EXECUTIVE SUMMARY

Fostering innovation in the agricultural sector has become a prominent goal for private firms, industry groups and virtually all levels of government. There is an economy wide interest in innovation and science policy. In the agricultural sector, significant investments continue in genomic technologies, variety development and value added processes. The increased demand for grains and oilseeds from the growth in the global biofuel industry has stimulated additional interest in innovation as a means to increase productivity in the agriculture and the Canadian economy as whole.

CAIRN (The Canadian Agricultural Innovation Research Network) is a network of twenty researchers created in December, 2004 with objective of increasing the understanding of agricultural innovation and to aid in the development of public policy that promotes both product and process innovation in the Canadian agriculture and food sector. The network also contributes to the development of expertise by providing opportunities for graduate students at both the M.Sc. and Ph.D. levels, to receive a broad training in how innovation occurs and affects the economy. The network researchers and graduate students undertake both conceptual and empirical research work. CAIRN is one of four agricultural policy research networks funded by Agriculture and Agri-Food Canada.

The 2006/07 fiscal year was a busy and productive year for CAIRN. The network was involved in over ten collaborative graduate student based research projects dealing with innovation in the agri-food sector at various stages of completion. This research effort was further leveraged through the ongoing research of network members and the development of proposals for several synergistic projects funded from other sources. This research not only increases the stock of related knowledge innovation policy, it is an important format for the training of many graduate students with knowledge and interest in innovation. The on going research of the network has allowed the members to build stock of knowledge and the communication channels to the point where they can provide significant input into the policy making process.

As evidenced in this report, members of CAIRN have disseminated research results and participated in policy making processes in many ways. CAIRN sponsored two organized sessions at the Joint Canadian Agricultural Economic Society and the Canadian Economics Association Meetings in Montreal and made two AAFC presentations hosted at the Sir John Carling Building. CAIRN also made a presentation and participated at the joint policy network meetings in December at St. Claire, Quebec where there we many AFFC officials present. Students and members presented research results at a workshop in March in Vancouver with AAFC official present. The network has undertaken a partnership with a SSHRC Knowledge Impact on Society project further enhance communication. Twelve different policy briefs were drafted by the end of 2006/2007.

In addition to these network level activities individual network members have made more than a dozen presentations at industry and government sponsored meetings. Several members continue to participate in organizations and decision making bodies, such as CAPI, and the CFA, SaskAgrivision, drawing on their knowledge and the knowledge of other CAIRN members to contribute to the policy making process.
While this report focuses on this year’s accomplishments, next year will be an equally important year for CAIRN. A major conference Food and Fuel: The Implication for Agricultural Research has been planned for June 4-6 in Saskatoon, hosted in conjunction with the Knowledge and Society Project and the Canadian Agricultural Economics Society. The flow of new knowledge from network research activities will reach an important critical mass more student projects are completed. CAIRN has developed a workplan with many exciting projects to explore important policy relevant knowledge gaps.

This report is organised into sections. Section 1 contains a description of CAIRN and its research areas. Section 2 describes the research projects funded by CAIRN in 2006/07 and the progress made to date in each of these projects. Section 3 describes additional innovation research activities that CAIRN network members have initiated but that are funded from other sources as well as a list of innovation-related presentations and papers/working documents developed by network members. Section 4 provides an overview of CAIRN expenditures for 2006/07. Section 5 describes a proposed work plan for 2007/08.
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1.0 INTRODUCTION

The Canadian Agricultural Innovation Research Network (CAIRN) was established in December 2004 by Agriculture and Agri-Food Canada as one of four Agricultural Policy Research Networks. This report covers the period April 1, 2006 to March 31, 2007. In the reporting of research projects we also report on those projects that were initiated prior to 2006/2007 to give a better indication of the accumulated knowledge as a result of the network since its inception.

1.1 Background and CAIRN Objectives

Increasing our level of international competitiveness is essential to maintain and expand our share of global trade and to ensure Canadians enjoy a growing standard of living. In agriculture and food, this will not be achieved without a well-developed and coordinated innovation strategy, which must include both the private and public sectors. The objective of the Canadian Agricultural Innovation Research Network is to provide the research results necessary to inform the policy debate, and to provide a solid foundation for the development of the appropriate innovation strategy.

Research conducted in the CAIRN has objective of increasing the understanding of innovation and to aid in the development of public policy that promotes both product and process innovation in the Canadian agriculture and food sector for the purpose of optimally increasing its future value of production. In addition, this network has the objective to provide an opportunity for graduate students at both the M.Sc. and Ph.D. levels, to receive a broad training in how innovation occurs and affects the economy. The network researchers and graduate students will undertake both conceptual and empirical research work.

1.2 Network Research Program Areas

The Innovation Research Network comprises five main policy areas. The areas collectively recognize the need for a multi-faceted public policy, which supports the innovation process, including the commercialization process.

Area 1: International competitiveness and innovation

Canada is an exporter of agri-food products. It is essential that the sector remain competitive in the international market if it is to enjoy continued economic growth. Because Canada wants to increase the export of higher valued products as well as farm commodities, more research effort will be directed at the question of how innovation affects the export potential of higher valued food products (Boulhol, 2004).

An important dimension of international competitiveness is the flow and use of intellectual property as governed through domestic policies and international agreements such as UPOV and TRIPs. Understanding how these polices affect trade and competitiveness will help inform policy makers and trade negotiators.

Another important consideration when examining the international competitiveness of the agriculture and food sector are the set of links among innovation designed to circumvent trade barriers, the strategic use of R&D subsidies, and innovation in a multinational framework. In Canada’s case most exports are destined for the U.S. market. Thus, having export products that can be quickly moved across the U.S. border and that avoid trade retaliation are important aspects of an innovation strategy.
The role of biotechnology in the development of an innovation strategy for the agriculture and food sector must be considered in the context of the global market. While it is not clear how the international community will sort out the biotechnology and food issue, Canada must prepare itself for any eventuality in this area. It may be necessary to develop more sophisticated trace-back systems, segregation techniques and food testing procedures to meet international standards.

Projects in this area will include: an examination of the relationships between the type of innovation and the value of exports, an examination of existing market access rules and the type of innovation, and innovation, trade, and income growth.

Area 2: Regional incidence of innovation

Innovation and productivity growth has a regional component (Baldwin et al., 2001), both in terms of participation in innovation, and in terms of the distribution of benefits from innovation. The spillover of innovation from one region to another may occur domestically or internationally, for example, between Canada and the United States. Canadian industry must be able to adopt technologies from elsewhere and make them applicable regionally.

The diffusion of new innovations has a spatial, or regional, dimension. The presence of appropriate forward and backward linkages is necessary for technology to be adopted in any region. These preconditions may, in turn, be dependent upon the incentive or regulatory policies that are in place in the region. There are some beggar-thy-neighbor policies among the Canadian provinces, which can lead to inefficiencies in the diffusion of technology (Armstrong et al., 2002).

Different regions of Canada have very different potentials in the agriculture and food sector, based partly upon climate and proximity to consumer markets. The scope for improvements in the regional level and rate of increase in productivity also depends upon macroeconomic conditions, such as the quantity and quality of public and private infrastructure and services, human capital, and the existing industry mix (Rigby and Essletzbichler, 2000). The network will examine the impact regional differences have on the potential for the diffusion of technology.

Projects in this area will include: an examination of the differences in regional endowments and innovation, an examination of the conditions that encourage and enhance regional spillovers, and an investigation of how changes in productivity through innovation affect the level of exports.

Area 3: The knowledge economy and innovation

Innovation in the agri-food sector will increasingly depend upon the knowledge economy. Thus the design of an appropriate innovation policy will rely on understanding the linkages between R&D, innovation, commercialization and profitability. While much of the new economy is based on ideas and new knowledge, the transmission mechanisms between knowledge and productivity improvements (income levels) is poorly understood in the food sector (Falcon and Fowler, 2002).

Regulation will be a major factor in determining the success of the future innovation strategy in the agriculture and food sector. Regulation occurs at the production level, such as on farms and in factories, as well as at the institution level (e.g. the property rights regime that is currently in place). Clearly, if new technologies are developed they need to fit into the regulatory regime of the nation (Furtan et al., 2003). Conversely, the regulatory structure
needs to anticipate the type of innovations that are likely to occur and respond appropriately. Therefore institutions and regulations in the future innovation strategy must account for how the technologies will fit into the market place. Among the new ideas as to how this can be accomplished, is the formation of landscape zones, which allows for the production of specific crops or animals.

The question of appropriate intellectual property rights (IPRs) is extremely important in developing a future innovation strategy. The IPR regime in Canada must address the freedom to operate issue, which is currently slowing down the rate of innovation. At the same time Canadian IPRs must protect the property of foreigners so that individuals and firms bring new ideas into the country through foreign direct investment.

Projects in this area will include: the impact of existing IPRs on innovation activity, the impact of regulation of new products and processes on innovation activity, and an examination of the linkage between productivity gains and IPRs.

Area 4: The structure of the agri-food sector and innovation

The market structure of the sector determines, in part, its demand for innovation. It is usually held that the more competitive a sector, the faster it will adopt innovations. New firms may arise from either domestic or foreign direct investment. Since foreign investment often brings with it new technology, Canada would want to encourage this type of investment activity.

The supply of innovation is likewise dependent upon industry structure. First, the private sector will not invest in innovation activity that leads to the production of pure public goods. Thus there continues to be a role for government in the provision of public goods. Where goods are part public and part private, joint public-private research efforts are appropriate. Finally, innovation that leads to the creation of private goods will be made by the private sector, assuming the appropriate patent protection and regulatory regime is in place. However, under certain industry structures, such as monopolies, the private sector may under-invest in research, and so, there remains a possible role for government (Isaac and Hobbs, 2002).

Supply chains are a key component of future competitiveness of the sector. The potential to innovate occurs at different points along the supply chain. The network will undertake projects that examine the innovation process along the entire supply chain. It is essential that the supply chain be coordinated so that the focus of R&D can occur in those areas of greatest potential.

Projects in this area will include: the rate of innovation and the market structure of firms, the commercialization of innovation and the structure of firms, and the ownership of firms and the rate of innovation.

Area 5: Entrepreneurship and innovation

Individual firms, whether they are farmers or multinational enterprises, must adopt innovations before they can have any economic impact. This typically is preceded by invention, creation and the anticipation of new possibilities beyond the innovation. The role of the entrepreneur is key to the process of increasing competitiveness through innovation. Research into the determinants of entrepreneurs’ adoption of innovations will be an important part of the network’s activities.

