p>1.1. Guest Speaker – David McGuire, Executive Director, UFV International</p> <p>1.2. Agenda – October 18, 2013</p> <p>1.3. Minutes – September 27, 2013</p>
Pg. 9 - 11	<p>2. Continuing Business</p> <p>2.1. Terms of Reference – Revision and Re-Approval</p> <p>2.2. Criteria / Standards for Teaching, Research & Scholarship – PSALT Committee</p> <p>2.3. Indigenization</p>
Pg. 12 - 130 Pg. 131 - 135	<p>3. New Business</p> <p>3.1. Discussion of Concept Paper to offer Master of Professional Accountancy and Corporate Financial Management Degree.; UFV Masters Project Labour Market Demand Survey – Mike Ivanof and Joe Ilsever</p> <p>3.2. Centre of Excellence in Agriculture (CEA) Faculty Involvement</p> <p>3.3. Rank and Tenure – Process Update</p> <p>3.4. BUS 338 minor course change proposal for Faculty Council</p> <p>3.5. Class Size - Report from Ad-Hoc Committee</p> <p>3.6. Faculty Council Meeting Start Times</p>
	<p>4. Standing Committee Reports</p> <p>4.1. Nominations and Elections Committee</p> <ul style="list-style-type: none"> ○ Faculty of Professional Studies Sessional Representation ○ New Student Representation

- 4.2. Field Education and Practicum Committee
- 4.3. Retention Committee
- 4.4. Learning Exchange Committee
- 4.5. Faculty Newsletter Committee

5. Other Reports

- 5.1. Dean's Report
- 5.2. Reports from other Faculty Councils
- 5.3. Report from Senate

6. Information Items

- 6.1. The next Faculty Council Meeting is **November 15, 2013** in room A261

**APPROVED MINUTES
Professional Studies Faculty Council**

Friday, September 27, 2013
10:00 a.m., Room A261, Abbotsford Campus

Chair: Cyrus Chaichian

Present:

Barbara Salingré	Doris Ball	Karen Power*	Ron Zitron
Cyrus Chaichian	David Dobson	Christine Slavik	Leah Douglas
D.J. Sandhu	Elizabeth Dow	Keith Lownie	Rod Hayward
Darrell Fox	Don Miskiman	Colleen Bell*	Mark Breedveld
George Melzer	Gerry Palmer	Kenneth Gariepy	Ron Wilen*
Joe Ilsever	Gillian Bubb	Kim Milnes	Rosetta Khalideen
Kirsten Robertson	Seonaigh MacPherson	Maple Melder-Crozier	
Margaret Coombes	Glen Paddock	Sandy Hill	

Regrets:

Amir Hajbaba	Cindy Rammage	Kevin deWolde	Robert Harding
Andrea Hughes*	Sheryl MacMath	Mark Lee	
Awneet Sivia	Fiona McQuarrie	Mike Ivanof	
Christina Neigel	Jan Lashbrook Green	Les Stagg	
Christine Nehring*	Gwen Clarke	Raymond Leung	
Cindy Stewart	Gwen Point	Lisa Moy	
Curtis Magnuson	Heather Compeau*	Lorne Mackenzie	
John Hogg		Lou Schroeder	
		Mary Higgins	

Recorder: Laura Chomiak*

* Indicates Non-Voting Member

1. ITEMS FOR APPROVAL

1.1 Welcome

Rosetta welcomed everyone to the first Faculty Council meeting of the new academic year, and acknowledged the new employees to the Faculty. Some of the new faculty had an opportunity to introduce themselves at the earlier Professional Studies Spark Faculty Forum Event.

1.2 Guest Speaker – Director, Teaching and Learning, Wendy Burton

Guests Wendy Burton, Director and Susan Brown, Coordinator, Teaching and Learning, gave a brief overview of UFV's Prior Learning Assessment and Recognition (PLAR) Services. In addition to addressing the review of PLAR Policy #94, Wendy and Susan spoke about the ways in which PLAR allows students to receive appropriate credits and recognition.

Wendy spoke about working with all departments to help them develop a process that would recognize experiential learning.

A copy of the PLAR PowerPoint Presentation is attached for your reference. Wendy welcomed any feedback, questions, and comments regarding the presentation, and the review of the current PLAR Policy.

ATTACHMENT

1.3 Approval of Agenda September 27, 2013

MOTION

Gerry Palmer/Leah Douglas

THAT the agenda of Sept 27, 2013 be adopted as presented with the addition of 3.6 Criteria/Standards for Teaching - Service & Scholarship and the renumbering of 2.2 (b) Indigenization to 2.3.

CARRIED

1.4 Approval of Minutes March 22, 2013

MOTION

Mark Breedveld/Gillian Bubb

THAT the minutes of May 17, 2013 be approved as presented

CARRIED

2. CONTINUING BUSINESS

2.1 Policy #105: Assignment of Course Credit

The Faculty Council discussion comments that resulted from Policy #105 were sent to UEC. The comments will be part of the larger feedback associated with this policy. Rosetta urged faculty to send any further comments to UEC.

ACTION: ALL FACULTY

2.2 Internationalization

a) Celebrating Internationalization Event – November 18, 2013

The Faculty of Professional Studies is hosting a Celebrating Internationalization Event again this year. The event will be the kick-off to the “Celebrating International Education Week” which runs from November 18-22.

Our event will take place on Monday, November 18 from 11:30 AM to 1:00 PM in the Alumni Hall. The presenters and performers will relay how internationalization has added to their experience and enhanced their own education. A reception will follow at 1:00 PM in the cafeteria fishbowl and international finger food will be served.

Faculty were asked to watch for announcements and posters in the coming months and encourage their students to attend.

2.3 Indigenization

The Indian Residential School Day of Learning took place on September 18 and was an opportunity for Indian Residential School survivors to tell their stories through presentations, panels, films, readings and displays. Aboriginal Elders, students, employees and the community participated and attended the event.

To make indigenization more visible and to coincide with the Institution's Education Plan, the School of Social Work and Human Services has changed their department's signage to reflect both English and Halq'eméylem.

Elizabeth Dow, who is a member of the Faculty's Indigenization Committee reported that a possible indigenization activity is a bus tour to visit some of the sacred Sto:lo sites. The Dean's Office will help fund the tour, which is in the planning stages. Elizabeth Dow, Gwen Point and Don Miskiman will facilitate the activity. Rosetta asked the committee to move forward with planning the bus tour.

ACTION: ELIZABETH, GWEN, DON

3. NEW BUSINESS

3.1 School of Business – Major Program Change: BUS 377

<p><u>MOTION</u></p> <p>THAT the School of Business – Major Program Change of adding BUS 377 Management of Cooperatives as an elective in the BBA Human Resource Management Option and BBA Organization Studies Concentration be approved as presented.</p>	<p>Sandy Hill/Gillian Bubb</p> <p><u>CARRIED</u></p>
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3.2 School of Business – Minor Course Change BUS 149 to BUS 249

The minor course change from BUS 149 to BUS 249 would allow the course to move from the first part of the program to the second part of the program. It will also bring the course in line with the other institutions.

<p><u>MOTION</u></p> <p>THAT the School of Business – Minor Course Changes to BUS 149 Essentials of Finance be approved as presented with the Calendar Description Note to read: Students may receive credit for only one of BUS 149, BUS 162 or BUS 249.</p>	<p>Christine Slavik / Kim Milnes</p> <p><u>CARRIED</u></p>
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3.3 LIBT 265: Major Course Revision

MOTION

Barbara Salingre/Leah Douglas

THAT the Department of Library Information Technology – Major Course Revisions to LIBT 265 Work Experience Practicum be approved as presented.

CARRIED

3.4 Terms of Reference – Revision and Re-Approval

The Terms of Reference for Faculty Council are up for review and need to be taken back to Senate before December 2013. An Ad-Hoc Committee has been put together to review the current terms and identify if any changes needed to be made. Gerry Palmer suggested looking at the two-year time-frame stipulation and changing it to “as necessary.”

ACTION

The Faculty Council’s, Terms of Reference requires review every two years. The following Ad-Hoc Committee to bring back a revised draft to the next Faculty Council meeting scheduled for October 18, 2013.

Ad-Hoc Committee:

- Elizabeth Dow, Chair
- Kenneth Gariepy
- Gerry Palmer
- Cyrus Chaichian

3.5 Enrollment Management

UFV is developing a Strategic Enrollment Management Plan. The new budget model will no longer be triggered by course sections, but by student enrollment. The new budget will need to be developed by Faculties by mid-November as a firm plan cannot be done within this timeline. However an Education Plan will need to be completed for the next budget year.

Joe Ilsever is assisting the Dean’s Office with current budgeting activities.

3.6 Criteria/Standards for Teaching, Service and Scholarship

Discussions that started 3-4 years ago regarding criteria are now being tied to rank and tenure. Management and the FSA are working out the final details. Departments within the Faculty of Professional Studies need to have standards and criteria ready by the end of December. The final version of “Defining Teaching, Service, and Scholarship in the Faculty of Professional Studies – October 2012” was circulated. The document highlights the strengths and high points of the Faculty and was the foundation for departments to develop their own criteria and standards for teaching, scholarship and service.

The Teacher Education Program (TEP), Early Childhood Education/Child and Youth Care (ECE/CYC), and the School of Business have developed their criteria and standards. Rosetta suggested putting together a Sub Committee to produce broad enough standards that can be used for Professional Studies.

ACTION

Form a Sub Committee to look at Criteria and Standards for Teaching, Service, and Scholarship.

Committee Membership:

- Directors
- Department Heads
- One designated member of each school and department to be considered

Rosetta will call the first meeting!

4. STANDING COMMITTEE REPORTS

4.1 Nominations and Elections Committee – Leah Douglas

- Leah Douglas reported that her term as Nominations and Elections Chair has ended and Glen Paddock volunteered to take Leah's position on the committee. Leah noted the vacant positions within the Faculty of Professional Studies and vacant positions on other Faculty Councils. Glen will arrange for a call for nominations to fill the vacancies.

ACTION: GLEN

4.2 Field Placement Committee

- . No Report

4.3 Class Size Ad-Hoc Committee

- Sheryl MacMath will report at the next Faculty Council meeting

4.4 Retention Committee

- No formal report – The committee is meeting on October 18, 2013

4.5 Learning Exchange Committee

- No Report

4.6 Faculty Newsletter Committee

- The committee has met and will be circulating a call for articles that fall within UFV's Institutional Learning Outcomes. Faculty were asked to forward their articles to Christine Slavik by October 30.

5. COMMITTEE REPORTS

5.1 Dean's Report – Rosetta Khalideen

- The Faculty has completed and submitted its 2013/2014 Education Plan update.
- We are currently engaged in the development of a Faculty Enrollment Management Plan and hope to have a first draft ready by the end of May 2013.
- The review of the School of Business has just been completed. Two programs have been scheduled for review in the 2013/2014 academic year – Teacher Education and Library and Information Technology. The MSW program in the School of Social Work and Human Services will also be seeking accreditation.
- We have a number of new faculty members who have joined us: Rod Hayward and Kirsten Robertson in the School of Business and Darrell Fox and Dr. Margaret Coombes from the School of Social Work and Human Services. Dr. Frank Ulbrich, the new Director of the School of Business will join us on October 1.
- Our Teacher Education Program continues to enjoy a high graduate employment rate. All of the 35 students who graduated in June have found employment.
- The School of Business will be delivering the second one-week module on "Leadership in the Context of Globalization" in partnership with the Lucerne University of Applied Arts and Sciences, October 14 – 19, 2013. The program will be held in Vancouver. [There will be a focus on Indigenous Leadership]. This initiative relates to the building of our international partnerships and is revenue generating.
- As part of the Faculty's Indigenizing activities, some of our signage will be written in both English and Halq'eméylem.
- The Faculty plans to host a second "Celebrating Internationalization" event as part of International Education Week, November 18 – 22, 2013. The date for this event is Monday, November 18. The University community will be invited to participate.
- The School of Social Work is continuing to work on acquiring scholarly funding and bursaries – Patsy and Crissy George Scholarship fund \$25,000; Dr. Abebe Teklu Scholarship \$1,500.
- Volume 7 of the Faculty's Newsletter – PScene is expected to be ready for publication by the end of December 2013.

- We are currently working on the development of our 2014/2015 budget for the Faculty.

Rosetta congratulated TEP for 100% employment rate of their students. TEP's secondary program was approved by the Ministry and will begin summer 2014.

5.2 Reports from Other Faculty Councils

- No Reports

5.3 Senate Report – Gerry Palmer

- There are two new Senate committees, the Faculty Standards Committee and the Indigenization Committee. New policies are coming out for consultation and comments.

6. INFORMATION ITEMS

6.1 Next Faculty Council Meeting

- The next Faculty Council Meeting is October 18, 2013 in Room A261.

UNIVERSITY OF THE FRASER VALLEY

TERMS OF REFERENCE FOR THE STRUCTURE AND FUNCTION OF FACULTY COUNCILS

FACULTY OF PROFESSIONAL STUDIES

Approved by Senate: December 9, 2011

1. PREAMBLE

In accordance with *the University Act of British Columbia, c. 468 RSBC (1996)* faculties of universities are required to make rules for the governance, direction and management of their affairs and to ensure that such affairs are conducted with representation from their membership.

2. ESTABLISHMENT OF FACULTY COUNCILS

In accordance with the University Act and with the amended University Act, 2008, Faculty Councils are hereby established as the senior academic governance bodies of the Faculties at the University of the Fraser Valley and each Council shall be responsible for its Faculty's respective governance and management of academic affairs.

3. MANDATE

Faculty Councils shall:

- a. serve as the forum for sharing information and the discussion of academic matters;
- b. receive recommendations related to academic programs, including but not limited to: development of new programs, program changes, new courses, and discontinuation of courses;
- c. vote on recommendations as related to the above;
- d. delegate such authority to Ad Hoc or Standing Committees of the Faculty Council as the Faculty Council may from time to time deem appropriate;
- e. transmit recommendations to Senate;
- f. pass policies related to the functioning of the Faculty Council and;
- g. deal with matters assigned by the Board or Senate;

4. MEMBERSHIP

4.1. Voting Membership

Voting membership of the Faculty of Professional Studies Faculty Council shall be comprised of the following:

- a. faculty members;
- b. student representatives elected by students in the Faculty, which number is to be determined by the Dean in consultation with the Faculty Council, normally for a one year term;
- c. academic advisors (if any) employed within the Faculty;
- d. two support staff representatives employed within the Faculty, elected by support staff for a two-year term;
- e. a maximum of two sessional instructor representatives, elected by sessional instructors for a one-year term;
- f. Departments which offer a major(s) that may be taken as part of a degree program in another faculty will have two designated representatives in that faculty council, with full voting rights in the faculty council, except that they may not stand for election to Senate or vote to elect a senator as member of that faculty council.
- g. Dean of the Faculty and;
- h. President.

4.2. Ex-Officio and Non-voting Members

Non-voting membership:

- i. Secretary to the Faculty Council;
- j. Vice-President Academic and Provost;
- k. Registrar;
- l. one representative each from other Faculty Councils;
- m. those invited by the Dean in consultation with the Faculty Council;
- n. University Librarian or designate.

5. FACULTY BUSINESS

Faculty business will normally be carried out at regularly scheduled council meetings where there is a quorum. The Faculty Council has the right to delegate business to Standing Committees and Ad Hoc Committees, which may make recommendations to the Council for consideration. The Dean of the Faculty (or designate) will assume the role of Chair on these committees, until such time as a Chair may be elected by the committee.

- a. Standing Committees –will report to the Faculty Council. Standing Committees will consist of Faculty Council members elected by the Council and members appointed by the Dean, with the requirement that the majority of the committee members must be faculty members. Members appointed by the Dean need not be members of the Faculty Council. The Dean is a non-voting ex-officio member of all Standing Committees.
- b. Ad Hoc Committees – may be struck by the Faculty Council for specific purposes.
- c. The faculty will elect a Chair and Vice Chair for the conduct of Faculty Council meetings. The Chair and Vice Chair will serve two-year, staggered terms. Cancellation of meetings will be at the majority decision of the Chair, Vice Chair

- and Dean. The proposed meeting agenda should be approved prior to distribution by the Chair in consultation with the Dean or designate.
- d. Business will be conducted in accordance with Senate Rules of Order.

6. QUORUM

A quorum will consist of at least twenty-five percent (25%) of the voting members of Council.

7. AGENDA AND MINUTES

- a. Minutes will be kept by a Secretary appointed by the Dean;
- b. Agenda, minutes and written reports will be circulated to council members at least twenty-four hours prior to meetings, though normally council members will be given at least seven days' advance notice on voting matters.

8. MEETING TIMES

Meetings will be held during the months of September, October, November, December, January, February, March, April and May unless cancelled. Notwithstanding, a majority of the Chair, Vice Chair and the Dean has the right to call a Council meeting at any time if there is urgent business that requires the attention of the Faculty Council.

9. REVIEW OF TERMS OF REFERENCE

The terms of reference will be reviewed at the end of two years after the date of Senate approval.

MEMO



To: UFV Faculty Members through Faculty/College Councils
From: John English, Dean, Trades & Technology and Sylvie Murray, Program Development Coordinator
Date: September 30th 2013
Re: Centre of Excellence in Agriculture (CEA) – faculty involvement

Context for the new Centre of Excellence in Agriculture (CEA)

UFV's 2011-2015 Education Plan identifies "Agriculture, Food Security, and Sustainable Development" as one of the institution's key priorities, directly supporting the central goal to becoming a "leader of social, cultural, economic, and environmentally-responsible development in the Fraser Valley." As the Ed Plan states, "Given the economic importance of agriculture and its environmental impact in the region, this goal will not be attainable without a greater institutional focus on this area."¹

Institutional commitment to developing educational and research programming in this area resulted in UFV's involvement, alongside the Chilliwack Agricultural Commission, in commissioning a report by Toma and Bouma Management Consultants on the needs of the BC agriculture industry for applied research and training in the Abbotsford and Chilliwack region, in particular in relation to "a new regional Centre and related research areas for potential UFV programming" which was released in April 2013.² UFV's efforts were then spurred last June when the newly-appointed Minister of Advanced Education was given an explicit mandate to "ensure that a Centre of Excellence in Agriculture is created at the University of the Fraser Valley."³ It is important to note that, while we now have unambiguous political support and new research data to support the development of the new Centre, its programming will be developed in a context of severe budgetary restraint. New funding is currently being sought for capital and infrastructure investment through the Western Economic Diversification Canada Program, but building the CEA will have to be accomplished with no increase (indeed, an anticipated decrease) to our operating budget.⁴

¹ *Students and Community: Education Planning at UFV, 2011-15*, <http://www.ufv.ca/media/assets/program-development-office/2011+-+2015+Education+Plan.pdf>, p. 8-9. "Environment and Sustainable Development" was also one of the priority areas identified in the Strategic Research Plan (*Strategic Research Plan 2010 – 2015*, <http://www.ufv.ca/media/assets/research/docs/stratplan2010.pdf>), p. 4-5.

² *Agri-food Directions to 2020: Trend and Technology Drivers*, April 2013, p. 3 (and p. 2 of short version).

³ Letter to Honourable Amrik Virk from Premier Christy Clark, June 10, 2013, http://www.gov.bc.ca/premier/cabinet_ministers/amrik_virk_mandate_letter.pdf. For the companion directive to Honourable Pat Pimm, Minister of Agriculture, see http://www.gov.bc.ca/premier/cabinet_ministers/pat_pimm_mandate_letter.pdf.

⁴ <http://www.wd-deo.gc.ca/eng/>

Faculty involvement

As with all of our academic programming and research activities, the input and participation of faculty members is essential to building a vibrant and sustainable Centre of Excellence in Agriculture. “Agriculture,” when viewed broadly and including the related fields of food security, environmental sustainability, agribusiness, agroecology, and others, are topics of expertise and interest for faculty members in a variety of disciplines across all Faculties. Programs and courses related to these themes, and research initiatives, are currently housed in the Faculty of Trades and Technology, the Faculty of Science, the College of Arts, and the Faculty of Professional Studies.⁵ The Faculty of Health Sciences and Access and Open Studies are also invited to explore ways to develop programming for inclusion in the CEA’s activities. UFV has proclaimed its commitment to inter- or multi-disciplinarily—this Centre will be created through us delivering on our promise to work collaboratively with colleagues from our diverse Faculties.

In order to foster the kind of faculty engagement that is critical to the success of this enterprise, a consultation process will unfold in the weeks and months to come involving both Faculty (and College) Councils and university-wide workshops. We have been asked to coordinate this process and we invite you all to participate.

Process for the development of programming for the Centre

1) Toma and Bouma’s report. The study conducted by Darrell Toma and Jerry Bouma was commissioned by the Chilliwack Agricultural Commission (a subsidiary of the Chilliwack Economic Partners Corporation, or CEPCO), in cooperation with Community Futures South Fraser (CFSF), the National Research Council of Canada’s Industrial Research Assistance Program (NRC-IRAP), and UFV. It consisted of a review of literature and a series of three focus group meetings with industry stakeholders. The report documents the major trends in the industry and identifies five top growth areas for the Fraser Valley: agri-business & technology; food ingredients and value added foods; sustainable production practices; skilled labor and industry practice change; and rural entrepreneurship & tourism. It calls for the development of a business plan to build a Centre that would meet industry’s training and applied research needs. (A 20-page summary of the report, along with the 95-page full version, is available on UFV’s Public Drive: specify location).

As an initial step, we invite you to familiarize yourself with the report, examine the themes identified by the authors as areas of priority for the development of UFV’s CEA, affirm these (or some of these) priorities and, if you think that the report leaves important themes unaddressed, identify the gaps and provide evidence of why they should be or are important for our region and institution.

We further ask you to suggest *principles* that should guide the development of our programming around the CEA.

We respectfully ask that each Faculty and College Council coordinate this first stage in the process of consultation between October 1 and November 22. We are available, upon invitation, to visit the various Council meetings to help guide, or simply listen to, your discussion of the report. *We further ask that each Council send us a synopsis of its deliberation by November 26.* We will collate the

⁵ An inventory of programs currently offered and planned will be available shortly on the UFV Public drive (H), folder “Centre of Excellence in Agriculture”.

material and present a summary report of all Councils' deliberations to faculty members, via the Councils, by December 2.

2) The second step will consist of a university-wide workshop to be held on December 4, the reading break between the end of classes and the beginning of the exam period. This day was chosen because it does not conflict with scheduled classes or meetings. The day-long workshop will be designed to review the existing educational and research programming that will support the Centre, and outline a realistic plan to expand it based on agreed-upon principles. Because the effort to build the Centre will have to come from the various Faculties, it is important that all be represented. The day will open with a presentation of the feedback received from the Councils and a discussion of the principles on which the Centre should be built. The opening session will be followed by a discussion of educational programming (current and future) before lunch, followed by a review of the research agenda (current and future) in the early afternoon, and will close with participants' suggestions for next steps to be taken in the formulation of a programming plan for the CEA.

Storing and sharing of documents will be done on the UFV's public drive (H, folder "Centre of Excellence in Agriculture"). This memo, along with the short and long version of the Toma and Bouma reports, will be kept there for all to access at their convenience. Documents submitted by the Councils, our summary report of the Councils' deliberations, further information about the December 4 workshop, and other relevant documents will be available on the drive as well.

We hope that you will take advantage of this opportunity to engage in designing what will become a major inter- and multi-disciplinary hub of activities around agriculture, broadly defined.

If you have questions about the process outlined above, please contact us at John.English@ufv.ca and Sylvie.Murray@ufv.ca. Thank you in advance for your participation.

Agri-food Directions to 2020: Trend and Technology Drivers



Research Report- Final

Presented to:

**Chilliwack Agricultural Commission,
CFSF, IRAP, UFV**

Submitted by:

**Toma and Bouma Management Consultants
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April 2013

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Executive Summary

Project Objectives

This project required an assessment of BC agriculture industry needs for applied research and training in the Abbotsford/ Chilliwack region. The objective was to conduct research and validate the top areas by industry consultation in defining directions for a new regional Centre and related research areas for potential UFV programming. To help agriculture and agri-business meet an opportunity, means having science and R&D capacity supplied into the region (from the public and private sector, where ever). Capacity means researchers, labs (wet or dry), contract manufacturing, consulting, technology transfer, production facilities, transportation and storage, venture capital and other resources or services which may be needed. These areas need to be explored more fully.

Findings- Top Growth Areas for the Fraser Valley

Based on the research above and industry experience, the top 5 areas are judged as:

- Agri-business & Technology- agri-business training including marketing, management, quality assurance, food safety management and skilled labor development. It must link to trends in mobility, e-commerce and bundled technologies;
- Food ingredients and Value Added Foods- based on region products. Foods for nutrition and for health- based on dairy, poultry, berries, wines and regional products;
- Sustainable Production Practices - in sustainable production for fruit and vegetable crops, poultry and livestock- processing, community and farm co-location for joint economic, social and environmental goals;
- Skilled Labor and Industry Practice change - in productivity improvement, robotics and automation for creating solutions to scarce labor supply problems. Related areas include: mobility applications/ analytics, technology bundling, equipment and machinery;
- Rural Entrepreneurship & Tourism- including marketing, management, customer service, foods, wine ventures, related beverages and small- scale ventures.

Importantly, the Fraser Valley has a unique climate and landscape which lends itself to agriculture and food production on a sustained basis. It can be developed into a “food destination” for people who are seeking these experiential opportunities and a food production base. The priority growth areas were confirmed in the dialogue sessions.

It can be argued that the top two areas initially may be:

- Agri-business, entrepreneurship and technology;
- Sustainable production practices (focus- crops, livestock).

Given the lack of supports in the above 5 areas, UFV may desire to leverage with UBC and others to access resources in research networks and collaborations. The specific focus and “how-tos” need to be specified with a robust business plan process to build/ attract in funds which now, are not serving the region. A strategic Centre research business plan and shared vision (from trend research, validated by industry) along with joint public- private leadership is required to meet training and applied research interests.

Introduction

The study was commissioned by the Chilliwack Agricultural Commission in cooperation with Community Futures South Fraser (CFSF), NRC-IRAP and the University of the Fraser Valley (UFV). The Chilliwack Agricultural Commission is a subsidiary of the Chilliwack Economic Partners Corporation (CEPCO). These organizations have participated as they recognize an industry need in an agriculture centre and related applied research efforts.

An Agriculture Centre of Excellence would provide research, training as well as repository of knowledge in practice documents (KPD) and best practices, fostering and enabling the continued and accelerated growth in an already efficient, effective, and internationally competitive:

- primary agriculture industry;
- value-added agriculture processing sector; and
- agriculture technology sector.

The activities of the Centre will be driven by industry needs and priorities and focus on delivering practical solutions to technological challenges and opportunities. It is expected that the Centre would become the hub of an inter-regional and international network of scientists and other industry specialist working on similar projects. The very large primary agriculture sector in BC is comprised of 20,000 SME, with \$2.4 billion in gross revenues. It is expected that the between 1,000 and 1,200 greenhouse, nursery, dairy, poultry and berry SME, grossing in excess of \$1.5 billion annually, would be the recipients of direct benefits resulting from this project.

Discussion by these community stakeholders (University, IRAP, CFC, industry) has led to strong interest in assessing the concept of a new applied research Centre at the University. A Centre can help provide a focus for applied research, technology transfer, industry training, student projects, new funding and many other means to support further value added developments. A steering committee of stakeholders and professionals directed the study.

The objective of this study:

- *“The primary objective of this project is to initiate a process to garner industry support for a Centre of Research, Innovation and Education that would provide local firms and other stakeholders with an awareness of the opportunities, new methodologies and challenges around the adoption of innovative technology, services and processes for productivity gains.”*

The scope of the research study was limited to a review of literature and a series of 3 focus group meetings in Abbotsford and Chilliwack with industry stakeholders. The scope was to assess the needs, gaps and interests in an applied research centre and related industry training. We appreciate the guidance and support of Anthony Edgar, Lorne Owen, Kevin Koopmans, John English, Netty Tam and many others. We see many ways to support BC agriculture and food industries.

Sincerely, Darrell Toma, MSc, PAg, CMC

Agriculture Trends and Issues

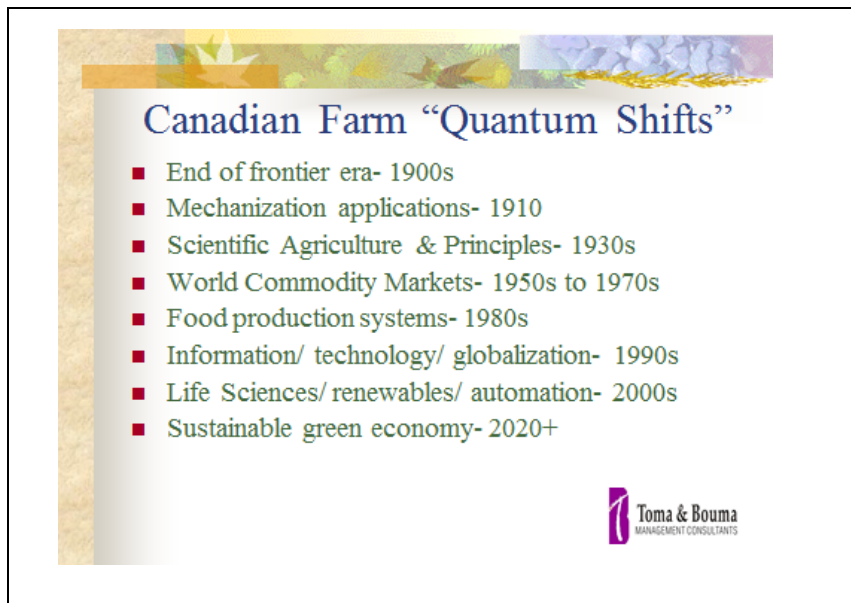
The following trends have been identified in the literature and help provide directions in which research and industry needs are being driven.

Canadian and BC Trends

Canada has a very well developed and respected agri-food sector which is export oriented, highly innovative and reacts to international trends and market opportunities. The next section indicates how the agri-food sector is changing, the key drivers and related reasons for these changes which will continue to affect Canadian farms, land use, productivity, labor and technology deployments.

The major changes in the sector can be viewed within a number of sector transformations since the 1900s as noted in the figure. The emerging trends and past trends are driving many changes which farmers and food company managers need to understand, assess and respond to in view of domestic and international competition.

Figure 1– Major Trends In Agri-food

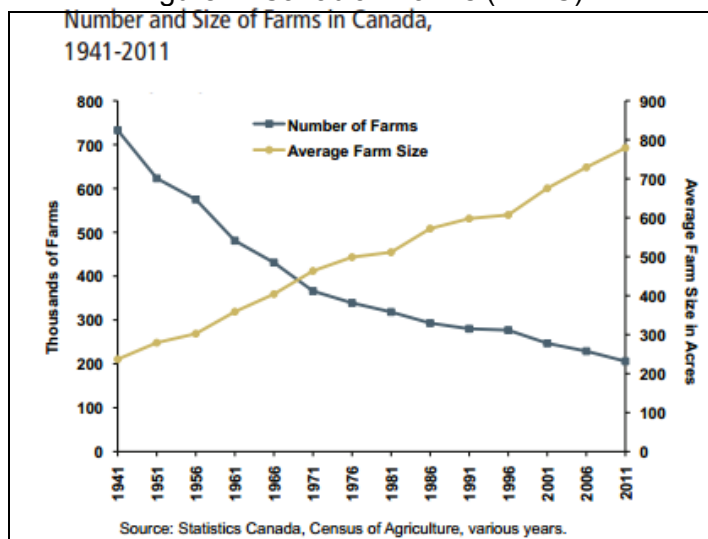


Canadian Farm Numbers Are Declining

Farms are declining in numbers nationally and show some general trends in use of technology and market types. The 2012 census shows nearly half (48.3%) of farm operators were 55 or older, compared to 40.7% of farmers in 2006. The total number of farmers is declining rapidly. As of last year, there were 294,000 farm operators or 10.1% decline since 2006. Of this total, 73% of farmers are male and 27% are female and only 8.2% of operators were younger than 35 years old. Quebec

has the youngest farmers, with an average age of 51 years. British Columbia’s operators had the highest average age at 55.7 years old.^a

Figure 2- Canadian Farms (AAFC)



With technology gains and innovation in the sector, fewer farms and farmers doesn’t mean less production. Some other findings:

- Canada’s agricultural sector has shifted from livestock-based farms to crop-based farms. “Crop production and beef farming have long been the backbone of Canadian agriculture, but the gap between the two has widened,” the census indicates. The share of oilseed and grain farms had grown to 30%, while beef farms had dropped to 18.2% of farms.
- The number of farms in Canada was 205,730 or 10% fewer than in 2006. The number of farms has been declining steadily since 1941. Between 2006 and 2011, the number fell in every province – except Nova Scotia, where it rose 2.9%.
- The average size of Canadian farms increased 6.9% between 2006 and 2011, to 778 acres (from 728 acres, in 2006). BC farms average about 808 acres (327 HA).
- Organic farms represent 1.8% of all farms in Canada, compared with 1.5% in 2006 and 0.9% in 2001;
- The percentage of all farms that were using the internet for farm business increased from 34.9% in 2006 to 55.6% in 2011. In 2011, 44.8% of all farms reported having access to high-speed Internet. In Canada, self-reported access to high-speed Internet on all farms ranged from a low of 40.6% in Quebec to a high of 49.5% in Prince Edward Island.

Canadian Research Agenda Changes

Many other changes have been spurred on in the Canadian agri-food sector in the last 15 years due to trade agreements including:

- Reduction in direct payments to farmers and a shifting to risk management approaches;

^a Agriculture and Agri-food Canada, Overview of Canadian Agriculture and Agri-food, 2013.

- Increased market access to Canada and also into other countries;
- An increased interest in applied research and in basic research commercialization through the federal and provincial governments and with more college level applied research;
- A reduction in direct farm extension services since 1995 by provinces and also by the federal government;
- An increase in private sector consulting especially in agronomy, grain and oilseed marketing, animal health and related extension areas;
- Since 2000, a federal effort to address all agri-food program through Ag Policy Frameworks (1,2) and a more recent Growing Forward program (<http://www4.agr.gc.ca/AAFC-AAC/display-afficher.do?id=1294780620963&lang=eng>). The focus on the 2013 program of \$3 billion (5 year) is on innovation, competitiveness and marketing. One aspect of the innovation theme is on industry lead research in science clusters and in one-off projects. Another them of the innovation area is in demonstration and commercialization. This new national program starts April 1, 2013;
- Canada's agri-food system is very export- oriented. Export opportunities are critical for most of Canadian agriculture and agri-food industries. In 2010, Canada was the fifth-largest exporter and sixth-largest importer of agriculture and agri-food products in the world [with the EU is treated as a bloc], with exports and imports valued at \$35.5 billion and \$28 billion, respectively. Competitiveness of the agriculture and agri-food sector depends on its ability to remain productive, profitable and viable over the long term in relation to relevant markets;
- Consumers are demanding more variety, more convenience, more environmentally-friendly and healthier food choices, as well as food that addresses their values, e.g. organic and halal products, accompanied by proper assurances of quality and safety. Imports also compete for these markets;
- Food development centres have been developed in a number of provinces to help in food product developments such as Leduc Food Development Centre, Saskatoon Food Industry Development Centre, Portage la Prairie, and Guelph Food Technology Centre. These food development centres offer equipment and services to help in new food product development and testing, product improvement and analysis. Some offer an incubator for small startups. (BC does not have a comparable food centre to our knowledge);
- Nationally, Agriculture and Agri-Food Canada has 19 research centres and scientists to work on projects for the agricultural and agri-food sector. BC has two centres at Agassiz (14 scientists, 70 staff, labs) and Summerland (30 scientists and 90 staff) with expertise in crop production, active ingredients, and agronomy;
- Biomass for industrial uses is gaining a stronger focus for Canada. The Canadian Biomass Innovation Network (CBIN) coordinates the Federal Government's interdepartmental research and development (R&D) activities in the area of bioenergy, biofuels, industrial bioproducts and bioprocesses.
- The University of Alberta has a national biorefinery network to address biomass- (<http://www.bcn.ualberta.ca/NetworkMembers/PrincipalInvestigatorsAndCollaborators/DavidBresslerPI.aspx>). Key themes include; bio-processing, conversion methods –thermal, biological and chemical methods. However, these technology platforms are in early stages of research;
- Biofuels are also a new area of support. The regulations (September 1, 2010 in the *Canada Gazette*, Part II) require fuel producers and importers to have an average renewable content of at least 5% based on the volume of gasoline that they produce or import

commencing December 15, 2010. The Regulations also require fuel producers and importers of diesel fuel and heating distillate oil to have an average annual renewable fuel content equal to at least 2% of the volume of diesel fuel and heating distillate oil that they produce and import.

The overview of the Canadian R&D system indicates a regional Federal Government system and provinces also have their own support programs and labs for their needs. An increased emphasis has been placed on biomass uses, biofuels, functional foods and more value added products in the last decade. These are emerging areas and in some cases high risk. In addition, a greater reliance on collaborations with the private sector, building a globally competitive business and increased innovation are key program themes. These topics are explored in more detail later in this report.

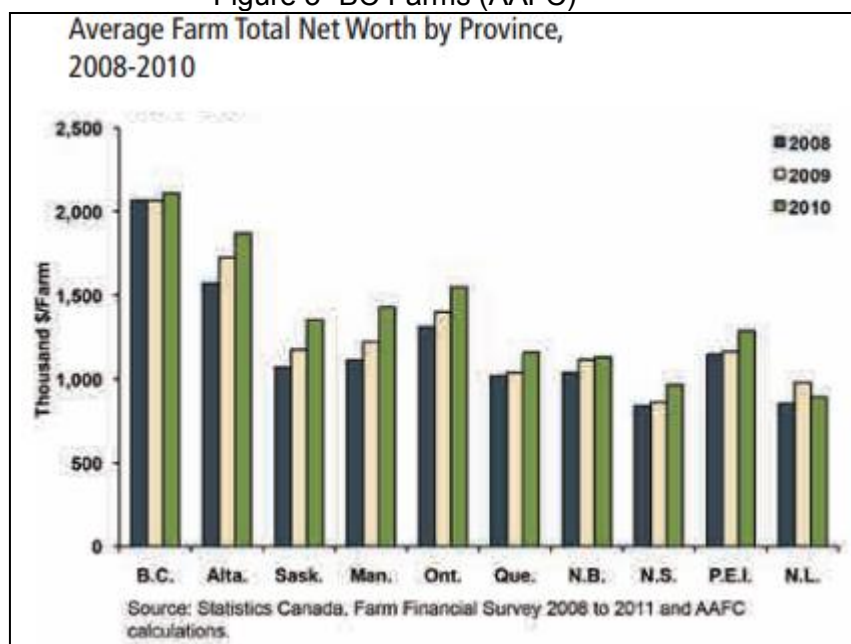
BC Agriculture Trends

BC specific findings include:

- Alfalfa area increased 7.9% to 538,438 acres in 2011 (since 2006, Census) while other tame hay area decreased 12.2% to 411,225 acres. Canola and spring wheat areas both expanded; canola area increased 37.7% to 88,557 acres and spring wheat area increased 50.4% to 81,971 acres;
- Soft fruits are important. Sweet cherry area expanded 30.4% to 4,178 acres and British Columbia accounted for 86.6% of the national sweet cherry area. Special crops are emerging such as blueberries and cranberries. In British Columbia, rapid expansion of high bush blueberry area increased total blueberry area by 76.8% to 20,858 acres. Cranberry area has increased to 6,519 acres in British Columbia, a leading province with a large area of cranberries. British Columbia also reported the largest areas of raspberries and apricots in the country;
- Grape area increased 17.6% to 9,169 acres in 2011 while apple area decreased 12.7% to 9,646 acres;
- British Columbia was ranked third in Canada in field vegetable area, behind Ontario and Quebec. BC reported 16,287 acres (down 5.3%). The largest vegetable crops in British Columbia were sweet corn, beans, and squash and zucchini. Sweet corn area decreased 5.9% to 3,216 acres;
- No-till methods were used on 28.3% of the land prepared for seeding in 2011, up from 19.1%. Conventional tillage decreased to 39.5% of land prepared for seeding, from 54.8% five years earlier. Conservation tillage was used on 32.2% of the land prepared for seeding, compared to 26.1% (2006). In 2010, crop residue was baled from 54,189 acres in British Columbia;
- Greenhouse area increased 4.2% to 59.7 million square feet. Greenhouse vegetables accounted for 30.6 million square feet, and floriculture products another 20.5 million square feet of the total BC greenhouse area. Nursery products accounted for 11,296 acres. These total \$756.6 million in sales;
- Dairy cows increased 1.3% from 2006 to 73,707 head and the number of beef cattle reported for breeding purposes (beef cows and beef heifers) decreased by 26.9% to 229,268 head;
- High-speed internet access was reported by 43.2% of all BC farms (the national average was 44.8%);

- About 32.9% of BC farms reported paid labour in 2010. The Census counted 45,505 paid employees, of whom 29.1% worked year-round in a full or part-time capacity while 70.9% were seasonal or temporary employees;
- The south Fraser valley has many farms. Chilliwack has 828 farms, and agricultural sector annual gross farm receipts of over \$252 million. Dairy farming accounts for almost 50% of all farm revenues in Chilliwack. Agriculture in Chilliwack accounts for 6% of the GDP. The poultry, vegetable and berry production, floriculture and nursery industries play a growing and important role in the regional economy (Agriculture Commission). Abbotsford has about 2,675 farm parcels which includes intensive livestock, pasture and forage, berry crops (raspberry, blueberry, cranberry), field and greenhouse vegetables, nursery and tree, mushroom and other farms (Abbotsford Agriculture Profile).

Figure 3- BC Farms (AAFC)



The BC Agriculture & Food Ministry (2012) has profiled the agri-food sector challenges recently. The primary agriculture and food processing sectors generated \$9.6 billion (2010) with farm cash receipts for primary agriculture estimated at \$2.4 billion. For a range of reasons, the average farm gross receipts in BC are consistently lower than the national average. In 2006, only 10.2% of the province's farms generated about 80% of the provincial gross farm receipts. Commodities generating the largest revenues (2010) included dairy, poultry, floriculture & vegetable greenhouse and beef. The report notes some key climate change issues for BC farms:

- Temperature- to increase by 2020s, more frost free days;
- Precipitation- to increase by 2020s, up to 7% more, snowfall decline;
- Extremes- to increase- by 2020s, hot and less cold weather, more wildfires, rains;
- Hydrology- varies by 2020s, increase runoff, dry conditions, water peaks vary;
- Sea level rise- increase by 2100 in the Delta and at Nanaimo.

The report notes the area will require many actions to help farms and the sector deal with adaptation, monitoring, knowledge- building and new industry approaches for a sustainable system. It is not clear who will deal with this industry change agenda.

The BC Government has prepared an agri-foods strategy which has 3 main goals. The *BC Jobs Plan Agrifoods Strategy* will have three key priorities:

- Focus on high-quality, high-value products;
- Expand domestic and international markets;
- Enhance the agri-foods sector's competitiveness.

The strategy has a target of \$14 billion in revenues by 2017, up from a current \$7.2 billion by more innovation, market expansion and product developments. This increase is a dramatic and aggressive goal. Other ideas include more supply chain developments and value added opportunities, with few specific "how-tos". The proposed foundation actions are to be:

- Ensure a safe food supply;
- Development of Innovative Products & Processes;
- Strengthen Domestic Markets;
- Expand International Markets;
- Grow the BC Advantage;
- Secure a Strong Future for Farming;
- Sustainable Land Base for Production.

For BC applied research interests, the aging of the farm population, concentration of fewer and larger farms and high capital investments means the use of more technology and other labor substitution methods to maintain and increase productivity. The BC farm sector is moving to more specialized crops and high value crops.

The BC Ministry completed a review of food self-reliance (2006) to understand and inform on needs. The report shows the province needs to increase its provincial foods. *"To produce a healthy diet for the projected B.C. population in 2025, farmers will need to have 2.78 million hectares in production of which 281,000 will need access to irrigation. This means that to produce a healthy diet for British Columbians in 2025, given existing production technology, the farmland with access to irrigation will need to increase by 92,000 hectares or 49% over 2005 levels. To maintain the current level of self-reliance through to the year 2025, farmers will need to increase production by 30% over 2001 levels."*

The report helps to set a frame for the local foods issue, which is a recent trend in many jurisdictions, and is explored in more detail later. The table below shows a 48% self-reliance of foods for populations in BC.

The report notes a need to increase productivity from the land base. *"... dairy is concentrated in the Fraser Valley and north Okanagan, and the major production area for small fruits and vegetables is in the Fraser Valley. These regional differences are primarily driven by climate and soil type. Regional production differences need to be considered when evaluating farmland needed to meet the food needs in B.C. For example for B.C. to expand small fruit and vegetable production it will need access to more farmland with irrigation in the Fraser Valley or Vancouver Island."* (pg 13).

Figure 4- BC Food Production (2006, BC Agriculture)

Food Group	B.C. Consumption Million Kg's	B.C. Production Million Kg's	% Self-Reliant
Dairy	1080	617	57%
Meat & Alternatives ¹	467	298	64%
Vegetables - Grown in B.C.	764	331	43%
Fruit - Grown in B.C.	172	273	159%
Grain for Food	315	43	14%
Total - Grown in B.C.	2798	1562	56%
Fruit - Not Grown in B.C.	310		
Vegetables- Not Grown in B.C.	1		
Sugar	136		
Total - B.C.	3245	1562	48%

The report notes that B.C.'s food self-reliance drops even further to 34% of diet needs if considered with Health Canada recommendations- for a higher level of consumption of fruits and vegetables over actual 2001 consumption levels.

Koch reports on BC trends (2011) which reflect the changing industry within a changing society. She notes three key areas for sustainability of the sector and concurs with other researchers:

- Economic;
- Environmental;
- Social.

The economic keys include: capital costs - land, quota, buildings, net farm income, carbon tax, input costs – fuel, fertilizer, feed, labour, public spending on agriculture, alternative energy, carbon as a crop and by-product utilization. The environment areas include: access to land & water, agriculture & wildlife interfaces, environmental regulations, environmental farm planning – BMPs, utilizing by-products and climate change. The social areas include: agriculture's image, rural/ urban interface, animal care, food safety & traceability, BC Young Farmers and food trends. She notes the need for research and extension activities also.

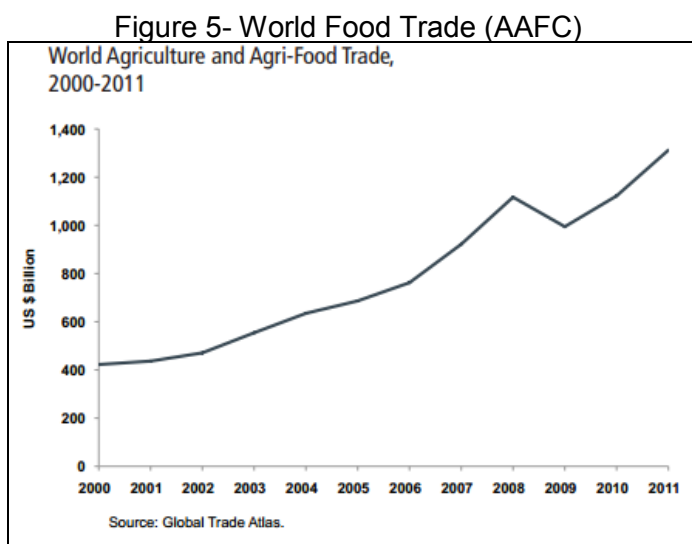
Technology and allied productivity practices are being used more in Canada and need to be considered for the agri-food sector to succeed. Veeman concurs with this productivity conclusion (pg 144 in Alston, 2010) and also indicates the strong linkages of research and development in both livestock and crop production with productivity. Investments in research have led to many productivity increases in Canada and internationally in the agriculture system with a number of country examples (Alston).

Globalization Trend

Canada is a trading nation and agriculture and food industries are generally very integrated to global changes in markets, technology, consumer needs, financing and climate issues. The trend of global effects into Canadian agriculture continues and offers both opportunity and threats. A number of drivers are supporting this trend and are noted below.

Increased Agri-food Trade Through Trade Agreements

Canada has grown as result of demand from global markets for products, commodities and services. Canada has been a member of the WTO (World Trade Organization, previously GATT) since 1945 and has since signed other bi-lateral and multi-lateral trade agreements. Canada has entered into the CUSTA (Canada-USA Trade Agreement, 1988) with the USA and the NAFTA (North American Free Trade Agreement, 1995) with the USA and Mexico. Canada has a trade agreement with Chile (and others), which may be more relevant to BC as they share wine industry commercial and training interests.



The WTO (World Trade Organization, prior GATT) agreement for agriculture was completed in 1994 and a current Doha round is still in process since 2001. The WTO's Agriculture Agreement was negotiated in the 1986–94 Uruguay Round and is a significant first step towards fairer competition and a less distorted sector. WTO member governments agreed to improve market access and reduce trade-distorting subsidies in agriculture. In general, these commitments were phased in over a six years from 1995 (10 years for developing countries). Agriculture is a difficult industry for all countries to address in a global marketplace because of domestic industry, regional historical food shortages and in some cases, the continued high economic impacts and numbers of people employed. (See http://www.wto.org/english/tratop_e/agric_e/agric_e.htm).

Canada is now reviewing a trade agreement with the EU (CETA, expected 2013) which has major possible opportunity and competitive challenges. Canada is also interested in the Trans- Pacific Partnership Agreement which can help secure market access into Asia. Many other agreements are being reviewed and as appropriate, being entered which means both new market access and also new competition. This trend helps to build global opportunity and also means internal productivity and innovation needs to keep up. (See <http://www.international.gc.ca/commerce/index.aspx?view=d>). Canada currently has 6 agreements in process and a number of consultations planned. This trend of more open global access is continuing as China has entered the WTO as a member (2001 after 15 years of negotiating) and

since then has increased its global interests.^b As is expected, some industries gain and some do not after implementing a trade agreement.

In 1988 the Canadian and American Governments negotiated a new Canada-US Free Trade Agreement (CUSTA), which was implemented to increase market access and reduce trade and market barriers. The wine industry was positively impacted by this huge change, as it received transition funds to improve grape quality, and since then it has responded remarkably well. The CUSTA provided the opportunity for growers to remove less desirable vines such as V. labrusca, and French Hybrids that were in production in favor of higher quality grapes which were increasing in demand. The earlier varieties were not suitable for producing the higher quality wines that Canadian consumers and other major global wine markets were demanding. Thus the industry moved to a higher quality product in the transition program (of \$28m).

The wine industry adjusted very well because hybrid regulations and a market focus with quality as a driver helped the wine industry expand. Now the Canadian industry is seen as world class and has won many awards for the VQA wines. The leading vintners in Ontario and BC are supporting the VQA quality program. Consumers can identify high quality wines based on the origin of the grapes. VQA wines, made exclusively from Canadian grapes, must be produced according to well defined standards, and approved by a taste panel to determine if they qualify to carry the VQA logo (CAPI). This is one example of how an industry adapts using research, new varieties and practice change/ technology. (See also Carew on the BC wine industry developments).^c

Msangi (2010) reviews the long term outlook for global agriculture and food in a book chapter. He notes a number of industry drivers which are useful to understand. These drivers range from environmental to socio-economic and from slow- to fast-moving issues which can affect outcomes differently in the short and long terms. Some of the underlying factors driving the long-term trends in food supply and demand have also contributed towards a global food market concern. These trends are driven by both environmental and socio-economic changes, and also agricultural and energy policies.

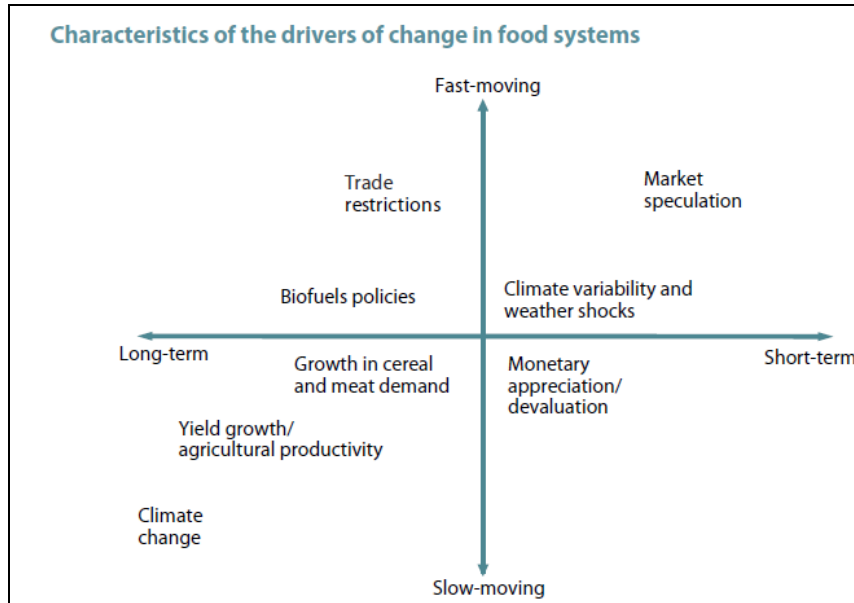
The figures below indicates the industry drivers of change which affect how an industry will get ready for future global markets. Some drivers occur more quickly and some are slower. These factors help to confirm that a clear path or plan will become very important for long term industry responses. The diagrams help to guide decisions into the change process, need for R&D, technology transfer and much knowledge building among many countries. For the BC sector, choices will also need to be made for a sustained and growing agri-food sector. Msangi concurs that populations will be increasing, most new consumers will be urban based and most will require higher quality foods and more meat proteins. Productivity increases will be needed. More research

^b China is now rapidly entering many geographic markets and owns many industries- such as textiles. It is now the top exporter, first in foreign direct investment and the second largest economy. See http://www.wto.org/english/thewto_e/acc_e/s7lu_e.pdf

^c Carew R et al, (2012), Wine Industry Developments in the Pacific Northwest: A Comparative Analysis of British Columbia, Washington State and Oregon. "The expansion of the wine industry in British Columbia has been driven by increased competition resulting from the enactment of the Canada-US Free Trade Agreement in the late 1980s. In contrast, the grape and wine industries of Washington State and Oregon have expanded in response to global market trends in consumers changing life styles and wine preferences."

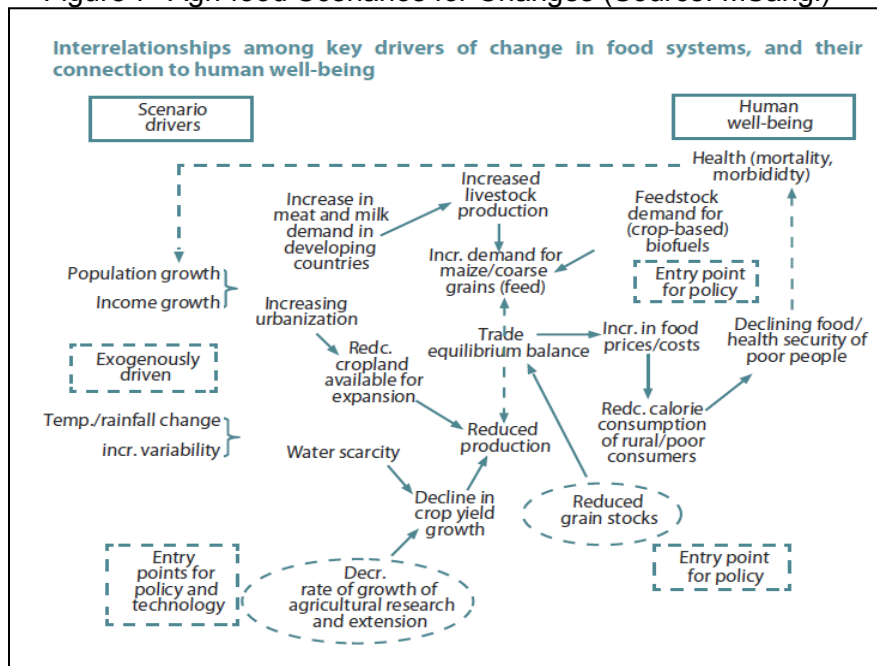
will be needed in all countries and yield gains/ new product will be needed to meet the global food needs (p 64).

Figure 6- Agri-food Drivers for Changes (Source: MSangi)



The scenario figure below helps to provide a system wide view of the drivers into a food system which is locally based, responsive to global trends, consumer desires and the economics of a production and marketing approach. The reference to crop yields and R&D gaps is important.

Figure 7- Agri-food Scenarios for Changes (Source: MSangi)



Bruinsma (FAO) completed a major global review of production, consumption and the many factors which will be important for populations in the world to 2030. The role of research and technology developments will become more important for addressing all production and yield improvement needs. *“It will need also to come from countries and agro-ecologies where such potential is very limited. This requires continued support to agricultural research to develop improved varieties for such environments (including those coming from modern biotechnology).”* (p 16). The need for strategic research will be very important, especially now given the budget issues that face many governments.

“The research agenda for the future will be more comprehensive and complex than in the past because the resource base of agriculture and the wider environment are so much more stretched today compared with the past. Research must increasingly integrate current advances in the molecular sciences, in biotechnology and in plant and pest ecology with a more fundamental understanding of plant and animal production in the context of optimizing soil, water and nutrient use efficiencies and synergies. Effective exploitation of advances in information and communication technology will be necessary not only to facilitate interactions across this broad spectrum of scientific disciplines but also to document and integrate traditional wisdom and knowledge in the planning of the research agenda and to disseminate the research results more widely.”

Some of the broad global trends in global livestock production and trade are notable:

- The increasing importance of monogastric livestock species compared with ruminants, together with a shift towards increased use of cereal-based concentrate feeds;
- A change, depending on the region, from many production objectives to more specialized intensive meat, milk and egg production within an integrated global food and feed market.
- A trend for intensive livestock production to grow faster than mixed farming systems and, even more, from grazing. Also, the increase in large-scale, industrial production with high livestock densities near human population centres brings with it environmental and public health risks, as well as livestock disease hazards.
- World livestock production will originate in warm, humid and more disease-prone environments and animal health and food safety issues will increase. Further, these developments will also have growing role of trade in both live animals, products and feeds;
- Increasing pressure on, and competition for, common property resources, such as grazing and water resources, greater stresses on fragile extensive pastoral areas and more pressure on land in areas with very high population densities and near urban centres.

“The challenge facing humanity is how to produce the quantum increases of food in sustainable ways (preserving the productive potential of the resource) while keeping adverse effects on the wider environment within acceptable limits.” (p 24).

It is interesting to note the FAO report comment on a future focused research agenda, which still seems to apply today.

“To meet the food security needs of an expanding global population in the decades ahead and to reduce poverty, there is a need to maintain and increase significantly agricultural productivity on land at present available across the developing world and at the same time to conserve the natural resource base. This will require (i) increasing productivity of the most important food crops both on

the more fertile soils and on marginal lands; (ii) exploring possibilities for limiting the use of chemical inputs and substituting these inputs with biologically based inputs; (iii) more precise use of soil, water and nutrients in optimized integrated management systems; and (iv) increasing production efficiency and disease tolerance in livestock. These challenges call for a comprehensive and complex research agenda that must integrate current advances in the molecular sciences, biotechnology and plant and pest ecology with a more fundamental understanding of plant and animal production in the context of optimizing soil, water and nutrient-use efficiencies and synergies. Effective exploitation of advances in information and communication technology will be necessary not only to facilitate the necessary interactions across this broad spectrum of scientific disciplines but also to document and integrate traditional wisdom and knowledge in the planning of the research agenda and to disseminate the research results more widely. This agenda calls for a three-dimensional research paradigm that integrates scientific investigation across genetics and biotechnology, ecology and natural resources and not least socio-economics.” (p 328).

Investing In Agriculture- Foreign Direct Investments

Another trend which is being seen is global investing and new financial flows of capital across borders in a non-transparent manner. This trend will accelerate in the next ten years.

“Globalization refers to the ongoing process of rapid global economic integration facilitated by lower transaction costs and lower barriers to movements in capital and goods.” (Bruinsma)

The first wave in this global trade started in the late 1850s with the use of steamships, ability to move ag commodities easily and the use of communication. Shortly after the first world war a number of countries implemented tariffs to protect their domestic industry which reduced trade (Bruinsma). The next wave of global trade was from 1945 to 1980 after the second world war. For developed countries, the second wave was a spectacular success as tariffs were reduced and trade greatly expanded the exchange of goods. International specialization within manufacturing became important, allowing scale economies to be develop and helped to drive up the incomes of the developed countries relative to the rest of the world. The current wave has been stimulated since 1980. Similar to the first wave about a hundred years earlier, more global links were brought about by a combination of lower trade barriers and numerous technological innovations that reduced barriers, reduced transaction costs for movements of goods and even people and capital.

A recent area of global trade and interest is investing in agriculture. For example, Sprott Commodities (Toronto) has even started a fund with farmland in western Canada (One Earth Farm). Investors are seeking agriculture and food production areas for growth and security.

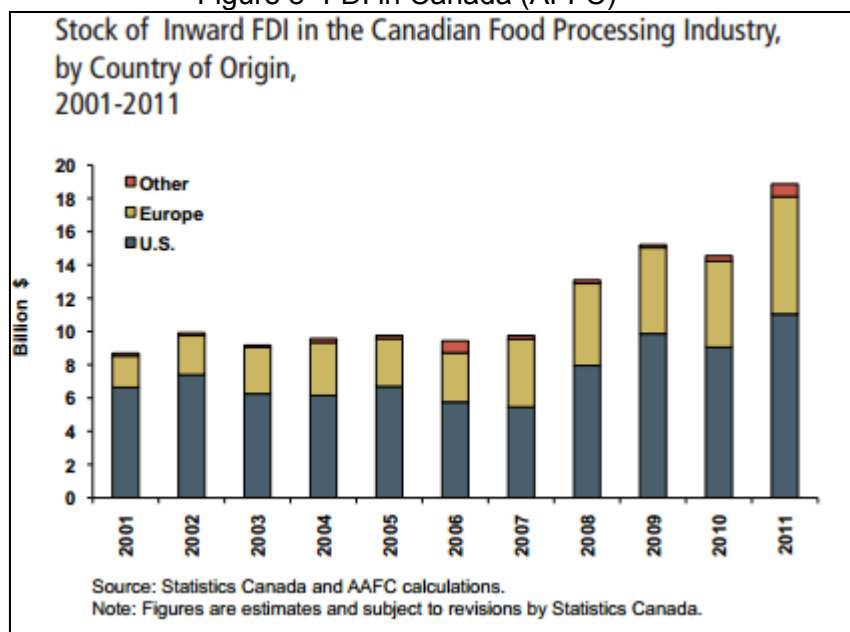
Sovereign wealth funds and capital flows are increasing in the world and impacts many industries including agriculture. The rise of sovereign wealth funds globally of more than \$11 trillion US, continues to grow allowing 40 countries (including Canada) to actively buy assets, resources and intellectual property. This new funding approach gives an edge to develop value-added businesses and leapfrog competitor industries. Main fund sources include China, Middle Eastern countries, Korea, Taiwan, Japan, India and Russia. Other investors include pension funds which also seek higher global returns in a domestic flat growth outlook.

Globally, foreign direct investment in farmland, food businesses and resource sectors is under scrutiny. It is difficult for developing countries and domestic business to compete with this novel approach of stealth investing to secure limited global resources. (See http://en.wikipedia.org/wiki/Sovereign_wealth_fund). This increase in these types of funds is allowing nations to enter commercial industries and resource sectors, including agriculture to acquire lands and businesses.

The Federal Reserve Bank (2010) indicated that farms will continue to grow in size over time and require larger amounts of capital and technology. A recent allied trend is in control of technology packages. *“This intensified knowledge approach to agribusinesses is where many U.S. agribusinesses have critical control of genetics, R&D and proprietary knowledge. It is these inputs that the foreign agribusinesses and producers are looking to attract in joint partnerships or foreign direct investment”.*

The outlook for global agricultural finance is strong and very positive. Most of the population and economic growth will primarily occur outside developed economies. Developing countries will generate enormous demand growth both for more food and higher quality food and technology. Foreign direct investment (FDI) is increasing globally and the figure shows FDI for Canada in food.

Figure 8- FDI in Canada (AFFC)



A parallel trend can be seen with FDI in the movement of technology. *“In the case of agricultural commodities, they involve fantastically brilliant “embedded” technologies. The embedded technologies involve genetics, mechanization, automation, chemical, managerial and financial transactions that are astonishingly complex. All of these complex embedded technologies involve capital (human or financial) of one sort or another. All these “commodities” get moved around the global, and the embedded capital moves with them.”* (FRB, p 4-13). It is expected that this trend of capital and technology will continue.

Food Safety, Animal and Human Health and Environment Risks

Over the past decade, food safety has become one of the leading issues for both producers and processors. In the UK, BSE was found to affect people negatively and several people died from eating red meat. In the USA, a Jack in the Box restaurant had several people die from hamburgers. In Canada, a BSE event in 2004 cost about \$4 billion or more to the economy and cattle were banned from exports to many countries including the USA, Japan, Korea and others. In 2008, listeria-tainted meat scandal (ON, Maple Leaf Foods) caused a number of deaths. An Avian flu event in BC caused a number of farms to be de-populated for fear of disease moving into the human population.

As a result of these types of events, the public has become increasingly aware of the impact of both production and processing practices on food safety and quality. Not only are they concerned about food contamination during production and processing, they also want answers about the health effects of the food production practices that include the use of chemicals such as growth hormones or stimulants to increase production, antibiotics and other medicines to manage animal diseases, agents such as ammonia to control the contamination of food by e-coli and other bacteria, and pesticides and other chemicals used in the production of animal feed.

The public is also demanding a lighter environmental “footprint” from the farming sector. Several high-profile cases of human illness have been traced to the contamination of the water table and soil through the disposal of manure. The impact of methane from cattle on air quality and climate change has moved to serious public debate. Other issues include the safe handling and disposal of animal parts (of diseased animals, as well as from slaughtering facilities) and the proper handling of food products, such as milk and eggs, on the farms where they are produced as well as during transport to collection and processing facilities.

Closely linked to concerns about human health, food safety and environmental issues is the persistent voice of animal welfare and even with human health. They continue to be concerned about the nature and quality of animal feed, and the conditions under which animals are managed (e.g. overcrowding, cleanliness, air quality, handling, transportation, and slaughtering, etc.). A dairy training program was developed on dairy cow joints.^d Like consumer groups, they question the use of genetics and other forms of bioengineering to alter animals to enhance productivity or to facilitate specific animal management practices. (Note: The Calgary Co-op recently passed a member resolution to buy eggs only from farms with adequate cage sizes for poultry and hogs, Calgary Herald, March 12, 2013. Physicians (Ontario) have recently commented that antibiotics in animal production are a big human health concern, National Post, March 20, 2013).

Under the last WTO agreement (1995), agriculture as part of the agreement, had member Countries agree to conduct further work on SPS issues (sanitary and phyto-sanitary) which will help reduce trade barriers and increase standards. Currently, this SPS topic is one that can be used quickly by a country to stop shipments, as was done with BSE in Alberta cattle. It is

^d De Passille A et al, (2012) A training programme to ensure high repeatability of injury scoring of dairy cows “We developed a training program to train observers to score injuries of the tarsal joint, carpal joint and neck on dairy cows. This training program can be used as a model to successfully train on-farm assessors.”

informative to review three recent events that impacted the Canadian beef and meat industry respond to food safety concerns and domestic and international market needs.

In 2003, the Canadian beef industry experienced a huge setback in which several cows with a condition known as BSE were identified and cost CND\$4 billion.^e In 2008, Maple Leaf Foods experienced a listeria contamination in a plant which caused a reported 20 deaths and over 50 illness cases.^f In BC an outbreak of Avian flu caused the elimination of 42 farm flocks in a pre-emptive decision, costing \$65 million.^g All of these events were managed in cooperation with the affected farms and processing companies under appropriate national food safety regulations. They were all directed by risk management approaches in food products in order to maintain consumer confidence, report in a transparent manner, and respond quickly to an event; under the meat inspection regulations act in a coordinated manner to contain and respond appropriately

Environmental farm plans (EFP) are a recent preventive approach. They are used and understood in the agriculture sector as a way to identify and manage potential risks related to an event occurring on farm land. In Canada, EFPs are a common method for addressing the environmental issue from a “risk” point of view. By 2006, it had been reported that about 15,630 Canadian farms (of over 205,000 total) had an environmental farm plan (APF Review Panel). Given the nation has many more farms, the uptake was in the order of 7% but generally is used by livestock and nearby urban farms. Recent reports indicate a higher level in the order of 50% of all farms having an environmental farm plan (AAFC). Various provincial organizations have the mandate to provide farmers with tools, education and advice on creating a plan and in implementing that plan for the benefit of the farm, the industry and the community.

Most of the plans have likely been completed for intensive livestock operations like feedlots, dairy, chicken and hog farms. No data split is apparent on the farm types, but it is likely that more livestock and mixed farms than crop farms have completed an environmental farm plan. The EFP rewards participation and is voluntary in Canada, using a peer review approach. The next steps will need to develop an audit and compliance model against the plan. Other related research is needed in manure management and livestock.^h

Interestingly, a recent international survey of competitor countries indicates the use of environmental farm plans has several purposes (Freeman, 2006):

- Human safety- on risks of storage, handling and application of pesticides;
- Food animal safety- for safe storage and use of pesticides;
- Water safety- from nitrogen and phosphate runoff;

^e Leroy et al, The Losses in the Beef Sector In Canada from BSE, CATPRN, 2006

^f CFIA, Lessons Learned: The Canadian Food Inspection Agency's Recall Response to the 2008 Listeriosis Outbreak, August, 2009

^g Serecon, Linkages: Considerations in Maintaining Markets for Large and Small Poultry Operations, for FAO, November, 2006. Pg. 8

^h Carew R (2010), Ammonia Emissions from Livestock Industries in Canada: Feasibility of Abatement Strategies, indicates “*Future research is required to evaluate the feasibility of biofilters and feces/urine separation methods. Livestock NH₃ emissions are higher in areas characterized by intensive livestock production with diet manipulation and land spreading offering the greatest potential for NH₃ abatement options.*”

- Crop safety- in reduction and elimination of residue risks in crops;
- Crop productivity- optimal use of nutrients for crop needs;
- Environmental stewardship- maintaining and enhancing farm reputations;
- Sustainable agriculture- integrating environmental health, economic profitability and social and economic equity.

The countries surveyed included Australia, Ukraine, Argentina and Brazil (Freeman 2006). It is interesting that the countries surveyed do not employ the same planning model as in Canada. In Brazil which is a major poultry producer, no system exists for an EFP and the key issues are land use, fertilizer overuse and watershed protection. Australia has a more recent program to deal with agriculture and environmental aspects, called “Signposts for Australian Agriculture Framework”. The project is a partnership among R&D corporations, Governments and the National Land & Water resources Audit. It has developed profiles for beef, grain, dairy and horticulture industries.

As a result of this rapid response to food safety issues and consumer concerns, a number of new business practices have emerged to address the idea of bio-security at a farm level. Many farms now do not allow direct access to visitors and a number of controls are in place. Food safety has become a priority focus for companies and government and will continue to be an important issue. On-farm food safety systems and production methods are used to prevent and contain any unplanned events. New food safety protocols have been implemented and traceability, monitoring and surveillance, on-farm food safety systems, a bio-security policy and restricting farm visitors was rapidly adopted in the industry. A driver to this implementation was the consumer fear to human health and the supply chain need to reduce the risk of such an event in the future.

Natural resources including water, land and air are key aspects in agriculture, especially in resource scarce areas. The OECD (2012) noted the role of water quality and agriculture as a key issue in many countries. Trends that are noted include (p 12):

- Water pollutants from agriculture include runoff and leaching into water systems from using and disposing of nutrients (inorganic fertilisers and livestock manure) and pesticides, soil sediments, and other contaminants (e.g. veterinary products);
- Quality is other stable or declining. While the current situation varies both within and across OECD countries, agriculture is often the main source of water pollution[
- There has been an overall increase in the uptake of farm management practices and systems beneficial to a large extent encouraged by recent policy changes;
- The overall economic, environmental and social costs of water pollution caused by agriculture across OECD countries are likely to exceed billions of dollars annually;
- The outlook over the next ten years for agriculture and water quality suggests that the growth and intensification of agricultural production in North America, Turkey, Korea, Australia and New Zealand, could further heighten regional pressures on water systems;
- The future consequences of climate change for agriculture and water quality linkages are complex. The area is not well researched.

Local Foods and Urban Agriculture

Local food production, a greater reliance on community gardens, the 100 mile diet and urban agriculture have become recent interests by communities and consumers in better understanding

where food comes from, how it is produced and in developing the “trust” issue better. Local food production is concerned with consumers having access to agriculture products which can be produced and consumed locally. The best products for this application involve: vegetables, fruits, eggs, poultry, dairy products and similar items.