Successful innovation requires commercialization, a component of innovation often thought to be under-developed in Canada. This is demonstrated by a comparison of research
activities and the start-up of profit seeking ventures using new innovations (Nikiforuk, 1996). A related question is why some regions of Canada have a higher level of entrepreneurial activity than others. Two important components of the Innovation Network’s research agenda will be an examination of the policies and programs that will be needed to encourage the commercialization of innovations, and regional differences in the existing commercialization rates.

Projects in this area will include: an examination of the constraints entrepreneurs face, the commercialization of new innovations, the training needs of entrepreneurs to aid in innovation, and the regional differences in entrepreneurial activity.

Major Network Project

The network has undertaken a major data collection project collecting data on innovation in the food processing sector in Canada. The data is be available to all five research areas outlined above. The survey used to collect the data will have two components. The first component will quantify the resources that are devoted to innovation activities and where innovation is occurring in the sector. By linking this data to other economic and geographic data, researchers will be able to examine the relationships between the individual investment of the firm, the economic environment of the firm and innovation outcomes. The second component of the survey will ask industry participants what constraints they face to further innovation.

The data will be collected by questionnaire and be housed in the GIS computer research lab being developed in the Department of Agricultural Economics at the University of Saskatchewan to complement other GIS and Statistics Canada databases being assembled on this same computer system. Thus network researchers will be able to access and link data files as needed in their various research projects.

To ensure there is no overlap between the data collected in this project and similar work being conducted elsewhere, we will coordinate our data collection activities with those underway by Government departments and agencies. Some data may have to be purchased from Statistics Canada and this activity will need to be coordinated among the network participants. The network leader will undertake this coordination.
### 1.3 CAIRN Membership (2007)

<table>
<thead>
<tr>
<th>Name</th>
<th>Position/Institution</th>
<th>Expertise</th>
</tr>
</thead>
<tbody>
<tr>
<td>Richard Gray</td>
<td>Network Leader, Agricultural Economics, U. of Sask.</td>
<td>Expertise in ag policy, agricultural research</td>
</tr>
<tr>
<td>Derek Brewin</td>
<td>Assistant Professor, University of Manitoba</td>
<td>Expertise in Regional economic spillovers</td>
</tr>
<tr>
<td>Ryan Cardwell</td>
<td>Assistant Professor, U. of Manitoba</td>
<td>Expertise in Development and Innovation</td>
</tr>
<tr>
<td>Richard Carew</td>
<td>Research Economist, AAFC. Summerland</td>
<td>Expertise in the economics of research</td>
</tr>
<tr>
<td>John Cranfield</td>
<td>Professor, University of Guelph</td>
<td>Expertise in production</td>
</tr>
<tr>
<td>Murray Fulton</td>
<td>Professor, Agricultural Economics, U of Sask.</td>
<td>Expertise in Industrial organization</td>
</tr>
<tr>
<td>Hartley Furtan</td>
<td>Professor, Agricultural Economics, U of Sask.</td>
<td>Expertise in ag policy, trade, ag res</td>
</tr>
<tr>
<td>James Gaisford</td>
<td>Professor of Economics, University of Calgary</td>
<td>Expertise in international trade &amp; IPRs</td>
</tr>
<tr>
<td>Jill Hobbs</td>
<td>Head, Agricultural Economics, U of Sask.</td>
<td>Expertise in supply chains, consumer demand</td>
</tr>
<tr>
<td>Grant Isaac</td>
<td>Dean of Commerce, U of Sask.</td>
<td>Expertise in management and innovation</td>
</tr>
<tr>
<td>Wilf Keller</td>
<td>NRC-PBI Director</td>
<td>Canola genome expert</td>
</tr>
<tr>
<td>Bill Kerr</td>
<td>Van Vljet Professor, U of Sask.</td>
<td>Expertise in international trade policy and innovation</td>
</tr>
<tr>
<td>Kurt Klein</td>
<td>University of Lethbridge</td>
<td>Expertise in research policy and bioproducts</td>
</tr>
<tr>
<td>Mark Partridge</td>
<td>Tier I Canada Research Chair, U of Sask.</td>
<td>Expertise in regional spillovers and clusters</td>
</tr>
<tr>
<td>Rose Olfert</td>
<td>Professor, SIPP Director, U of Sask.</td>
<td>Expertise in Rural economy</td>
</tr>
<tr>
<td>Stavroula Malla</td>
<td>Professor University of Lethbridge</td>
<td>Expertise in IPRs public research</td>
</tr>
<tr>
<td>James Nolan</td>
<td>Associate Professor, Ag. Econ, U of Sask</td>
<td>Expertise in transportation &amp; regulation</td>
</tr>
<tr>
<td>Peter Phillips</td>
<td>Professor of Political Studies, U of Sask.</td>
<td>Expertise in biotech research policy</td>
</tr>
<tr>
<td>David Sparling</td>
<td>Institute of Agri-Food Policy Innovation</td>
<td>Expertise in Management Consumer Attitudes</td>
</tr>
<tr>
<td>Larry Stewart</td>
<td>Professor of History, U. of Sask.</td>
<td>Expertise in the history of innovation</td>
</tr>
<tr>
<td>James Vercammen</td>
<td>UBC-Resources/Sauder School of Business</td>
<td>Expertise in Industrial Organization</td>
</tr>
</tbody>
</table>

**Area 1:** International competitiveness and innovation  
*Jim Gaisford* (area leader), Bill Kerr, Wilf Keller, Hartley Furtan, and Ryan Cardwell

**Area 2:** Regional incidence of innovation  
*Mark Partridge*, James Nolan, Richard Gray, Rose Olfert, and Derek Brewin

**Area 3:** The knowledge economy and innovation  
*Kurt Klein*, Larry Stewart, John Cranfield, Richard Carew, and Stavroula Malla

**Area 4:** The structure of the agri-food sector and innovation  
*Jim Vercammen*, Grant Isaac, Jill Hobbs, and Murray Fulton

**Area 5:** Entrepreneurship and innovation  
*David Sparling*, Mark Partridge, Bill Kerr, and Peter Phillips
2.0 CAIRN RESEARCH PROJECTS

2.1 CAIRN Funded Projects Initiated in 2006/2007

2.1.1 Genetic Use Restricting Technologies in Developing Countries: An Answer to Market Failures or the Death Knell to Gains from Innovation?

Research Area: Area 1 - International Competitiveness and Innovation
Location: The University of Manitoba
Team Members: Ryan Cardwell and an M.Sc. Graduate student
Timeline: September 2006 to December 2007
Requested Funds: $20,000
Disposition of Funds: funding for one M.Sc. graduate student, including travel to CAIRN workshop to present thesis research
Deliverables: M.Sc. thesis, policy brief

Project Description:

This project will investigate the efficacy of genetic use restricting technologies (GURTs), such as the terminator gene, as a solution to market failures in developing countries. Weak enforcement of intellectual property rights (IPRs) in developing countries has resulted in the failure of markets to transfer rents from primary producers to seed developers. This failure has generated a range of market developments. The first is the removal of incentives for biotechnology firms to invest in seed varieties that are best suited to agronomic conditions in markets wherein their IPRs are unenforceable. The second is the widespread pirating of genetically-modified (GM) seed technology in developing countries. The third development, which is as yet unresolved, is the potential for trade disputes under the WTO’s Agreement on Trade Related Aspects of Intellectual Property.

GURTs are a technological solution to the IPR market failure. By rendering seeds sterile, primary producers are obliged to purchase seeds directly from the innovator every growing season. However the inability of farmers to save seeds has been decried as a violation of a perceived farmer entitlement and as a possible blow to productivity gains that might arise from adoption of GM crops (Goeschl and Swanson). Studies that have predicted the diffusion effects of GURTs, using high-yielding variety corn hybrids as a proxy, have predicted lower rates of technology transmission and correspondingly slower productivity growth.

This study will build on the existing literature by considering two, as yet, unexplored concepts. First, the prospect for a higher degree of appropriability may provide the incentives necessary for innovating firms to invest in the development of GM traits that are better suited to agronomic conditions in regions where IPRs are weakly enforced. This could provide benefits to developing countries. Second, GURTs provide a technological solution to trade disputes that may arise in the case of poorly-enforced IPRs. The adoption of GM crops that contain GURTs would avert retaliatory trade actions from the innovating firm’s host country. Also, GURTs would reduce IPR enforcement costs and eliminate the need for alternative solutions to IPR enforcement (ex: GM levies).
An attempt will be made to determine if these potential benefits of GURTs (averting trade actions and reducing enforcement costs) could tilt the balance in favour of positive agricultural productivity gains in developing countries. If so, then the resistance to GURTs may be unfounded. If not, then this study will provide further evidence of the risk of GURTS, particularly in developing countries.

References:


2.1.2 Migration and its Impact on Human and Physical Capital in Rural Areas

Research Area: Area 2 - Regional Incidence of Innovation
Location: University of Manitoba
Team Members: Derek Brewin, Martin Shields (tbd), one M.Sc. Graduate student.
Timeline: September 2006 to September 2007
Requested Funds: $20,000
Disposition of Funds: Funding for one M.Sc. graduate student, including travel to present thesis research.
Deliverables: M.Sc. thesis

Project Description:

Solow (1957) argued that economic growth is not exclusively caused by conventional labour and capital measures but includes changes in the stock of knowledge. More recently the quality of labour was argued to have an impact on growth in terms of labour's ability to make good use of the knowledge and capital stocks. Support for this argument can be seen in the rapid economic growth of the Asian Tigers. Lucas (1988) claimed that the rapid economic growth and development in East Asian countries is not a miracle but a calculated movement which started some years ago by investing in education. These investments have increased the quantity and the quality of education and according to a World Bank report (1993), these investments have caused the cognitive skill levels of secondary school graduates in East Asian economies to be comparable or even higher than graduates in high-income economies.

The importance of education and human capital has been illustrated in many recent studies of economic growth. Lucas started the development of models that specify education as a type of investment that generates technological progress. In these models, education and human capital can be viewed as critical inputs for innovation and R&D activities (Van Den Berg, 2001). From these perspectives, education is seen as an intentional effort to increase the resources needed for creating new ideas, and thus any increase in education will directly accelerate technological progress by creating new knowledge and new products.

One of the ways to analyze rural questions is to use the models developed to differentiate growth patterns across countries to evaluate growth for rural versus urban communities. With these small open economies, migration can be a force of convergence
in incomes if it balances labour supplies to demands. If human capital and the knowledge economy offer external agglomeration economies, however, migration may be part of a divergent force between economies of differing levels of knowledge stocks as skilled workers move and supplement those stocks.