Figure 8- Local Foods



MetroVancouver completed a regional food system strategy (2011) to help inform and understand the food needs, suppliers and longer term issues. The macro goal *“A sustainable food system meets the needs of the present generation without compromising the ability of future residents to meet their needs. Accomplishing this will require protecting and conserving the region’s rich ecological legacy while taking actions that provide for ongoing profitability in the food sector, support healthier eating habits and address inequities in food access. Healthy, functioning ecosystems are essential for the on-going provision of food from land and sea as well as a wealth of other natural goods and services we all depend on.”* (p 4). The idea of a food system strategy has been developed in the USA (such as CA or Ohio) and in some Canadian cities (for example, Edmonton, Calgary).

Understanding the issues, roles and responsibilities in the local food system is not easily reconciled in a global food system. *“These include issues like disparities in food access, loss of prime farmland, food safety, and degradation of fish habitat. Other groups that influence the food system include professional associations, non-governmental organizations, community groups, educational institutions and the media. Understanding the functions of the food system and the roles of various groups is essential for determining the best avenues for building a sustainable, resilient and healthy regional food system.”* (p 7).

A number of ways to meet these new emerging trends for local foods including:

- Using local farmer markets for products;
- Local and community gardens on unused urban lands;
- Incorporating land use zoning and enabling regulations (urban chickens);
- Internet marketing with local farmers in economic development agencies;
- Teaching people how to cook food, defining healthy foods and diet counselling;
- Buy local food procurement policy by retail stores and restaurants;
- Promoting local farm tours and pick your own products.

More of these products will be needed but market penetration will be tempered with global food supply chains which do an effective job of meeting many consumer group's product requirements, safely and on a timely basis. Local foods which are not processed (raw) need to be handled carefully with rural water and to avoid food safety issues as one researcher suggests.ⁱ

Related to this emerging need are the concerns for animal welfare, production practices and ability to know your farm food sources via a retailer. In the UK and EU, this is a common practice and in part due to a greater use of traceability systems and smaller farm sizes. For Canada, it is more difficult given an integrated North American market for foods and a lack of regulations

Biotechnology and Yield Improvements

Biotechnology and the use of new lab techniques to identify, extract and use specific genes is being used to help overcome certain problems in a species. Some developments have led to yield improvements, resistance to pests and addition of missing elements- generally for purpose designed improvements. Biotechnology has been defined as a "*combination of advances in molecular and cellular biology, plant, animal and human genetics and how the human immune system fights disease.*" (Biotechnology Industry Organization, Washington, DC). Biotechnology developments can involve diverse skill sets, equipment and labs, applications, and analysis to develop new processes, inputs, products and technologies for a breadth of markets.

Traditional breed selection practices interestingly, are also seeing a trend of maintaining the "old ways"- such as using heritage breeds in poultry to maintain genetic diversity. For example, the University of Alberta has a Poultry Research Centre which has fostered both broiler breeder research and also maintains a heritage poultry species (See <http://www.poultryresearchcentre.com/>). In some ways, the organic movement is also a reaction to this biotech and local foods trend.

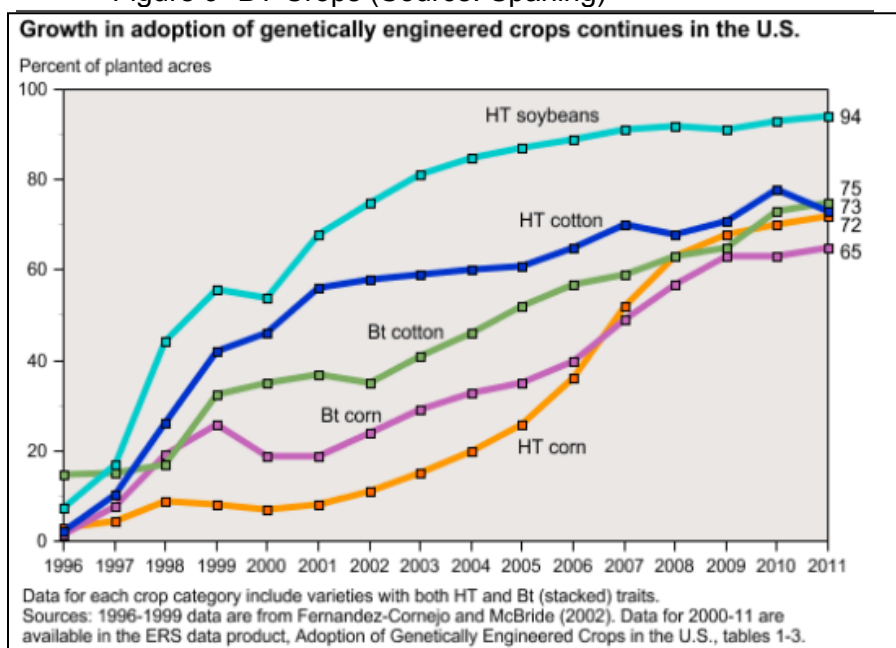
Many related scientific discoveries are occurring in agriculture, food and health segments. The developments are generally viewed as clusters of scientific activities (early stage) moving to market ready products. Biotechnology in agriculture is well recognized and accepted in crops but less so in livestock. The University of Saskatchewan and others at Innovation Place in Saskatoon have been seen as a biotech (crop) centre in Canada. This segment is an emerging area and offers many opportunities and challenges for the agriculture sector and for society, especially in difficult ethical issues.

Golden rice has been developed for low income countries and provides a source of vitamin A for human health benefit- less deaths. The lives of 25% of many poor children can be spared by providing them with diets that included crops biofortified with provitamin A (beta-carotene) and zinc. *Golden Rice* grains are easily recognized by their yellow to orange colour. The stronger the colour the more β -carotene. While a yellow rice is still unfamiliar to most, it is hoped that the pleasant yellow colour will help promote its adoption. (See <http://www.goldenrice.org/>).

ⁱ Delequis P. et al, (2010) A Framework for Developing Research Protocols for Evaluation of Microbial Hazards and Controls during Production That Pertain to the Quality of Agricultural Water Contacting Fresh Produce That May Be Consumed Raw.

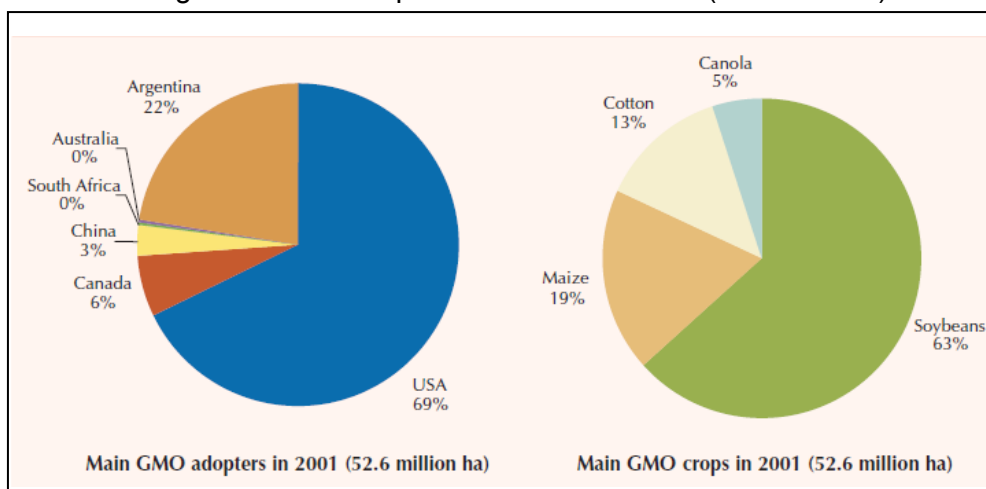
Some very interesting and beneficial crop products have been developed by global life science companies. BT corn, wheat and soybeans have been developed and are used by farmers. The chart below (reported by Sparling) shows the trend in BT crops is increasing rapidly.

Figure 9- BT Crops (Source: Sparling)



The FAO shows the adoption of BT crops is growing and meets many different country needs.

Figure 10- GM Crops in Several Countries (Source FAO)



The benefits of BT crops can also be seen in using less chemicals on lands. BT crops are insect resistant. "For example, the use of Bt cotton has reduced the use of traditional insecticides by 207,900,000 lbs of active ingredient of insecticide and resulted in a 24% benefit to the

environment, as well as reduced pesticide poisoning to humans (Brookes and Barfoot, 2006).” (Shelton)

The trend of biotech will continue to grow and fits within the theme of a life sciences trend that meets consumer desires for meeting various aspects of market demand, notwithstanding a continued debate on applications. Some applications will involve purpose designed crops.

Value added Products

Higher quality food products and value added foods and related products are a goal for all jurisdictions and part of the national agri-food agenda. As incomes rise, people desire higher quality goods and Canada has many raw agriculture goods which can easily fit into this category. Value added products are a global trend in the agriculture and food industry.

Some examples in the BC South Fraser Valley give ideas into potentials. Sandel Foods for example prepares fruit and berry products into high value apple pie fillings, fruit glaces and other ingredients for seasonal meals. The valley has over 20 value added food processors with varied products including egg, wines, berries, meats, dairy and other smaller scale opportunities. Carew argues more berry crop variety and crop management research is needed.^j

Value added food products develop in a variety of ways:

- Entrepreneurial efforts in a new jam, jelly, baked product or a new combining of ingredients;
- Research which demonstrates efficacy and utility with an ingredient in a current product;
- Developing a new product form (eg. meal replacement food bars);
- Adapting an international food product into a domestic niche (eg. tacos, salsa).

As noted above, a national network of Canadian food development centres has been developed to assist in regional food product development issues from research, formulation, packaging to testing, labeling and other areas. BCIT (Burnaby) does some of this work with food processors.

Value added foods can include many types such as:

- Meat and grain snacks and products;
- Vegetable and fruits;
- Baked and processed foods;
- Wines, beer and beverages;
- Ingredients into food products.

^j Carew R et al, (2009) Developments in Raspberry Production, Cultivar Releases, and Intellectual Property Rights: A Comparative Study of British Columbia and Washington State, “*Raspberry research in BC has concentrated its efforts in developing improved cultivars with little research on the effects of management practices on fruit yields. The development of improved cultivars in the PNW has relied on conventional or classical breeding approaches. With reduced public support for raspberry breeding research in the PNW, breeding programs rely more heavily on support from industry associations.*”

Figure 11- Value Added Foods- commodities

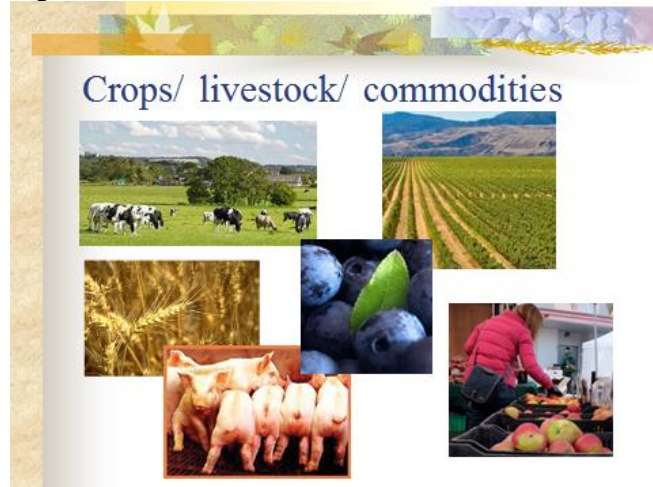


Figure 12- Value Added Foods- niche



Some of the barriers to the value added food trend need to be understood:

- Municipal and provincial regulations affect production facilities and regional markets;
- Food labels, and in some cases need for evidence (functional foods);
- For meats, special CFIA regulations need to be met, and for interprovincial and international trade, need a federally inspected plant (higher costs);
- Accessing a retail or HRI marketplace in a sustainable manner is difficult, competitive and expensive for listing allowances and advertising

Quebec has developed an Artisan cheese industry which links to rural community culture and farms. This is a niche food example which has been embraced by the retail segment. ^k This is a regional food cluster example and more can be done in this fashion.

^k See <http://www.metro.ca/produits-quebec/fromages-du-quebec.en.html>

CAPI (2011) prepared a report on the destination for the Canadian agri-food system based on trends, needs and current sector performance. The report highlights a number of issues for industry change to remain competitive:

- Canada needs a compelling food plan that is systems-based;
- Centre for food systems- a new partnership among industry, government and the health community to inspire, engage and inform food systems;
- innovation centres- industry-led and co-funded centres on every facet of developing innovative products, coordinate “pre-competitive” data and R&D opportunities;
- food system risk management;
- sustainability- standard and sustainable farm plans for responsible practices across food systems; adaptation of beneficial practices, leveraging science and technology;
- regulatory- regulatory process creates the optimum environment for success, while protecting consumers.

The report concurs on the trend for global competition and sector adaptation and use of better practices and technology to ensure Canada’s position in the world. Value added foods should be a focus in the Fraser Valley region and Canada.

Renewables- Bio-Products, Bio-Energy and Bio-Mass

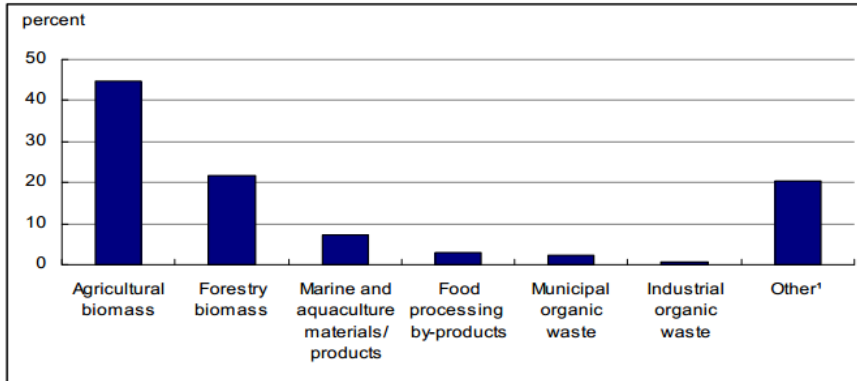
Renewables and bio-products are a national and global trend which is developing. The topics of new products from bio-materials derived from agriculture, forestry and other sources are an area of research and development. Bio-based materials include agri-fibre applications for papers, boards, composite materials and other related items. Bio-chemicals involve developing polymers and monomers for bio-cosmetics, bio-plastics and bio-lubricants. Bio-energy involves uses of municipal solid waste, forest wastes and slaughter plant wastes and manure for co-generation of heat and power. In addition, wind power can be considered a bio-energy application.

Other countries (USA, Japan, EU) are in the process of creating new approaches, products, strategies and investments towards a transition *from the fossil carbon- based economy to a renewable carbon-based economy* and industries. Globally, we have limited fossil carbon supplies, global populations are increasing and renewable materials are needed.

The industry is increasing in Canada with a growth trend from 2003 to 2006 and beyond. The major biomass source is from agriculture. Benefits of using bioproducts (Sparling) are rated as:

- Reduced damage to environment and greener products;
- Reduced production costs;
- Develop new markets and new products;
- Increased market share;
- Improved product value and performance.

Figure 13- Canadian Biomass Used by Source (Sparling, 2009)



Bio-based materials include two main product areas:

- bio-composites, fibreboards and specialty paper products from non-wood supplies for consumer, auto and building product applications;
- bio-polymers and bio-plastics for industrial and consumer applications.

Bio-Composites

Bio-composites include the use of crop materials in related composite products (combining 2 or more materials into a new superior one). It includes potential uses of crop fibres in auto parts such as molded components (dashboard, casings, recycled newsprint in packaging) and car doors. The use of non-wood fibres has increased since 1975 with about 50 or more countries making non-wood pulps. Examples of feedstock for a new specialty paper industry are Bagasse and Kenaf. Bagasse fibres (sugar cane) offer potentials in papers, boards, newsprint, panelboard and other products. In Canada, some agri-fibre board plants have been attempted in Manitoba (Eli- one owned by Dow), Saskatchewan and Alberta (one now converted to wood products, others have failed). The picture below shows some of the Dow product from Manitoba. It is used for cabinets and was about \$12 per sheet at the Home Depot stores. We understand it is now shut-down.

Figure 14- Dow Cereal Straw Fibre Board



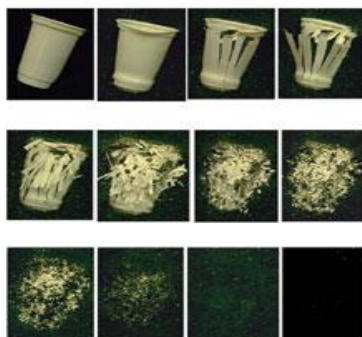
Bio-Polymers

Bio-polymers are polymers (chemical) which can be derived from agricultural biomass for use in advanced materials which have utility and biodegradable characteristics. Crops offer new product

opportunities through cellulose, hemicellulose, lignin, protein and starch components. Specific chemical functionality can be identified, extracted and converted into new industrial uses. By weight, the largest component of crops is the lignocellulosic material, which through conversion processes, can be converted into natural stable polymers. These polymers can be used in turn as bio-polymers to create new unique materials for packaging, plastics, and many other materials.

Bio-polymers are being researched for bio-plastics applications using plant oils as the feedstock. One plant of this type has been built (2001) in the USA for processing corn oil into polylactic acid (PLA) for use as a biodegradable feedstock. However, it is also a highly expensive and long-term applied research investment area. PLA used in these bioproducts are made at the Cargill plant in Blair, Nebraska. Produced under the brand name NatureWorks™, the applications for PLA-based products are diverse, from thermoformed food containers, compostable plastic cups, comforters stuffed with PLA-based fibers, and fibers for non-wovens and textiles.

Figure 15- PLA Products (Cargill)



Bio-Energy

Bio-energy is another product opportunity and trend which offers potential for regions with biomass. Markets for bio-energy products include:

- Bio-lubricants;
- Bio-gas co-generation;
- bio-diesel and bio-fuels.

Bio-Lubricants

Bio-lubricants are degradable oils derived from agriculture materials and can be safely used in a sensitive environment such as forestry, wildlife, public parks, mountains, fish habitats and similar areas. Typically these will be sourced from a vegetable oil product such as soybean, canola and corn. These types of products are in the early product introduction stage in the USA and account for less than 1% of the industrial lubricant markets. The uses will be for lubricating engines and parts, hydraulic fluids and total loss oils (eg, chainsaws).

Bio-Gas

Bio-gas is a well- accepted technology platform in the EU and the USA and provides for heat and power products from natural biomass sources. Co-generation of electrical power and heat from agriculture and forestry residuals is emerging in the province. Markets are seeking power from alternative sources, which includes waste residuals. This is also driven from the GHG agenda and from a need for renewable sources of energy for increasing demand and higher prices.

Use of ag waste materials and slaughter plant and food plant wastes are ideal. Some technology developments have occurred in collecting biogas from landfills (Edmonton), dairy and hog farms and a more technically advanced manure compostor. AITF (Alberta Innovates Technology Futures, was Alberta Research Council) developed a technology platform (IMUS- Integrated Manure Utilization System) which may provide a commercial solution for global uses in intensive livestock and biomass applications. It is now owned by Highmark Renewables (Vegreville).

Figure 16- IMUS plant (Highmark)



The IMUS investment initially was over \$8 million (and increased) and generates 3 MW of power from a feedlot of 24,000 head of beef cattle. The plant is scalable and is in piloting phase. It is a patented technology and is operating. See www.highmark.ca. It has two tanks for generating the methane gas (3-4 days) which is collected for burning in a Genset engine to generate electricity which is then used or sold into the power grid. Sales are timed to meet the higher priced daily electricity demands in the system. (British Columbia Anaerobic Digestion Benchmark Study evaluated the feasibility of developing on farm anaerobic digestion (AD) systems at 12 agricultural sites.)

Bio-diesel and Ethanol

Biodiesel is another bio-energy choice which is renewable. It was first used in 1900, with a Rudolf Diesel engine which burned peanut oil at the World's Fair in Paris. In World War II, Brazil, Argentina, China and India used vegetable oils due to shortages. In the USA- 1998- a bill was passed to encourage use of biodiesel, with estimated savings to the government by developing a new biomass energy source.

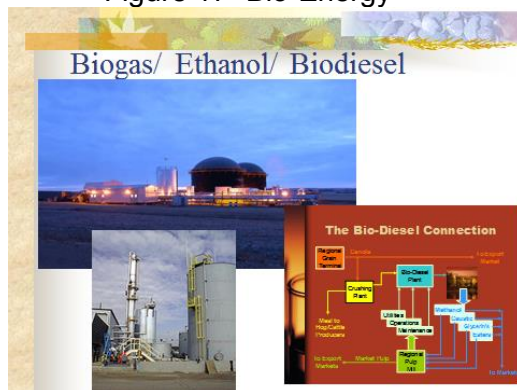
In 1998, the USA DOE (Department of Energy) designated neat (100 percent) bio-diesel, or B100, as an alternative fuel and established a credit program for bio-diesel use. Bio-diesel is an ester-based fuel oxygenate derived from renewable resources (e.g., soybeans, rapeseed, peanuts and other vegetable oils, such as used cooking oil, as well as animal waste, such as beef tallow). Bio-diesel can be used in pure form (100 percent bio-diesel) or blended in any ratio with petroleum diesel (petrodiesel) for use in compression-ignition (diesel) engines.

Two keys influence ethanol (for gas engines) production- the technology base and the supply of feedstock. The proven technology is fermentation of starch to sugars for ethanol and the novel and emerging technology is cellulosic conversion from straw and wastes. The conversion of starch-based crops like cereals (wheat, barley, oats, potato) using an enzymatic hydrolysis process (converts starch to sugars) is proven. There are two major types of processing technologies used to convert corn grain to fuel-grade ethanol (a major US industry with more than 58 plants): wet mills (commonly known as corn refineries) and dry mills (AAFC). However, conversion of lignocellulosic materials for ethanol is complex. The technology hurdles include: separation of the lignin from the cellulose and hemi-cellulose and hydrolysis of cellulose and hemi-cellulose. The hydrolysis process yields a variety of sugars, with pentose sugars being difficult to ferment (AAFC).

logen (private company near Ottawa) was working on a process to do this but it is likely some years away from a commercial application. This process is a cellulosic process to use fibres, straw and other materials to produce ethanol from underutilized feedstocks. The process is experimental (not yet proven), but of much interest. The company was acquired in 2012.

Ethanol is generally made in the United States from corn. Ethanol is a liquid alcohol fuel that can be made from many biomass feedstocks, including agricultural crops, waste from agriculture and forestry, wastepaper, and municipal solid waste. As an alternative fuel, ethanol is most typically used as a blend of 85 percent ethanol and 15 percent gasoline, known as E85, which is appropriate for light-duty vehicles. Another less common ethanol/ gasoline combination is a 95/5 percent blend called E95. Ethanol is most commonly used as a blending component with gasoline in a combination of 10 percent ethanol and 90 percent gasoline, but this fuel, commonly known as gasohol or E10, is not an alternative fuel. Ethanol can be blended in even lower concentrations with gasoline to produce oxygenated gasoline, but is not considered an alternative fuel.

Figure 17- Bio-Energy



Brazil is another ethanol producer and uses sugar cane as the input feedstock. The technology is well proven and the industry has national support. The areas of ethanol are difficult to develop due to the feedstock costs, technology platform and economics. For biodiesel, the northern climate is a further difficulty for cold flow properties (canola, fats) in winter and a lack of distribution. It also has to compete with petroleum products.

The area of bio-products offers many opportunities and also large research challenges in adapting technology in a region and in gaining acceptance in a market favoring other products. This area of industrial uses research is highly specialized and some of the key centres were noted above. Until the technology platforms are developed and proven these areas will be higher risk than the market prefers. The area of biogas from dairy manure can be served with USA and EU technologies but is not always feasible.¹

Biochar

A related technology area of heat and power from agriculture, forest and MSW products is biochar. Biochar is a soil amendment which can increase yields, lock in carbon and offers GHG benefits. However, in Canada a lack of policy/ protocol limits industry developments, compared to the USA, AU and EU. Biochar is made from organics (manure, forest waste, MSW) in a process involving generation of heat and power.

From the literature, a number of overarching findings are clear (Toma):

- Australia, the UK, the Netherlands and the USA continue to research biochar and develop demonstration projects on industry applications;
- Positive benefits are seen from reduced emissions of nitrous oxide and carbon, high water retention, better uptake of nitrogen and in some cases higher crops yields;
- In Canada a few companies are operating or in start-up operations in bio-energy and co-products including biochar;
- The technology is proven for a fast pyrolysis system making bio-energy and biochar. Market opportunity appears to exist in commercial agriculture (solonchic soils), home and garden and with MSW wastes.

Biochar can be an area for convergence with agriculture, farms, forest wastes and urban agriculture. The technology platform is developed, proven and can perform.

Solar and Wind Power

Solar and wind power are renewables and are used to a small degree in Canada, but are not highly viable technologies in the current economic and market conditions. Some wind power farms are located in Alberta (Lethbridge) and Ontario and in other countries. A large wind power farm is located near Palm Springs, CA. Solar power technologies are facing difficulties and several companies have withdrawn from the markets due to the lack of financial viability including Bosch (Germany) and a China manufacturer. Bosch lost \$3 billion US since 2008 on solar power.

¹ See for example, <http://www.epa.gov/agstar/documents/chapter1.pdf>. It is not a panacea for all farms.

Wind power is slowly growing in the world. About 25% of the world's wind power capacity is in China, which had more than 75,000 MW of wind energy, The United States is second at 60,000 MW and Germany is third at 31,000 MW. Canada ranks ninth with about 6,200 MW (2012) with about 2% of the world's wind power (Globe & Mail, Feb 2013). Solar power is very undeveloped commercially with only Ontario having several sites at Sarnia, Sault St Marie and some planned sites. It is heavily subsidized under the provincial energy plan. These renewables are less likely for the agriculture sector which needs dependable low cost power.

Food For Health Products

Canada has a relatively new natural health products and functional food industry compared with other countries. In spite of that, the Canadian industry which comprises \$3.7b has an estimated 2.6% share of the global market for functional foods and dietary supplements.^m These products have science behind the products to defend their claims. Canada has 689 companies (up from 294 in 2002) involved in the industry. The industry is national in scope, and many agriculture and marine products have active ingredients for use.ⁿ Examples of the functional food products and health benefits are noted in the table below.

Table 1- Examples of Functional Food Ingredients from Canadian Agriculture

Product	Ingredient	Benefit
Salmon, trout	Omega -3 HDA and EPA	Brain and eye development
Apples	Anthocyanins Quercetin	May prevent cancer
Blueberries	Anthocyanins Ellagic acid	Lower cholesterol
Canola oil	Omega 3 ALA	Heart disease risk lowered
Flax	Omega 3 ALA	Heart disease, stroke, cancers
Pulses	Saponins, Protease inhibitors, Phytic acid Inositol PKP	Cancers
Oats, barley	D glucan soluble fibre	Prevent diabetes
Soy	Isoflavones	Breast cancer
Tomatoes	Lycopene	Prevent heart attacks

Source: CAPI, Towards a Building Convergence, Towards an Integrated Health & Agri-food Strategy

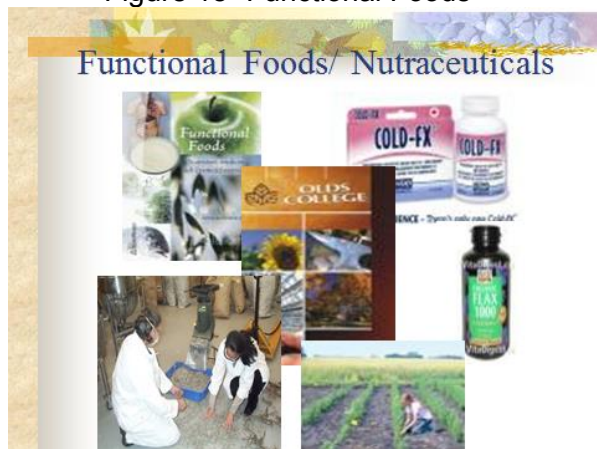
Functional foods are easier to develop and bring to the market, while nutraceuticals fall under the natural health products (NHP) regulations. Nutraceuticals are defined as:

- Vitamins and minerals;
- Herbal remedies;
- Homeopathic medicines;
- Traditional medicines such as traditional Chinese medicines;
- Probiotics; and
- Other products like amino acids and essential fatty acids.

^m CAPI, Towards a Building Convergence, Towards an Integrated Health & Agri-food Strategy, pg. 80, 2009

ⁿ Tebbens, J., Functional Foods and Nutraceuticals The Development of Value-added Food by Canadian Firms, Statistics Canada, 2005, Agriculture and Agri-food Canada, Canada's Functional Foods and Natural Health Products Sector, 2007

Figure 18- Functional Foods



NHPs (Natural health products) must be safe for use as over-the-counter products, and do not require a prescription to be sold. Products requiring a prescription continue to be regulated under the Food and Drugs Act. Functional food products may have a nutrition claim such as:

- Nutrient content claims- nutrient in a product;
- Biological role and structure- function claims; and
- Risk reduction health claim.^o

These types of products are very science-intensive and require many skills to bring a product to the market. Gaining approval for the product to be used can take 1 to 2 years. The trend continues for these products and is a specialized area for researchers and labs. Some cranberry research has been done on the active ingredients and now need to be further tested commercially. ^p These products are a strategic area which should be pursued given the berry supply base in the Valley and the high value that active ingredients (derived by fractions) can achieve.

Obesity and Healthy Foods

The area of healthy foods and food links to obesity is noted briefly as it is a major concern for many countries. This research area attempts to better link food products with health issues, and specifically obesity and healthy weight. Overweight and obese people tend to have higher levels of disease. This food linked obesity issue has been explored to a degree by CAPI and others previously. ^q The Canadian Obesity Network has nearly 9,000 members across the nation and is growing in numbers. It attempts to be a source of unbiased knowledge and methods to deal with the issue. (See <http://www.obesitynetwork.ca/>).

^o FAO, Report on Functional Foods, 2007, pg. 10

^p Oomah D et al, (2011) Bioactivities of pilot-scale extracted cranberry juice and pomace. "Cranberries are a rich source of polyphenolics, which correlate positively with bioactivities related to multiple health benefits. The results could be useful for the industry in determining process feasibility and the economic value of producing products for commercial use. Recovery of these components from cranberry press residues for food, feed and cosmetic uses may be an important step in increasing the overall profitability of the cranberry industry

^q CAPI, Towards a Building Convergence, Towards an Integrated Health & Agri-food Strategy, 2009

In today's society, obesity and overweight in many countries' populations is a huge issue. For example, in Canada overweight and obesity rates are as high as of 26% for children younger than 18 yrs of age.[†] Healthy weight is a global agenda item, and countries are concerned with unhealthy foods compared with healthy foods.[§] Consumers are confused with the current system, and more can be done. People need to reduce high levels of salt, sugar and fat in foods (HSSF foods, deemed to be unhealthy foods) and consume more healthy foods. Marketing foods and ads directly to children is also becoming restricted in progressive countries. However, access to healthy foods is important. Finally improved food labeling (and certification) of healthy foods (low SSF) is occurring in some countries to help consumers choose healthy foods over unhealthy foods.

Consumers also want to prevent disease and manage disease with natural products. Food has been labeled as healthy and unhealthy by people involved in health services and health promotion. A trend towards globalization is encouraging more frozen, processed and packaged foods for global retailing, in effect ensuring longer shelf-life. Fresh and local products do not easily compete. Kitchen technology has been developed to reduce labor, including the use of microwaves and many labor saving devices that are used for food preparation to respond to time constraints.

People have also "deskilled" their knowledge in cooking methods, simple food preparation, and canning for many reasons. Companies have responded by making ready to eat foods, packaged ingredients and other meal solutions. Ingredients are developed for specific flavour, color, scent, and mouth feel to encourage consumption through modern food design, specific purposes, and to meet global food product needs. Together these ingredient applications have also meant consumers are consuming more unhealthy foods.[‡] This change also means that people are gaining weight and many are obese. Thus, the link of food, diet, socio-economic factors and community to obesity and agriculture.

A new food topic which is emerging is ingredients that are allergens to people. This ingredient issue means that a person with the allergen has to read all labels and ask about the specific ingredients used in salads, soups, buns, breads and in meals. For example, mustard is now listed as an allergen in the EU and is now also listed in Canada.

Obesity and links to foods is a huge real issue when food is supposed to provide nutrition for life. It can also be an avenue to early disease development through overweight. The emerging area of food for health, disease prevention and cure can in some cases, provide a human health benefit.

Rural Tourism

Rural tourism is a related area to agriculture and foods and is commented on as some rural landowners and farmers may offer these experiential product areas. Some examples are given.

[†] Healthy Weights for Healthy Kids, MP Standing Committee on Health, 2007, <http://www2.parl.gc.ca/Content/LOP/ResearchPublications/prb0511-e.htm>

[§] World Health Organization, Global strategy on Diet, Physical Activity and Health, <http://www.who.int/dietphysicalactivity/publications/facts/obesity/en>

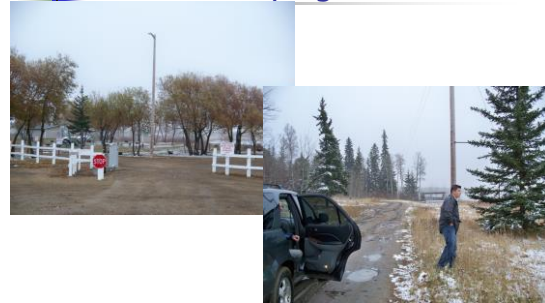
[‡] Jaffe, J et al, Vicinal Vicissitudes: Consumer deskilling and the (gendered) transformation of food systems, Agriculture and Human Values. 2006

Culture- The Alexander Band is located near Edmonton and has many Aboriginal people and a number of buildings and some tourism activities in the summer. Annually the Band holds Pow Wow days in August and is one of the original style celebrations still offered in Canada. They offer a unique asset to the region north of Edmonton in their crafts, culture and annual activities (Toma & Bouma).

Assets- Native Cree Culture



Assets- Camping+ Potential



Legal is north of Edmonton and has a very interesting number of high quality murals which describe how the area was settled and some of the family histories. The murals are managed by a historical society and funds are raised to hire professional quality artists. Legal is trying to create 3-4 more murals to get into the Guinness Book of Records for North America. Legal also has a strong French culture and has over 28 murals proudly displayed around Legal, welcoming visitors to this bilingual town. Legal's strong cultural heritage has collaborated with the *L'Association canadienne-française de l'Alberta régionale Centralta* to bring this project to life. Tourists from around the world have come to Legal for their Northern Alberta culture. *L'Association canadienne-française de l'Alberta régionale Centralta* is available to provide bilingual guided tours to visitors. (See <http://www.town.legal.ab.ca>)

Assets



Regional icons/ events- another agriculture tourism example is the use of an attraction icon. From other work we have done, the use of specific icons has worked as a tourism draw. Examples of Smoky Lake, and Torrington are among the many we have seen. Tourists like these to see and experience these local icons.

World Famous Gopher Hole Museum, Torrington, Alberta-
Opened June 1, 1996, Visitors: Over 20,000. In 1996,
Torrington gained international notoriety for its
controversial Gopher Hole Museum



The Great White North Pumpkin Fair and Weigh In -Smoky Lake, Alberta
Annual Event Since 1988. The Great White North Pumpkin Fair and Weigh in has been an annual
cultural event for the Town of Smoky Lake for the past 16 years. People from Western Canada
and elsewhere have gathered in Smoky Lake for the
pumpkin growing contest and fair. The event, which
also includes music, games, and rides, attracts
approximately 5,000 visitors to the town in early October
of each year.



Regional wine showcase- The Napa Valley (USA)
annually holds a “Mustard Festival” annually to increase agro-tourism and wine promotion activity
in January - March. This event is essential to allow for cross-marketing of wine, tourism and
mustard. Saskatchewan Mustard Commission is now involved with this marketplace because of
their mustard relationships.

The Napa Valley Mustard Festival, a non-profit community service organization, has a dual
purpose: it attracts visitors to Napa Valley during the months of January, February, and March, a
beautiful time of the year with wild mustard carpets, vineyards with brilliant hues of green and gold;
and it promotes national and international business interests. Throughout the festival, a network of
Napa Valley communities, businesses, and non-profit organizations welcome visitors and
encourage them to explore the arts, culture, and agriculture of Napa Valley. They join forces with
national sponsors and mustard companies from around the world to produce the world's most
sensational season of events. The festival has produced a Mustard Season Calendar promoting
the season's events since its inception. Calendars are mailed directly to the local, regional, and
national food, wine, art, and travel press, as well as tens of thousands of consumers.