This research will look at the natural endowments of rural places and the long term potential for growth within an endogenous model of agents who can choose to invest in human and physical capital, and can also choose to migrate to a region with different attributes including the knowledge stock.

The bulk of research on regional economic growth has been conducted using U.S. data. This paper will look at Canadian data to compare the converging patterns of rural income growth already measured by Goetz and Hu (1995). It will also confirm recent findings by Brewin et al., (2006) on the role of migration in U.S. regional income convergence. Brewin et al., found that migrants carry enough human capital in most instances to be net contributors to income growth even though they are increasing the local labour supply.

References:


2.1.3 Private, public and regulatory incentives for R&D in functional foods in Canada

Research Area: Area 3 – The knowledge economy and innovation
Location: University of Saskatchewan
Project Leader: Stavroula Malla
Research committee: Jill Hobbs and Richard Gray
Graduate Student: Chrysoula Parvolidaki (M.Sc., University of Saskatchewan)
Duration: April 1, 2006-September 30, 2007

Brief Project Description:

There is an important link between agricultural research and the health of Canadians. The incidence and severity of many major diseases facing Canadians such as diabetes, coronary heart disease, stroke and cancer are directly affected by diet. It is estimated that these four dietary-related diseases accounted for $29.4 billion of direct and indirect health care costs in 1993 (2004 dollars) or 19% of Canadian health care costs (Cash et al., 2004). The Heart and Stroke Foundation of Canada suggests that 60% of adults in Canada are overweight or obese (Heart and Stroke Foundation). The World Health Organisation (WHO) identifies nutrition as a significant and manageable determinant of chronic disease, stressing
the need for a shift in nutrient intake towards ‘healthier’ foods. Through modern biotechnology and conventional breeding, agricultural research can change the composition of diets by lowering the cost of producing food that is more beneficial to health and by improving the composition of the foods that are currently grown. Agricultural research has the potential to improve the health of Canadians and reduce costs associated with disease.

Advances in biotechnology, genomics, medicine, nutrition, and other sciences have enhanced the potential to develop healthier foods. It is now even easier to genetically modify crops and animals so that the derived food products are healthier and contain more (fewer) nutrients that are currently deficient (in excess) in diets (e.g., Mackey, 2002). For instance “Golden Rice” is genetically modified rice that contains elevated levels of vitamin A, a nutrient deficient in many third world diets (e.g., Ye et al., 2000; Chong, 2003; Lusk, 2003; Potrykus, 2003). Lutter and Tucker (2002) show that genetically modified salmon could lower the price of salmon, increase consumption, and in turn, prevent between 600 and 2600 deaths per year in the United States through the reduction in coronary heart disease risk. In addition to genetic transgenic modification, conventional crop breeding and advances in food processing have the potential to create healthier foods. For example, Natreon, a new variety of Canola improves the stability of oil so that it does not need to be hydrogenised and is therefore virtually trans-fat free, reducing the health risks associated with trans-fatty acids (Dow AgroScience, 2004).

Despite evidence of research activity in crop and animal genetics, four compelling reasons, as described in the economics literature, suggest there are inadequate private incentives to develop healthier foods: (1) In the process of scientific discovery there are spillovers of knowledge, genetics, and human capital, that make it impossible for innovating firms to capture all of the benefits from their innovation. This is the standard argument used to support the long history of public involvement in agricultural research (e.g., Huffman and Evenson, 1993; Alston et al., 1995); (2) The concentrated nature of the research industry, and the exclusive ownership of key pieces of intellectual property give research firms some degree of market power, which through higher prices reduces the incentive for product innovation and adoption downstream (e.g., Moschini and Lapan, 1997; Malla and Gray, 2005 and 2003); (3) The successful introduction of novel functional foods requires knowledge and information to be created to satisfy the regulatory process, which ultimately must be disseminated to consumers who decide to purchase the product. The public good nature of this information suggests a lack of private incentives to invest in these activities (Avery et al., 1999; Freehan, 1998). The distortions in private incentives are exacerbated by information asymmetries. The lack of full information for consumers with respect to the health attributes of food products means that many of these attributes have credence properties that are only revealed through labeling. Food firms may have a disincentive to label low quality (unhealthy) food attributes voluntarily, and consumers face an increasingly bewildering array of (sometimes contradictory) information related to diet and health. Accurate and credible information enables consumers to make informed consumption decisions with respect to diet and health. The regulatory approach to nutrition and health claims remains an important challenge for policymakers (e.g. Mojduszka and Caswell, 2000; Ippolito, 2003); (4) Finally, and perhaps most importantly, consumers have only a partial incentive to pay for healthier foods because health and disability insurance create a moral hazard by reducing the incentive to undertake disease prevention measures (Gray et al., 1998; Cutler, 2002). While food consumption is primarily a private decision, much of the
cost from ill health is borne by society through publicly funded health care, private insurance plans, disability insurance and pension plans. The magnitude of health care costs, which approach 10% of GDP in Canada (e.g., Jackson and McDermott, 2004), suggest that these diet related externalities could be economically significant. In developing a methodology to examine research and development, we recognize the theoretical and empirical challenges an issue of this breadth presents.

The objective of this research is to address the question “who pays and who benefits from the current regulatory system of novel functional food?” Obviously, the Canadian regulatory system is beneficial to consumers as it helps them to enhance their knowledge of food that is entering the market and protects their safety and health by assessing the nutritional quality of novel foods. Through information concerning the novel functional foods, the Canadians can improve their health state and reduce the risk of diseases. Thus, the annual health care costs are diminishing. However, consumers confront the high price of some products that would not be such if the regulation did not exist. Thus, some of the cost is borne by the consumers via the increasing price.

Producers are the ones who are mostly affected by the regulation. One benefit that producers may acquire is the possible marketing of such products. Another benefit that the regulatory system offers to them is the support of innovation, competitiveness, entrepreneurship and investment. However, they face several costs that decrease their revenues and profits that would otherwise obtain without the regulation. One of the main costs that a firm encounters is the compliance costs which are the time costs of internal staff collecting, maintaining and understanding the regulatory information as well as the external financial costs (Industry Canada). The firms also deal with the approval times which tend to take three to five years and the delay costs are huge. In addition, Canada’s firms are in a difficult position as there are some small regulatory differences between Canada and U.S. which means that there is prevention of Canada’s exports.

A vital fact that should not be overlooked is the comparison between large and small firms. It worth mentioning that the firm size really matters when we are dealing with costs as large and small size firms have different costs. It is obvious that small-sized firms are in a predicament and are supposed to pay more for the food safety legislation as they do not have economies of scale, an advantage that large firms possess. These costs fall sharply with firm size as there are high fixed costs in learning about applicable regulations and undertaking procedures to ensure compliance. Smaller firms spend a higher proportion of revenue for the compliance costs compared to medium-sized and large-sized firms.

A last goal of this research is to deal with the costs under alternative regulation. This means that if we assume for example that the regulatory costs are covered by the government, how does the behavior and incentives of the producers change? Are they now better off and how this alternative benefits the consumers?

Case Study

The M.Sc. will examine two functional foods, one novel and one non-novel that they will be representative of each category. These two goods will be Nexera canola and omega-3 enriched eggs respectively. The research will estimate how producers and consumers are benefiting from these foods and how much they should pay because of the food legislation. It will also examine the costs that the firms are facing because of the
regulation. The measurement of these costs is far from straightforward. Firms that are asked to provide information about costs can have difficulty determining and identifying these costs. This is because it is likely difficult for firms to separate the compliance costs from the administrative activities that a firm would do as a part of its operation.

Nexera canola belongs to the novel functional foods category and is developed by Dow AgroSciences. Natreon canola oil is a new variety of canola oil and is the healthiest oil among the common ones as it has low levels of saturated fats and is almost zero trans fat which means that it contributes to the reduction of many major diseases facing Canadians.

Eggs enriched with omega-3 fatty acids are not a new idea and can serve as ideal functional foods. Omega-3 fatty acids play a crucial role in brain function as well as normal growth and development and good vision. The omega-3 enriched eggs provide a dietary alternative to fish for these essential fatty acids and they are one of few foods considered to be a complete protein as they contain all nine essential amino acids.

References


Progress to March 31, 2007:
The literature review the conceptual model is complete and the case studies are well underway. The project framework was presented at the March workshop in Vancouver. The thesis and research should be complete by September 2007.

2.1.4 Producer Associations, Check-off Schemes and Innovation

Research Area: Area 4a – The structure of the agri-food sector and innovation
Location: University of British Columbia
Key Supervisors: James Vercammen and Murray Fulton
Graduate Student: Zoe Campbell, Ag Econ MSc Student, UBC
Research Advice: Grant Isaac and Jill Hobbs
Duration: April 1, 2006 to March 31, 2007
Amount Budgeted: $20,000

Project Overview:
Area 4 funding for April 1, 2005 to March 31, 2006 was used to fund two projects. The smaller of the two projects is complete. The larger of the two projects will be continued using part of the funds from the April 1, 2006 to March 31, 2007 allocation.
Zoe began working on this project in August of 2005, and worked on it continually through to January, 2006. Zoe began taking courses in the Agricultural Economics MSc program at UBC in September 2005. Zoe withdrew from the program for the January to April, 2006 semester to recover from a major surgery, which she had in January, 2006. Zoe re-engaged herself in the project in March 2006, and is expected to resume course work in the MSc. Program in September, 2006. The above project will form the basis for her MSc thesis, which she will begin writing later this fall.
During the fall of 2005, Zoe used a mail-out questionnaire and a series of personal, telephone and e-mail interviews to obtain information about how check-off funds are being used by Canadian agricultural producer associations. Zoe is currently analysing this information and writing a report that summarizes her findings. Zoe will go on to develop theoretical hypotheses concerning check-off schemes, and then use the data she collected to test these hypotheses econometrically as part of her MSc thesis.
Zoe's first objective is to compile a database of precisely how producer associations use the money raised via member check-offs. Of particular interest is the extent that producer associations use check-off money to fund research and development. Zoe's second objective is to better understand how producer associations make check-off funding allocation decisions. Zoe's third objective is to better understand producer associations' perceptions about the comparative usefulness of the various sources of R&D (e.g., private versus public).

Zoe has discovered that many producer associations are keenly aware of the benefits of producer-funded R&D, but the standard collective action problem and disagreements over how check-off funding should be utilized often prevents these associations from becoming serious players in the R&D process. Individual producers are often reluctant to commit scarce resources to a check-off scheme that usually provides benefits only after a considerable amount of time. Producers are also uncertain about the marginal benefit of a check-off dollar, which is allocated to R&D versus other activities such as generic promotion of the industry’s product. The agency issues that arise when a group internal to the organization is placed in control of the check-off scheme is also a concern.

When money is used to finance R&D, producers must decide the type of R&D to finance (e.g., process R&D versus product R&D), who to target the funding toward (e.g., federal research labs, universities or industry) and what type of commercialization agreements to write. Producer associations are keenly aware that spillovers from producer-funded research are particularly large, and thus estimates of the marginal benefit of R&D are particularly complex. Theoretical research in the general area of producer association R&D is virtually nonexistent, so there is considerable scope for Zoe to make a sizeable contribution with her MSc thesis, both with the theory and the empirical work.

2.1.5 An Economic Analysis of Gene Marker Assisted Selection in Beef Cattle: Phase 2

Research Area: Area 4b- The structure of the agri-food sector and innovation
Location: University of British Columbia/University of Saskatchewan
Project Leaders: Murray Fulton and James Vercammen
Graduate Student: Douglas Akhimienmhonan, Ag Econ MSc Student at UBC and Ag Econ PhD student at U of Sask.

Project Overview:
Douglas received funding for Phase I of the above project from the National Beef Industry Development Fund (NBIDF) from April 1, 2005 to March 31, 2006. As of March, 2006 he is nearing completion of his UBC MSc thesis, which encompasses all of his work on Phase 1 of the above project. Douglas is currently taking courses within the Agricultural Economics PhD program at the University of Saskatchewan. He will receive departmental funding during the time he is taking classes, so CAIRN funding will be provided to him from May to August, 2006, which is when he will begin work on Phase II of the above project.

In Phase I of the project, Douglas examined the impact of emerging genomic technologies for beef supply chains. Specifically, he examined how gene marker assisted
seedstock selection technology becomes integrated within the supply chain and serves to increase the tenderness of the beef product being delivered to consumers. His main focus was on the net welfare gains from this innovation, and how the gains are distributed amongst the various participants within the supply chain? He is also interested in how the genomic innovation is being commercialized? The literature has been reviewed and industry experts have been surveyed to help answer these questions. As well, an economic model of the beef supply chain has been constructed and calibrated to generate simulation results that shed light on these questions.

In Phase II of the project, Douglas will continue his examination of livestock genomic technology in the context of beef supply chains. A number of important theoretical and empirical questions have been raised during Phase I, and the purpose of Phase II is to address these questions. It will take some time for Douglas to narrow the set of questions down to something that is manageable. At this point, Douglas is particularly interested in emerging regulations for genomic technologies. Regulations are important in a number of areas including governance rules for intellectual property rights, public agency involvement in the commercialization of genomic technologies, information disclosure to consumers and other supply chain participants, and the ethical/animal welfare issues concerning genomics technology when applied to beef cattle.

Douglas will spend the summer talking with industry experts, reviewing various literatures and formulating his ideas to come up with a concrete research proposal that will form the basis for his PhD thesis.

2.1.6 Disseminating Genomic Knowledge to Crop Research

Research Area: Area 5a – Entrepreneurship and Innovation
Location: University of Saskatchewan
Team Members: Murray Fulton, Richard Gray, Wilf Keller, Hartley Furtan
Graduate student: Emmanouil Oikonomou
Timeline: September 2006 to September 2007
Requested Funds: $20,000
Disposition of Funds: Funding for one M.Sc. graduate student.
Deliverables: M.Sc. thesis

Project Description:
Canada is moving into an information-knowledge driven economy. In the agriculture sector this means that new innovation which leads to economic development will be information-knowledge intensive. Canada is only one of many countries that are moving down this path in search of higher productivity. In order to be successful in this endeavour Canada must have those institutional structures in place that facilitate the creation of new information-knowledge and then make the information-knowledge available to Canadian entrepreneurs.

Genomic research is by its nature “big science”, requiring large clusters of dedicated scientists. Canada has made significant public investments in genomic innovation, which is predominately housed in a few large institutions. This clustering of genomic science differs from applied crop research where there are many institutions
with a few crop-specific scientists. If the public sector is not successful in finding ways to coordinate and integrate these research roles, the large multinational research firms, who can undertake both of these activities, will begin to dominate crop innovation.

The question we are asking is “what are the optimal research-development organizations and institutions for the creation and release of publicly produced information-knowledge in the life sciences sector of Canadian agriculture”? Organizations (such as federal research labs and universities) must work in a coordinated fashion to produce the best possible set of new information-knowledge. This new information-knowledge must then be available to entrepreneurs to create new products that can reach the market, both domestic and export.

**Progress to March 31, 2007:**
The research is well underway. The M.Sc thesis examines how breeders and scientists in the canola sector share intellectual property. A survey was completed in February (along with a parallel wheat breeder survey) to explore how knowledge sharing has been influenced by intellectual property rights. The survey we presented in the Vancouver workshop and a policy brief has been written. The thesis should be complete by August, 2007

### 2.1.7 Factors Affecting Innovation in the Canadian Bioproducts Industry

**Research Area:** Area 5b - Entrepreneurship and Innovation  
**Location:** Institute of Agri-Food Policy Innovation and University of Guelph  
**Project Leaders:** David Sparling (Institute of Agri-Food Policy Innovation) and John Cranfield (UG)  
**Duration:** Summer 2006 to Summer 2007  
**Amount Requested:** $20,000  
**Use of Funds:** Funding for one research assistant and an M.Sc. student

**Brief Project Description:**
The project will extend a research partnership by the researchers with Statistics Canada and AAFC on the first Bioproducts Development Survey 2003. During the summer of 2005 the researchers worked with AAFC to analyse summary tables of the responses to the 2003 Bioproducts Development Survey. Funds were used to employ Pamela Laughland, an extremely bright research assistant, to assist with the bioproducts survey analysis. Partly as a result of her work on the bioproducts survey Pamela has decided to pursue an MSc in Agricultural Economics at the University of Guelph. To date the analysis of the survey has been limited to the summary tables of the responses sorted on two dimensions, province/region and firm size. The first analysis revealed significant variability on both dimensions but it only scratched the surface of the analysis that can be undertaken with this valuable resource. A deeper understanding is imperative as this industry will make significant use of agri-food biomass and will be a leading source of innovative new industrial products in the next decade.
The proposed analysis will involve placing a research/MSc student (Pamela Laughland) in Statistics Canada during part of the summer term to extend the range of descriptive statistical and cross tabular analyses to better understand the nature of innovation and the challenges faced in the Canadian bioproducts industry. The analysis will then move to an exploration of the factors influencing innovative activity and financing success for firms in the Canadian bioproducts industry. The project will involve the development of an econometric model regressing measures of innovation performance in the bioproducts industry and financing success on various firm and industry factors. The method used in this analysis will be based on the regression analyses used by the researchers for the Canadian biotechnology and functional food surveys.

One intentional byproduct of the project will be to connect a talented young researcher with key personnel in AAFC and Statistics Canada, as well as with innovation researchers across Canada.

Progress to March 31, 2007:
The data has been collected and the analysis is well underway. A policy brief has been written outlining preliminary results. As proposed for 2007-2008 work this summer will compare the 2003 results with the 2005 survey results.

2.2 CAIRN Funded Projects Initiated in 2005/2006

In 2005/2006 CAIRN undertook eight graduate student related research projects. The projects were selected so each of the five research areas in CAIRN would receive funding.

2.2.1 Innovation in the agri-food sector and the presence of foreign equity

Research Area: Area 1- International competitiveness and innovation
Location: University of Saskatchewan
Project Leader(s): Hartley Furtan
Graduate Student: Pascal Ghazalian
Duration: September 1, 2005 – June 30, 2006
Amount Budgeted: $10,000

Brief Project Description:

Foreign direct investment (FDI) is an important source of investment and innovation in the Canadian economy. The linkage of FDI to the growth of the overall Canadian economy has been well documented. However, one sector where little to no research has occurred in measuring the relationship between growth and the level of FDI is the agriculture and food sector. The purpose of this research is to start to fill the gap in our knowledge of the relationship between FDI, innovation and growth in the agriculture and food sector.

In terms of ongoing research in the area of FDI in the Department of Agricultural Economics, there are currently two projects that would support the proposed research.
First, Pascal Ghazalian is completing his doctoral dissertation examining the question of how FDI impacts the measured ‘border effects’ between two countries. He has completed some fairly original theoretical research and is currently testing the hypotheses which fall out of the model. To date his results look very promising. Second, Olfert and Furtan have a short paper on Canada-U.S. economic integration, which formally incorporates the role of FDI. This paper is limited by the paucity of data on the quantity of FDI in the Canadian agri-food sector. Thus all of our work to date has focused on the linkage between the level of trade and FDI. This proposal would model explicitly the role of FDI in increasing the level of innovation in the food processing sector, using the network survey data.

The links between innovation and foreign equity can take various forms and have influences in different directions. The internal presence of foreign equity may reallocate the innovation activities (such as research and development) to the parent multinational enterprise (MNE). In this case, the innovation outcome developed by the parent MNE has a public good aspect and is supplied to the foreign affiliates at a lower cost. Yet, it can be argued that the presence of the foreign capital may also boost the research and innovation activities in a country as the foreign ownership brings access to a wide range of skills associated with innovation activities. Further, the presence of foreign equity and associated innovation can generate external economies in the industry through spillovers. Development and adoption of innovation by local firms, in this case, can be the result of simple observation, information leakages, or cooperation. Clusters of innovation may develop. Spillovers may be strongly influenced by geographic proximity.

The potential spillover resulting from the presence of foreign capital has inspired a massive literature. Previous literature has mainly described firms’ performance by productivity. Görg and Greenaway (2002) provide an excellent overview of the empirical evidence of spillover. The evidence of spillover in the developed countries is mixed. Some literature has found a positive effect at the industry level (e.g. Caves, 1974; Liu et al., 2000; Driffield, 2001) and at the firm level (e.g. Ruane and Ugur, 2001). Other literature finds inconclusive results (e.g. Grima et al., 2001; Grima and Wakelin, 2001; Harris and Robinson, 2001; Barrios and Strobl, 2002). Some literature searches the spillover effects of foreign affiliates on the exports and the propensity to export of domestic firms (e.g. Sousa et al., 2000; Barrios et al., 2001).