Rural retail farm- Vernon has a nearby rural farm and goat exhibit for featuring local foods and ag
tourism products. The farm store sells local foods, crafts and provides a rural experience off th4e
highway.



These varied examples help to show how a rural area can access its local rural assets for highly interesting and sustainable agri- tourism activities. This is an area which can be further assisted in the Fraser Valley as a sustainable destination enterprise model.

Entrepreneurship Ecosystem & New Business Starts

Entrepreneurship and development of an ecosystem is another trend and can be another means to a sustained rural economy. The market niche of entrepreneurship in a rural community is a very viable and expanding trend which can also be served through the internet to allow global marketing. This can include rural “experiential” products like paintballing, river canoeing, camping, bed and breakfasts and petting zoos. It is a very diverse niche and some businesses have developed these product examples.

An interesting example of an Alberta agri- entrepreneur venture is PaSu farms near Didsbury. See <http://www.pasu.com> / It is operated by a former South African couple who have made a living from sheep and sheep products and a restaurant. It is interesting because people with no prior knowledge had a vision for this venture and made it work with no government supports. It is a very viable venture and has many Calgary visitors annually. Each year they get in Greyhound busloads of seniors on day visits in addition to day car traffic.

A well know and highly integrated “branded” entrepreneurial farm model is Sunterra farms, which operates near Three Hills. See <http://sunterrafarms.ca> . The Price family is involved in grain and livestock production to processing and even with retail stores and high end deli’s in Edmonton and Calgary. This is a very complicated model to duplicate but offers ideas for others to assess.

Entrepreneurial ecosystems research is now underway by Harvard University professors in about 22 countries in understanding what is needed to create large fast growth companies from startups. Dr. Dan Isenberg of Babson College is leading the research on entrepreneurial action and successes. This can include business incubators and other services. Babson College is widely recognized as the world leader in the field of entrepreneurship education and is dedicated to sharing practical and proven methodologies for teaching entrepreneurship with other institutions around the world. See <http://www.babson.edu/enterprise-education-programs/babson->

global/Pages/global-consortium.aspx Edmonton's Chamber of Commerce is working with this network model to develop its regional system to help accelerate new business growth. This is an area which can be applied into the Fraser Valley region.

A related high school entrepreneur training method which should be noted is Junior Achievement (JA, 2010). An evaluation of Canada's program graduates shows it helps form many good habits for youth and in entrepreneurship and business.

"Moreover a large proportion of "Achievers" cite JA participation as a significant source of impact on their ability to get a job, performance success at work, and personal network. This production of more work ready employees helps to close the talent gap and provides companies with the future leaders of their businesses, while simultaneously driving personal impact for participants. JA produces graduates who are more likely to become entrepreneurs, create jobs and power our economy. These future business leaders attribute JA as the catalyst that gave them the ambition to open their own business and the transformational force that empowered them with the skills and abilities to do so successful". (p 4).

Summary

Rural areas which have farmers, small businesses and food processors are facing many driving trends. Ultimately the strategy of the owner is important and likely falls into:

- Commodity based approach- such as is seen with grain and livestock products;
- Niche and value added oriented as is seen with specialty products like greenhouse, direct sales products and high value products (eg soft fruits).

The general trend for the agri- production sector appears to a bi-modal structure with either fewer very large commercial farms or many smaller farms with off- farm income to help support operations. Many small farms have people who also work off the farm to supplement their incomes. Very large scale farms generally have enough farm revenue and resources to fully employ people.

The mid- sized farms, however, are being left out with little or no extension and innovation support even though many are advising a move is needed to more value added products and greater direct marketing. Over time this segment may decline. Thus the need for both the small and mid- sized owner to assess both a good business- based strategy and even a new operating model to build their defined market. In addition, the changes in technology and more stringent operating procedures for food safety and delivery protocols often implies many small and mid-sized farmers do not get much extension support.

From the broader trend review of the agriculture and food sector, a number of research needs are identified:

- Populations are increasing and will need food products of many types for nutrition and life. By 2050 the expectation is about 9 billion people in the world;
- Trade agreements and global trends mean more market access and also more competition into Canada and thus more economic and market changes. Globalization is driving many changes because of increased international trade, more standards and industry needing to adapt to market needs;

- Sustainable approaches in production and processing are increasingly under scrutiny and research into new/ improved methods and practice change is needed;
- Food for nutrition, ingredients, health benefits and specialty uses are growing in demand;
- Local foods, direct sales, urban agriculture and e-marketing are increasingly being used in connecting with regional farms;
- New uses with renewables and bio-products and bio-fuels are increasing but the technologies are not all fully developed or proven;
- Related niches including agri-tourism ventures and rural entrepreneurs are emerging;
- Technology (biotech, robotics, automation) for yield and productivity are tools and newer practices which are being used. Green technologies and life sciences are expanding but are still highly developmental in many cases;
- Computers, the internet and knowledge sharing with researchers assist management as the public lab extension supports have largely been stopped;
- The agri-food sector is always seeking new products, practices, technology uses and markets. Risks are a related issue to these trends and must always be considered.

Related Technology Trends and Practices

In addition to the agri-food driving trends in research interests noted above, there are also a number of allied important technology trends and practices which are being used and developing. These allied trends are:

- Labor and demographics;
- Robotics and Automation;
- Productivity improvement;
- Innovation;
- Mobility and e-commerce;
- Supply chain management.

These are discussed as they directly relate to overall sector performance and are areas for research and technology transfer activities.

Labor and Demographics

Labor and demographics is a trend affecting the agriculture sector just as it is affecting other sectors. Labor on a typical farm involves both family members and some hired labor. Fewer and fewer Canadians desire to work in agriculture and on farms. This means a need for more immigrant labor and is a common approach to labor shortages, including workers from Mexico, The Philippines and other countries. In the berry, dairy and poultry sector a number of new business entrants have also come from The Netherlands, India and other countries as immigrant investors. This is not expected to diminish in the near future.

Retention of people on the farm will involve use of “soft skills” and various engagement methods. Compensation may include regular pay and holiday time, but also “pay for performance”, specific benefits, annual education/ training opportunities and even special recognition. In the farm industry more labor will be needed and sourcing it will be harder. Farms need to compete with other industries and the need for non-family workers will grow. (CACHR).

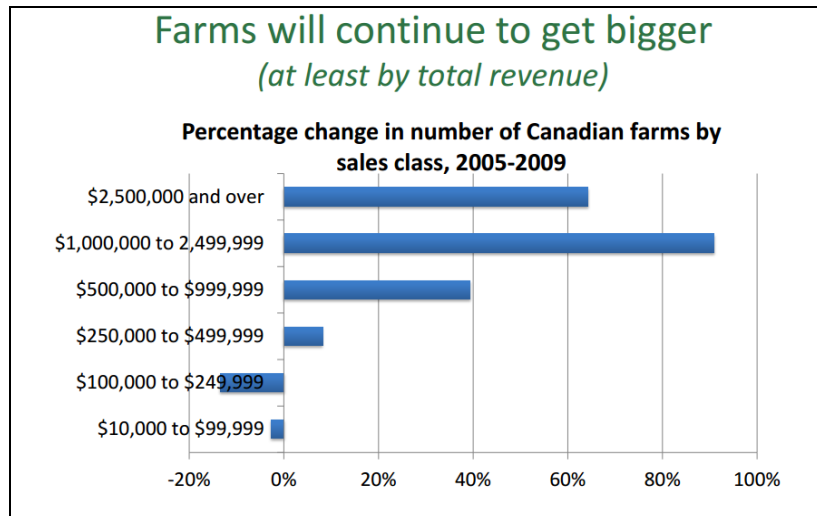
Canadian farms are declining in numbers over time. Figure 19 notes the trend of increasing in size and assets (was also noted earlier from the last Census about the speed in the trend change). For a modern and profitable sector, a mix of labour, skilled labour and larger scale equipment and technology will be needed more and more in the future. The challenge in the sector is being able to adapt in competitive markets while meeting regulations, managing a capital intensive business for changing and growing consumer demands.

Canada has rapidly developed its economy over the least 140 years in responding to many factors. In the agri-food sector the developments have been dependent on responding to domestic and global market demands, use and adoption of new technology and practice change and accepting the idea of building a knowledge-based economy.

“Human capital, or the education and work experience levels of individual workers, has redefined and reshaped the structure of many industries in advanced countries. Most firms believe that there

are two methods that can ensure continuous profit and future survival in the market. These two methods are reducing production costs or improving product quality.” (Omirar)

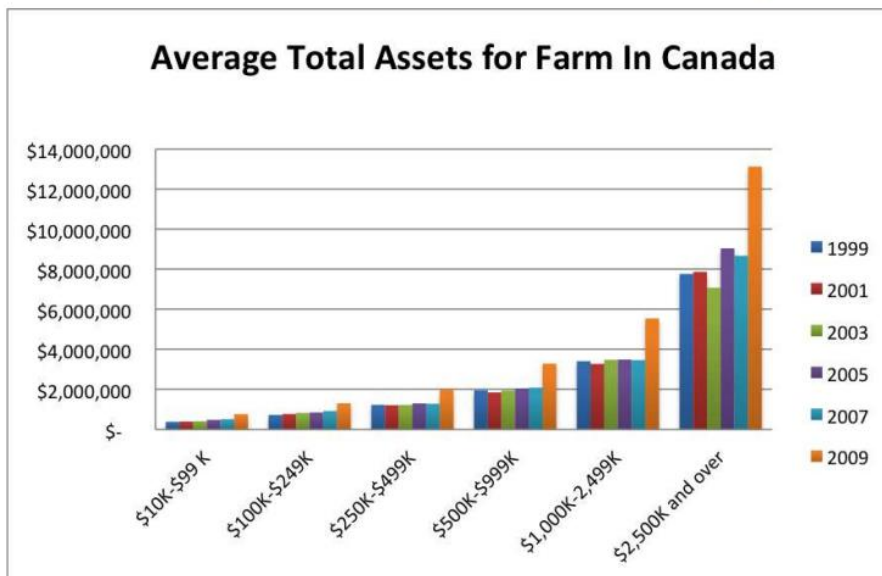
Figure 19- Farms In Canada (Source: Sparling)



Farm investments and capital needs is also a notable trend.

Figure 18- Farm Assets (Source: Sparling)

Investments will continue to grow



The farms that seem to desire training are the higher income farms and are noted in figure 19 below.

Figure 19- Farms Participating in Training (AAFC)



Other work shows similar farm management and strategic training requirements. The BMP Group (2004) concluded that top Canadian farm managers had some special knowledge and approaches to managing in difficult times. The research showed top farmers had very high incomes compared with the group, which was still a higher performing norm compared with industry averages. Toma (2006) concluded these leading farmers had 9 key management areas which allowed them to be better performers due to key strengths:

- Vision
- Leadership;
- Financial;
- Production, innovation and environmental;
- Marketing;
- Human resources;
- Risk;
- Relationships and alliances;
- Confidence and motivation.

That work has been validated in several farm and conference workshops with Canadian Young Farmers Forum, Wild Rose Ag Producers, Ag Food Council and others to understand how the current reality is changing and that in future, farmers will need a higher level of skills, judgement and knowledge in many areas. Sparling and others confirm the needs. (Note BC research notes 45,000 adult seasonal agriculture learners).

These studies and others indicate a trend of the need for more skilled labor, likely more technology and automation, larger equipment and more computer- based tools. In addition there exists a need for other broader management and soft skills to help farmers and processors operate and sustain. The area of a future labor shortage, increased demand for skilled labor and knowledge workers, improved human relations, cross-cultural training and many other related areas will require a

response. From this “platform for skill development”, many aspects can be delivered for rural, agri-food and other small businesses’ benefits.^u

Robotics and Automation

Robotics and automation are entering many sectors including agriculture and food. Two applications of robotic systems that are gaining popularity in newer manufacturing plants are the use of material- handling and inspection robots. (Milking system robots are being used in dairies). All systems use intelligent operating systems to allow detailed and complex tasks to be performed autonomously and semi-autonomously. The inner workings of the robotic network function according to two systems: control systems direct the motion of the robot based on information received from sensors. These sensors make up the sensory system and gather relevant information from their surroundings necessary to perform the desired task.

Automation refers to the ability of an operating system to be regulated by an automatic procedure. An example of automation is the transition from filing cabinets to computer organized folders, a system so well organized that information can be located quickly, easily and with minimal error. These systems are designed to reduce tedious tasks and maintain quality work, therefore, making the workplace more efficient. Automation is commonly used in banking machines, grocery and retail checkouts, telephone calling systems, computer assisted programs, home appliances and many areas of daily life.

Agriculture also has some emerging areas of robotics research and uses (Toma & Bouma, 2009):

- In 2002, the American Society of Agricultural and Biological Engineers provided a brief look into the future of farming with the introduction of a robotic tilling machine known as Robotra (Matsuo Yosuke, Automation Technology for Off-Road Equipment, 2002). The basis of this machine relies on a normal farming tractor complete with an XNAV navigation system, a commercial computer as the artificial control system, and the original vehicle controller to operate it. According to Japanese scientists Yosuke Matsuo, Satoshi Yamamoto, Osamu Yukumoto, Robotra “*can perform unmanned tilling in the rectangular field area of 50*100m at almost the same efficiency and accuracy as manual work*”, and when compared to a skilled operator based on accuracy, Robotra was better (Matsuo Yosuke, 2001). This is largely because the system utilizes satellite navigation to direct its' tilling operation rather than relying on than a human operator. Some modifications that have been explored with this same technology for seeding and soil paddling, which can be easily altered by simply adjusting the software.
- Vision Robotics Inc. is working on an orange harvesting machine known as Scout CAD Render that will be capable of picking orange trees quickly and efficiently. The system scans the entire tree using stereoscopic cameras positioned on the end of telescoping mechanical arms that produce a virtual 3D image of the oranges. Once the position and size are recognized the eight mechanical arms gently pick the fruit (Corp.). The potential to

^u Carew R. Productivity and Business R&D: A Study of Canadian Food Manufacturing Industries, 1994-2005 (2010) notes that “*results show that food and beverage manufacturing productivity is more responsive to physical capital than R&D knowledge capital. The results of this study show that university educated workers and international trade are critical determinants of labour productivity in food manufacturing.*”

apply this technology to other areas of fruit harvesting is enormous, and Vision Robotics is currently exploring all avenues. However, the success of the Scout is still to be determined, but a positive outcome would improve fruit harvesting.

- In the research paper titled Machine Vision–Based Guidance System for an Agricultural Small–Grain Harvester, E. R. Benson, J. F. Reid, and Q. Zhang discuss a machine guidance system for a combine/ tractor that can autonomously harvest a corn field. The system navigates the field according to coordinates that are generated by images taken by a monochrome camera mounted to the cab and are processed by an on board computer system. The system can distinguish uncut crop rows, and work within a set parameter by guiding itself based on calculated guidance coordinates. The system was tested in both day and night conditions and provided the same accuracy as the GPS navigation system. A trend is towards fewer and farms, which has caused many farmers to use larger farm equipment. This equipment is harder to maneuver and requires more focus from the operator because of its large size. This creates a greater chance of operator fatigue and increased chances of harvesting overlap, both of which can be eliminated with the machine vision-based guidance system (E. R. Benson, 2003).
- Based on a request from the Japanese Ministry of Agriculture, Forestry and Fisheries (1983), Yamaha started researching and developing an unmanned aerial vehicle (UAV) that could be used for crop dusting, known as the RMAX. The UAV has undergone many adjustments over the years and was reintroduced in 2003 as the RMAX Type II G. This system is very easy to operate, and is capable of dusting crops in many difficult to reach locations. If input from the operator stops the UAV will just hover in one spot, reducing any chance of human error when the machine is idling. The RMAX flies only five meters above the ground and is light enough for two people to carry, making it very accessible on a farm. The RMAX is also available as an advanced model equipped with four onboard cameras, and fly's 100m above the ground, making it very useful for taking aerial photographs (Hanlon).
- This aerial technology is also catching the attention of Spanish researchers at the Institute for Sustainable Agriculture in Andalucía, Spain. Scientists there are developing a UAV system that will be able to calculate the level of water in a particular crop through thermal multispectral cameras. *“This system allows you to know the ideal time to water the crops, saving water, and it can even be used to detect situations of water waste or water leaks in the irrigation system”* (Tejada, 2009). This system can greatly reduce unused water and wasted time, and is attracting the attention of two of the world's largest pistachio and almond producers, AgriWorld and Paramount. This UAV has the capability to fly up to 2 hours at a time, and is able to cover 1000 hectares at 300m above ground, allowing for quick and reliable transfer of information. Since its inception in 2007 this technology has been used for water detection in “wheat, corn, peach, olive, orange and vineyards fields in Spain” and has flown over 600 successful flights.
- Minnesota has started to use automated milking in a number of dairies. Minnesota has the largest number of automated milking systems (a.k.a. robotic milking systems) of any USA state. Strong service, knowledgeable sales people and interested producers have helped drive the growth of this technology. Minnesota also has a very good number of automated

calf feeding systems in operation. Researchers have conducted a field study on automated milking systems (AMS) in Minnesota and western Wisconsin, with approximately 30 producers in the region who had installed AMS. Training cows to use the AMS is challenging and is a 24-hour job for a period of time. Most producers indicated that training time is high- it takes a very intensive 3 days, a very busy 3 weeks working with many cows, and after 3 months, most cows will voluntarily come to the AMS.

Figure 21- Milking Robot (Narocki)



- Australia is also using AMS robots for milking (see <http://esvc000872.wic018tu.server-web.com/indexframe01.htm>). The milking can occur 24/ 7 days per week to respond to the cow as needed. *“An idle robot awaits a cow with entry gate open, on entering the cows collar is identified, entry gate closes and detailed information about this cow is provided by the central controller. Feeding begins and the robot arm moves under the cow to brush the teats, once completed the laser scanner locates the teat positions and the cups are attached one at a time, the rear teat which took longest to milk last time is attached first. When all cups are attached the robot checks for milk flow to confirm correct attachment, then continues to monitor each quarter for, milk flow rate, colour and conductivity, milk time and time between attachment and first milk flow. All this information is recorded at every milking of each cow and stored in the system.”*

Figure 22– Slaughter Robot (Narocki)

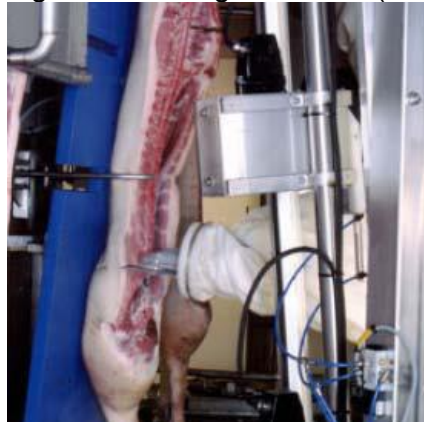


Figure 23– Shearing Robot (Narocki)



The trend to more robotic and automation applications offers many labor- saving ideas for use in the farm and agriculture sector. The integration of ICT tools into monitoring, surveillance, analytics and other management functions in capital intensive agriculture and food applications will continue. Overlaying this need will be the issues of integrating these functions with utility into the biological systems involved in agriculture.

This area of automation and robotics will become more important for many businesses. It is becoming more affordable, easy to use can complete dirty, repetitive, dangerous and heavy work tasks that can be with quality and speed. A technology transfer support program can help industry to adapt and train skilled labor in these areas.

Innovation

Innovation in Canada has been a focus for the Federal Government for a number of years and in 2012 the Jenkins report on innovation was released. *“Studies have repeatedly documented that business innovation in Canada lags behind other highly developed countries. This gap is of vital concern because innovation is the ultimate source of the long-term competitiveness of businesses and the quality of life of Canadians.”*

The Jenkins report (on NRC/ IRAP) had recommendations including the need for more business innovation, use of public procurement for developments, more private sector focus on commercial activity and changes to increase commercialization activities. The guiding principles included:

- More transformative programs- to support business commercialization;
- Positive net benefits- for programs, should have a net benefit;
- Build collaborative sector strategies- to help build business capacity;
- Establish clear outcomes and a user oriented approach;
- Design for flexibility- allow for novel approaches;
- Assess effectiveness- performance management.

Innovation is defined as developing in several areas of a business or organization (p 2-2):

- Process;
- Product;
- Organization;
- Market.

Productivity in Canada relative to the USA is seen to be lagging by a large degree. A business model for innovation is noted from the report (p2-10).

One of the troubling findings of the report is that Universities and Colleges are ranked as the eighth source for ideas, after: employees, customers, the internet, competitors, industry sources, market research and the owners. To overcome this college gap, likely means using a different engagement model. Some ideas in the report including program changes and more research-business networks, incubators, applied research offices, technology transfer and other proactive approaches. Innovation can be accelerated with a Centre and regional applied research and help in many ways to foster technology adaptation and process/ product developments.

Figure 24- Canada compared to USA Productivity (Jenkins)

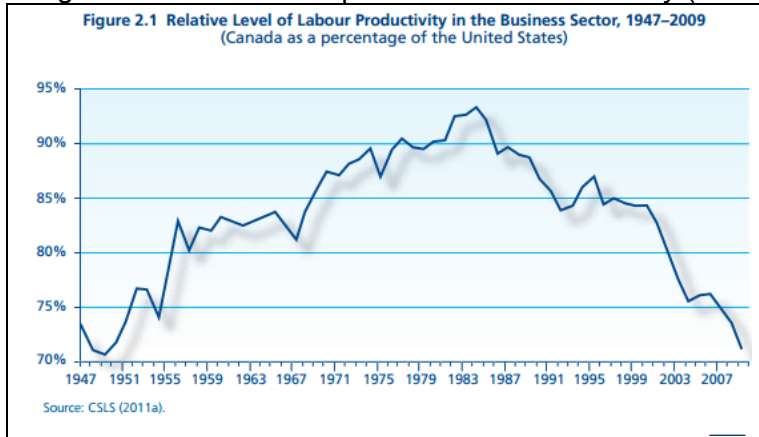


Figure 25- Innovation Model (Jenkins)



A recent study by the Conference Board of Canada (2013) indicates Canada is doing very poorly on innovation, technology transfer and in commercialization of new ideas. Countries which are more innovative are passing Canada on important measures like per capita income, productivity, and quality of social programs. Innovation can be addressed in a training program and in technology transfer and in practice change at an industry level.

Mobility, Devices and E-Commerce

The internet and the development of small computer-based devices are causing many other related changes to all sectors including the agriculture sector. Mobility, portable computers and devices which improve decision-making and productivity are a growing trend of bundling technologies.

The use of RFID (radio frequency identification) tags in inventory control and traceability is increasing as the asset becomes valuable enough to track. This technology was developed in the 1940s, has been refined over decades to a point where an RFID chip, packed with information, can potentially be applied to almost any object imaginable. The information is accessed remotely, eliminating any need for connecting wires, making it possible “to automatically track and trace a unique object anywhere in a value chain. RFID is used in warehousing and asset management.

The use of RFID tags has been adopted in the beef cattle industry (and others) as these passive tags help in tracing and tracking animals for consumer concerns. RFID has many potential applications and helps in monitoring inventories. Currently, many governments are also moving to secured warehouses which can offer pre-clearance for international shipments and traceability with registered freight suppliers. This system will tie in data on all shipments to help secure and track all shipments as they are “cleared once and accepted twice” (Beyond the Borders Action Plan).

The University of Illinois (Hornbaker) completed a study on RFID and GPS with wireless in a grain application. The researchers indicated the system is feasible and needs some development.

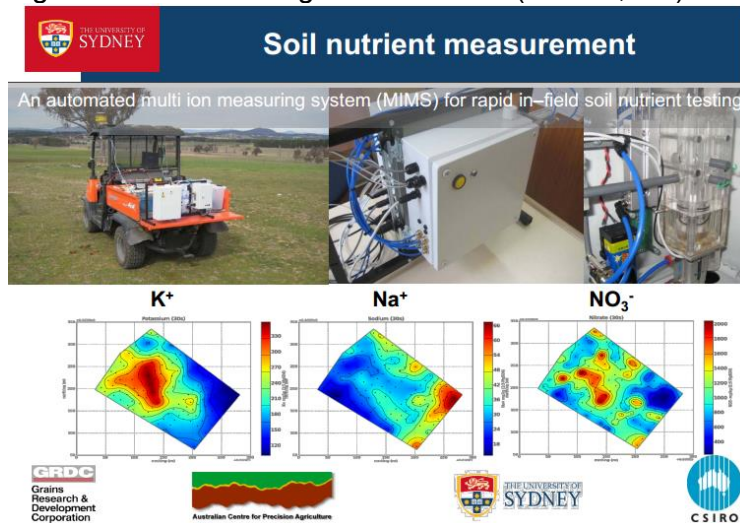
“ The system shows great potential for tracking grain and grain attributes while improving food security and efficiency of the agricultural food supply chain. This system has the ability to: 1) trace back, with visualization tools, the entire transportation/movement of grain from the end use/processor to storage, road transport back to the field of harvest and origination of seed stock, 2) query the data base for information/location of grain with specific attributes or characteristics, 3) link to other spatial and non-spatial database for identifying other attribute information associated with the grain, and finally, 4) identifying alternative sources of food and export safe grain when potential contamination or agro-bio-terrorism events occur” (p 13). The research indicates how a technology needs to be adapted to a specific industry need.

Figure 26- RFID in Grain (Hornbaker)



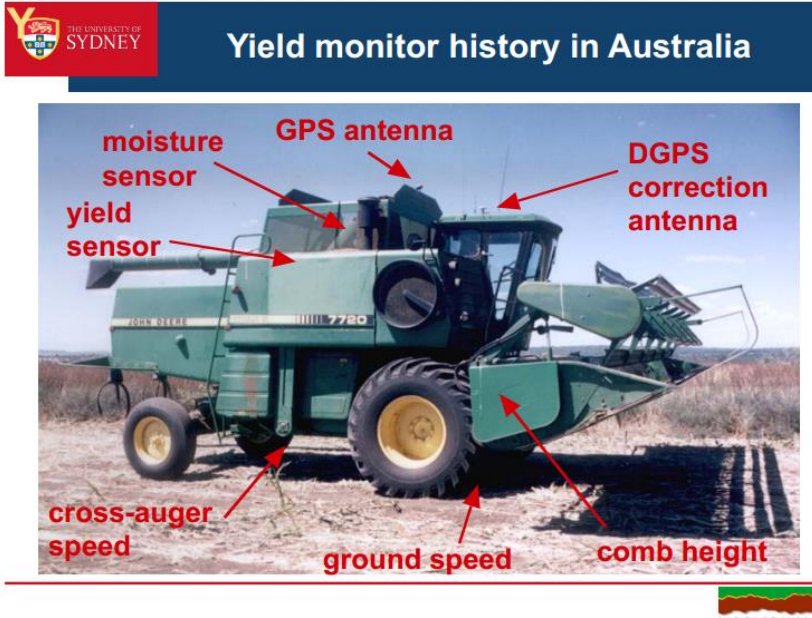
GPS (geo-positioning systems) in devices is another means of information becoming common place for many applications, including in agriculture for precision farming. Precision farming is the science of applying nutrients at a specific rate, depth and to a location near the plant for optimal growth. These systems require a number of components including a computer, sensors, data collection, analysis, software and machines in a biological application (Whelan). AU started these applications in 1995 and now has many working systems. A BC GIS system was piloted by AAFC for food safety monitoring.^v

Figure 27- Precision Agriculture Model (CSIRO, AU)



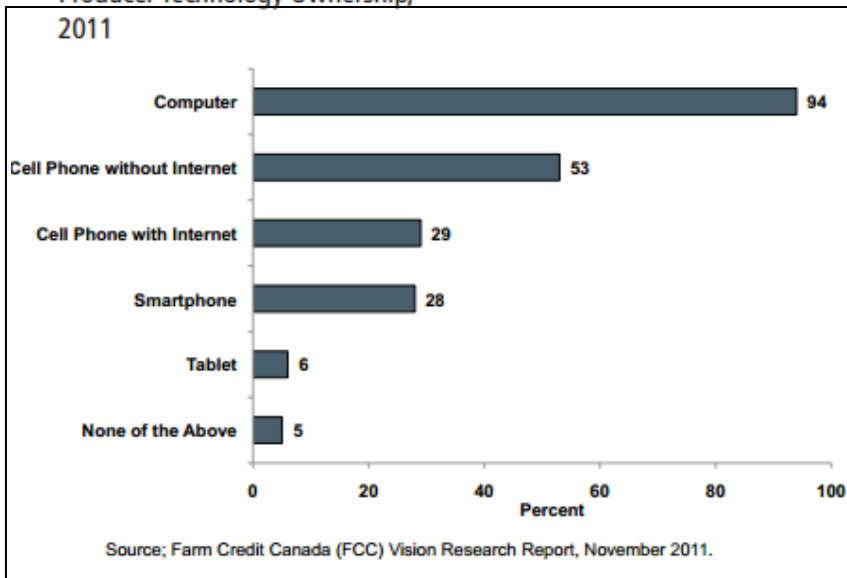
^v Delequis P et al, (2011) A GIS-based approach in support of an assessment of food safety risks. “A Geographical Information System (GIS)-based approach was developed for the identification of vulnerabilities and the measurement of risks associated with contamination of food systems with biological agents.”

Figure 28- GPS in Combine Yield Monitoring (CSIRO, AU)



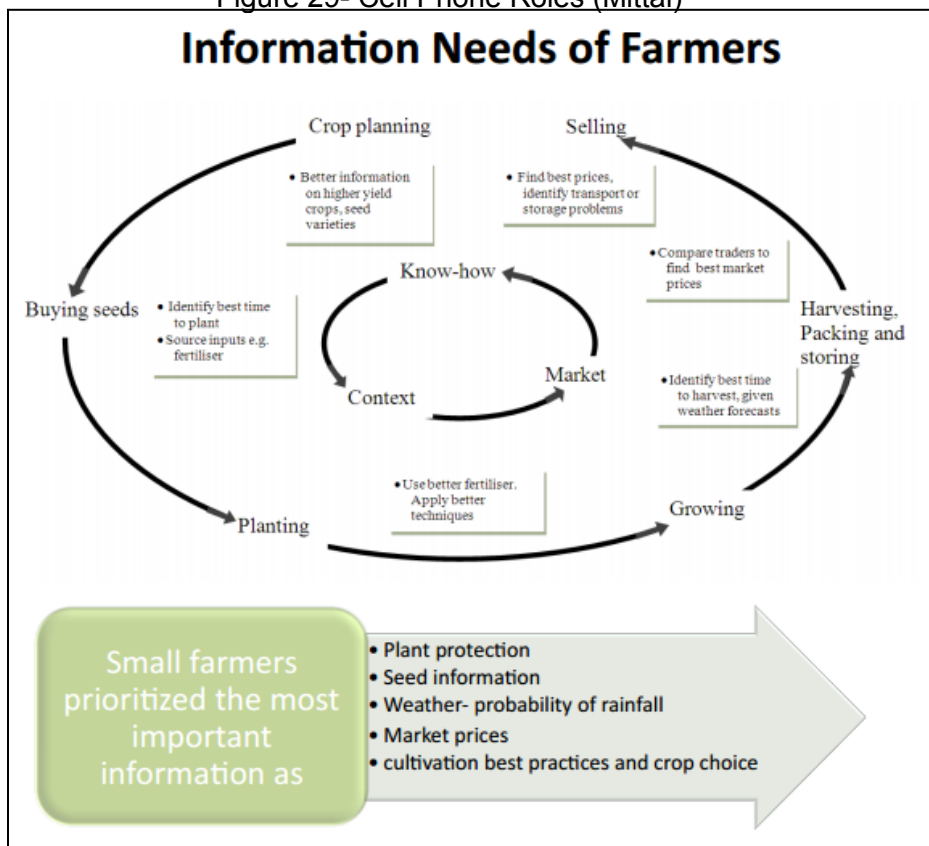
Mobile cell phones having multi-functions and purposes are really driving many knowledge-building changes. MDs are using iPhones for assisting in rapid diagnostics, with specific applications for disease files, cell cameras for use in collecting pictures of small samples in diagnostics and for many other related communication purposes. This area will rapidly increase with more industry specific applications with technology bundling.

Figure 29- Canadian Technology- Farms (AAFC)
Producer Technology Ownership,



Mittal (2011) indicates that the role of cell phones in India is very important for information sharing, knowledge building and technology transfer. The information needs of these farmers is not unlike those in North America in understanding markets, crops and other aspects. Some lessons can be learned from this viewpoint and apply to the Canadian agri-food sector.

Figure 29- Cell Phone Roles (Mittal)



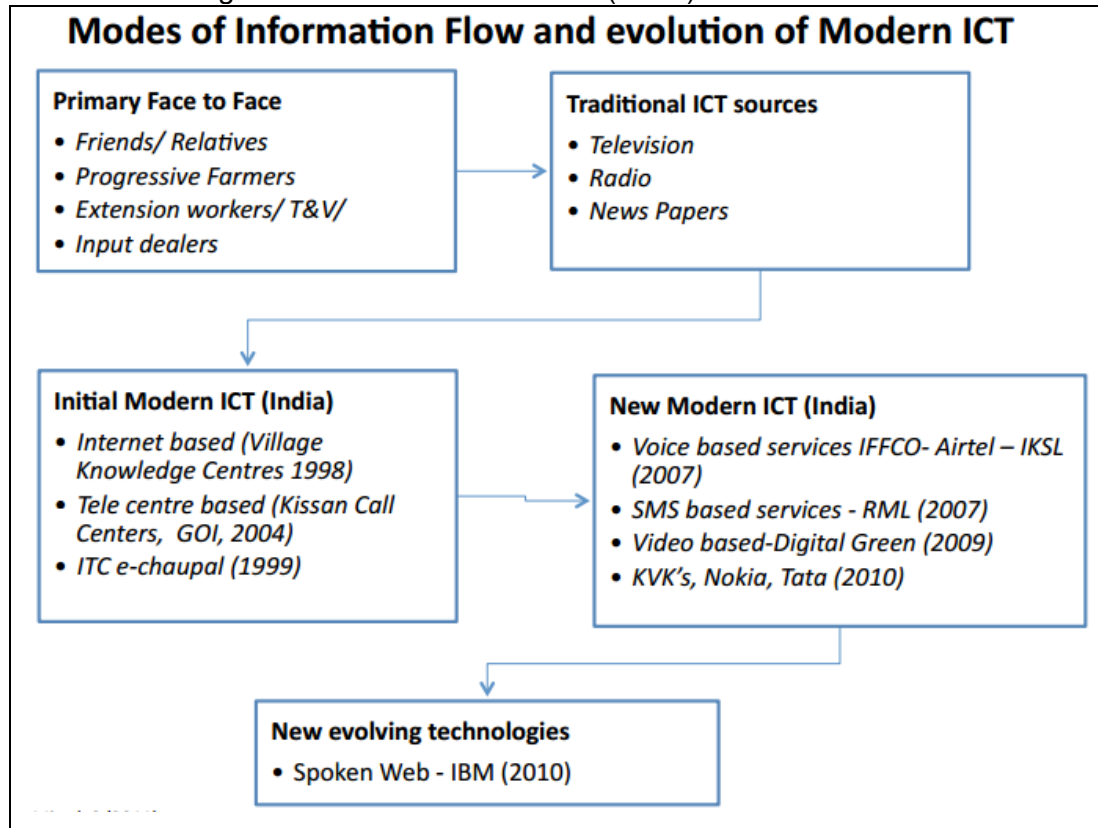
He indicates the need for helping build a stronger second green revolution with cell phones. “A push towards higher agricultural productivity will require an information- based decision making agricultural system”.

He notes several important points relative to this technology use in agriculture:

- The contribution of ICT is in all parts of the agriculture cycle;
- Impacts are seen in quantifiable increases in income, improved yield and non- quantifiable gains (social);
- Benefits of improved communications, information about education and health;
- Improved access to land use of information and reduced search costs;
- Greater market participation and crop diversification;
- Improved coordination among agents and increased market efficiency;
- Reduces risk by connecting to social networks;

- A strong correlation between high GDP per capita and mobile telephone penetration in a country (Kathuriaet.al, 2009).