Our proposed research is in the spirit of the previous literature yet it focuses on the effect of the internal and external foreign equity on the innovation performance of firms. The effect of internal foreign equity may be measured by the innovation adoption by the firm, either from its’ locally generated research and development, or that transferred from the foreign parent company. The effect of the external foreign equity on the firms’ innovation activity reflects the spillover aspect. When studying the effect of the external foreign equity, particular interest is directed towards the domestic firms that are exporters or recipients of foreign direct investment. Evidence of positive spillover effects implies enhancement of domestic firms’ global competency that becomes self-reinforcing.

We provide additional detail by disaggregating the innovation into product innovation and process innovation and by disaggregating the innovation activities into six sub-categories: intramural R&D, extramural R&D, acquisition of machinery, equipment
and software, acquisition of other external knowledge, training, market introduction of innovations and other preparations.

**Progress to March 31, 2007:**

Analysis is complete; papers were presented at the joint CAIRN/CAES joint sessions in Montreal. A journal article has been submitted for publication.

**2.2.2 Intellectual Property Rights and Agricultural Trade Volumes**

**Research Area:** Area 1 - International competitiveness and innovation  
**Location:** University of Calgary  
**Project Leader(s):** James Gaisford, University of Calgary  
**Graduate Student:** Olena Ivus, University of Calgary PhD Student  
**Duration:** September 1, 2005 – June 30, 2006  
**Amount Budgeted:** $10,000

**Project overview:**

The beginning of the twenty-first century can be characterized as a period of rapid internationalization, worldwide economic integration and development of international trade. Economists all over the world recognize that “Intellectual Property Rights” (IPR) can have a significant impact on trade flows. That is one reason why the regulation of national regimes of intellectual property rights protection has recently become a contentious issue and is assigned a major importance.

Despite the fact that a great deal of effort has already been made in this area, there are still some aspects of the relationship between the level of IPR protection and trade that require a more detailed theoretical and empirical investigation. Unfortunately, theoretical literature cannot provide us with the clear prediction about the direction of the effect on international trade volumes from strengthening IPR protection in a particular country. How more rigorous enforcement of intellectual property rights (IPRs) affects trade volumes, particularly import volumes, is an important empirical question, especially in reference to agricultural trade. Maskus and Penubarti (1995) have outlined a simple theoretical model that decomposes the impact of increased intellectual property protection into a market power effect, which reduces imports, and a market expansion effect, which increases imports.

As far as empirical papers are concerned, one can easily notice that there are many areas that merit further research attention. One of these areas is trade in agri-food products. With the exception of Wisniewski, no studies have been completed specifically for products of agriculture. Knowledge of the performance of firms and industries in this field will become increasingly important to policy makers as the amount of intellectual property embodied in agricultural products increases due to the potential widespread application of agricultural biotechnology.

There are two goals of this study. First, the aim of this research is to carry out an extensive empirical investigation of the effect of IPR protection on international trade volumes in agricultural products and to evaluate the impact. Second, the question of interest is to examine the effect of strengthening in IPR protection on Canadian export flows in food. These empirical results will be of particular importance to policy-makers in Canada and elsewhere who are concerned with the connections between innovation, intellectual property rights and trade in the agri-food sector.

The effects of IPR on bilateral trade flows are commonly evaluated on the basis of the Gravity Model of international trade. This model is a conventional method used to
estimate the effects of a variety of phenomena on international trade. This model explains bilateral trade flows with the distance between the countries and their incomes, and it also allows for a number of trade distorting factors to be included in the model. The gravity model has been adopted for empirical estimation by a number of authors (Hejazi and Safarian, 1998; Maskus and Eby-Konan, 1994; Frankel, 1995; Smith, 1999 and 2000; Rafiquzzamann, 2002). In the proposed project, we will review the recent developments in the econometric methodology of Gravity models and refine the estimation techniques used to investigate the role of intellectual property rights in agricultural trade.

The results obtained with Gravity models using the standard cross-sectional approach can be questioned on several grounds. Cheng and Wall (1999) demonstrated that the restriction of equal intercepts across the country-pairs produces biased estimates, i.e. trade between low-trade countries is overestimated and trade between high-trade countries is underestimated. The strong positive correlation between the residuals and the level of exports tends to produce this bias. They argue that the inability of the standard cross-section estimation to account for the pairwise heterogeneity of bilateral trade relations is the principal cause of the bias. Heterogeneity implies that the level of exports from country \(i\) to countries \(j\) and \(k\) may be different even if \(GDP_j = GDP_k\) and \(D_{ij} = D_{ik}\). These differences can be explained by political, historical and cultural factors that are correlated with levels of bilateral trade and with the baseline gravity variables. Omission or misspecification of these variables will lead to the heterogeneity bias.

Thus, when estimating the effects of strengthening IPR on the bilateral agri-food trade flows using the gravity model approach, it is important to account for country-pair heterogeneity. In this respect Cheng and Wall (1999) adopted a two-way fixed-effects model which includes both the country-pair \(\{\alpha_{ij}\}\) and year dummies \(\{\alpha_t\}\). In turn, Mátyás (1997) argues that the correct econometric specification of the gravity model should include \(\{\alpha_i\}\) - the importer (target) country effects, \(\{\alpha_j\}\) - the exporter (local) country effects, and \(\{\alpha_t\}\) - the time effects. In other words, the Gravity Model should take the form of a triple-indexed model.

Thus, utilizing only cross-sectional data imposes severe restrictions on the specification of the model. In this research project, we will use panel data to generalize a Gravity Model that examines the effect of intellectual property rights on trade in various agricultural sub-sectors. The two approaches discussed above will be adopted. The first will be a two-way FEM, with a set of dummies for each year \(\{\alpha_t\}\) and a set of specific effects for each country-pair \(\{\alpha_{ij}\}\). In the second, triple-indexed model, a set of dummies for each importer \(\{\alpha_i\}\), for each exporter \(\{\alpha_j\}\) and for each year \(\{\alpha_t\}\) will be estimated. If these alternative models are nested, the likelihood-ratio test provides a way to compare them.

In addition, it is important to address the question to what extent the explanatory variables in the model can be considered to be strictly exogenous. For example, GDP and imports are intrinsically linked. Ignoring this endogeneity will result in the simultaneous bias of the parameters estimates. To circumvent this problem, instrumental variables technique will be applied for the likely endogenous variables.

**Progress to March 31, 2006:**
The analysis and final report is complete.
2.2.3 Regional Dimensions of Innovation in the Canadian Food Processing Industry

**Research Area:** Area 2 - Regional incidence of innovation  
**Location:** Saskatoon  
**Project Leader(s):** Mark Partridge  
**Graduate Student:** Jill McDonald, University of Saskatchewan M.Sc. Student  
**Duration:** April 1, 2005 - March 31, 2006  
**Amount Budgeted:** $20,000  

**Project overview:**

Using the draft food-processing innovation survey developed in the first quarter of 2005, this project will assess the regional dimensions of innovative activities. Goals of this project include an assessment of the input-output linkages of technological change and the resulting economic impacts on the various regional economies. Empirical techniques will include geographical information system analysis using the C-RERL lab and database, survey analysis, and spatial econometrics.

While the survey has not been completed and there will be constraints in its size, our goals will be to answer the following questions:

- **Identify innovative capacity in the Canadian food processing industry.**  
  - Does it differ by firm size, by region/province, and by rural/urban location?  
  - How have government policies supported or constrained innovation, including technology transfer?

- **How can Canadian food processors be encouraged to export their products?**  
  - Enhanced entrepreneurship.  
  - Improved market intelligence regarding potential foreign and domestic markets.  
  - Changing U.S. trade barriers.  
  - Identifying partners in other foreign markets for product distribution.  
  - Improved quality and availability of transportation infrastructure. (e.g., on the Prairies, north-south rail and highway transport is limited.)

- **Identify constraints in adopting best-practice technology such as lack of information technologies and out-dated capital stock.**  
  - Lack of knowledge or understanding of new technology (suggesting a need for a government outreach/extension to disseminate best practices).  
  - Lack of financing. (Does government need to better promote their efforts to broker or provide venture financing?)  
  - Regulatory, taxation, and business-climate constraints. Difficulties in attracting a qualified workforce as there are looming labour-shortages?

Using these findings, what can cities, municipalities, provinces, and The Government of Canada do to promote future innovation, competitiveness, and export success in the knowledge economy.
During this one-year period, we want to support the administering of the survey instrument and to support the data entry process. The student hopes to have a preliminary analysis completed at the end of the period and to have completed a literature survey of innovation in food processing and related industries.

**Progress to March 31, 2007:**

Data from the innovation survey is being used to test if there are locational advantages for firms in urban or rural regions and to determine what characteristics innovative food-processing firms have in common. Jill’s master’s thesis was completed in the summer of 2006. Jill has been employed with the Saskatchewan Trade Export Program since September 2006.

### 2.2.4 Alternative Management of Public Intellectual Property Rights

**Research Area:** Area 3 - The knowledge economy and innovation  
**Location:** University of Saskatchewan  
**Project Leader(s):** Richard Gray and Stavroula Malla  
**Graduate Student:** Dan Holman, M.Sc., Student University of Saskatchewan

**Project overview:**

Governments have historically played a large role in agricultural research. During the 20th century, most crop research was undertaken by public institutions and the products of the research were held in the public domain (Huffman and Evenson, 1993). At the very root of support for agricultural research was the notion that the innovator could not capture all of the benefits from research (Alston and Pardey, 1999) as benefits “spilled over” to adopters. The lack of private incentive created from these spillovers resulted in public investment in research. More recently, the introduction of modern biotechnology and improved Intellectual Property Rights (IPRs) have conferred monopolistic rights to the inventor, leading to increased private investment in agricultural research. Despite the considerable growth in private investment, the government continues to make large public investments in research, especially in basic research which creates a positive spillover to private firms as many successful industries are based on breakthrough innovations created in the public sector.