Figure 30- Information Sources (Mittal)



The area of e-commerce is a related area for both market research and for developing and managing customer databases across many platforms and management needs. Websites, having a CRM (Customer relationship management function), e-invoicing and many other e-commerce (direct sales, marketing) is not commonly performed well by agriculture businesses. These are all areas in which applied research and technology transfer can help build innovative and beneficial practices for the sector.

A paper by Kirui (2012) on the use of cell phones in Kenya for a money transfer function is very beneficial. His study found that use of mobile money transfer services significantly increased levels of annual household input use by \$42, household agricultural commercialization by 37% and household annual income by \$224. “We conclude that MMT services in rural areas help to resolve an idiosyncratic market failure that farmers face; access to financial services.” This is not a common issue in North America but shows the power of bundling technologies.

Some other uses are possible:

- Medical dictionary downloads for cell phones;
- Diagnostics- such as ResolutionMD™ Mobile (Calgary). A state-of-the-art medical viewing product, enabling instant access to radiology diagnostic images and reports from mobile

devices. FDA-cleared for diagnostic viewing on the iPhone and iPad, ResolutionMD Mobile brings together all of the viewing tools needed to make a diagnosis including 2D, MIP/MPR, 3D and interactive collaboration. ResolutionMD Mobile is in use at multiple world-renowned medical institutions – including the Yale-New Haven Hospital and the Mayo Clinic

- Diagnostics- UBC spin-off company [Lionsgate Technologies Inc.](#) is preparing to launch a software application — developed by two UBC professors – that transforms smartphones, tablets and laptops into mobile medical diagnostic tools capable of real-time vital signs monitoring. Using standard medical sensors connected directly through the universal audio port of virtually any mobile device, the proprietary interface, called the Vital Signs DSP (Digital Signal Processor), provides precise monitoring of blood oxygen levels, blood pressure and body temperature which are displayed on the mobile device's monitor. The availability of an accurate, affordable mobile medical diagnostic tool has sweeping applications in the medical/clinical and consumer markets as well as in the developing world, where 64 per cent of mobile phone users are found.
- Microsoft reports a Digital Inclusion Kit for a smart phone as a diagnostic tool by two Argentina professors. Health workers send remote collected data to a central database for common medical records and use in care.

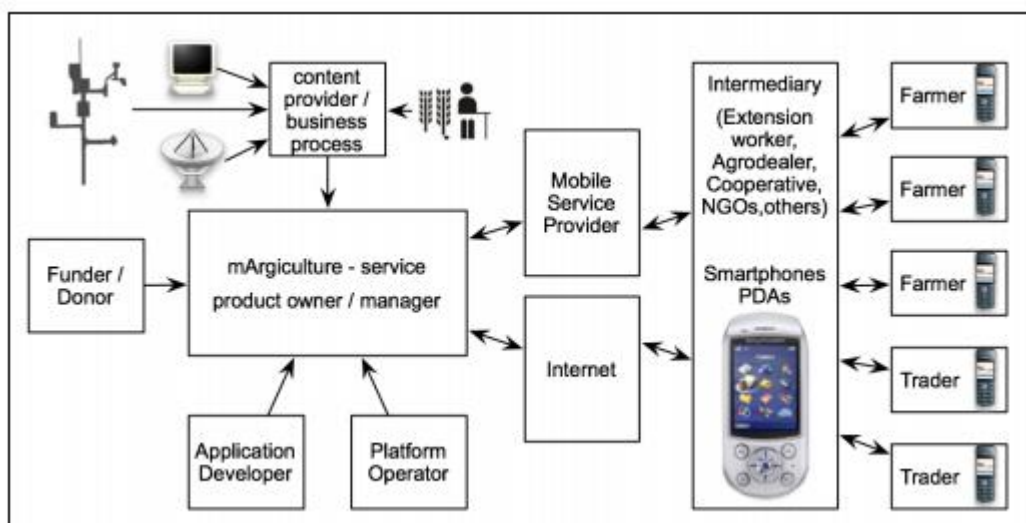
Syngentia (2011) has an interesting paper on the use of mobility devices in e-learning, knowledge and new applications. *“Farming is becoming a more time-critical and information-intense business. A push towards higher productivity will require an information-based decision-making agricultural system. Farmers must get information at the right time and place.”* Some of the best mobility models noted includes:

- A common model is the call center approach: on their mobiles, farmers can call a tele-center where agents – usually agronomists – answer their questions and provide vital information on cultivation techniques such as planting, irrigation, disease treatment and other input-related issues;
- Mobile-driven extension services are possible with mobile technologies to foster demand-led extension and to reduce knowledge and skills gaps. One concept is mLearning- the focus of mLearning applications is transfer of basic skills state-of-the-art technologies, and production skills for crops, livestock and fisheries. Examples include: Internet platforms: many governments and research institutions offer or work towards. Another example is a Wiki-type (India: Agropedia) of website developed as a collaborative project by seven consortium partners for a crop-specific library, blog and chat. Another is an FAQ model- (India: aAqua) Almost All Questions Answered) aAQUA is basically an internet-based discussion portal, initiated by the Developmental Informatics Lab;
- Another model is Nokia Life Tools, launched in India in 2008, Indonesia and China in 2009. Information related to commodity prices, commodity news, agri-inputs (seed, fertilizer and pesticides) prices, weather forecasts and agricultural tips & techniques. Digital green (Gandhi et al., 2009) seeks to disseminate targeted agricultural information to small and marginal farmers in India through digital video. The system includes a database of digital videos produced by farmers and experts. Sequencing of the various content types enables farmers to progressively become better farmers;
- Geospatial applications- These applications enabling data and information related to geography and space to be managed, processed, and visualized. They contribute to land

and water use planning, natural resources utilization, agricultural input supply and commodity marketing, poverty and hunger mapping;

- mFarming- The key feature of mFarming applications is that local information is used to provide farm- and situation-specific advice. An example is Philippines: Farmers' Text Center (FTC) started by the Open Academy for Philippine Agriculture (OPAPA) of the Philippine Rice Research Institute. This is a service for providing technical knowledge to rice farmers as well as agricultural extension workers. Farmers receive message for one peso each;
- Embedded ICT in farm equipment and processes: Support services and systems that enable greater efficiencies in farm equipment and agricultural processes, and traceability in agricultural products' transport and marketing through mobile technologies such as RFID, wireless Internet, and cellular telephony for labeling, traceability and identity preservation;
- Logistics and business processes- the supply chain is a notoriously weak element in the agricultural market. It affects cooperatives' and farmer organizations' processes – collection, grading, weighting of produce, proper records of farmers' accounts –, transport and communication with processors;
- Data collection- a cluster of applications focuses on data collection. Agricultural and environmental data from biological and environmental sources are important for research, baseline surveys, monitoring, impact evaluation, to inform policy making and for many other purposes. Good collection enables proper analysis and use.

Figure 31-Mobility Concept to Farmers (Syngentia)



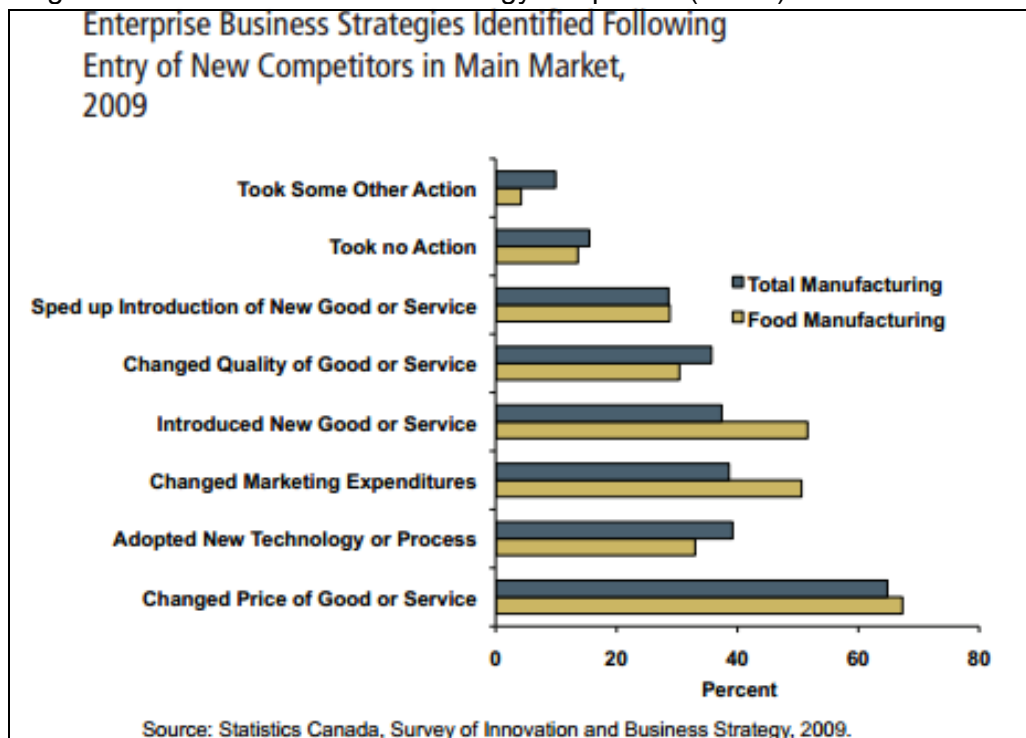
The area of mobility and ICT is very important today and will increase as organizations move to cloud computing, more portable devices, more niche applications and as consumers, buyers and processors require more traceability. The approach also allows for direct technology transfer and much broader reach of specific audiences for research and training information.

E-commerce is an area which must be utilized more and is a developing platform for many related knowledge sharing in addition to marketing and even selling in an automated manner. The use of

e-commerce and direct website marketing options means more can be done in a global effort to reach out and also be found with the correct keywords and offers. Direct marketing can be done with a good website and in our experience, many websites are poor quality, are poorly designed with poor navigation, do not entice customers and do not give a return on investment. Many websites are designed by people with design ideas but little understanding of the end customer needs, wants or preferences. We find good design principles (clarity, readability, pictures and content) plus a business focus greatly improves results.

The figure below shows how Canadian food processors lag in technology adoption which can result in real benefits. This gap can be overcome with improved technology transfer.

Figure 32- Food Processor Technology Adaptation (AAFC)

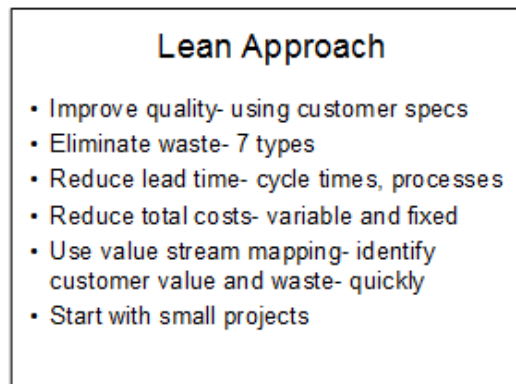


These ICT related areas require skill building, training and regular updates for SME growth and market presence. Much can be done in this area for skill building, technology transfer, applied research and industry support.

Productivity Improvement

A related trend is the movement to productivity improvement in all manufacturing and service industries by using “lean thinking”. Productivity improvement is an area for applying “*lean thinking*”. Lean thinking is a powerful tool which is understood and is used by about only say 15% to 20% of Canadian businesses. It is also being applied to the agri-food sector and offers many ways to enhance competitiveness. This model is based on the system of continuous improvement and Norquest College and NAIT (Alberta) and others offer these programs for business.

Figure 33- Lean Thinking Model (Toma)



Lean thinking (LT) is a training and improvement model of reducing waste while increasing productivity, and can be applied to the processing aspect associated with agriculture. The overall objective is to “*reduce costs, add value, improve processing efficiency, and improve product quality and food safety*”. It is based on the highly regarded Toyota model, which has been built on continuous learning and reducing waste. A central theme of LT is to eliminate *muda* (waste in Japanese). Lean manufacturing attempts to reduce waste (7 areas):

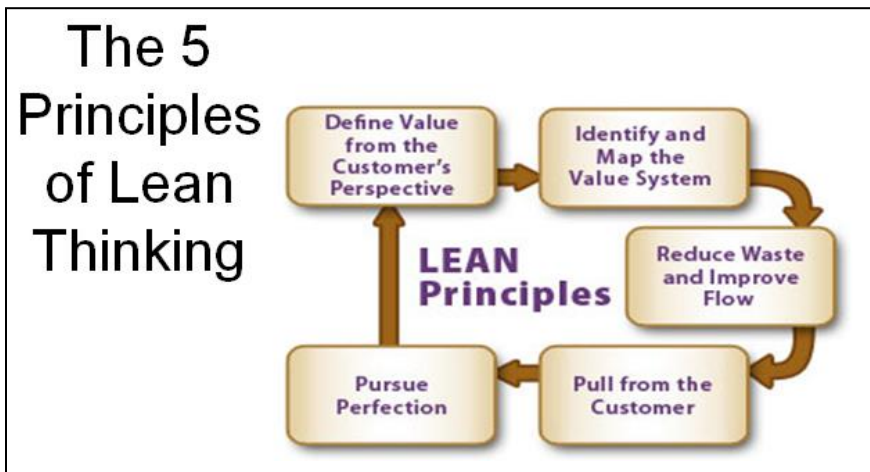
- overproduction;
- time;
- transportation;
- processing;
- inventory;
- motion; and
- making defective products.

“*Waste is in fact, the opposite of value in the eyes of the end customer*”. In any business or organization, waste is often found in the processes that are employed. Lean thinking attempts to continuously focus on improvements, the use of continuous processes, implementing a “market pull” approach and the use of specific targets.

New gains can often result with lean thinking, such as using 50% less of current inputs- of people, manufacturing space, investment in tools and R&D/ engineering time to produce the same outputs. The concept of “learn”, (the kaizen approach of quick fixes to improve) and “do” are central to the lean approach. As people build this method into their operations, they find productivity improvements at very low investments.

Some Canadian food processors are actively engaged in application of lean thinking tools (5-S, value stream mapping) to help improve operations. It means defining current processes, training and engaging employees and is critical before applying more automation and technology. This lean thinking should become a best (and normal) business practice for many.

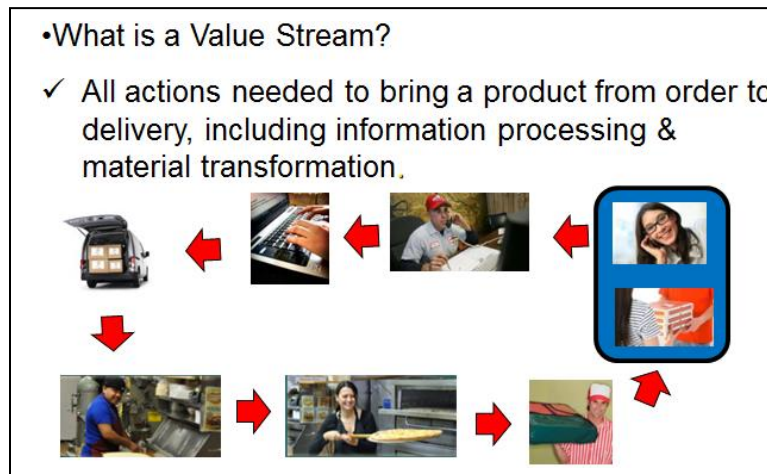
Figure 34- Lean Thinking Principles



“When your enterprise has achieved these “half” reductions, you should again try to reduce by half. This sort of lean thinking - the belief that you can always find more waste to cut away- will lead you to a world-class production system.” (Womack)

This training is a practice change model for industry and can help many organizations to improve and reduce the error rates and issues in quality management. For the food processing sector, the application of lean principles is a critical next step to managing the labor and technology gap and helping all to compete in a competitive meat marketplace. This productivity improvement training needs to be a foundation within business and agri-business programs and in extension courses.

Figure 35- Value Stream Map Example

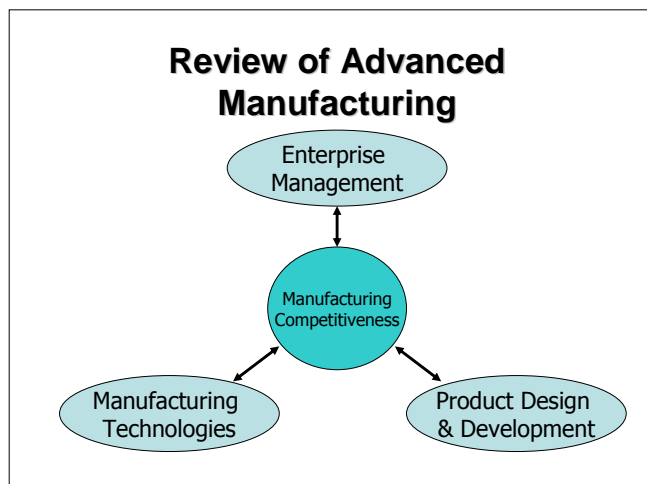


Supply Chain Management/ Collaborations

Supply chain management and value chains are becoming common in many countries and industries, including the food business. Modern manufacturing and food processing businesses

(enterprises) are connected through many supply chain networks and can access many available advanced technologies and tools. Manufacturing enterprises are complex and competitive in a global marketplace. Given that raw materials are available, changing raw materials into value-added products involves three essential components: product design and development, manufacturing of the products through a process and managing the business enterprise successfully (marketing, sales, suppliers and customers).

Figure 36– Advanced Manufacturing Model (Toma)



“Supply chain management” (SCM), stems from the concepts of integrated business planning and execution, is possible due to the rapid advances in information technology. Processing firms can no longer conduct their business in isolation. Customers, suppliers, vendors and other business partners can be integrated in a common infrastructure to deliver quality products on time and at competitive prices. Supply chain management is a more difficult tool or strategy and involves working with many others in your product and market space. However, in future it is clear that supply chains will compete just as individual firms compete.

The complexity of manufacturing and food processing is high and will increase in complexity. The general needs model (below) can be used to start to highlight agri-business and processing issues. Manufacturing and food processing enterprise management activities includes:

- Understanding customer design requirements and responding to them;
- Developing a market-driven business culture and systems;
- Employing effective business processes like “Lean enterprise”;
- Managing business costs and resources for profitable operations.

Manufacturing and food processing technologies includes:

- Employing an educated and trained workforce;
- Using appropriate and current technology and tools;
- Using quality materials and quality management systems;
- Employing cost competitive operations.

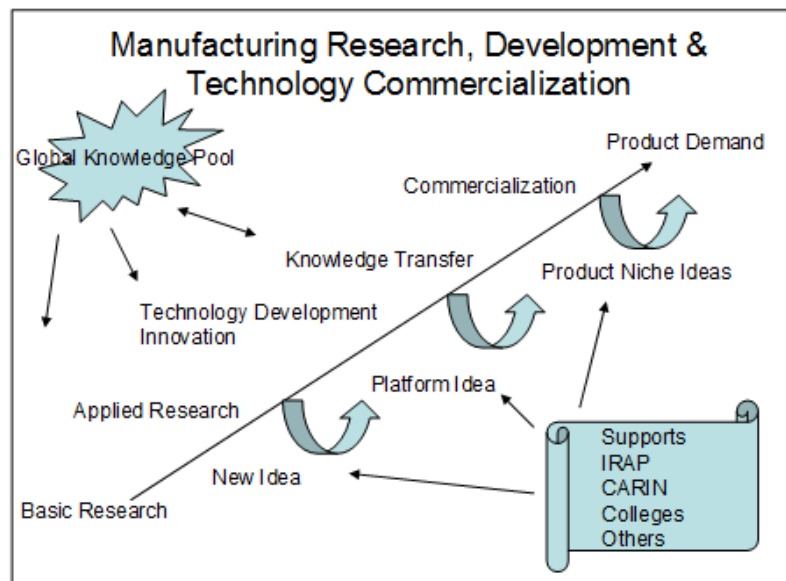
Product design and development means:

- Developing an appropriate product for the customer needs and wants;
- Innovating and improving design based on R&D methods;
- As far as possible developing a unique service and product mix which can sustain the business over several business cycles and anticipate new market needs in advance of others.

A processing company's supply chain may even comprise facilities in different locations where raw materials, semi-finished and finished products are acquired, stored and transported. A trend continues to consolidate few suppliers in a manufacturing process to ensure tighter supply integration, reduce error rates and "process flow" issues for the end customer. Developing a small number of preferred qualified suppliers, which have a long term interest in the core business, may be very important. Internationally, one of the key trends is the development of competitive supply chains which may mean that either you are "inside or not inside" a growing supply chain opportunity. The food business is not exempt from this trend.

Product design is an extremely critical step in creating a successful product with final customer acceptance. Products build revenues for companies. Product design considers manufacturing equipment and specification needs, customization aspects, environmental "friendliness" as well as customer requirements of functionality, utility, cost and quality. Products often have "life cycles" and can be improved upon with technical improvements or built directly from a novel idea. The "life cycle" means how long sales can continue until a competitive product emerges. Products can be created in many ways. The R&D and technology commercial path will involve much research and applied research within the chain of innovation.

Figure 37- Applied Research Path (Toma)



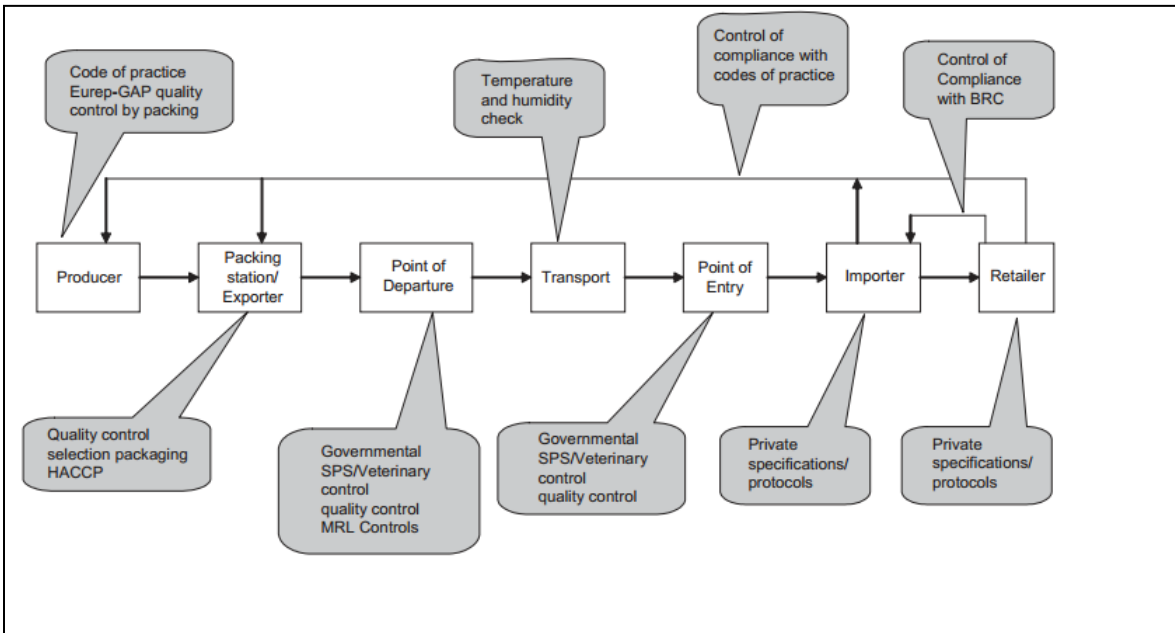
UNIDO noted the increased role and power of agri-food value chains and their power (2006). They indicate 3 key reasons for the developments (p 5):

- Increased standards in world trade participation;

- Global buyers requirements for food safety, custom products, prices, delivery volumes;
- The opportunity to differentiate such as country of origin, organic, fair trade etc.

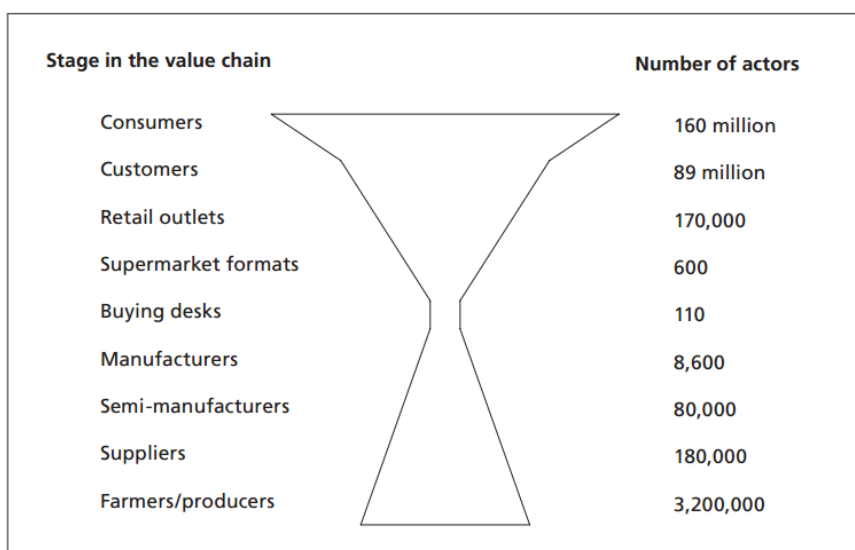
The food chain risks from safety concerns are noted in the diagram below (UNIDO, p 25).

Figure 38- Food Safety Risks (UNIDO)



A supply chain “funnel” from the EU shows the high concentration in the EU food business (UNIDO, p 35). The same issues affect Canadian agriculture and food industries.

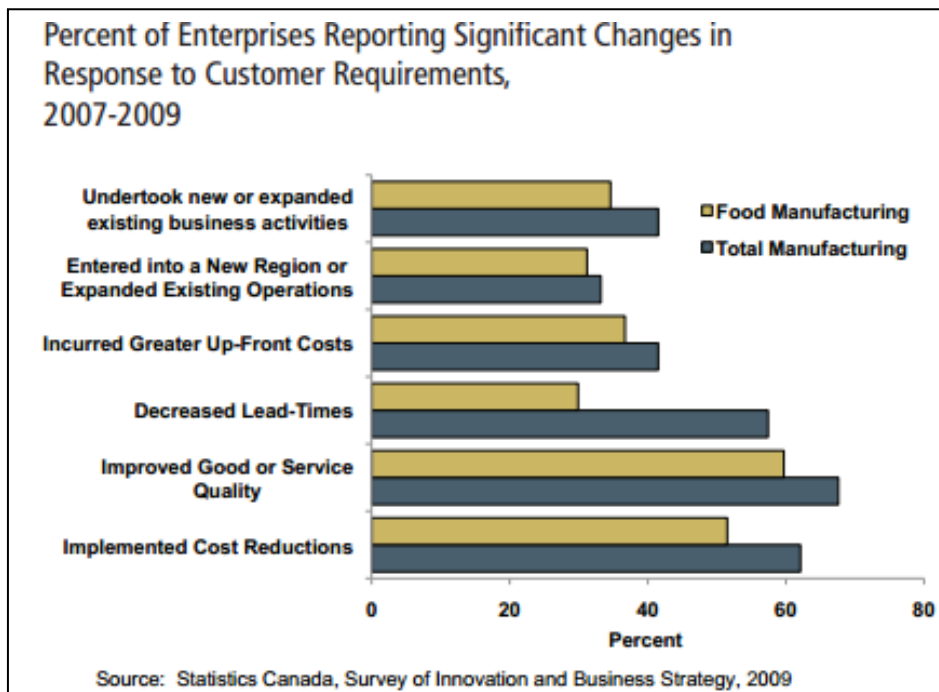
Figure 39- Food Supply Chain Funnel (UNIDO)



To overcome these decision points and market entry will require a number of approaches such as: enterprise branding, regional brands, and certification approaches.

Some of the practice change barriers for food businesses identified a recent report are noted in the figure below.

Figure 40- Food Processor Changes



Building alliances and collaborations with other businesses is a related business strategy which is being used to compete domestically and globally. This approach requires the ability to communicate well, build trust, share information and listen well. Fundamentally it means the ability to develop solid business relationships through personal interactions, events and meetings towards a mutual basis of respect. Again this area offers much potential for applied research and adaptation into the sector for practice change improvements. Supply chain improvements can involve use of technologies in ICT, scanners, bar code readers, printers and many allied mobile technologies.

IICA (Inter-American Institute for Co-operation on Agriculture), Agriculture and Agri-food Canada and the USARS and Mexico developed a research and technology collaboration for North and South America. The program to 2013 includes agricultural research & innovation, moving towards trans-border plant and animal health research, food safety and capacity building for trade, food security, environment, biotechnology and other themes. The keys will involve: collaborate in agricultural science across borders. problem - solve on trilateral issues through scientific guidance, help target agricultural research, share knowledge, information and experiences. These topics are valid to consider in applied research plans.

Applied Research Centres

A brief overview of applied research centres was completed to help frame the concept of an applied research centre, roles and approaches. We draw on models we are familiar with and others which can help guide discussions. WE have experience with many of these models.

Olds College School of Innovation

A new activity for the Olds College was the area of applied research and innovation through the Olds College School of Innovation (OCSI). The OCSI has evolved over the last 12 years from a concept to an operating entity with over 10 staff and facilities of about \$20 million in investments for offices, bioprocessing labs, and other related facilities. The OCSI was the first college-based applied research centre in western Canada to develop, and has since become a model for a number of colleges. This centre was one of the first of its type in Canada. The concept was to develop a centre of innovation located at the Olds College which would serve industry in several project areas.

The focus areas for the new centre were:

- Bio-processing in functional foods;
- Composting and renewable bio-energy;
- Small agri-business products and services.

The innovation project (started in 2000) was to set up the Olds College Centre of Innovation (now the School of Innovation). The first step was a feasibility analysis and a business plan in 1999 and by 2000 (10 months later) it was operating with a new CEO. Originally consultants prepared a \$17m business plan and to date it has attracted about \$20m, and now is operating with staff (scientists, technical staff) and special processing equipment. See <http://www.oldscollege.ca/schools/ocsi/index.htm>. The innovation model has changed a few times to reflect industry and public sector response and acceptance. The initial model was developed with the idea of a chief scientist, technicians, and a business manager for industry liaison.

Figure 41- OCSI



A new Board of Directors was developed within the concept of a for profit innovation company to serve and compete in the marketplace. A CEO and senior scientist were recruited from Saskatchewan, as well as several other technicians. The scientist and the Innovation centre leader were in charge of managing a break-even or profitable budget within the centre. However, this was not accomplished and an organizational change was required. The innovation centre was initiated to work with the Olds College system as a school of innovation, which allowed for sharing of resources, facilities, staff, and students within the college. As a result, the board of directors was eliminated and the school was changed to report to the VP Academic. The focus also changed to a bio-fuel and soil reclamation specialization from their previous bio-processing focus. Some bio-processing equipment was moved to the Ag Discovery Place in Edmonton (University of Alberta) due to the changes.

This centre is primarily focused on the Olds College students, local business and entrepreneurs. However, this model did not achieve a high level of business commitment; even though, it had received funds from many provincial and federal sources. Therefore, it never became a sustainable business model in its original form. The School serves an important contribution in the area of composting, bio-processing and in small-scale bio-diesel applications for rural Alberta. It does show a regional model for innovation. See <http://www.oldscollege.ca/occi/facilities/>

Grande Prairie Regional College, Centre for Research and Innovation (CRI)

CRI is a recent applied research centre in northern Alberta and a new focus in innovation in the Grande Prairie region. The Centre for Research and Innovation (CRI) is located at Grande Prairie College and started in August 2008. The funding for this centre came from Alberta's Rural Development Fund, amounting to \$3.5 million over a three year term. The centre is located at the college as a standalone area, and reports to the VP of Administration. See <http://www.gprc.ab.ca/community/cri>.

The CRI has a focus on rural ventures in the Peace region:

"The issue for the Peace Region, like other rural regions in the province, is that business growth can no longer be tied exclusively to traditional natural resource development. In order to become part of the new diverse and knowledge-based economy, entrepreneurs and innovators in the Peace region need access to innovation services. For example, a patented agriculture feed system is being proposed by a local entrepreneur but market research and prototyping is lacking and is a barrier to commercialization. In another instance, technical expertise for plastic product design and studies of methods of fabrication do not exist in the region. In yet another case, forestry productivity improvements require regional research but such research lacks committed infrastructure and dedicated leadership.

Other product opportunities for developing or enhancing business exist in the development and marketing of computer games and software; or in providing assessments of community needs for particular products, services and businesses. These types of projects would add to the economic diversity of the Peace region."

Figure 42- Centre for Research and Innovation



CRI provides leadership and resources to meet the needs of the region for client innovation, productivity, and competitiveness, and in doing so, has a vision to *“Making the Peace Region the Best Place in Canada to Innovate”*. The CRI has an Executive Director, three main staff, 4 adjunct staff as needed, and a Manager of Innovation and a Manager of Applied Research. The CRI has an Advisory Committee of 3 from the Peace Region Economic Development Alliance (PREDA), 4 from the College, and 5 from the community at large. The CRI actively travels to Edmonton and elsewhere to seek out new opportunities. It works with PREDA (regional economic agency- Peace Region Economic Development Alliance) to find new projects and funds.

CRI’s core businesses are:

- Build better capacity to do applied research;
- Foster and Develop a Culture of Innovation; and
- Provide (innovators and SMEs) access to the best level of services and resources that will enable commercialization of new products and services.

Operationally the CRI has offices in the GPRC and another business office in Centre 2000, which is co-located in the Chamber of Commerce building. The CRI facilitates business linkages to innovation service providers and provides an advisory function to the regions’ businesses. However, distance and diversity in the north between Grande Prairie and the businesses located in the Peace River, High Level, and Fairview regions present some service delivery issues. It reflects the need for regional innovation and commercialization support.

MEP Centres- USA

The manufacturing extension partnership centres (MEP) in the USA are a very useful network to be aware of. These centres have operated since the 1980s and have been benchmarked as best in the world to help entrepreneurs, businesses, manufacturers and food processors to compete. These centres offer regional programs and a network of about 400 offices exist in the USA.

Often these centres are located near a college or university and some are co-located on campus. The centre has a specific focus- for example in Cleveland the centre focus in on consumer products, automotive, in Kansas the focus is on foods, equipment and small manufacturing, in Seattle- the focus is on aerospace, forestry and light manufacturing and in Texas (7 centres) the focus is on food processing, oil and gas, and light manufacturing.

The national network of 400 offices has national programs including:

- Quality assurance- ISO and other standards;
- Lean thinking- productivity improvement;
- IT systems integration;
- Business planning;
- Human resources.

These centres have a specific focus in serving a business issue which is assessed for free and then a proposal for work is submitted. The business owner can use the centre or contract an independent consultant. Applied research projects will occur in coordination among between MEP program staff, the business, a college or university and students. This approach allows business access to students for applied research projects. The projects reflect the business product or process problem. These centres reflect a regional model for innovation and adaptation support for businesses and agri-food. The USA government recently added 15 new manufacturing centres (April 2013) to help further develop the manufacturing base and the opportunities for change to meet world markers.

Food Development Centres

Canada has created a network of food development centres in various provinces to help scientists, businesses and new startups to prepare, test, produce and commercialize their food and value added projects. The centres were noted earlier in this report and each one provides specific services and programs. BC has two related food research centres in Agassiz and Summerland.

Growing Forward 2 Program- Agriculture

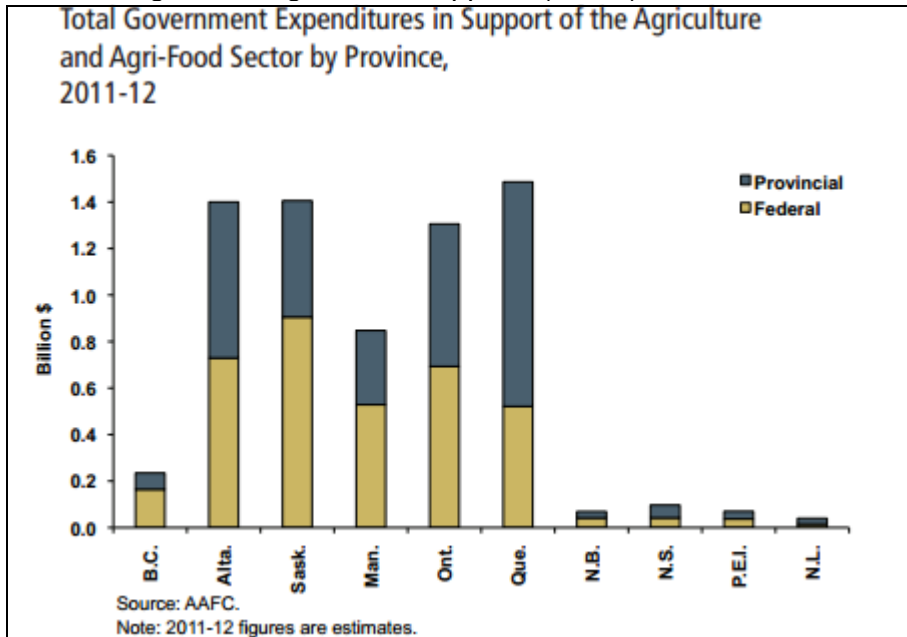
The Canadian government has developed integrated national programs since 2000 as Ag Policy Framework 1 and 2 and then Growing Forward 1, with about \$5 billion in a 5 year program model. The current program was announced in the 2013 federal budget as Growing Forward 2:

- Research opportunity and innovation initiatives;
- International market development and investment attraction initiatives;
- Confined feeding operation stewardship program to limit risk to water sources;
- Agricultural watershed program on wetland restoration and promote surface water quality
- Regional water supply program to assess and develop water supplies for producers;
- Plant health and biosecurity program to ensure proper risk management strategies;
- Pest surveillance initiatives to develop tools or smartphone apps for timely identification and response to pests;
- Livestock welfare producer program.