Public IP and research spillovers have important implications on the research intensity, industry structure and the distribution of research benefits. A number of studies show that while IPRs create incentives to invest, they may create market power and efficiency losses (e.g., Lindner, 1993; Perrin, 1994; Moschini and Lapan, 1997; Fulton and Keyowski, 1999; Alston and Venner, 2000; Gray and Malla, 2003). Moreover, the inherent non-rival nature of agricultural research output tends to create a concentrated private industry as firms move to capture economies of scale and scope (Fulton and Giannakas, 2001). A further push towards integration occurs as firms adopt strategies, such as vertical integration, mergers, acquisitions and joint venture arrangements, to preserve their own freedom to operate (e.g., Kalaitzandonakes and Bjornson, 1997; Lesser, 1998; Lindner, 1999; Falcon and Fowler, 2002). Finally, the concentrated nature of the research industry, and the exclusive ownership of key IPRs give research firms some degree of market power, which, through higher prices, reduces the incentive for
product innovation and adoption downstream (e.g., Mochini and Lapan, 1997; Malla and Gray, 2003)

Furthermore, the introduction of a single genetic trait into a product of biotechnology can require the use of many separate pieces of IP. Before the innovator can have ‘freedom to operate’, they must reach an agreement with each of the other IP owners (Kowalski et al., 2002). If the ownership of the IP is dispersed, negotiating ‘freedom to operate’ agreements to share the proceeds from the innovation is an expensive, time consuming process, and can be subject to hold up by any of the parties involved (Falcon and Fowler, 2002). For example, the commercialization of Golden Rice involves at least 70 process and genetic patents (e.g., Rafi Communiqué, 2000), which represents a hold up problem. Hence, the high transaction costs associated with the exchange of intellectual property have adversely affected the structure of the private and public research industries and have created an economic barrier for the commercialization of second generation GM crops.

Many policy makers and economists have begun to examine the ‘freedom to operate’ issues related to IP ownership. They have developed proposals that focus on improving ‘freedom to operate’ for public institutions and for innovators working on smaller crops in lesser developed countries. Many US land grant Universities and other public institutions have joined together to form a new organization called PIPRA (Public Intellectual Property Resource for Agriculture). Richard Jefferson of CAMBIA has proposed the use of open source IP agreements similar to the one used to develop Linex, the open source computer operating system (Broothaerts et al., 2005 and Philipkoski, 2005). In this model, new users can use existing IP on the condition that any improvement to the IP is made available on an open source basis.

In Canada, meaningful progress on this issue has been very limited to date. Agriculture and Agri-Food Canada has indicated they will withdraw from commercial varietal development, however, the process they will use to transfer IP to private firms remains unclear. Public breeders in Universities and other public institutions often avoid using proprietary IP, and only protect their own knowledge on a case by case basis.

The objective of this study is to examine alternatives for the management of public crop related IP in Canada. This will include a comparison of: existing structures, “PIPRA” type models, open source models, and quasi-public models. Each management structure will be evaluated for its impact on freedom to operate, revenue generation, and impacts on downstream users. The research will focus research on two or three crops that differ in scale, IP, and private sector involvement.

References


Progress to March 31, 2006:
The student originally proposed for the project was unable to return to the University of Saskatchewan this summer because of US visa restrictions. In October, we recruited Dan Holman, an M.Sc. Agricultural Economics student with a B.S.A. in crop science for the project. Dan was subsequently awarded a CWB fellowship, beginning January 1, 2006, to continue work on this project. Thus CAIRN project costs are limited to three months of salary. Dan has a draft of the thesis, which should be defended by July. A policy brief has been prepared summarizing one of the aspects of this project.

2.2.5 Producer Associations, Check-off Schemes and Innovation

Research Area: Area 4- The structure of the agri-food sector and innovation
Location: University of British Columbia
Project Leader(s): Murray Fulton and James Vercammen  
Graduate Student: Zoe Campbell; UBC MSc student  
Duration: August 1, 2005-March 31, 2006  
Amount Budgeted: $14,000

Project overview:

Agricultural producers in Canada often belong to a producer association such as the Canadian Organic Growers, Ontario Corn Growers Association or the Saskatchewan Pulse Growers. The Saskatchewan Pulse Growers, for example, represents over 20,000 pulse crop farmers growing 2.7 million acres of pulse crops in Saskatchewan. Many producer organizations use a member check-off scheme to finance a variety of activities such as product promotion, research and development, member education and administration. For example,

“The Manitoba Canola Growers Association (MCGA) commits a major portion of its money each year to funding canola research projects. The majority of this research will take place in Manitoba in 2003 but other projects will be conducted in Edmonton and Vegreville, AB, Saskatoon, SK and Melfort, SK.

The researchers represent Agriculture and Agri-Food Canada (AAFC), Alberta Research Council, Alberta Agriculture, and Alberta Agriculture Food and Rural Development (AAFRD). They receive their funding through the Canola Agronomic Research Program (CARP), to which MCGA and other provincial canola grower associations contribute funding. This year, MCGA will contribute dollars to three continuing and five new projects.” [source: MCGA website]

The purpose of the proposed research is to construct a detailed database of producer check-off schemes, and to supplement this quantitative data with qualitative survey information. A variety of research questions have been identified. For example, what is the size of the check-off for each producer association, how are members levied (e.g., yearly membership fee versus a per tonne charge), and precisely how is the money spent by the association? Of particular interest is the extent to which check-off funds are used to support research and development (R&D). Do most associations use the majority of their check-off funds to support research, as is the case with the MCGA, or is it more likely that an association will use most of its funding for generic product promotion? Also of interest is how funding targeted for R&D is actually spent. Is partnering with government research labs the most common scenario? Is funding ever provided to private research labs? Do producer associations attempt to maintain or sell intellectual property rights? In general, how do managers of producer associations view the relative usefulness of private and public R&D that originates outside of the organization? What specific features of an industry or producer association tend to be associated with relatively high levels of association sponsored R&D?

Ms. Campbell has conducted a series of face-to-face interviews and telephone/e-mail interviews with senior managers of various producer organizations to collect the data which is required to answer the above questions. All of the major producer organizations and a large number of the minor producer associations across Canada are
being contacted. The quantitative data will be statistically analyzed and summary results reported. The qualitative data, together with the quantitative statistics, will provide a comprehensive overview of the check-off activities of Canadian producer associations, and will form the basis for the answers to the above research questions.

**Progress to March 31, 2006:**

Zoe is currently in the first year of a MSc program in AgEcon at UBC. She began work on this project on August 1, 2005 and has been working on the project for 20 hours per week since that time. She will complete the project by March 31, 2006.

Zoe developed a questionnaire and a set of interview notes that she is currently using to obtain information from a comprehensive set of Canadian agricultural producer associations. She conducted a set of face-to-face interviews with several Saskatchewan-based producer associations in December, 2005. She is currently conducting telephone and e-mail interviews with producer associations from other provinces.

Zoe’s first objective is to compile a database of precisely how producer associations use the money raised via member check-offs. Of particular interest is the extent that producer associations use check-off money to fund research and development. Zoe’s second objective is to better understand how producer associations make check-off funding allocation decisions. Zoe’s third objective is to better understand producer associations’ perceptions about the comparative usefulness of the various sources of R&D (e.g., private versus public).

Zoe intends to have a first draft of the report completed by March 31, 2006. Fulton and Vercammen will take the lead in using the draft report to write an academic paper, that will be presented at a future workshop or conference.

### 2.2.6 Using Matlab for Stochastic Dynamic Programming

**Research Area:** Area 4 - The structure of the agri-food sector and innovation  
**Location:** University of British Columbia  
**Project Leader(s):** James Vercammen  
**Graduate Student:** Seena Mortazavi, UBC MSc student  
**Duration:** May 15, 2005 to August 14, 2005  
**Amount Budgeted:** $3,000

**Project overview:**

Seena is pursuing a MSc in Economics at Queens University. He was taking classes at UBC from May – September, 2005. He was hired to work with Jim Vercammen from May 15, 2005 to August 14, 2005 to program MatLab for solving stochastic dynamic programming problems. The specific application was a model of direct payments and farm investment. Vercammen is now in a position to use MatLab to solve stochastic dynamic programming problems that are applied to agricultural innovation.
Progress to March 31, 2006:
The project is complete. Vercammen, on sabbatical this year has prepared two research papers for presentation at the AAEA and the WEA annual meetings.

Expenditures to March 31, 2006: $3,000 - salary

2.2.6 Factors Affecting Innovation, Biotechnology and Bioproducts

Research Area: Area 5a - Entrepreneurship and Innovation
Location: University of Guelph
Project Leader(s): David Sparling (UG) and John Cranfield (UG)
Graduate Student: Daryl van Moorsel, M.Sc. University of Guelph
Duration: Summer 2005 to Summer 2006
Amount Budgeted: $20,000

Project overview:
The project extends a previous research partnership by the researchers with Statistics Canada and AAFC. The project involves the analysis of AAFC and Statistics Canada surveys completed in 2003/2004, the Bioproducts Use and Development Use, the Agri-Food Innovation Survey and the 2003 Biotechnology Use and Development Survey. The Bio-products survey is a world first in the area and the Biotechnology survey will allow the researchers to extend their previous analyses of the 1999 and 2001 surveys where they focused on agricultural biotechnology and performed a longitudinal analysis for firms common to both surveys. The biotechnology project examines the structure and characteristics of innovative biotechnology firms with the objective of understanding characteristics of successful biotechnology companies in terms of product innovation and success in securing the financing required to commercialize the innovations. The opportunity to study the industry and individual firms over three data points is unique and worthwhile, particularly since few studies focus on agricultural biotechnology.

The project involves the development of an econometric model regressing alternative measures of innovation performance in the different industries and financing success on various firm and industry factors. For the biotechnology survey, an analysis linking the 2003, 2001, and 1999 surveys will be used. While the sample common to all three surveys will be smaller, it will still be sufficient to perform a longitudinal analysis in addition to the comparison, for all firms in the three surveys. The 2003 AAFC innovation survey and 2004 bio-products survey both offer new opportunities to gain insight into areas critical to the future of Canada’s agri-food sector.

Progress to March 31, 2006:
This project is complete and was very successful. One MSc student was supported through his last term in Summer of 2005. He completed his analysis of the 1999 and 2001 Biotechnology Use and Development Surveys. The results of the research were reported at three conferences and there has been one publication accepted. Another two papers are being submitted to journals as outlined below. The MSc student, Daryl van
Moorsel has since been employed by the Research Branch of AAFC and we have cooperated with him on the analysis of the bioproducts development survey.

We made an agreement with AAFC to analyse the summary tables of the 2003 Bioproducts Development Survey. Funds were also used to employ Pamela Laughland, an extremely bright and talented research assistant, to assist on the bioproducts survey analysis. Pamela also assisted on projects in innovation in the biotechnology and food processing sectors. She worked full time through the summer and part time through the fall and winter. Pamela is a 90+ student who had originally planned to complete a postgraduate degree in either law or economics. She was fascinated by the work on the bioproducts survey and her other research this summer and has decided that she will to continue to study and do research in the area of agricultural economics. She will make a valuable contribution to the field in the future.