Each province has the ability to adjust local delivery mechanisms. The current program is for \$3 billion on a national basis for 5 years. These programs are relevant to a regional research effort.

Support to BC agriculture appears to be lower than other western provinces and others (Figure 42).

Figure 43- Agriculture Supports (AAFC)



The supports are to assist in industry growth and development and overcome many barriers in research, training and many other areas of agriculture.

Selected Canadian University and College Agriculture Offerings

Summary of Canadian Post-Secondary Offerings

A review of Canadian Universities and colleges was completed to help guide the research review and how each is responding to the global trends and industry needs. Table 2 highlights the courses, students, academic capacity and approaches the various organizations are taking.

Table 2- Canadian Agriculture/ Food Student Programming and Research

Province	College/ University	Programs	Comments
BC	University of British Columbia - UBC http://landfood.ubc.ca/ "Land and Food Systems"	3 undergrad, 9 graduate programs within; Applied Biology; Food, Nutrition, and Health; Global Resource Systems; human nutrition, food & nutrition, applied biology, agriculture and resource economics, soil science, animal science, land & food systems	1,300 undergrad, 200 graduate students, 51 profs. Undergrad and graduate teaching and research; 12 research centres
	BCIT- http://www.bcit.ca/	1 program: Applied and Natural Sciences- ecology, sustainable resource management, chemical and environmental, forensics	Diploma and certificate. In food formulation and pilots.
	University of Fraser Valley - UFV http://www.ufv.ca/agriculture/ "Agriculture"	1 diploma program: Horticulture, ag production, ag business, certificates. Programs combine theory and principles with practical training in horticulture, integrated pest management and livestock production.	40 students, 12 prof/ staff, also geography has Cdn research chair in food safety; total 15,000 FLEs
Alberta	University of Alberta http://www.ales.ualberta.ca/ "Agriculture, Life and Environmental Sciences"	8 undergrad, 4 graduate programs; Agricultural, Food and Nutritional Science, Agricultural, Life and Environmental Sciences, Animal Science, Agricultural and Resource Economics, Environmental and Conservation Sciences, Entomology, Forest Economics, Forest Engineering, Forest Science, Human Ecology, Interdisciplinary, Nutrition,	120 academic staff, 1,500 undergrad, 500 graduate students. A research intensive faculty, over \$40 m in research funding annually, 11 research stations, 4 research networks, 5 collections. 19 human ecology profs, 72 food and nutrition profs, 21 resource economics & environmental sociology, forest science & mngt

		Nutrition and Food Science, Plant Science, Renewable Resources, Rural Sociology, Soil Science	
	Olds College- http://www.oldscollege.ca/	5 ag diploma programs- Agriculture, animal sciences, horticulture, land & environment, science; business, fashion, trades & tech, university transfer, continuing education	1,286 students total, 82 faculty and 33 contract Individuals. Research- Olds College School of Innovation- Agronomy Biodiesel Biogas Production Research Demonstration Bioprocessing Horticulture Research Natural Fibre Reclamation and Remediation Renewable Energy Socio-Economic Research
	Lakeland College- http://www.lakelandcollege.ca/	1 ag diploma program- Agriculture; business, environment, energy, fire & emergency, health & wellness, human services, trades, interior design, upgrading, transfer. Also aboriginal programs and e-campus delivery.	2,216 FLEs total, 114 academic faculty Research- environmental science, fire & emergency, agriculture science, energy. \$2.3 m from NSERC for renewable energy lab, \$900k for 2 biochar units, now 6 full time research staff/ centre
	Lethbridge College- http://www.lethbridgecollege.ca/	2 programs: Agricultural Technology -Animal Science Major -Plant and Soil Major Agricultural and Heavy Equipment Technician Pesticide Applicator- cert.	4,185 total students, mainly non agriculture In-class, online credit courses, more than 50 career programs, applied degrees and apprenticeships. Has applied research interests. Aquaculture Centre- since 1997, production facility of grass carp for water bodies, biological vegetation control
Saskatchewan	University of Saskatchewan- http://aqbio.usask.ca/ "College of Agriculture & Bioresources"	13 degree Programs: Agribusiness, Agricultural Biology, Agricultural Economics, Agronomy, Animal Bioscience, Animal Science, Applied Plant Ecology, Crop Science, Environmental Science, Food and Bioproduct Sciences,	350 people, including faculty, research scientists, administrative and scientific support staff/ undergrad and graduate students. \$31 m in research. Core areas- soil science, plant science, animal science, applied

		Horticultural Science, Renewable Resource Management, Soil Science.	microbiology, economics. 173 total profs; 40 animal & poultry science profs, 19 bio-resource policy & economics profs, 22 food & bio-products profs, 55 plant science profs, 37 soil science profs & tech, 5 centres
Manitoba	University of Manitoba http://umanitoba.ca/afs/ "Faculty of Agriculture and Food Sciences"	4 Bachelor's degrees: Bachelor of Science in Agriculture, Bachelor of Science in Agribusiness, Bachelor of Science in Agroecology, and Bachelor of Science in Food Science. Key areas of research include Healthy Food, Healthy Environment, Healthy Bioproducts and Healthy Communities.	25,000 total university students. Agriculture- 86 total profs, \$16.5 m in research; 5 profs- farm management, 2 profs- functional foods, ag economics-11 profs, animal science- 16 profs, 3 research stns, technicians, 15 biosystems engineering, 5 entomology profs, 10 food science profs, 16 plant science profs, 11 soil science profs (plus 2 x technicians for all)
Ontario	University of Guelph http://www.uoguelph.ca/fare/ "Food, agricultural and Resource Economics"	Since 1874, OAC Ontario Agriculture Colleges provides innovative life sciences education and research for agriculture, food, the environment and rural communities. 6 degree programs within: -animal and poultry science -food, agriculture and environmental sciences -food science -plant agriculture. Has 4 campuses.	1,500 students, 750 grad students. 130 full time profs. Has over \$50 m annually in research, manages 13 research stations; 73 plant science profs, 7 crop research stations, 11 resource economics profs, 31 animal science profs, 110 graduate students. Four Centers of Excellence- Nutrition Modeling, Animal Breeding and Genetics, Animal Welfare, and Aquaculture. Eight Canada Research Chairs, The Premier's Research Chair in Biomaterials, and Transportation, The Inaugural Loblaw Chair in Sustainable Food Production, Ontario Dairy Council/NSERC Industrial Research Chair in Dairy Technology, The Egg Farmers of Canada Research Chair in Poultry Welfare, The Rebanks Chair

			in Pollinator Conservation. Affiliated with over 20 Research Institutes and Centres
MOOCS	Massive Open Online Courses- global trend to provide massive access as a new business model.	Many and growing http://see.stanford.edu/see/faq.aspx http://webcast.berkeley.edu/ http://www.extension.harvard.edu/open-learning-initiative http://oyc.yale.edu/	Universities are offering free courses. 8 companies offer the linking service which effectively removes barriers. Costs small amt to write the course.

Source: Websites, accessed March 23-25.

From the table above, one can see the strength in the various schools and capacity in various disciplines and sciences. The system has developed with regional delivery, specializations, core disciplines and emerging areas for research and teaching within a strategy.

Discussion and Observations

Some of the post-secondary observations include:

- Nationally, applied research and research with industry is of high interest;
- BC- has developed a focus on land, environment and resource systems;
- Alberta- has developed expertise in bio-energy, nutrition, production, resource economics;
- Saskatchewan has strong farm management, crops, soils and agronomy;
- Manitoba has farm management, crops, plant science, animal science, bio-engineering;
- Guelph has foods, animal and crop science and foods specialties;
- All of these organizations employ research networks and centres to help leverage their knowledge. Often specialty labs are developed. Industry links are strong;
- Strong professors and research programs help attract students, research funds, partners and global industry. It is very important to build a critical mass to succeed;
- Core areas include: soil science, plant science, crop science, animal science, economics, agribusiness. Other specialty areas include: nutrition, bio-engineering, food sciences, environment, ag equipment, sociology and rural communities;
- Emerging areas include: renewables, green tech and products, bio-energy, food safety, functional foods, sustainable agriculture, environmental monitoring, community impacts;
- Complexity is increasing in adaptation of new technologies, equipment, use of computers and in understanding practice change for an industry segment;
- Soft skills and better community advocacy in rural- urban resource issues are needed;
- Public extension is declining but the internet allows for leveraging of knowledge delivery and research results across vast distances. Applied research is increasing;
- Distance delivery of courses by post-secondary is increasing and MOOCS (massive open online courses) offers many free high end courses and is a competitive threat;
- The differentiation point for many education offerings now is the reputation, overall experience and peer learnings/ relationships that can be delivered;
- Linkages can be seen with all trends that require more agriculture and food products in a growing and resource constrained world. Canada is one of the few places (of say 4 or 5 regions) that has the agri-food sector potential to offer to the world.

Trend Opportunity Assessment and Top Growth Areas for Fraser Valley

This section draws together the trend and technology driving forces in the agri-food economy which are causing changes in a regional sense and pose challenges which must be met. If the trends and technology drivers are correct, then it is only a matter of time until one must see how to deal with each trend, within the competitive marketplace.

Some of the other underlying assumptions to 2020:

- Populations will continue to increase in Asia and developing countries and as these people gain higher incomes they will seek out higher quality goods, travel more and seek out the Canadian culture and experiences which they can afford;
- Trade agreements will continue to create market access and industry adjustments will be made, with some industries gaining and other industries that do not. (If supply management does face any real market access adjustments, they will be phased in over 8 to 10 years or more and niche markets will become more important);
- Governments are entering a decade or more of fiscal austerity or limited budgets, depending on their citizens' directions. In Canada, the national position is actually stronger than may other nations. Currencies may become a larger tool for trade;
- More self-reliance may be expected by Canadian industry in R&D as budgets are reduced and skilled managers will need to build stronger alliances, networks, collaborations and supply chain links to compete globally;
- A stronger reliance on technology supports, communications and labor saving devices will continue and skilled workforces and knowledge- based businesses will become the norm;
- The role of the transformative University and College will change towards a stronger experience-based program with collegiality, in addition to great distance delivery, applied research and industry collaborations to help the nations' industries, compete. Skill building in technical disciplines will need to be bundled with business, case materials, new business models, co-op training and relevant industry learnings to better serve all involved.

Risks for the Near Future

In any future oriented project, scenario and event risks will exist and need to be explored to a degree. Some of the clear risks to serving the agri-food sector include:

- Animal and human health risks via a biological issue such as BSE, avian flu, and other natural bacteria which can cross species;
- Food safety issues such as e-coli, listeria, salmonella, and high density;
- Reduction of market access protections to supply management industries (poultry, eggs, dairy) which causes industry reductions or elimination in regions;
- Excessively high land costs in the Fraser Valley which prevent commercial farms from local production of products for use in foods;
- Canadian dollar above par (to US dollar) which reduces exports and increase imports;
- Potential border closures to food products judged by the importing country as unsafe in their view (customs borders can be closed very quickly);

- Lack of labor, skilled labor and management who desire to work in the agri-food sector;
- Loss of social license (or changes) to operate in the region;
- Uncompetitive sector due to a convergence of several factors which increase costs, see lower returns and unprofitable farms and processing businesses.

If any of these types of scenario and event risks emerge for a sustained period of time, the agriculture sector can face certain periods of challenge and even decline and will need to rapidly adjust to survive. (This is not impossible, as the BSE event occurred in Canada in 2004 and cost over \$5 billion and greatly reduced production and beef farm numbers. The pork industry is facing that threat and adjustments will continue to be made.)

An additional note is made about disruptive technology game changers. These concepts do occur. The current Canadian oil price decline is in part due to a new fracking technology developed in Calgary for the oil industry to produce oil, gas and liquids which were not accessible. (See <http://www.packersplus.com/>). This technology is being used in the USA and globally (8,500 installs) and Canadian oil supplies are facing discounts of \$30+/bbl. More technology game changers of this type will occur and industry will need both foresight and supports to help see these disruptive changes in advance.

Opportunity Assessment

Given the above trends and actions taken by others in the industry and post-secondary industry, an opportunity assessment can be made and judged as reasonable in direction and even possibly, timing. Many opportunities exist but also must be viewed in a competitive sense as others will also see the same opportunity. Accessing the opportunity means making a choice and deploying resources in a defined strategy and business model. In addition, some opportunities do not fit well currently given the state of technology developments, high risks and a lack of market acceptance means more research is needed (such as bio-products).

For any opportunity to be realized commercially, requires a supply base of raw material, a proven technology or process, financing to invest and adequate management to bring it to market. Thus technology in the food business is generally well developed and viable, compared with technology in the bio-fuels area which lacks a number of the pre- conditions for broad deployment.

To help agriculture and agri-business meet an opportunity, also means having science and R&D capacity supplied into the region (from the public and private sector, where ever). Capacity means researchers, labs (wet or dry), contract manufacturing, consulting, technology transfer, production facilities, transportation, storage, venture capital and other resources or services which may be needed. These areas need to be explored more fully once the priority setting is completed for the top growth areas.

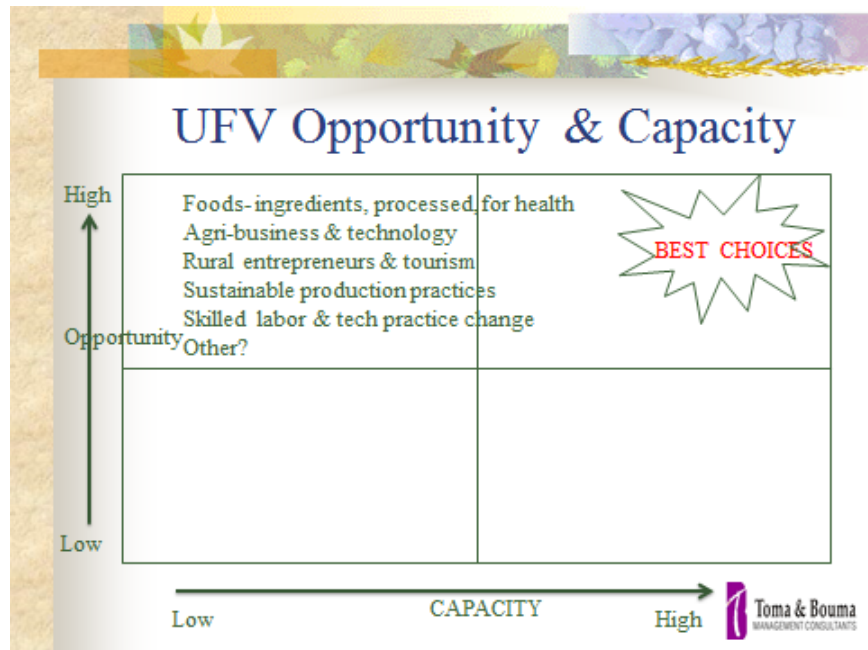
Top Growth Areas for the Fraser Valley

Based on the research above and industry experience, the top 5 opportunities are judged as:

- Agri-business & Technology- agri-business training including marketing,

management, quality assurance, food safety management and skilled labor development- which can be cross-discipline, cross culture and support several sectors. It must link to trends in mobility, e-commerce, bundled technologies and other strategic needs. This training is a gap and can be offered to many industries;

- Food ingredients and Value Added Foods- based on region products. Foods for nutrition and foods for health- based on dairy, poultry, berries, wines and other regional products offer much growth and opportunity. These are valid product opportunities for applied research, piloting, test marketing and pre-commercial work;
- Sustainable Production Practices - in sustainable production for fruit and vegetable crops, poultry and livestock- processing, community, farm co-location and intensive livestock operations for joint economic, social and environmental goals. This training is needed to ensure sustained farm production within many competing issues of local foods, consumers, environmental management, food safety, farm practices;
- Skilled Labor and Industry Practice change - in productivity improvement, robotics and automation for creating solutions to scarce labor supply problems. Related areas include: mobility applications/ analytics, technology bundling, equipment and machinery solutions for industry benefit. These areas can be offered to assist small companies to grow to larger companies and to manage within a labor short scenario;
- Rural Entrepreneurship & Tourism- including marketing, management, customer service, foods, wine ventures, related beverages, small- scale ventures and many related entrepreneurial projects.



Importantly, the Fraser Valley has a unique climate and landscape which lends itself to agriculture and food production on a sustained basis. It can be developed into a “food destination” for many people who are seeking these experiential opportunities. (World-wide, certain regions have done so, including Lethbridge with 3 global scale French fry processing

plants (from local potatoes), Napa Valley with local wines and agri-tourism, Quebec with Artisan cheeses and others in Europe.) The priority growth areas were confirmed in the dialogue sessions.

It can be argued that the top two areas are:

- Agri-business, entrepreneurship and technology;
- Sustainable production practices (focus -crops, livestock).

However, given the lack of region supports in the above 5 areas, UFV may desire to leverage with UBC and others to access out of region resources in research networks and other collaborations. The specific “how-tos” and plans need to be specified with a robust business plan process. As the agriculture sector is facing much global demand growth, and the Fraser Valley has many economic and agriculture strengths with not many supports, a strategic research business plan is needed (based from this trend research, validated by industry).

Next Steps in the Journey to 2020

This report addresses the Fraser Valley agri-food path forward, given the trends and technology drivers that are changing the Canadian and BC agri-food sector. These findings allow one to assess, judge and reflect on possible agriculture industry and student needs and requirements for growth and opportunity (or decline). The report will help guide and define the regional agri-food future too. The top opportunities for sector growth can be acted upon within a unified and shared vision that needs to include a regional model for public service and private participation.

The next steps (with confirmation of the 5 priorities) include:

- Applied research centre/ program Business Plan- Developing an inventory of region assets, capacity, skills and labs which can support the opportunities, and then developing a plan to serve that overall need (3 to 5 months);
- Fundraising Plan- Developing a capital campaign plan to fund the applied research plan from investors (public and private). Confirm a leadership team/ champions for the campaign; industry consultation and confirmation;
- Startup and Implementing the Plan- Once funds are assembled for the plan, develop the management team and other resources needed to deliver the plan;
- Governance and Monitoring- Build the Governance model which can sustain the organization as needed and guide future successful developments.

Attachments

A. Contacts-

Debbie Aarts
Trevor Allen, Sustainable Poultry Farming Group
Pamela Ambriz, VEL Foods
Chris Byra
Dr. Richard Carew, Summerland
Jennifer Curtis, BC Agriculture
Al Dick
Herman Driedeger
Rhonda Driediger
John Van Dongen

Tom Droppo, BC Agriculture
Walter Dyck, Sprucewood Farms
Anthony Edgar, NRC/IRAP
John English, UFV
Reg Ens, BC Ag Council
Miriam Esquitin, Investment Ag Foundation
Paul Goertzen, Hiprofeeds
Mona Granfors
Rick Hansum, RBC
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Ken Huttema
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Ryan Holling, TD Bank
Dr. Murray Isman, UBC
Allen James, Sustainable Poultry Farming Group
John Jansen
Nathan Janzen
Timothy Kendrick, BW Global
Jonathon Klinck
Henry Klop, Re/Max Nyda Realty

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Kevin Koopmans, Community Futures, South Fraser
Chris Kloot
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Dr. Kelly Ross, Pacific Agri-Food Research Centre
Dr. Kenna MacKenzie, Pacific Agri-Food Research Centre
Steve Saccoman, BMO
Larry Stinson
Netty Tam, CEPCO
Henry Weins
Bill Weismiller, BC Agriculture
Dave Woodske, BC Agriculture
Dr. Jim Vercammen, UBC

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C. Dialogue Session Input & Comments

As part of the report process we conducted three dialogue sessions with agriculture and food industry professionals in Chilliwack and Abbotsford April 16 and 17. The list of contacts is noted and the major comments and themes are discussed below. Top growth areas from the research are:

- Foods – ingredients, value added, or health;
- Agri-business and technology (GPS RFID, etc.);
- Rural entrepreneurs and tourism (destination);
- Sustainable production practices;
- Skilled labour and technology practice change.

The purpose of the sessions was to obtain feedback from the invited participants, which over the three sessions totaled 47 people from all parts of the industry. This feedback is gauged with the literature review to help set priorities for the applied research and centre directions for BC agriculture and food. The dialogue comments follow below from the three sessions held at the University classroom facilities.

Session 1 - Are these the top strategic opportunities? What should be the top 2 or 3 areas?

-Key to this is thinking globally; look at global trends. Crop failures in Romania 8 of 9 years. Eg. Need to produce more food, but protect from erratic weather patterns, etc. Need to make UFV known internationally, compete with the Dutch. Controlled environment; propagate knowledge. – see major growth in certain areas, stagnation in others. Commodity has no future, can't compete, can't stay on top of regulations, cheaper labour, should stay away. If you add value, find niche markets, differentiate, as an international company you make money. Have to be a leader, not a follower. Nutraceuticals, Functional foods, are making money if they are leaders. "Processed" has become a bad word, need to find new terminology. Focus on unique ingredients.

-ground crop and berry. Really recommend to take off rural entrepreneurs and tourism. Really shouldn't fit in the applied research or training. Let it happen outside, not a priority.

-a concern around table like this, level we are talking about and the communication links between producer and higher level, usually the connection isn't that good. This is an attempt to do that, but have to bring value to the producer, very difficult to do, hasn't been done well in the past. Need to create a plan that connects and promotes good communication.

-at grocery store; have to be fresh and diversified. Are getting farmers to grow the particular beans that the Chinese community is looking for.

-have a list of main poultry issues that they would like to see researched. Trying to compete against established areas, but it's very difficult to get it down to a producer level; focus on very simple things like fly control for everyday operations

-98% rule is important to be aware of; Canada only has 2% of R&D, populations etc, we usually want to build things here, but 98% is already being done elsewhere. We don't need to build it here, we can tap into what is already being done.

- dairy producers are worried about educating their children; need business management skills and technology. This is the next generation; need Agri-business and technology as a priority
- primary poultry; we need to think of what is going to be important 20 years from now. Communicate with public; food ingredients; producers; sustainable production practices. The consumer is going to drive what happens, not the farmer.
- just back from Europe; pig farming is an important part, consumer doesn't care about production, they only care about the ethics; can't have a high mortality, growth of chicken has to be half speed for ethical reasons. It's the consumer that drives it.
- Calgary coop just decided to shift to bigger cage sizes; eventually cages will be phased out.
- consumers want confidence; animal welfare, food safety, environmental, etc. Every time there is a new technology or process or practice, somewhere in the background someone screams it's going to make world come to the end. That consumer confidence is part of the social licence; how do we as industry address this over the next 20 years? Put forward a reasoned dialogue to consumers that this is a rational and reasonable choice
- Investment Agriculture is interested; coming from a consumer research background, look at the way consumers behave; least packaging and environmental impact but look at coffee pods. Looking at consumer wants, customized health foods is an opportunity. Sustainable practices to increase production and reduce environmental impact. Looking at Olds and UBC, we are losing ag capacity; how do we train and continue to build this? How do we want young people going into the industry if they don't know what it is?
- we have a high level of clients that are interested in agriculture, not just young people. Maybe we have to look into delivering education in a different way to facilitate this.
- as a farmer today, I'm already outsourcing information. In the dairy industry there are so much robotics, etc. We have to look all the peripheral industries. Some private industry has included that, but this is one of the things.
- Mitacs is interested and funds research in conjunction with industry. Fed gov't has been supportive. Gov't wants to address innovation issue; but are technology isn't getting to industry. This is a big area that gov't is interested in. Also connect with private enterprise to find challenges and get universities to work on them. In Canada we have a culture where business is hesitant to invest in R & D due to risk; in Ag rather than one company invest in R & D the money is pooled into associations, but the individual producers are trying to discover what's in it for them? What is the direct benefit? Traditional university works on very early stage research which may not have a benefit.
- from a nursery in Chilliwack. Horticulture and nursery is a sizeable industry, wasn't well represented. When you listed all the professors, it looks like pure research is covered. Can't see UFV having funds to research a whole lot of problems, would have to focus on one small issue. What I come back to is what do they all have in common? Agribusiness. If we don't have the entrepreneurial capacity we won't be competitive. Need smart, educated people running businesses, then grow more sustainable industries, innovations.
- from Canadian University trends agribusiness is hot area and is definitely a gap. Need to start at youth level. That is very important. What could be done differently; could focus on something that Ag Canada wants to get rid of an area, they might transfer it.
- Thinking there are a number of programs being delivered to farm groups already; nutrient management committee, don't need to reinvent the wheel about what is already in place. IAF

has money for helping farmers on the ground. IAC sees there is a gap there is no doubt. But a lot of this information has already been connected. Should be collecting information on what is going on now. One of the big concerns is Ag Canada and where it is going with the research station; intent seems to be closing down Agassiz; retiring staff and not replacing them. This is creating a vacuum; maybe this is filling that but somehow we need to capture some of those funds and get them here. What we need is more consultation before things get shut down. - need to think about funders table and service delivery table. All of service deliver has to be great quality; adds to the cost of running. Priority setting is important

- 20 years from now in Vancouver, food processors are slowly being squeezed out. Odor bylaws, etc. trend is that processing plants will need to move out of Vancouver. Some companies have gone out of business, some have moved to Chilliwack. This is an opportunity. Of the 5 areas, how would we measure success? More jobs? Investment? Need some kind of measure.

- this is phase one of focussing through the funnel, next phase would look at how to do this and how to measure it. Best case these are only 30 to 50% self-sustaining. In Edmonton, the Nisku Business Park was started from bare land and now has 5,000 employees and over 300 businesses. All businesses located there because of synergies, near the airport. That's what happens when you get that chance of joint shared opportunity. A centre of excellence could attract that kind of growth.

-Agribusiness and entrepreneurship. From feed mills and poultry experience in Western Canada; two things are important; what is the market?; our job is to feed the world and ourselves; hard core agriculture production is still 95% of the business, niche is only 5%. Even countries like Germany where they say no more cages they eggs are just produced elsewhere. Policy vs. trend is important to really differentiate. Just spoke to a University of Alberta class, 27 people hoping to find someone to hire. We need people for our future and is key; University isn't going to show us how to make better feed or chickens, but can provide a training ground for skilled labour to supply our business.

- can you talk more about skilled labour; what does that look like?

-It's the right training. Learn how to adapt and work in highly competitive adaptive market. We develop people to help us make money in a sustainable way. In that respect, the conversation always goes to where to find the people to hire. Can figure out what to do, but who is going to do it.

-We need agribusiness and technology skills and we need to learn how to distribute what we have in other areas, or grow them elsewhere. Secondly, advocate for having people who have something to say, speak to universities about the careers that they might embark in. Co-op education, get Co-op students out to the workforce. So; interface between industry, agriculture and university. Part of their training. 4 or 5 priorities make sense; this area has strong production future, has to be successful, succession planning will be key.

-another thing; commercial and niche market; there are so many things I wish I could test but too much red tape to do that; actually create the products or develop them; a centre to help farmers develop turkey salami, etc.

-food development centre needs to be a federally inspected lab; may be \$25 million; is that here?

-was one formed here but it was eliminated, there is a massive need for this model. Another thing, it is really hard to find people, we have opened up a category for food science students, Masters students to link them with processors for a short time, helps them match. But we are really struggling with Match Making. So many plants idle for six months of the year, trucks that

only go one way and come back empty. Need partnerships, but the challenge is getting the people to speak together.

-I think there is small scale test kitchen at BCIT, but it's not getting it to the pilot size, but there is investment agriculture that helps with the pilot programs.

-What about linking the culinary arts program here? That might have some merit. TRU has something similar, not a test kitchen but integrated center around culinary arts.

-explore developing skilled labour some more. That's what Universities do; so what about executive training or people in the industry; who helps you now? Answer; nobody, just go to conferences, just tell stories- that becomes best practice.

-In horticulture, Kwantlen, the other area has always been Olds College for picking up technicians, but that's horticulture. Douglas has an animal health technician. But it's a huge gap. UFV does have something.

-How do you see this thing getting going? How would we fund this thing? This is an information gathering phase, next step is developing a business plan.

-four feather groups in supply management pool funds on a national level, it all ends up in Guelph none of it gets back here. Marketing boards collect a levy. Are some small ad hoc programs which channel money into research, Industry development funds for commodities that go through producer associations, a group like dairy that works through BC dairy association. There are several of these that happen here or there; could identify some of them. Not a lot of funds available though, even the dairy industry is looking to get funds to help them with marketing, etc. Pacific berry research centre housed in this department.

- TRU had a federal program to hire a researcher to hire someone to create a program, cattle industry funded that. IAF couldn't fund the person, but could fund the research once the person was in place. That's a role that IAF could play.

-in horticulture industry, Vineland research station is offering themselves out as contractors to do research in food and horticulture. They were trying to sell themselves to the grocery industry in Vancouver.

-What about food industry; they really need technology, but are very competitive, it can be troublesome if it's public funding because they want to create their own thing but they do invest heavily in research, have to address the competitiveness; have to do research for them on a very specific problem. They work closely with IRAP.

-BC Government is not sure agriculture is a significant priority; but there could be a perspective where in 20 years people realize the importance of agriculture. This could be blue skying it, but there are enough challenges and ag is a solution to many of them. But in BC we have a cultural problem where economics are based around forestry, and agriculture is currently undervalued. Need to get to the root of that culture and change that. Have to prove and develop the value. A couple of years ago we were close, but didn't get that culture changed, but shifted back to forestry. Government sees its' revenue as being in forestry. But this is a fallacy, agriculture processing & manufacturing is bigger than forestry but this isn't well recognized or publicized.

Final comments

- huge step forward for getting ag focus in the university. Thanks for doing

- challenging to find the place to focus, but UFV is well positioned to do something great for farming and the province.

- food processors need to go somewhere, Chilliwack is ideal. If the door is opened they will come here. How do we sustain them? Need to build new plants and get into production.

- UFV needs to first build a foundation for what it means to education and empower people to

be then next generation. Once you build that foundation, then research and development phase can happen.

- intrigued. Lots of need out there; it's about where you focus as government does less.

-UFV guy, here to listen, this is very informative; UFV is looking to find ways to keep university growing and moving forward, looking forward to the report.

- it's great to see this room full of industry and people creating more than I went through. From producer level, need the base; applied stuff. As an association, we have a poultry fund in motion, but if something was created and industry needed to put in \$100,000, farmers can put in in kind. We as an industry are willing to spend money in an area that will defend our way of life.

- gov't austerity is a reality, we still have to compete. Need to find joint funding.

- many challenges; what is vision at board level for what UFV is? On one end is pure research, on the other end is people development. Almost incompatible options. Will be a challenge to sort through.

-ground crops not really represented, also blueberries; hope to see representation. Those guys should be heard and factored in.

- research and applied research; mention of research funds going to Guelph; part of that is Guelph's grad program. May need to develop a Master's level program at UFV to attract more research funds. (at UFV we do a lot of applied research). Push to see graduate thesis to be less theoretical and more practical. Co-op programs are similar to what Mitacs does; coops for researchers. Pleased to see this conversation beginning here before the program is set up.

- Don't cut too wide a swath and try to be something for everyone. Try to find the unique common thread across universities. Human resource development, robotics and automation is not the end all be all, it solves one problem and opens up more; not every dairy producer is happy with robotic milkers because of the additional level. Courses for dairy milker training are in high demand because they give theory and applied training. Farm business management; succession planning is a huge need. A million dollars is only a drop in the bucket....

-Business administration; see marketing, finance, people management, etc in an ag focused environment or incubator of ideas could be very valuable, might lead to where farmers move up higher in the social and cultural values. If you are state of the art, that could attract more young people. The business drives the whole thing.

- it's not working against each other; agribusinesses and training is core of university; the other piece on research and development, build on what you already have, fruit research already here, can we ratchet that up? Could be other things like that which have already been started.

-it's all about people, if you are training, the professor that trains is critical. If you are going to go there, find the right people. From the business standpoint, hazelnut association asked for help, the whole crop was collected, processed in the US, the value added happened south of the border and brought back here. Why US companies bought BC hazelnuts was because they liked our quality. There are low hanging fruit; centre of excellence with a focus on agribusiness.

-Access to capital; we need to help people to commercialize business ideas.

Session 2- Are these the top strategic opportunities? What should be the top 2 or 3 areas?

- there is definitely a lack of options for industry to do applied research; had to build our own pilot. Have 4 MSc food science staff to meet this need; either have to go to Saskatchewan, but have to get them educated. Has cost a lot of money to teach them, so it's better to do it in house. Also work with PEI institute. Has to be industry driven, have to have industry tell them

what needs are; have to have flexibility. Our area works like a mini research centre. Also need process development. It's easy to develop a new ingredient or product, but to be able to develop it into the line, that is the challenge. Funding isn't that easy, IRAP has helped fund some, but mostly we try to fund it in house. Having a partner like a research centre would be huge.

- I see an opportunity with integrating environmental with agriculture with social. Consumers want food with less pesticides for example. How do we respond? It lends itself to interesting opportunities. For example, Abbotsford aquifer; ground water supply is potentially being polluted; similar conditions around the world. Could we use this as a model; just finished a paper; using compost as fertilizer can reduce nitrates, create healthier soil with increased organic matter, can reduce pesticides and they lesser pesticides will be degraded before they hit the water table. Nutrient management; 440,000 acres of soft fruit and or field veggie production and excess of raw manure that can't be used on those fields. Consumers are driving the change, certified organic

- Media interfering with information, government making decisions based on media, etc. big proponent of tech transfer; certainly opportunity for innovation at producer and processor level. Problems around patent sharing, those kinds of things have to be considered when developing new products. Regulatory; pesticides, GMO's, animal welfare causing detriment to industry. This education must be continually promoted. Eg. Some of the products developed and tested in the US have to be retested here, but this doesn't make sense because our market is so small and it takes time, hurts competition.

- work in dairy; it's not in their interest to support processors because they are already selling their milk. Pork is different, and a lot of commodities. Have Limited, expensive land but huge population that are willing to pay premiums for desirable products / attributes. Look at a lot of these groups that are forming; they are using value chains to access markets, way to utilize high price land to access markets. You will see more people looking at these routes, including agri-tourism. Demand is for sustainable practices including animal welfare, food traceability, etc. to access this market. East Coast Quebec has been successful doing this.

-first; diversity vs. focus; one of the real difficulties, strength and weakness, Ag is very diverse, especially in BC. Anything UFV has to recognize that and not be all things to all people. Whatever we do with our institutions, we have to look at holistically as a province, because we can't do all the pieces. Have to work together, rather than compete.

-I believe there is a need for ongoing involvement by the ministry and institutions like UFV in the area of sustainable production and good ag practice. Extension and practical research working with farmers, on farmers land. Disease management help, unbiased assistance, testing production regimes. In FV, the intensity and capitalization of ag. Is amazing; people are stunned by farm gate sales; 20% of agriculture in BC is in Abbotsford; an indicator of this trend. Relevant to be plugged into this.

-Back to sustainable production; soil and water management. Sumas prairie; very painful to see a guy out there with a sprayer, spraying berries through standing water with a crawler tractor. That should not be happening; can't be good. Need to continue doing education; we are losing ground with soil based agriculture, not as good a place in my opinion as 25 years ago; bigger tractors, spreaders, more cows per acre, berries is no different; plant huge berry fields which are so compacted from working in the rain.... Need someone to take leadership on the issue of drainage.

-Agrifood trends; market trends; diversity. Markets looking for specific characters, including traceability. The market is driving this, not government. This is a serious trend. We have a

renewed focus on local production, connecting with growers. That is taking hold now more than ever. Good time to mention the area of new product development and innovation with new ingredients. If we are going to try compete / duplicate what other provinces are doing, I'm not sure we should try do it. I don't see our government supporting that scale of food processing development.