Publications related to the Project

Publications in Refereed Journals

Publications in Abstracts and Conference Proceedings

Technical Reports

Presentations related to the Project:

2.2.8 Adoption of New Innovations by Prairie Farmers: Case of Minimum Tillage Technology

**Research Area:** Area 5b - Entrepreneurship and Innovation  
**Location:** University of Saskatchewan  
**Project Leader:** Hartley Furtan  
**Duration:** Spring 2006  
**Amount Requested:** $1,500  
**Use of funds:** Present results of Masters thesis (funded by SSHRC and Biocap) at the CAES meeting in Montreal 2006

**Brief Project Description:**

In recent years there has been an increased focus on the damage being done to the environment by increased industrial and agricultural production. One example of this environmental damage is land degradation caused by soil erosion and nutrient deprivation from increased agricultural production. Producers, researchers, and farm implement manufacturers have been working to reduce land degradation through innovative farming practices and equipment. An example is the innovation of minimum tillage technology and farming practices which are designed to reduce damage caused by increased tilling of the land. The primary objective of this research is to determine what socio-economic, farm, and regional characteristics play a significant role in determining whether minimum tillage will be adopted by producers in the Prairie Provinces. In addition, this research will test whether the adoption of minimum tillage technology by prairie producers follows the bell curve of the technology adoption life cycle.

Empirical work for this research will be done by running both Probit and Logit models. The primary data source for this research will be farm level data from the Agriculture Census for the years 1991, 1996, and 2001. Additional data representing regional characteristics will be used, including soil zone and climate data. Finally, tillage data for the years 1991, 1996, and 2001 will be used to test whether the adoption of minimum tillage technology follows the bell curve of the technology adoption life cycle. Tillage data prior to 1991 is not available from agriculture censuses.

The model estimated revealed that education, farm size, location, income levels have a positive impact on the probability of adoption. Older farmers, smaller farmers and farmers in the brown soil zone were slower at adopting minimum tillage technology. The
The model was able to correctly predict over 80% those individuals which had adopted the innovation.

The results obtained from this research will benefit both the private and public sectors. The private sector will be able to see what socio-economic, farm, and regional characteristics significantly influence the adoption of innovative technology and from this they will be able to develop specific marketing strategies for different groups of producers and for different geographic regions. The public sector will benefit by seeing how producers view environmental concerns in their decision of whether or not to adopt new technology. From this they will be better able to develop favorable policies which will help reduce or eliminate the affects of climate change.

2.2.9 Producer Cooperatives, Commercialization, and the Ownership of IPR

Location: Saskatoon
Research Area: Cross Cutting-Area 3 and 4
Project Leader(s): John Cranfield, Murray Fulton, James Vercammen
Graduate Student: Lampros Lamprinakis, University of Saskatchewan Ph.D. Student
Duration: April 1, 2005-March 31, 2006
Amount Budgeted: $15,000

Project overview:

The following proposal is designed to cut across the structure and intellectual property groups within the network.

Overview of Proposed Research

Since the early 1990s, producer groups in Canada have emerged as significant players in agricultural R&D. Funded through check-offs on grain and livestock production, groups such as the Saskatchewan Pulse Growers, the Canola Growers of Saskatchewan, and the Western Grains Research Foundation have invested millions of dollars in R&D. Most of this R&D has been targeted towards new varieties with improved yields and other agronomic characteristics – i.e., the R&D has been directed at process innovation at the farm level.

Recently, a number of producer groups have been considering R&D directed at product innovation at the processing and further processing level. A good example of this type of activity is the involvement by the canola industry in bioproducts. This investment is intended to create new markets for producers’ products, and thus to benefit producers through increased product demand, particularly for niche and/or differentiated products.

The economics of R&D directed at farm-level process innovation are reasonably well understood. Alston, Norton and Pardey provide an extensive survey of the research in this area. The focus of much of the literature that they review is the public provision of R&D; the impact of R&D funding by producer groups is very similar to the case when R&D is publicly-funded research. Moschini and Lapan show that R&D undertaken by private companies and directed at the farm sector can have very different impacts, depending on the market structure of the industry in which the firms operate.
The economics of R&D directed at processing-level product innovation and undertaken by producers are much less well understood, in large part because of the complex impact that this R&D can have. The development of new products can lead to new markets for producers’ products, thus potentially benefiting producers. The extent to which producers will benefit, however, will depend on a number of factors. One important factor is the degree to which producers can limit the supply of any new product that is supplied at the farm level. If supply cannot be limited, then the benefit to producers may be limited.

There may also be market structure impacts that need to be considered. As Sutton shows, R&D activity undertaken by firms in the processing or further processing sectors is likely to influence the market structure (e.g., the number of firms) of these sectors. Depending on the nature of the underlying technology, greater R&D can lead to more a concentrated sector or to a sector that supports a large number of firms producing highly differentiated products. A key economic variable affecting the market structure is the sunk costs that the firms incur when they undertake R&D.

The structural impact of producer groups undertaking R&D directed at the processing or further processing sector has not been investigated. Given the key role that sunk costs play in determining industry structure, the impact of producer-funded R&D on market structure will likely depend on the effect the R&D has on sunk costs. For instance, if R&D funding by producer groups does not affect sunk costs in the processing sector (producers incur the sunk costs rather than the processors); then concentration may fall or remain constant, which in turn has implications for the price they are willing to pay for the producers’ product.

The sunk costs that the firms in the processing sector have to incur will depend on the manner in which producer groups exploit their new technology. For instance, if the producer group is successful in generating a new product, then it has to decide how this product will be produced – i.e., will the producer group try and produce it themselves or will they license it to another firm. If they choose the licensing option, then they also have to decide the price at which the product should be licensed. The sunk costs incurred by the processors will depend on the price paid for the license.

Given the lack of understanding of the impact of producer-funded R&D directed at the processing sector, the purpose of the proposed research is to examine the consequences to producers of their direct investment in product innovation at the processing and further processing level. Specifically, the research will examine the following questions:

(1) If producer groups are not constrained by R&D fund availability, what is the optimal amount of processing-level product innovation R&D to undertake?

(2) Given that producer groups have a limit to the amount of R&D that they can undertake, what is the optimal split of R&D spending between farm-level process innovation and processing-level product innovation?

(3) Will producer groups be better off producing the new product that they have developed, or should they license the technology to a third party?

(4) If the producer group licenses the technology, what form should the license take? What price should be charged?
(5) What impact does the choice of technology exploitation mechanism have on the optimal amount of R&D to undertake?

Methodology

The proposed research will have both a theoretical and empirical component. The theoretical component will involve an examination of the incentives faced by producer groups to undertake R&D at different stages in the supply chain. The basic model will consider a standard Bertrand differentiated products oligopoly that utilizes a common input (e.g., canola). The literature normally considers the incentive of one or more of the oligopolists to conduct R&D in order to create a less elastic demand for its product. The impact of this R&D on the selling price of canola needs to be traced. Within this framework, we then ask what happens if the suppliers of canola come up with an innovation that either: (a) makes one of the final product demand schedules less elastic; or (b) creates an entirely new product (i.e., adds a new player to the game). The analysis should also be able to answer the question of whether it is best for producers to sell the product themselves or license it.

The analysis will consider at least two situations. In the first, the number of processing firms will be kept fixed, so that the direct impact of R&D investment on the industry can be determined. In the second situation, the number of firms will be endogenized so that the impact of R&D activity on market structure, and subsequently on the prices paid, can be investigated.

The empirical portion of the research will consider a case study of a producer group that is involved in R&D activity of the type outlined above. The research will examine the issues considered by the producer group as they undertook R&D activity in this area and will attempt to obtain some idea of what the producer group hopes to accomplish with its R&D. Given the lack of data on R&D activity of this type, a case study represents the only method of being able to empirically study this phenomenon.

The theoretical work will be carried out by the three researchers, as well as by a graduate student that will be employed under this project. The graduate student will be largely responsible for the development of the case study.

The budget will be used to fund the graduate student and to provide travel funds for the researchers and graduate student to meet at a common location where they can work on the theoretical model.

References


Progress to March 31, 2007:

Funding for this project has been provided primarily from
Lampros has a draft of several chapters in his Ph.D. Dissertation. He has good progress and should be complete by the end of 2007.

2.2.10 Regional and Individual Human Capital Effects on Innovation

**Research Area:** Cross-Cutting Area 2 and Area 5  
**Location:** University of Manitoba  
**Project Leader(s):** Mark Partridge, University of Saskatchewan  
**Other Project Members and affiliations:** Derek Brewin (University of Manitoba) and Daniel Monchuk (University of Southern Mississippi).  
**Graduate Student:** Vahid Omidvar, University of Manitoba M.Sc. Student  
**Duration:** April 15, 2005-March 31, 2006  
**Amount Budgeted:** $20,000

**Project overview:**

This research proposal is presented as a cross-cutting project of the Canadian Agriculture Innovation Research Network. It includes rural and entrepreneurial elements in an exploration of the location of innovation and its link to human capital. The proposal is to fund a student at the University of Manitoba with participation in the research by Mark Partridge, Daniel Monchuk, and Derek Brewin. The focus of the research will be the link between human capital and innovation. The current plan is to use the survey suggested by the rural team in this network and focus on firm and regional human capital capacities as a driver in innovation among those firms surveyed.

There is a clear body of evidence linking the growth of a regional or national economy to education levels (see Goetz and Hu, 1996; Barro and Sala-i-Martin, 1992; Partridge, 1997; and Carlino and Mills, 1987). Solow's theory was that this education is a type of capital stock that saves labor in the production process or as Lucas suggested in 1990, it effectively raises the labor supply. As endogenous growth models have grown in use and tractability (Romer, 1986 and Lucas, 1988), there is a new view of investments in human capital as part of a continuing cycle of innovation, profitability and obsolescence. A key goal of this research would be to compare the importance of two human capital processes that could sort through both effects. Education rates for a regional labor supply can impact the effective work force, but firm level measures of human capital could capture impacts on the cycle of innovation at the firm level.

This research uses data already being collected as part of the "Innovation Survey" described by Mark Partridge in the Calgary meeting of the Innovation network. In sections 10 through 13, the survey asks questions to measure the level of innovation incorporated by the firm in the last three years. Human capital factors are also collected within the surveys that identify low levels of educated workers as a possible impediment to innovation.