-Didn't see a consciousness of competitiveness, wither supply managed or not; I argue supply managed products have to be competitive as well.

-Agree about level standards with herbicides and pesticides; it's not acceptable for other countries to be producing chemicals we can't get in Canada because market is too small. I am in favor of less rather than more, but when you need a product, you should be able to get everything that the competition has.

- innovation, applied research training; I see a role for UFV; I'm stronger on this point, working in conjunction with gov't (ministry). I see this as a big opportunity. Numbered eggs, traceability will continue to unfold; guys building greenhouses in AB and California. We have lost our best growers due to carbon taxes. Value added; still lots of room to grow. Maybe something on the Value added side. Functional foods, nutraceuticals; really think the private sector with serious money has to go there; don't see the university or government being effective. Ethanol and Biodiesel; no because this is a huge problem making livestock more difficult. US subsidies aren't helping.

-Focus; trying to find the niche for UFV is really important; have to have a way to have various players functioning. Great to see UBC here.

-I see things differently based on my experience. I see innovation as an area we can focus on, as well as value added. The issue I see is that it doesn't stay here; we develop it here, then it goes across the border. This is a big issue, it doesn't stick around. The other problem is urban densification, has to be done on a lot smaller land. Most farms are 20 to 40 acres, tops. In terms of focus, value added, traceability, and innovation.

- everything I've heard is great. I want to follow up on some comments; I have always found the diversity of the Ag sector to be a major challenge; so many areas, you can count on one hand the ones that are big enough to support research. Greenhouse, Poultry, Aquaculture, Dairy and Berries, that's it. Even those, only give about \$150 K per year. 30 years ago it was \$100 million. Our peer institutions on the prairies have big commodities that support research, but we don't have those big commodity groups. We have a little bit of funding from Ag Canada, trying to get 3Ps going, but the IP issues become insurmountable. We are the smallest of all our peer institutes, meaning we can't cover all the areas. We have become boutique, doing dairy, some stuff on yeast genetics, etc. We used to be strong in poultry, our last scientist retired last year and we are totally out. Maybe that's an area for UFV. Other than fish and wine, we do very little on the production side. We do some stuff on how farming and urban can be integrated; using our 60 acre UBC farm to look at that. Outside of dairy and aquaculture we have gotten away from production. Mostly looking on post market stuff. We are still looking at some innovation, in wine and yeast, but it's tough because there isn't much history in BC of ag sector and university working together.

-One of the big challenges is trying to break down government regulation and IP ownership issues. In food processing, long history of discussion of food innovation centre like Leduc, but that is a losing proposition. Too many small players with huge diversity of needs, but have to be so careful with limited funding. Can't help more than just a small individual business here and there. UFV needs to find complimentary areas that UBC or Kwantlen isn't doing. One example, UFV is doing well in berries; Ag Canada is not hiring another breeder; industry is nervous, have

asked UBC to host this; there are areas where we are losing capacity, UFV should look at this... need to pick 2 or 3 areas.

- associations are too small, but partly it's a reluctance to spend. Many industries spending 10 – 15%, our industries only want to spend 1% despite documented successes. We need to convince industry to invest more. UFV needs to choose to collaborate or look at other areas, but not compete

-food safety, animal welfare, food sciences, could collaborate or look at other areas. Poultry calls for research looking at poultry, bird flu, etc. That alone might be enough

- Venture capital; high tech industry is built on this; how do we get venture capital into Ag? Can University do anything on this? This is a key constraint

-I think, private standards, Walmarts are niche, but we are still mostly commodity ag that we are producing, not vertically integrated, don't see this changing too quickly. Govt backing out of research, industry not picking it up, glaring gap in terms of research. New product development is incredibly hard to do; success rate is 10%, this illustrates need for venture capital.

-Research is down to Summerland and Agassiz, wouldn't be shocked if Agassiz was divested. Role of Ag Canada has shifted, base budgets are so small, looking for partnership with industry. Focus on industry led innovation, that is problematic here. They are downsizing, in the same way environment Canada has gone out of research into regulatory, DFO as well, Ag Canada is going this way. Provincial government has no research to speak of.

-UBC 13% international, trying to grow that to 20%. Very few students come from outside province. Master's program which was a research masters, but 4 years ago started a Professional Masters, it's been incredibly successful; up to 30 students, but could only get 2 or 3 in the research program. Hoping to see more in the valley. Also food science masters; focus on process engineering and food safety. Also launching land and water resource management. Seems to be a lot of demand for that.

- I like phrase "follow the money". In terms of GDP, our province spends 1.3 to 1.8%; Japan is 2.3 to 2.8%, huge difference. We have lost a lot of that in the ag industry, Summerland is an example. But their organization is still in place, Ardcorp, great tripartite thing including industry, feds and province. Lots of good ideas came out of that.

-Poultry industry, live on a very narrow edge in the world; 3 or 4 breeders. Genetics held by these companies, for us to do research and development, the feed companies and breeders all get their R&D there. I don't see a lot of opportunity, maybe in lysozymes or something like that.... Pretty narrow opportunities.

-three areas that might have potential; Ag economics; train people to take these companies forward; politics, finances, and how to run a business; Second, Dairy industry – talk to industry people, third, berries and wine industry as well; California is doing research, why not bring that here? Network and build collaborations. Need a chief scientist or leader to build those bridges.

- sustainable ag, ag business, entrepreneurship as focusses? In terms of food development, cost a lot of money and need good scientists or industry won't go there. Don't know if it can be done here.

-fundamental decision; do we want to foster a research or teaching centre?

-if looking at entrepreneurship and ag business training; it's the marketing that is most important and is usually falling apart. Several agree; we might have ideas, but who wants it? Who is the market, we can't get grants unless we can market it.

-college system in AB got \$6 million in applied research ; one of the ideas was market research in a region, maybe get library and upper level students to do some research? Still need a portal, or a way to make a centre or programs business- friendly, "7-11" model. Need someone

to call who says where to go.

- half of our UBC students are doing market research with different business, should think about hiring a summer intern.

Final Comments:

-communication is key, try get UBC Okanagan, Kamloops, Kwantlen, TRU onsite.

- complimentary, don't compete

- get industry information, work of things already in place

- marketing; maybe duplication, but I think of it in terms of following and obtaining money, industry would support it and applies to all sectors from producer to wholesaler

- in late 70s ag program was to be comprehensive that Chilliwack was to be the leader at the production level, not to be research leader. what happened, Kwantlen, Capilano, BCIT, etc. diminished Chilliwack. Lost a real opportunity, can't unravel that, need to move on.

- yes we need to listen to industry, but have to understand why the industry exists, general population has ideas as well and they are ultimately drivers, need to not just look at industry but consumers as well

- don't know how to make a research centre to meet various demands, but like idea of training and marketing centre as that's a big need we have.

- this session has been great, helping us drill down and focus. A lot of this really resonates, so thank you so much. Speaks to the realities, don't compete, don't duplicate, etc. can't do everything, so find the niches.

Session 3- Are these the top strategic opportunities? What should be the top 2 or 3 areas?

- Co-op students, some incredibly gifted students; larger scale, bring in conference groups, eg. Holland in the greenhouse industry; we need to collaborate not re-create. Build on ideas that are there. Another important one; sustainability and environmental; emphasis there already, only going to increase. Water is already a huge challenge. Main point, integrate students more into real life situations.

- from financial end, a lot of small farms decreasing, big farms growing; kids need to have a good understanding of finances. Kids need more management and financial training, because as the farms grow we are expecting more from them. Regarding sustainable production practices, environmental groups pressure, cage sizes in poultry and how that affects farmers, in dairy how they deal with manure, potential for digesters?

- I don't represent industry but I hear a lot. I work with emerging sectors, organics, functional foods, first nations. One issue/area included is social sciences, seasonal workers situation in Fraser Valley. Training and compliance could be addressed. First nations opportunity; have capital and land, could have digesters. Also native plant nurseries / reclamation for First Nations. Royal Roads is leading this in the North. Sustainable practices / organics; recently funded a report looking at trade; few sectors which has tripled in terms of trade, this area is well positioned, we consume 1/3 of national production. Water / watershed planning. Waste Management, recent study from UBC calculated value of waste as 2.7 billion, more than Canadians spend on dining out. Also a vacuum with the food centre being closed, used to help food processors, but now is nothing. 50% of companies of functional foods in Canada were located here in BC, but now do to regulation, etc. they have moved away. Institutional challenges, lack of support, capital, extensions, a lot of vacuums to fill.

- tremendous opportunity for exports, commodity, organics is a small industry so it's easy for

them to triple in size). Farms are getting larger and more complex; another colleague completed growing your farm enterprise; almost half the farms have sales under \$10,000 so many small farms, could help them. $\frac{3}{4}$ under 50,000 in gross sales, so look at demographics. Also, working with Canadian human resource council, just recently developed national occupation standards, this is something universities should be using to look at their curriculum. Sustainable ag practices, etc. this document is now complete, would be open to further meetings to find ways to implement those standards. Integration into other areas, the Ministry has lots of really good documents; starting a new farm enterprise, growing your farm enterprise, human resource guide for employers, planning for profit, but don't have the resources to get that information out; so collaborating on that.

- currently interested in alternative energy, wind solar, funding programs for renewables. Looking at manure composting, options for mortalities, manure and litter management, alternative uses for manure, vegetative barrier for dust, pest control, welfare of poultry, cage areas, dust control, bio-security. Who helps you with that now? We are the sustainable poultry farming group, all four sectors contribute, we are a research group so we get money to look at these issues, we also look at IAF, etc. Who does the work? Various consultants, private sector.

- Poultry and chicken industry; biggest challenges is education and public awareness with regards to poultry, on farm practice, biosecurity, antimicrobials is a huge issue that we are working on, how much is out there, and how much is in the chicken, big huge project. Biggest thing is education and awareness to the public in all the areas Esther mentioned.

- put a financial lens on things, we are seeing farms consolidate, need to access capital, greater need for business and financial capital, risk management including environmental, succession, capital, etc. We see so many farms today surviving only because of off farm income. It is business acumen that determines the success or failure. Also from financial perspective, huge swings in regulatory framework; big changes since crisis of 2008.... Actual due diligence of investigating files is become onerous.

- who is your audience; who are you trying to appeal to? Is it hobby farming, that's a lifestyle choice. Hobby farmers are not who you are educating. Think of who your student is, how are they going to find a job? It's great if you teach them farming and the environment, but teach them how to manage! How to interview, how to show to work on time, teach them some reality. Think about who you are attracting into these programs and what they are going to do after. Give them a management philosophy.... Goes back to organic, we need to stop labelling, we need to be better farmers, stop doing us vs them, let's all be better and use what's out there. Organics have run into a wall, they said you are poisoning the earth, we are not, but they hit a wall production wise and marketing wise. Think about commercial agriculture, not back yard gardeners.

- From the federal side of things, programming attempts to get better collaboration and more involvement of the industry to direct what research gets done. The latest research development and tech transfer, but not extension in the province, but trying to get the research out there and used, but we have limitations because the provincial people aren't on the ground doing that; so we are struggling to get the knowledge out there and adopted. In BC, ag education has dropped so out of sight, it's interesting to see in the last couple of years it's starting to make a comeback; this is good to see. Universities have roles to play in this; like the idea of an applied research centre, but make sure it's not duplicating, Kwantlen already has some sustainable production system work, make sure you are unique.

- can't look out 20 years, I just sell stuff that's current, but a couple of observations, find a project that is really applicable locally, because stuff that is national or international is money

down the drain, eg. LED lights, nobody is making it for agriculture, but if you jump in now, you'll be 10 years late. If the University of Georgia is doing something, don't try doing it here, they are way bigger. Look at the ALR, or something specific to our local situation / economy. Look into our problems here, like manure management, not looking at improving broiler chickens or something.

- echo comment about duplicating. We are diversified, but don't have capacity to be world leaders. Building on that, if you were outside, why would you invest here? Competitive advantage, if you were starting, would you start here? Understand this, and what does society want. Most farmers are here because of family or emotional ties. Is it lifestyle or business, or what? Small vs. large, in small you get free labour from family, but there is a huge gap. What's our expectation? Comment about Kwantlen; focused on urban farming so don't duplicate. Innovation; some people are going to fail. We have to be prepared to accept failure.

- this is exactly what we want to do, we don't want to duplicate, we want to be locally relevant not trying to be an international leader. As far as farm labour, whose fault is that? Education system taught that farming was for dummies, but ag did very well through the financial crisis; we are now beginning to realize that farming is still going strong. Shortage of labour; great opportunity through mechanization and automation technology. Also, expertise that we can export our technology information.

- teach greenhouse production class at UFV, was only 8 at first, now a waitlist. Demographics have changed, at first all were from AG, now they are in business management taking it as an elective. Maybe need to integrate Ag into business management. This is maybe an opportunity.

- two things; first is innovation; farm processing is an answer to small farms, do value added. Ties into ALR, bylaws, etc. needs to be opened up a little more. So much potential. Another thing, we need to think bigger, compete with china, they are getting more wealthy there, we need to start thinking out of the box to increase efficiency, productivity. Re-think the ALR, some land there that shouldn't be, other land that should be in.

- Top two or three seem to be; sustainable production practices, that has to be one or two.

- farming on an aquifer, social licence to do what we are doing is important to sustain

-Ag Business Management; training new young farmers, beginning farmers, skilled labour

-Looking at how we use strawberries; we get \$14,000– 15 0000 per acre, how can I use that land better, get more from the land? More yield, production

-Critical to get students onto farms, give them a chance to figure that out.

-Strong messages; compliment not compete with other research institutes and private sector.

One approach might be to be a clearinghouse; industry will pay for the information, whether it's by travelling elsewhere.

-Secondly, business, management and marketing. Maybe compliment UBC; support

-If you are setting up separate projects, look for sweet spots being overlooked in the Fraser Valley; don't take a shotgun approach, don't look at commodities. Some looking at specialized are going all over the world, we can't compete. Helps to position or build through capacity through networks or bringing people in.

-Those are our directions, we will start to figure out the how-to's from this. Center of excellence can only generate 30% – 50% from the marketplace, other support necessary. Gov't is withdrawing, industry needs to come forward and step up to the plate, and then foundation approach, and commodity groups. Funding can be available around research projects.

- you need a shared vision, with such a diverse industry, would industry groups agree to share in this vision... the industries that are well organized or making money could invest, but there are a lot of challenges in working together. Also, they are already being asked on many

different levels to contribute. Many of the small, unique agricultures would really benefit but don't have capacity to kick in money. How can we work together to look at opportunities that might be there

-Agriculture awareness is a key component. Need to know the vision, scope, etc. before we can answer the funding question.

Final comments:

-thanks, this is a great first step, good to sit in the room together. Feel strongly about taking this to another level; a group study of learning from other countries; Holland for example. We can learn so much, would answer a lot of our questions, how can we do this better. I think this would excite students at the same time, spark their creativity. Innovate.

- hope to continue to be involved

- I feel like we are struggling with the same issues at the Ministry, lots of opportunity to collaborate and work together

- good to hear others thoughts, business, management and applied research, having students on farm, learn by doing rather than textbook.

- great to hear the industry overview perspective. I'm taking the words of collaboration; so key in agriculture in the Fraser valley and all BC; this is huge, we would all be better for working together.

- great to connect to higher level of industry. Growth areas, did anybody touch base on licencing of "grow -ops" seems to be happening, should there be resources allocated

- have you had consumers come in and comment on processed foods, health, 7% shop cross border, many consumers don't care, would be interesting to hear attitudes.

-consumers always lie on the surveys. Supply creates demand, this place could be humming if it had the right stuff.

- great to be hear, all sit in one room, I'm sticking with agri-management, could have streams towards poultry or greenhouse, but teach them to be good managers.

- Concentrate on strengths of Fraser Valley and what we can do with that, very exciting area for Agriculture. I agree about looking at the Joe public, not niche markets. The education of consumers, but also students, this is the reality of agriculture. No farmers like spraying pesticides; those are myths. Joe public doesn't get it; stay practical.

-some of the comments brought me back to Ag management course from BCIT; it sounds like a lot of people are suggesting we go back to that style of program; very practical, did summer work on farms or in greenhouse, was a good taste of reality. Sounds like that's what people are asking for; this led to working in Agriculture, buying into a business, to where I am today. Need a balance between private and public; I'm a small business. Need to like business, teach them there is a place for business, we aren't the bad guys, the 1%. We aren't bad

- everything we talk about has to have a business focus. Secondly, we have to look at this regionally and collaboratively, not just Chilliwack vs. Abbotsford, etc. 3rd, industry has to lead, not academics, otherwise it won't be practical.

- I totally agree, there is a lot of passion to drive this forward, we are looking to create something regional or even provincial. From management side, it's so difficult to find people willing and able to manage. We had a spot open for second level management, were looking at 24 yr old, offered a \$10,000 raise, first wasn't interested, looked at the operation, went to talk to his boss, now his boss is paying over \$100,000. We have a hard time finding good people.

-strategic opportunities- manufactured berry products (blueberries, cranberries), niche products such as herbs and exotic crops

- top research interests- berry and vegetable variety development and evaluations, Pacific Berry Centre helps a bit but needs more funding
- is a real need for a funding expert or contact centre that would help grower associations in developing proposals
- perhaps through BC Ag council or ARDCORP there needs to be assistance for groups of growers or food processors that are pursuing new crops/ ideas so they can access research funds

Other Comments In via Input Form

What are the Top agriculture/ food development opportunities?

- opportunities are limitless especially in further processed food for all kinds of niches
- training a new generation of farmers for conventional and innovative agriculture
- developing niche, high value products that meet consumer wants
- agriculture/ horticulture business centre of excellence
- brand BC grown product on our pristine environment
- what are our advantages?
- high value intensive crops
- further processed crops
- health/ supplements
- manage environmental impacts
- much greater emphasis on value added
- greater flexibility on the food processing/ retailing
- build agriculture awareness & importance
- implement national occupational standards for managers in agriculture
- use resource materials produced by Ministry staff
- R&D, incubator, pilot centre for value added and functional foods
- social science research into seasonal workers and First Nations
- IPM & productivity and adaption of berries/ vegetables/ potatoes
- sustainability
- high value quality nutritious recognized around the world
- mechanization/ robotics in the production chain
- sustainable production
- building sustainable agriculture (European like)
- marketing high attributes from local foods
- value chain / business & entrepreneurship development
- unique or best quality products in Canada (for export)
- new product development
- agro-tourism, hospitality
- certified traceable novel food products
- mesh into local food markets
- become leaders in animal care/ welfare
- local production and processing of fruits and vegetables (ie. promote value added processing) to ensure food self- reliance and support local economy
- developing bioenergy and bio-products from cull fruits/vegetables and/or fruit/vegetable waste to reduce food producer's energy costs, enhance/supplement income, and reduce carbon footprint
- utilizing/adjusting pre-harvest and postharvest conditions to enhance bioactive components of

fruits and vegetables

What are the top agri-food research interests or issues?

- agri-business and technology
- food ingredients and processed foods for health
- sustainable production practices
- developing innovative technologies
- meeting consumers wants for assurances about their foods
- attaining Canada class food production / processing research
- pest management (production based)
- technology to replace labor- more automation
- farm business management, key to farm success in today's highly competitive markets
- small fruit health properties
- agri-food entrepreneurship- want to expand but not lose control of their business to venture capital
- closed circuit indoor fish farms
- increased processing of foods, fruits, meat etc
- restrictions that the supply and demand system burdens and restricts innovation
- HR management
- sustainable ag in Fraser Valley
- co-op programs- integrate private / public – industry led
- manure management/ composting
- alternative energy
- dust control
- shelf life to establish production and packaging processes to be able to ship fresh to high revenue market places
- mechanization – robotics
- marketing skills, non-commodity
- sustainability & traceability
- general agri-business management
- implement & market bio-tech
- urban encroachment, urban-rural interface
- food safety
- food in proactive health products
- food safety
- traceability
- creation of novel food products
- value added processing of lower value or cull crops into value added products to supplement producers income and reduce the dependency on optimum growing conditions for producing highest quality/highest grade produce for the fresh market
- climate change and abiotic stresses and the effects on bio-actives along with carbohydrate and lipid compositions and digestibility of energy of fruits and vegetables
- developing bioenergy and bio-products for biomass (crop waste, food processing waste)

Is anyone helping you? Yes- 9 no- 3

- federal/ provincial/ private sectors
- both experts in private & public sector but the level of help is diminishing gradually in public

sector

- some capacity at UBC/ BCIT
- our group has been involved in development of a fish farm project
- gov/ federal/ IAFBC, BCAC
- food innovation centre- now done, Fraser B Council, some consultants
- through sustainable poultry farming group, some national research
- not really, some individuals but poor availability of marketing skills. Guelph MBA
- some academic research but modest
- UBC has recently hired 2 profs in food safety an engineering

Free Service? Yes-3 no – 7

- yes, largely free, but some growers do hire consultants to research problems
- solve industry problems or opportunities- research reports
- should be a free service

Would you be interested in Supporting an applied research effort and any other comments?

- we need to emphasise the agribusiness program and train people for ag careers. Applied research is essential on some scale even though it is expensive
- yes!!, building credible assurance systems and creating a technology advisory service or centre
- I would really question where the funds would come from if not Government
- I encourage the University to focus the type of expertise in the Centre. I'd prefer to see the centre focus on two areas- there is tremendous breadth in the 5 strategic opportunities that were presented. Not possible to cover all of them
- would be good to link the centre with AAFC- Agassiz because they have the facilities but are lacking researchers to perform work. Not sure we need another greenhouse research site developed without sufficient operating budget
- IAF will assist in the support of research projects that benefit the agriculture/ food/ bio-product sectors
- this forum is an excellent start to the process. I would be very interested to have a group study exchange that allows visiting other countries and learning from them
- yes, pilot a farm business management challenge on solving industry issues brought forward by local producers- Dragons Den approach
- IAF has funding for industry needs but not for capital
- yes
- I would be interested in assisting in applied research
- food marketing, all levels or product/ processing, venture capital, private financing, value chains
- ag business management, link to Soder School to provide a food industry course, case studies
- UBC Land & Food Systems would be happy to continue discussions with UFV on identifying niches for research / training and potential areas for collaborations
- as an economist I have limited capabilities to support technical research. I can help facilitate student interest in the area and in food market analysis
- I would be very interested in helping in these research efforts however to justify AAFC personnel's time on projects, funding must be secured and funding for these types of projects is extremely limited

-end

Slides

South Fraser Valley Dialogue: Ag Food Trends 2013- Sponsors- Chilliwack Agricultural Commission, CFSF, IRAP, UFV



Darrell Toma, MSc, PAg, CMC,
dtoma@shaw.ca, 780-413-9262



Understanding Trends & Practices

- Trends inform expected changes
- We want you to help discuss priorities
- Dialogue sessions will be aggregated
- Is part of the report findings



Canadian Farm “Quantum Shifts”

- End of frontier era- 1900s
- Mechanization applications- 1910
- Scientific Agriculture & Principles- 1930s
- World Commodity Markets- 1950s to 1970s
- Food production systems- 1980s
- Information/ technology/ globalization- 1990s
- Life Sciences/ renewables/ automation- 2000s
- Sustainable green economy- 2020+



Agri-food Trends

- CDN farm sizes larger, fewer farms, Total- 205,730 farms (2011- 17% less from 2001)
- BC SFV– more berry, dairy, poultry, specialty
- Global markets/ trade/ competition- more
- Food safety, animal & human health/ environment -links
- Effects-Climate change, GHG, water, land, air
- Bio-tech, yield improvements



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- Global markets/ trade/ competition- more
- Food safety, animal & human health/ environment -links
- Effects-Climate change, GHG, water, land, air
- Bio-tech, yield improvements



Related Technology Trends

- Labor & Demographics- changing
- Robotics, automation, innovation- needs
- Mobility, devices, e-commerce- increase
- Productivity Improvement, lean, SCM
- Applied research, Centres, University system, MOOCs- changes/ roles
- Trends inform our planning ideas



Considerations

- Canada is one of say 5 or 6 ag food export producers
- If you came to Canada, where would you invest?
- Ag food is a strength of south west BC but has challenges
- Think 10-20 yrs out, what can be here?
- This is the context

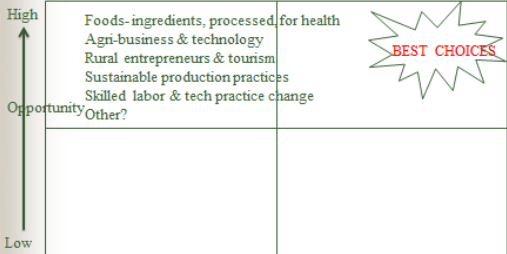
Top Growth areas In FV Region-

Draft Findings

- Foods- ingredients, value added, for health
- Agri-business & technology (GPS, RFID, etc)
- Rural entrepreneurs & tourism (destination)
- Sustainable production practices
- Skilled labor & technology practice change




UFV Opportunity & Capacity



High
Opportunity
Low

Low CAPACITY High



Questions-

Your Input to UFV R&D Priorities

15 min each

- Are these the top strategic opportunities?
- What are your top agfood research interests?
- Who is helping you now?
- Are you interested in the applied research & centre concept?



E&OE, April 23, 2013

Agri-food Directions to 2020: Trend and Technology Drivers



Summary Research Report

Presented to:

**Chilliwack Agricultural Commission,
CFSF, IRAP, UFV**

Submitted by:

**Toma and Bouma Management Consultants
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Ph 780-413-9262; F 780-401-3044**

April 2013

Executive Summary

Project Objectives

This project required an assessment of BC agriculture industry needs for applied research and training in the Abbotsford/ Chilliwack region. The objective was to conduct research and validate the top areas by industry consultation in defining directions for a new regional Centre and related research areas for potential UFV programming. To help agriculture and agri-business meet an opportunity, means having science and R&D capacity supplied into the region (from the public and private sector, where ever).

Findings- Top Growth Areas for the Fraser Valley

Based on the research above and industry experience, the top 5 areas are judged as:

- Agri-business & Technology- agri-business training including marketing, management, quality assurance, food safety management and skilled labor development. It must link to trends in mobility, e-commerce and bundled technologies;
- Food ingredients and Value Added Foods- based on region products. Foods for nutrition and for health- based on dairy, poultry, berries, wines and regional products;
- Sustainable Production Practices - in sustainable production for fruit and vegetable crops, poultry and livestock- processing, community and farm co-location for joint economic, social and environmental goals;
- Skilled Labor and Industry Practice change - in productivity improvement, robotics and automation for creating solutions to scarce labor supply problems. Related areas include: mobility applications/ analytics, technology bundling, equipment and machinery;
- Rural Entrepreneurship & Tourism- including marketing, management, customer service, foods, wine ventures, related beverages and small- scale ventures.

Importantly, the Fraser Valley has a unique climate and landscape which lends itself to agriculture and food production on a sustained basis. It can be developed into a “food destination” for people who are seeking these experiential opportunities and a food production base. The priority growth areas were confirmed in the dialogue sessions.

It can be argued that the top two areas initially may be:

- Agri-business, entrepreneurship and technology;
- Sustainable production practices (focus- crops, livestock).

Given the lack of supports in the above 5 areas, UFV may desire to leverage with UBC and others to access resources in research networks and collaborations. The specific focus and “how-tos” need to be specified with a robust business plan process to build/ attract in funds which now, are not serving the region. A strategic Centre research business plan and shared vision (from trend research, validated by industry) along with joint public- private leadership is required to meet training and applied research interests. Collaborations are possible and need to be explored.

Introduction

The study was commissioned by the Chilliwack Agricultural Commission in cooperation with Community Futures South Fraser (CFSF), NRC-IRAP and the University of the Fraser Valley (UFV). The Chilliwack Agricultural Commission is a subsidiary of the Chilliwack Economic Partners Corporation (CEPCO). The activities of the Centre will be driven by industry needs and priorities and focus on delivering practical solutions to technological challenges and opportunities. It is expected that the Centre would become the hub of an inter-regional and international network of scientists and other industry specialist working on industry projects. The large primary agriculture sector in BC is comprised of 20,000 farms, with \$2.4 billion in gross revenues and is a strong base for the regional and provincial economy to build into global agri-food markets.

Objective

The objective of this study was:

- *“The primary objective of this project is to initiate a process to garner industry support for a Centre of Research, Innovation and Education that would provide local firms and other stakeholders with an awareness of the opportunities, new methodologies and challenges around the adoption of innovative technology, services and processes for productivity gains.”*

The scope of the technology and trends research study was limited to a review of literature and a series of 3 focus group meetings/ interviews (about 50 industry people) in Abbotsford and Chilliwack. These trends will continue to challenge agriculture and food businesses in BC and Canada.^a

We greatly appreciate the guidance and support of Anthony Edgar (NRC-IRAP), Lorne Owen and Kevin Koopmans (CFSF), Dr. John English (UFV), Netty Tam (CEPCO) and many others. The next steps are:

- Continue regional discussions on these concepts;
- Confirm Centre programs and plans in a strategic business plan with funder input;
- Develop the capital campaign as needed;
- Organization and startup of a new program and Centre.

We see many ways to support BC agriculture and food industries with this proven model just as others have done and look forward to these developments.

Sincerely,

Darrell Toma, MSc, PAg, CMC

^a This summary is based on the larger technical report.

Canadian and BC Agriculture Trends and Issues

Canada and BC has a very well developed and respected agri-food sector which is export-oriented, highly innovative and the major changes in the sector can be viewed within a number of sector transformations since the 1900s. The emerging trends are driving many changes which farmers and food company managers need to understand, assess and respond to.

Figure 1– Major Trends In Agri-food



Canadian Farm Numbers Are Declining- Farms are declining in numbers nationally and show some general trends in use of technology and market types. The Census shows nearly half (48.3%) of farm operators were 55 or older, compared to 40.7% of farmers in 2006. The total number of farmers is declining rapidly. Quebec has the youngest farmers, with an average age of 51 years. British Columbia's operators had the highest average age at 55.7 years old.

Canadian Research Agenda is Changing- Many related research changes have been spurred on in the Canadian agri-food sector in the last 15 or so years:

- Reduction in direct payments to farmers and a shifting to risk management approaches;
- An increased interest in applied research and in basic research commercialization through the federal and provincial governments and with more college level applied research;
- A reduction in direct farm extension services since 1995 by provinces and also by the federal government and an increase in private sector consulting;
- Canada's agri-food system is very export- oriented. Competitiveness of the agriculture and agri-food sector requires its innovation ability to remain productive and viable;
- Consumers are demanding more variety, more convenience, more environmentally-friendly and healthier food choices, as well as food that addresses their values;
- Food development centres have been developed in provinces to help in food product developments, and offer equipment and services to help in new food product development and testing, product improvements and analysis;

- Nationally, Agriculture and Agri-Food Canada has research centres and scientists to work on projects. BC has two centres at Agassiz and Summerland.

An increased emphasis has been placed on biomass uses, biofuels, foods for health and more value added products. These are emerging areas and in some cases high risk. In addition, a greater reliance on collaborations with the private sector, building a globally competitive business and increased innovation are key themes.

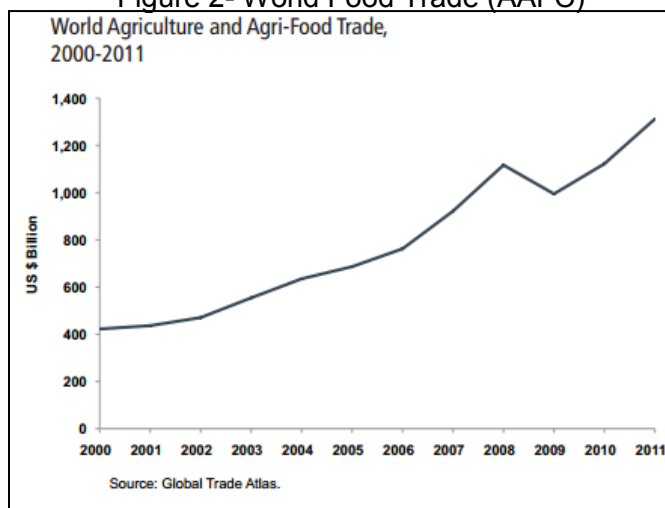
BC Agriculture Trends- BC specific findings include:

- Alfalfa, canola, wheat area are increasing while other tame hay area decreased. Soft fruits are important including: sweet cherry, blueberries, cranberries, raspberries and apricots. Other important crops include: grapes, apples, field vegetables, greenhouses and greenhouse vegetables. Dairy cows, poultry and livestock are also significant and the Fraser valley has many farms and food processors;
- For BC agriculture and food applied research interests, the aging of the farm population, concentration of fewer and larger farms and high capital investments means the use of more technology and other labor substitution methods to maintain and increase productivity. The BC farm sector and their needs are changing.

Increased Globalization and Trade- Canada has grown as result of demand from global markets for products, commodities and services. The WTO (World Trade Organization, prior GATT) agreement for agriculture was completed in 1994 and a current Doha round is still in process since 2001. The WTO’s Agriculture Agreement was negotiated in the 1986–94 Uruguay Round and is a significant first step towards fairer competition and a less distorted sector.

Canada is now reviewing a trade agreement with the EU (CETA, expected 2013) which has major possible opportunity and competitive challenges. Canada is also interested in the Trans- Pacific Partnership Agreement which can help secure market access into Asia. Other agreements are being entered into which means both new market access and also new competition. This trend helps to build global opportunity and also needs more internal productivity and innovation.

Figure 2- World Food Trade (AAFC)

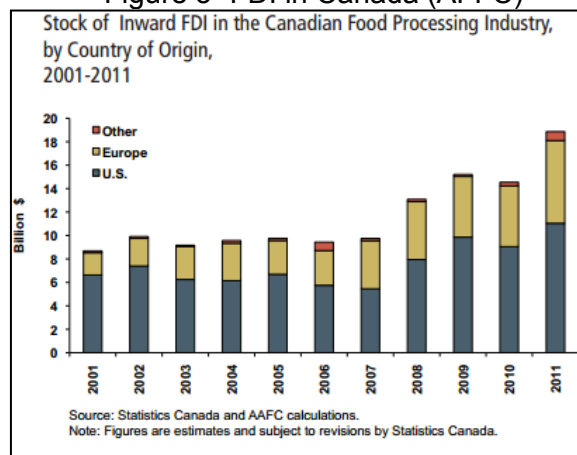


The FAO completed a major global review of production, consumption and the many factors which will be important for populations to 2030. The role of research and technology developments will become more important for addressing all production and yield improvement needs. *“It will need also to come from countries and agro-ecologies where such potential is very limited. This requires continued support to agricultural research to develop improved varieties for such environments (including those coming from modern biotechnology).”* The need for strategic research will be very important, especially now given the budget issues that face many governments. Some of the broad global trends in global livestock production and trade are:

- The increasing importance of monogastric livestock species compared with ruminants, together with a shift towards increased use of cereal-based concentrate feeds;
- A change, depending on the region, from many production objectives to more specialized intensive meat, milk and egg production within an integrated global food and feed market;
- A trend for intensive livestock production to grow faster than mixed farming systems and, even more, from grazing. The increase in large-scale, industrial production with high livestock densities near human population centres brings with environmental and public health risks, as well as livestock disease hazards;
- World livestock production will originate in warm, humid and more disease-prone environments and animal health and food safety issues will increase. These developments will also have growing role of trade in live animals, products and feeds;
- Increasing pressure on, and competition for, common property resources, such as grazing and water resources, greater stresses on fragile extensive pastoral areas and more pressure on land in areas with very high population densities and near urban centres.

Investing In Agriculture- Foreign Direct Investments- Another trend is being seen in global investing and new financial flows of capital across borders. This trend will accelerate in the next ten years. Similar to the first wave (more than a hundred years ago), more world-wide links are expected as well as reduced transaction costs for movements of goods, people and capital. Developing countries will generate enormous demand growth for more food, higher quality food and technology. Foreign direct investment (FDI) is increasing globally and the figure shows FDI for Canada in food.

Figure 3- FDI in Canada (AFFC)



A parallel trend can be seen with FDI in the movement of technology. *“In the case of agricultural commodities, they involve fantastically brilliant “embedded” technologies. The embedded technologies involve genetics, mechanization, automation, chemical, managerial and financial transactions that are astonishingly complex. All of these complex embedded technologies involve capital (human or financial) of one sort or another. All these “commodities” get moved around the global, and the embedded capital moves with them.”* It is expected that this trend of capital and technology will increase.

Food Safety, Animal and Human Health and Environment Risks- Over the past decade, food safety has become one of the leading issues for both producers and processors. In the UK, BSE was found to affect people negatively and several people died from eating red meat. In the USA, a Jack in the Box restaurant had several people die from hamburgers. In Canada, a BSE event in 2004 cost about \$4 billion or more to the economy and cattle were banned from exports to many countries including the USA, Japan, Korea and others. In 2008, listeria-tainted meat scandal (ON, Maple Leaf Foods) caused a number of deaths. An Avian flu event in BC caused a number of farms to be de-populated for fear of disease moving into the human population.

As a result of these types of events, the public has become increasingly aware of the impact of both production and processing practices on food safety and quality. They want answers about the health effects of the food production practices that include the use of chemicals such as growth hormones or stimulants to increase production, antibiotics and other medicines to manage animal diseases, agents such as ammonia to control the contamination of food by e-coli and other bacteria, and pesticides and other chemicals used in the production of animal feed. The public is also demanding a lighter environmental “footprint” from the farming sector. Several high-profile cases of human illness have been traced to the contamination of the water table and soil through the disposal of manure. Other issues include the safe handling and disposal of animal parts (of diseased animals, as well as from slaughtering facilities) and the proper handling of food products, such as milk and eggs, on the farms where they are produced as well as during transport.

Natural resources including water, land and air are key aspects in agriculture, especially in resource scarce areas. The OECD notes the role of water quality and agriculture as key issues:

- Water pollutants from agriculture include runoff and leaching into water systems from using and disposing of nutrients (inorganic fertilisers and livestock manure) and pesticides, soil sediments, and other contaminants (e.g. veterinary products);
- Quality is other stable or declining. While the current situation varies both within and across OECD countries, agriculture is often the main source of water pollution;
- There has been an overall increase in the uptake of farm management practices and systems beneficial to a large extent encouraged by recent policy changes;
- The overall economic, environmental and social costs of water pollution caused by agriculture across OECD countries are likely to exceed billions of dollars annually;
- The outlook over the next ten years for agriculture and water quality suggests that the growth and intensification of agricultural production in North America, Turkey, Korea, Australia and New Zealand, could further heighten regional pressures on water systems;
- The future consequences of climate change for agriculture and water quality linkages are complex. The area is not well researched.

Local Foods and Urban Agriculture- Local food production, a greater reliance on community gardens, the 100 mile diet and urban agriculture have become recent interests by communities and consumers in better understanding where food comes from, how it is produced and in developing the “trust” issue better. Local food production is concerned with consumers having access to agriculture products which can be produced and consumed locally. The best products for this application involve: vegetables, fruits, eggs, poultry, dairy products and similar items.

Figure 4- Local Foods



Understanding the issues, roles and responsibilities in the local food system is not easily reconciled in a global food system. A number of ways to meet these new emerging trends for local foods:

- Using local farmer markets for products;
- Local and community gardens on unused urban lands;
- Incorporating land use zoning and enabling regulations (urban chickens);
- Internet marketing with local farmers by economic development agencies;
- Teaching people how to cook food, defining healthy foods and diet counselling;
- Buy local food procurement policy by retail stores and restaurants;
- Promoting local farm tours and pick your own products.

Biotechnology and Yield Improvements- Biotechnology and the use of new lab techniques to identify, extract and use specific genes is being used to help overcome certain problems in a species. Some developments have led to yield improvements, resistance to pests and addition of missing elements- generally for purpose designed improvements. Biotechnology has been defined as a “*combination of advances in molecular and cellular biology, plant, animal and human genetics and how the human immune system fights disease.*” Biotechnology developments can involve diverse skill sets, equipment and labs, applications, and analysis to develop new processes, inputs, products and technologies for a breadth of markets.

Traditional breed selection practices interestingly, are also seeing a trend of maintaining the “old ways”- such as using heritage breeds in poultry to maintain genetic diversity. In some ways, the organic movement is also a reaction to this biotech and local foods trend.

Many related scientific discoveries are occurring in agriculture, food and health segments. Golden rice is an example. The developments are generally viewed as clusters of scientific activities (early

stage) moving to market ready products. Biotechnology in agriculture is well recognized and accepted in crops but less so in livestock. This segment is an emerging area and offers many opportunities and challenges for the agriculture sector and for society, especially in difficult ethical issues. The trend of biotech will continue to grow and fits within the theme of a life sciences trend that meets consumer desires for meeting various aspects of market demand, notwithstanding a continued debate on applications.

Value added Products- Higher quality food products and value added foods and related products are a goal for all jurisdictions and part of the national agri-food agenda. As incomes rise, people desire higher quality goods and Canada has many raw agriculture goods which can easily fit into this category. Value added products are a global trend in the agriculture and food industry. Some examples in the BC South Fraser Valley give ideas into potentials. Sandel Foods for example prepares fruit and berry products into high value apple pie fillings, fruit glaces and other ingredients for seasonal meals. The valley has over 20 value added food processors with varied products including egg, wines, berries, meats, dairy and other smaller scale opportunities. Some argue more berry crop variety and crop management research is needed.

Value added food products develop in a variety of ways:

- Entrepreneurial efforts in a new jam, jelly, baked product or a new mix of ingredients;
- Research which demonstrates efficacy and utility with an ingredient in a current product;
- Developing a new product form (eg. meal replacement food bars);
- Adapting an international food product into a domestic niche (eg. tacos, salsa).

Value added foods can include many types such as:

- Meat and grain snacks and products;
- Field vegetable and fruits, and greenhouses and products;
- Baked and processed foods;
- Wines, beer and beverages;
- Ingredients into food products.

Some of the barriers to the value added food trend need to be understood:

- Municipal and provincial regulations affect production facilities and regional markets;
- Food labels, and in some cases need for evidence (functional foods);
- For meats, special CFIA regulations need to be met, and for interprovincial and international trade, need a federally inspected plant (higher costs);
- Accessing a retail or HRI marketplace in a sustainable manner is difficult, competitive and expensive for listing allowances and advertising

Renewables- Bio-Products, Bio-Energy and Bio-Mass- Renewables and bio-products are a national and global trend. The topics of new products from bio-materials derived from agriculture, forestry and other sources are an area of research and development. Bio-based materials include agri-fibre applications for papers, boards, composite materials and other related items. Bio-chemicals involve developing polymers and monomers for bio-cosmetics, bio-plastics and bio-lubricants. Bio-energy involves uses of municipal solid waste, forest wastes and slaughter plant wastes and manure for co-generation of heat and power. In addition, solar and wind power can be considered a bio-energy/ alternate application.

The major biomass source is from agriculture. Benefits of using bio-products are:

- Reduced damage to environment and greener products;
- Reduced production costs;
- Develop new markets and new products;
- Increased market share;
- Improved product value and performance.

Food For Health Products- Canada has a relatively new natural health products and functional food industry compared with other countries. The Canadian industry of \$3.7 billion, has an estimated 2.6% share of the global market for functional foods and dietary supplements. These products have science behind the products to defend their claims. Functional foods are easier to develop and bring to the market, while nutraceuticals fall under the natural health products (NHP) regulations. Nutraceuticals are defined as:

- Vitamins and minerals;
- Herbal remedies;
- Homeopathic medicines;
- Traditional medicines such as traditional Chinese medicines;
- Probiotics; and
- Other products like amino acids and essential fatty acids.

These types of products are very science-intensive and require many skills to bring a product to the market. Gaining approval for the product to be used, can take 1 to 2 years. The trend continues for these products and is a specialized area for researchers and labs. Some cranberry research has been done on the active ingredients and now needs to be further tested commercially. These products are a strategic area which should be pursued given the berry supply base in the Valley and the high value that active ingredients (derived by fractions) can achieve.

Obesity and Healthy Foods- The area of healthy foods and food links to obesity is noted briefly as it is a major concern for many countries. This research area attempts to better link food products with health issues, and specifically obesity and healthy weight. Overweight and obese people tend to have higher levels of disease. The Canadian Obesity Network has nearly 9,000 members across the nation and is growing in numbers. It attempts to be a source of unbiased knowledge and methods to deal with the issue.

Consumers want to prevent disease and manage disease with natural products Food has been labeled as healthy and unhealthy by people involved in health services and health promotion. A trend towards globalization is encouraging more frozen, processed and packaged foods for global retailing, in effect ensuring longer shelf-life. Kitchen technology has been developed to reduce labor, including the use of microwaves and many labor-saving devices that are used for food preparation to respond to time constraints.

People have also “deskilled” their knowledge in cooking methods, simple food preparation, and canning for many reasons. Companies have responded by making ready to eat foods, packaged ingredients and other meal solutions. Ingredients are developed for specific flavour, color, scent, and mouth feel to encourage consumption through modern food design, specific purposes, and to

meet global food product needs. Together these ingredient applications have also meant consumers are consuming more unhealthy foods, and that people are gaining weight and many are obese. Thus, the link of food, diet, socio-economic factors and community to obesity and agriculture. A new food topic which is also emerging is ingredients that are allergens to people.

Rural Tourism - Rural tourism is a related area to agriculture and foods and is commented on as some rural landowners and farmers may offer these experiential product areas. Varied examples help to show how a rural area can access its local rural assets for highly interesting and sustainable agri- tourism activities. This is an area which can be further greatly assisted in the Fraser Valley as a sustainable food- oriented destination model.

Entrepreneurship Ecosystem & New Business Starts- Entrepreneurship and development of an ecosystem is another trend and can be another means to a sustained regional rural economy. The market niche of entrepreneurship in a rural community is a very viable and expanding trend which can also be served through the internet to allow global marketing. This can include rural “experiential” products like paintballing, river canoeing, camping, bed and breakfasts and petting zoos. It is a very diverse niche and some businesses have developed these product examples.

Entrepreneurial ecosystems research is now underway by Harvard University professors in about 22 countries in understanding what is needed to create large fast growth companies from startups. This can include business incubators and other services. Babson College is widely recognized as the world leader in the field of entrepreneurship education and is dedicated to sharing practical and proven methodologies for teaching entrepreneurship with other institutions around the world. This is an area which can be applied into the Fraser Valley region. A related high school entrepreneur training method which should be noted is Junior Achievement. An evaluation of Canada’s JA graduates shows it helps form many good habits for youth and in entrepreneurship and business.

Trend Summary- From the broad trend review, a number of research needs are identified:

- Populations are increasing and will need food products of many types for nutrition and life. By 2050 the expectation is about 9 billion people in the world;
- Trade agreements and global trends mean more market access and also more competition into Canada and thus more economic and market changes. Globalization is driving many changes because of increased international trade, more standards and adaptation;
- Sustainable approaches in production and processing are increasingly under scrutiny and research into new/ improved methods and practice change is needed;
- Food for nutrition, ingredients, health benefits and specialty uses are growing in demand;
- Local foods, direct sales, urban agriculture and e-marketing are increasingly being used in connecting with regional farms;
- New uses with renewables (bio-products, bio-fuels) are increasing but the technologies are not all fully developed or proven;
- Related niches including agri-tourism ventures and rural entrepreneurs are emerging;
- Green technologies and life sciences are expanding but are developmental in many cases;
- Computers, the internet and knowledge sharing with researchers, now assists management because the public lab extension supports have largely stopped;
- The agri-food sector is always seeking new products, practices, technology uses and markets. Risks are a related issue to these trends and must always be considered.

Related Technology Trends and Practices

In addition to the agri-food driving trends in research interests noted above, are a number of allied important technology trends and practices which are developing. These allied trends are:

- Labor and demographics;
- Robotics and automation;
- Productivity improvement;
- Innovation;
- Mobility and e-commerce;
- Supply chain management.

Labor and Demographics- Labor and demographic change is a trend affecting the agriculture sector just as it is affecting other sectors. Labor on a typical farm involves both family members and some hired labor. Fewer and fewer Canadians desire to work in agriculture and on farms. This means a need for more immigrant labor and is a common approach to labor shortages, including workers from Mexico, The Philippines and other countries. In the berry, dairy and poultry sector a number of new business entrants have also come from The Netherlands, India and other countries as immigrant investors. This is not expected to diminish in the near future. Retention of people on the farm will involve use of “soft skills” and various engagement methods. Compensation may include regular pay and holiday time, but also “pay for performance”, specific benefits, annual education/ training opportunities and even special recognition. In the farm industry more labor will be needed and sourcing it will be harder. Farms need to compete with other industries and the need for non-family workers will grow.

Studies indicate a trend of the need for more skilled labor, likely more technology and automation, larger equipment and more computer-based tools. In addition there exists a need for other broader management and soft skills to help farmers and processors operate and sustain.

The potential future labor shortage, increased demand for skilled labor and knowledge workers, improved human relations, cross-cultural training and many other related areas will require a response. From this “platform for skill development”, many aspects can be delivered for rural, agri-food and other small businesses’ benefits.

Robotics and Automation- Robotics and automation are entering many sectors including agriculture and food. Applications of robotic systems that are gaining popularity in newer manufacturing plants such as material-handling and inspection robots. (Milking system robots are being used in dairies). All systems use intelligent operating systems to allow detailed and complex tasks to be performed autonomously and semi-autonomously. The inner workings of the robotic network function according to two systems: control systems direct the motion of the robot based on information received from sensors. These sensors make up the sensory system and gather relevant information from their surroundings necessary to perform the desired task.

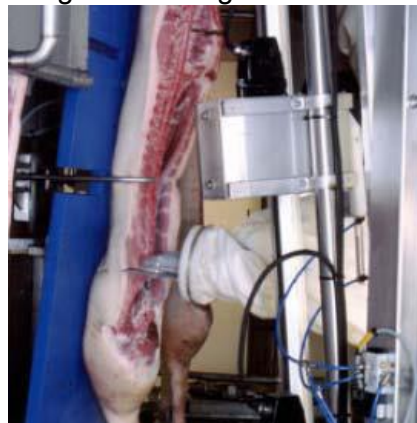
Automation refers to the ability of an operating system to be regulated by an automatic procedure. An example of automation is the transition from filing cabinets to computer organized folders, a system so well organized that information can be located quickly, easily and with minimal error. These systems are designed to reduce tedious tasks and maintain quality work, therefore, making the workplace more efficient. Automation is commonly used in banking machines, grocery and

retail checkouts, telephone calling systems, computer- assisted training programs, home appliances and many areas of daily life.

Figure 5- Milking Robot (Narocki)



Figure 6- Slaughter Robot



The trend to more robotic and automation applications offers many labor- saving ideas for use in the farm and agriculture sector. The integration of ICT tools into monitoring, surveillance, analytics and other management functions in capital intensive agriculture and food applications will continue. Overlaying this need will be the issues of integrating these functions into the biological systems involved in agriculture. Automation and robotics will become more important for many businesses. It is becoming more affordable, easy to use can complete dirty, repetitive, dangerous and heavy work tasks that can be with quality and speed. A technology transfer support program can help industry to adapt and train skilled labor in these areas.

Innovation- Innovation in Canada has been a focus for the Federal Government for a number of years. *“Studies have repeatedly documented that business innovation in Canada lags behind other highly developed countries. This gap is of vital concern because innovation is the ultimate source of the long-term competitiveness of businesses and the quality of life of Canadians.”*

One of the troubling recent findings is that Universities and Colleges are ranked as the eighth source of ideas, after: employees, customers, the internet, competitors, industry sources, market research and the owners. To overcome this “idea” gap, likely means using a different engagement model. Approaches include: program changes and more research- business networks, incubators, applied research offices, technology transfer and other proactive approaches. Innovation can be accelerated with a Centre and regional applied research and help in many ways to foster technology adaptation and process/ product developments. Innovation can be addressed in a training program and in technology transfer and practice change at an industry level.

Mobility, Devices and E-Commerce- The internet and the development of small computer- based devices are causing many other related changes to all sectors including the agriculture sector. Mobility, portable computers and devices which improve decision- making and productivity are a growing trend of bundling technologies. Four areas are noted as examples.

The use of RFID (radio frequency identification) tags in inventory control and traceability is increasing as the asset becomes valuable enough to track. The information is accessed remotely, eliminating any need for connecting wires, making it possible “to automatically track and trace a unique object anywhere in a value chain. RFID is used in warehousing and asset management.

GPS (geo-positioning systems) in devices is another means of information becoming common place for many applications, including in agriculture for precision farming. These systems require a number of components including a computer, sensors, data collection, analysis, software and machines in a biological application. AU started these applications in 1995 and now has many working systems. A BC GIS system was piloted by AAFC for food safety monitoring.

Mobile cell phones having multi-functions and purposes are really driving many knowledge-building changes. MDs are using iphones for assisting in rapid diagnostics, with specific applications for disease files, cell cameras for use in collecting pictures of small samples in diagnostics and for many other related communication purposes. This area will rapidly increase with more industry- specific applications and technology bundling.

The area of e-commerce is a related area for both market research and for developing and managing customer databases across many platforms and management needs. Websites, having a CRM (Customer relationship management function), e-invoicing and many other e-commerce (direct sales, marketing) is not commonly performed well by agriculture businesses. These are all areas in which applied research and technology transfer can help build innovative practices.

The area of mobility and ICT is very important and will increase as organizations move to cloud computing, more portable devices, more niche applications and as consumers, buyers and processors require more traceability. The approach also allows for direct technology transfer and much broader reach of specific audiences for research and training information. These related areas require skill building, training and regular updates for SME growth and market presence. Much can be done for skill building, technology transfer, applied research and industry support.

Productivity Improvement- A related trend is the movement to productivity improvement in all manufacturing and service industries by using “*lean thinking*”. Lean thinking is a powerful tool which is understood and is used by about only say 15% to 20% of Canadian businesses and organizations. It is also being applied to the agri-food sector and offers many ways to enhance competitiveness at low costs.

Lean thinking (LT) is based on the highly regarded Toyota model, which has been built on continuous learning and reducing waste. A central theme of LT is to eliminate *muda* (waste in Japanese). Lean manufacturing attempts to reduce waste (7 areas):

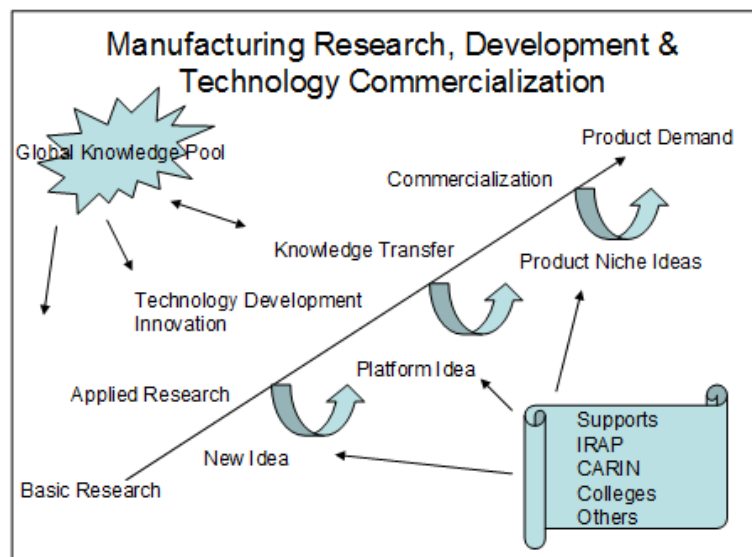
- overproduction;
- time;
- transportation;
- processing;
- inventory;
- motion; and
- making defective products.

Some Canadian food processors and manufacturers are actively engaged in application of lean thinking tools (5-S, value stream mapping) to help improve operations. This training is a practice change model for industry and can help many organizations improve processes, reduce the error rates and addresses quality management. For the food processing sector, the application of lean principles is a critical next step to managing the labor and technology gap and helping all to compete. This productivity improvement training needs to be a foundation within business and agri-business programs and in extension courses.

Supply Chain Management/ R&D Collaborations- Supply chain management and value chains are becoming common in many countries and industries, including the food business. Modern manufacturing and food processing businesses (enterprises) are connected through many supply chain networks and can access many available advanced technologies and tools. Manufacturing enterprises are complex and competitive in a global marketplace. Given that raw materials are available, changing raw materials into value-added products involves three essential components: product design and development, manufacturing of the products through a process and managing the business enterprise successfully (marketing, sales, suppliers and customers).

The R&D and technology commercialization path involves much research and applied research within these supply chains in new product and food innovations. Support is needed.

Figure 7- Applied Research Path (Toma)



Building alliances and collaborations is a related business strategy which is being used to compete domestically and globally. This approach requires the ability to communicate well, build trust, share information and listen well. Fundamentally it means the ability to develop solid business relationships through personal interactions, events and meetings towards a mutual basis of respect. Again this area offers much potential for applied research and adaptation into the sector for practice change improvements.

Applied Research Centres and the R&D System- A brief overview of some applied research centres was completed to help frame the concept of an applied research centre, programs, roles and approaches.

The Olds College School of Innovation (OCSI)- has evolved over the last 12 years from a concept to an operating entity with over 10 staff and facilities of about \$20 million in investments for offices, bioprocessing labs, and other related facilities. The OCSI was the first college-based applied research centre in western Canada to develop, and has since become a model for a number of colleges. This centre was one of the first of its type in Canada. The concept was to develop a centre of innovation located at the Olds College which would serve industry in several project areas.

Grande Prairie Regional College, Centre for Research and Innovation (CRI)- is a recent applied research centre in northern Alberta located at Grande Prairie College. The CRI has a focus on rural ventures in the Peace region in the new diverse and knowledge-based economy, entrepreneurs and innovators in the Peace region need access to innovation services. Its core businesses are:

- Build better capacity to do applied research;
- Foster and Develop a Culture of Innovation; and
- Provide (innovators and SMEs) access to the best level of services and resources that will enable commercialization of new products and services.

MEP Centres- USA- The manufacturing extension partnership centres (MEP) in the USA are a very useful network to be aware of. These centres have operated since the 1980s and have been benchmarked as best in the world to help entrepreneurs, businesses, manufacturers and food processors to compete. These centres offer regional programs and a network of about 400 offices exist in the USA. Often these centres are located near a college or university and some are co-located on campus. The centre has a specific focus- for example in Cleveland the centre focus is on consumer products, automotive, in Kansas the focus is on foods, equipment and small manufacturing, in Seattle- the focus is on aerospace, forestry and light manufacturing and in Texas (7 centres) the focus is on food processing, oil and gas, and light manufacturing.

Food Development Centres- Canada has created a network of food development centres in various provinces to help scientists, businesses and new startups to prepare, test, produce and commercialize their food and value added projects. The centres were noted earlier in this report and each one provides specific services and programs. BC has two related AAFC research centres in Agassiz and Summerland, but a gap is identified.

Selected Canadian University and College Agriculture Offerings- A review of Canadian Universities and colleges was completed to help guide the research review and how each is responding to the global trends and industry needs. An overview highlights the agriculture and food science courses, students, academic capacity and approaches the various organizations are taking. Findings show:

- University of British Columbia – UBC- with 1,300 students and over 50 profs in Applied Biology, Land, Food, Nutrition, and Health and Global Resource Systems;
- BCIT- Diploma and certificate, in food formulation and small pilots;
- University of Fraser Valley – UFV- 40 students, 12 profs/ staff, in production agriculture and

- a Canada research chair in food safety;
- University of Alberta- 1,500 undergrad, 500 graduate students, 120 academic staff in resources, production, processes, foods, nutrition;
- Olds College- 1,286 students total, 82 faculty in production agriculture and horticulture;
- Lakeland College- 2,216 FLEs total, 114 academic faculty in production agriculture/ other;
- Lethbridge College- 4,185 total students, mainly non-agriculture;
- University of Saskatchewan- 173 total profs and a large agriculture and resources program;
- University of Manitoba- 25,000 total university students. Agriculture- 86 total profs in a large production agriculture, resources and foods;
- University of Guelph- 1,500 students, 750 grad students. 130 full time profs in a large agriculture production, processing, nutrition and foods;
- A number of specialized research centres and networks in the R&D system;
- MOOCs- Massive Open Online Courses- global trend to provide massive access as a new business model- as a new competitor globally.

Discussion and Observations of the Research- post-secondary observations include:

- Nationally, applied research and research with industry is of high interest;
- BC- has developed a focus on land, environment and resource systems, with gaps;
- Alberta- has developed expertise in bio-energy, nutrition, production, resource economics;
- Saskatchewan has strong farm management, crops, soils and agronomy;
- Manitoba has farm management, crops, plant science, animal science, bio-engineering;
- Guelph has foods, animal and crop science and foods specialties;
- All of these organizations employ research networks and centres to help leverage their knowledge. Often specialty labs are developed. Industry links are strong;
- Strong professors and research programs help attract students, research funds, partners and global industry. It is very important to build a critical mass to succeed;
- Core areas include: soil science, plant science, crop science, animal science, economics, agribusiness. Other specialty areas include: nutrition, bio-engineering, food sciences, environment, ag equipment, sociology and rural communities;
- Emerging areas include: renewables, green tech and products, bio-energy, food safety, functional foods, sustainable agriculture, environmental monitoring, community impacts;
- Complexity is increasing in adaptation of new technologies, equipment, use of computers and in understanding practice change for an industry segment;
- Soft skills and better community advocacy in rural- urban resource issues are needed;
- Public extension is declining but the internet allows for leveraging of knowledge delivery and research results across vast distances. Applied research is increasing;
- Distance delivery of courses by post-secondary is increasing and MOOCs (massive open online courses) offers many free high end courses and is a competitive threat;
- The differentiation point for many education offerings now is the reputation, overall experience and peer learnings/ relationships that can be delivered;
- Linkages can be seen with all trends that require more agriculture and food products in a growing and resource constrained world. Canada is one of the few places (of say 4 or 5 regions) that has the agri-food sector potential to offer to the world.

Trend Opportunity Assessment and Top Growth Areas for Fraser Valley-

If the trends and technology drivers are correct, then it is only a matter of time until one must deal with each trend, within the competitive marketplace. Certain assumptions will prevail such as a need for more food, agriculture derived products, a population of 9 billion by 2050 and a need for more collaborations given a decade of likely austerity. Risks also exist in not acting on the environment, food safety and related competitive areas for agriculture/ foods.

Given the above trends and research, an opportunity assessment is made and judged as reasonable in direction and even possibly, timing. To help agriculture and agri-business meet an opportunity, means having science and R&D capacity supplied into the region (from the public and private sector, where ever). Capacity means researchers, labs (wet or dry), contract manufacturing, consulting, technology transfer, production facilities, transportation, storage, venture capital and other resources or services which may be needed. These areas need to be explored more fully once the priority- setting and discussions are completed.

Top Growth Areas for the Fraser Valley- Based on the research above and industry experience, the top 5 opportunities are judged as:

- Agri-business & Technology- agri-business training including marketing, management, quality assurance, food safety management and skilled labor development- which can be cross-discipline, cross culture and support several sectors. It must link to trends in mobility, e-commerce, bundled technologies and other strategic needs. This training is a gap and can be offered to many industries;
- Food ingredients and Value Added Foods- based on region products. Foods for nutrition and foods for health- based on dairy, poultry, berries, wines and other regional products offer much growth and opportunity. These are valid product opportunities for applied research, piloting, test marketing and pre-commercial work;
- Sustainable Production Practices - in sustainable production for fruit and vegetable crops, poultry and livestock- processing, community, farm co-location and intensive livestock operations for joint economic, social and environmental goals. This training is needed to ensure sustained farm production within many competing issues of local foods, consumers, environmental management, food safety, farm practices;
- Skilled Labor and Industry Practice change - in productivity improvement, robotics and automation for creating solutions to scarce labor supply problems. Related areas include: mobility applications/ analytics, technology bundling, equipment and machinery solutions for industry benefit. These areas can be offered to assist small companies to grow to larger companies and to manage within a labor short scenario;
- Rural Entrepreneurship & Tourism- including marketing, management, customer service, foods, wine ventures, related beverages, small- scale ventures and many related entrepreneurial projects.



Importantly, the Fraser Valley has a unique climate and landscape which lends itself highly to agriculture and food production on a sustained basis. It can be developed into a “food destination” for many people who are seeking these experiential opportunities. (World-wide, certain regions have done so, including Lethbridge with 3 global scale French fry processing plants (from local potatoes), Napa Valley with local wines and agri-tourism, Quebec with Artisan cheeses and others in Europe.) The priority growth areas were confirmed in the dialogue sessions with about 50 people from the regional agri-food industry.

The industry dialogue sessions indicated a high urgent need to address agri-business and management, entrepreneurship, sustainable production practices (farming, berry, fruits, dairy, poultry) and regional training needs, and to help in food product developments. A shortage of regional industry training and applied research provides a large gap which must be filled. People have to go out of the region now for training, product supports and advice. A better way can be implemented and help build a sustainable industry.

It can be argued that the top two areas are:

- Agri-business, entrepreneurship and technology;
- Sustainable production practices (focus -crops, livestock).

However, given the lack of regional capacity in the above 5 areas, UFV may desire to leverage with UBC and others to access out of region resources in research networks and other collaborations. The specific “how-tos” and plans need to be specified with a robust business plan process. As the agriculture sector is facing much global demand growth, and the Fraser Valley has many economic and agriculture strengths with not many supports, a strategic research business plan is needed (based from this trend research, validated by industry).

Next Steps in the Journey to 2020

The next steps (with confirmation of the 5 priorities) include:

- Continue regional discussions on the concepts noted herein;
- Applied research centre/ program Business Plan- Developing an inventory of region assets, capacity, skills and labs which can support the opportunities, and then developing a plan to serve that overall need (3 to 5 months);
- Fundraising Plan- Developing a capital campaign plan to fund the applied research plan from investors (public and private). Confirm a leadership team/ champions for the campaign; industry consultation and confirmation;
- Startup and Implementing the Plan- Once funds are assembled for the plan, develop the management team and other resources needed to deliver the plan;
- Governance and Monitoring- Build the Governance model which can sustain the organization as needed and guide future successful developments.

From: [Margaret Nickelchok](#)
To: [Laura Chomiak](#)
Cc: [Rosetta Khalideen](#); [Kevin Dewolde](#); [businfo](#); [Marla Fralick](#)
Subject: BUS 338 minor course change proposal for Faculty Council
Date: October-09-13 2:25:52 PM
Attachments: [Rationale memo and official course outline BUS338-20130201.pdf](#)
[image001.png](#)

Hi Laura,

Please find attached a minor course change proposal to be included in the next Faculty Council meeting.

The proposal was approved by the School of Business at the Oct. 8, 2013 department meeting.

Thanks,

Margaret

Margaret Nickelchok
Program Advisor, School of Business
Email: businfo@ufv.ca
Web: www.ufv.ca/business



Memo

To: Undergraduate Education Committee Assistant

From: Kevin deWolde

Date: October 2, 2013

Subject: Proposal for a minor revision of an existing course (BUS 338)

If the course is a revision of an existing course, fill out A and c. If it is a new course, fill out B and C.

A. Course revision:

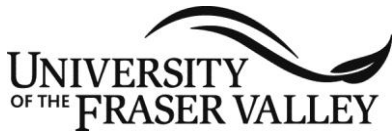
1. Rationale for change: Correct intent that BUS 343 can be either a pre or co requisite
2. Summary of substantive changes: Changed BUS 343 to be both a pre or a co requisite, rather than just a co-requisite.

B. New course: N/A

1. Rationale for new course
2. How new course fits into program(s)
3. If a new discipline designation is required, explain why.

C. Budget and Learning outcome Issues N/A

1. How does your course address the UFV Learning Outcomes?
2. Is this course required by any program beyond the discipline? If so, how will this change affect that program or programs?
3. What consideration has been given to indigenizing the curriculum?
4. If any of the following items on the OCO have changed, or this course is new, explain how the change will affect the budget for your area or any other area:
 - a. Credit value
 - b. Class size limit
 - c. Frequency of offering
 - d. Resources required (labs, equipment)
5. If this course is not eligible for PLAR, explain why.
6. Are field trips required for this course? Will the dates be announced in the timetable? How are the trips funded?
7. Please provide an estimate of the typical costs for this course, including textbooks and other materials.



COURSE IMPLEMENTATION DATE: September 1993
 COURSE REVISED IMPLEMENTATION DATE: September 2013
 COURSE TO BE REVIEWED: March 2019
(six years after UEC approval) *(month, year)*

OFFICIAL UNDERGRADUATE COURSE OUTLINE INFORMATION

Students are advised to keep course outlines in personal files for future use.
 Shaded headings are subject to change at the discretion of the department – see course syllabus available from instructor

BUS 338	School of Business	3
COURSE NAME/NUMBER	FACULTY/DEPARTMENT	UFV CREDITS
Accounting Information Systems		
COURSE DESCRIPTIVE TITLE		

CALENDAR DESCRIPTION:

The emphasis of this course is the controllership and public practice role of accountants. It will include a comprehensive computerized accounting simulation that will involve the design of the accounting system, designing reports to monitor short-term liquidity and capital projects, entry of data to test the system, and reporting financial analysis of the results to management. In the public practice portion of the course, a client's business will be created in CaseWare where a year-end file will be prepared, including the preparation of financial statements. Students will also use software to complete a simulated personal tax return.

PREREQUISITES: BUS 160 or CIS 110.
 COREQUISITES: **BUS 343**.
 PRE or COREQUISITES: ~~_____~~ **BUS 343**

SYNONYMOUS COURSE(S):

- (a) Replaces: _____
- (b) Cross-listed with: _____
- (c) Cannot take: _____ for further credit.

SERVICE COURSE TO: *(department/program)*

TOTAL HOURS PER TERM: 45

STRUCTURE OF HOURS:

Lectures:	<u>5</u>	Hrs
Seminar:	_____	Hrs
Laboratory:	<u>40</u>	Hrs
Field experience:	_____	Hrs
Student directed learning:	_____	Hrs
Other (specify):	_____	Hrs

TRAINING DAY-BASED INSTRUCTION:

Length of course: _____
 Hours per day: _____

OTHER:

Maximum enrolment: 25
 Expected frequency of course offerings: Fall and Winter
(every semester, annually, every other year, etc.)

WILL TRANSFER CREDIT BE REQUESTED? (lower-level courses only) Yes No
WILL TRANSFER CREDIT BE REQUESTED? (upper-level requested by department) Yes No
TRANSFER CREDIT EXISTS IN BCCAT TRANSFER GUIDE: Yes No

Course designer(s): Larry Howe

Department Head: Don Miskiman

Campus-Wide Consultation (CWC)

Curriculum Committee chair: Kevin deWolde

Dean/Associate VP: Rosetta Khalideen

Undergraduate Education Committee (UEC) approval

Date approved: _____

Date of meeting: January 11, 2013

Date approved: October 23, 2012

Date approved: January 25, 2013

Date of meeting: February 1, 2013

LEARNING OUTCOMES:

Upon successful completion of this course, students will be able to:

1. Identify the controllership functions.
2. Design an effective accounting system.
3. Enter data into a computerized accounting system.
4. Assess the performance of a business based on analysis from the accounting information system.
5. Evaluate the cash management performance of a business.
6. Prepare a year-end file using CaseWare.
7. Complete an individual tax return (T1).

METHODS: *(Guest lecturers, presentations, online instruction, field trips, etc.)*

Lecture, accounting simulation project with related assignments.

METHODS OF OBTAINING PRIOR LEARNING ASSESSMENT RECOGNITION (PLAR):

Examination(s) Portfolio assessment Interview(s)

Other (specify):

PLAR cannot be awarded for this course for the following reason(s):

TEXTBOOKS, REFERENCES, MATERIALS: *[Textbook selection varies by instructor. Examples for this course might be:]*

1. No text required.
2. References to material in textbooks used in other business courses.
3. Various business articles as provided by instructor.

SUPPLIES / MATERIALS:

Simply Accounting Software (Student Version)
Flash drive

STUDENT EVALUATION: *[An example of student evaluation for this course might be:]*

Written assignment	5%	
Computerized accounting simulation	40%	
CaseWare file preparation project	15%	
Personal tax return assignment	5%	
Final exam		35%

COURSE CONTENT: *[Course content varies by instructor. An example of course content might be:]*

Weeks 1 – 7: Industry Accounting

1. Designing an accounting system including a chart of accounts and subsidiary ledgers.
2. Use the system to enter data for a simulated company over a two month period.
3. Assess the performance of the simulated company using various reports from the accounting information system.
4. Evaluate the cash flow management performance of a business.

Weeks 8 – 13: Public Practice Accounting

5. Prepare a year-end file for a simulated company, using CaseWare software.
6. Prepare financial statements for the simulated company.
7. Prepare a personal income tax return.