Human capital is a complex and important construct. Berkowitz (2001) wrote:

"[K]nowledge is now the most versatile and the most important of all the factors of production, whether we can measure it or not. Knowledge has now become the real capital of a developed economy. A computer wizard with a bold new program
in mind can walk across a border with no tariff, carrying more capital assets within her head than might be contained in a thousand cargo ships."

As Berkowitz suggests, human capital, or knowledge as used above, is very important but difficult to measure. The foundational work by Schultz (1961) suggests investment in human capital can take the form of anything from direct investment in factors like education and health to the less obvious use of leisure time to improve skills and obtain additional expertise in the field. It is difficult to capture much beyond average education rates in regional data, even though the theory of learning by doing suggests significant impacts from experience. Three possible measures are suggested in this research; the first is a regional education level, likely the percentage of a local population with a college education, the second would be firm level education stocks measured as the average education level of employees or the manager of a firm or the highest education level of any employee; and the third would be the years of experience of the manager or most experienced employee.

These impacts could be compared to the incidence of innovation already captured in the survey to help sort out the contrasting effects of human capital on firm level innovations and regional productivity. The survey offers us a unique opportunity to explore the effectiveness of human capital investments on innovation at the firm level as well as the contribution of regional factors on innovation and productivity.

References:

Progress to March 31, 2007:
Vahid was at the University of Nebraska, Lincoln studying development from Hendrik Van den Berg until the end of 2005. His literature review on development linked to education and human capital investment was completed in December, 2005. The survey, which was used to test the link between human capital and innovation in food processing, was complete sometime in early 2006. Vahid's master's thesis was completed in the fall of 2006. A policy brief has been drafted based on the research.
3.0 RELATED INNOVATION RESEARCH

Section 2 outlines nine projects that are being funded through CAIRN. This description does not capture the related research that has been generated at least in part because of CAIRN’s support and focus on innovation. Many CAIRN members have developed innovation related research proposals and have recruited students to work on these projects while seeking other ways to finance the work through research grants, contracts and student fellowships. Because this research contributes and leverages the work of CAIRN, efforts will be made to report this ongoing research and to facilitate the communication of research results. CAIRN is in the process of developing a database for the ongoing projects and will be developing incentive for these researchers to report their analysis in policy workshops and to publish summaries of their research.

While CAIRN has not compiled a complete list, there is very likely a large number of innovation related projects, which involve CAIRN members. To give an idea of the extent of this related research, at the time of writing the report the Network is aware of four students working on innovation related research at the University Saskatchewan.

1) Viktoriya Galushko, a Ph.D. student with three years of funding from the Western Grains Research Foundation to examine producer/public and private funding mechanisms for crop research in western Canada. Among other things she is interested in the ramifications of the hybridization of canola
2) Michael Gusta, a MSc. Student, has a CWB fellowship to examine the efficacy of producer ownership and CWB control of IP wheat varieties.
3) Dan Holman, an MSc. Student, has a CWB fellowship to examine the applicability of open source research platforms for crop development in Canada.
4) Lampros Lamprinakis, a Ph.D student, is partially funded through project 2.1.8 above, and has other sources of funds to support the bulk of his research.

Given these examples it is very clear that CAIRN is generating a great deal of research in innovation that is far beyond those projects and resources provided directly from the CAIRN funds.

3.1 Proposal Development

Many CAIRN network members have been active in proposal development. The keen interest in innovation has created an opportunity to apply for funds to complement the work of CAIRN. Early in 2005, CAIRN undertook a major proposal development project to apply for a GELs related network for Genome Canada. While this endeavor was ultimately unsuccessful, we did make it to the final round of competition.

Given the very active research program of individual network members many have applied for SSHRC grants and other additional research grants.
### 3.2 Conferences and Workshops

#### 3.2.1 CEA 40th Annual Meetings - Montreal

Friday, May 26 - Sunday, May 28, 2006 Concordia University, Montréal (Québec)

Thu 14:00 - 15:30

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3.2.2 CAIRN Workshop March 23-24, Vancouver B.C.
The meeting was attended by 25 individuals including, CAIRN members, CAIRN students, AAFC official and other Graduate students. The first afternoon was a presentation of the research results. The next morning was discussion of AAFC and general innovation issues.

Paper Presented:

*IPR and Public Incentives to Share Research*
  Dan Holman – University of Saskatchewan

*Plant breeders Rights, Hybrids and Research Incentives*
  Viktoryiya Galushko - University of Saskatchewan

*Potato Cultivar Development, Plant Breeders’ Rights, Potato Yield and Quality*
  Richard Carew – AAFC Summer

*A Survey of Breeder Perceptions of IPRs and FTO*
  Emmanouil Oikonomou - University of Saskatchewan

*Explaining Product Innovation in Food Processing*
  Derek Brewin University of Manitoba

*An Economic Analysis of Gene Marker Assisted Seedstock Selection in Beef Cattle*
  Douglas Akhimienmhonan -University of Saskatchewan

*Functional food Regulation and Innovation*
  Chrysoula Paravolidaki - University of Saskatchewan

*Have Biofuels Created a New Paradigm for Ag Innovation?*
  Richard Gray – University of Saskatchewan

3.3 AAFC Presentations

3.3.1 Economic Aspects of Research Spillovers, IPRs and the Anti Commons
Brian Wright and Richard Gray- October 3, 2006 - a one day visit including a webcast technical seminar, a policy seminar and several face to face meetings with senior AAFC personnel in Ottawa.

3.3.2 What’s up with Innovation
Richard Gray, December 10, 2006 – a presentation to the Joint APRN meetings with AAFC, St. Claire, Quebec
3.3.3 Traceability and Process Verification in the Beef Sector
Jill Hobbs October 13, 2006 Ottawa. Co author: Kim Sanderson (Study funded by CANFAX research services of the Canadian Cattlemen’s Association)

3.4 Policy Briefs
3.4.1 Innovation And Bioproduct Development
David Sparling, Professor – University of Guelph
Pamela Laughland, M.Sc. Student - University of Guelph

3.4.2 An Economic Analysis Of Gene Marker Assisted Seedstock Selection In Beef Cattle
Douglas Akhimienmnhonan, Ph.D. Candidate, University Of Saskatchewan
James Vercammen, Professor, University Of British Columbia

3.4.3 Innovation Rates in Canadian Food Processing: The role of Human Capital
Vahid Omidvar, PhD Student, University of Nebraska
Derek Brewin, Assistant Professor, University of Manitoba

3.4.4 IP Protection In Canadian Agriculture: A Shift To “The Tragedy Of Anticommons”? 
Viktoriya Galushko, Ph.D. Candidate, University of Saskatchewan
Emmanouil Oikonomou, M.Sc. Student, University of Saskatchewan

3.4.5 Is Wheat Variety Development In Canada Open Source?
Dan Holman, M.Sc. Student, University of Saskatchewan
Viktoriya Galushko, Ph.D. Candidate, University of Saskatchewan

3.4.6 Producer-Funded R&D By Western-Canadian Producer Associations
Zoe Campbell, M.Sc. Student, University Of British Columbia
Rozita Jalili, M.Sc. Student, University Of British Columbia
James Vercammen, Professor, University Of British Columbia

3.4.7 The Rate Of Return To Agricultural Research In Canada
Richard Gray. Professor, University of Saskatchewan
Stavroula Malla- Associate professor, University of Lethbridge

3.4.8 R&D Subsidies With Uncertainty, Spillovers And Externalities
James Vercammen, Professor, University Of British Columbia

3.4.9 R&D Versus Commodity Promotion: Budget Allocation Decisions By Agricultural Producer Associations
Zoe Campbell, M.Sc. Student, University Of British Columbia
Rozita Jalili, M.Sc. Student, University Of British Columbia
James Vercammen, Professor, University Of British Columbia
3.4.10 Reducing Trans Fats Consumption In Canada: Voluntary, Mandatory Labelling System Or Trans Fats Ban?
Richard Gray. Professor, University of Saskatchewan
Stavroula Malla- Associate professor, University of Lethbridge

3.4.11 Research Spillovers – What They Are And Why They Matter For Policy
Richard Gray. Professor, University of Saskatchewan
Stavroula Malla- Associate professor, University of Lethbridge

3.4.12 Toll Goods and Agricultural Policy
Murray Fulton, Professor, University of Saskatchewan
Richard Gray, Professor, University of Saskatchewan
4.0 2006/07 EXPENDITURE SUMMARY

The total network expenditures for the 2005/06 fiscal year was $215,000 as reported below.

<table>
<thead>
<tr>
<th>Receipts</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Balance as of March 31, 2005</td>
<td>$(81,291.35)</td>
</tr>
<tr>
<td>Government of Canada</td>
<td>81,291.35</td>
</tr>
<tr>
<td>Total funds available</td>
<td>$ -</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Expenditures</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Salaries</td>
<td>$ 129,406.73</td>
</tr>
<tr>
<td>Management Fee</td>
<td>20,000.00</td>
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<tr>
<td>Services</td>
<td></td>
</tr>
<tr>
<td>Survey work, website design &amp; result tabulation</td>
<td>5,550.00</td>
</tr>
<tr>
<td>Office services</td>
<td>5,000.00</td>
</tr>
<tr>
<td>IT services</td>
<td>150.00</td>
</tr>
<tr>
<td>Other services</td>
<td>10,50</td>
</tr>
<tr>
<td></td>
<td>10,710.50</td>
</tr>
<tr>
<td>Materials, supplies &amp; other expenditures</td>
<td></td>
</tr>
<tr>
<td>Supplies</td>
<td>$ 1,715.77</td>
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<tr>
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</tr>
<tr>
<td>Telephone &amp; fax</td>
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</tr>
<tr>
<td>Courier, delivery &amp; freight</td>
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</tr>
<tr>
<td>Hospitality &amp; working lunches</td>
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<tr>
<td>Registration fees (conferences &amp; workshops)</td>
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<tr>
<td>Journal subscriptions</td>
<td>467.74</td>
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<tr>
<td>Equipment Maintenance &amp; operating costs</td>
<td>49.50</td>
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<tr>
<td>Workshop facility rental</td>
<td>1,454.73</td>
</tr>
<tr>
<td></td>
<td>9,552.88</td>
</tr>
<tr>
<td>Travel</td>
<td>31,887.83</td>
</tr>
<tr>
<td>Overhead @ 10% expenses</td>
<td></td>
</tr>
<tr>
<td></td>
<td>19,549.79</td>
</tr>
<tr>
<td></td>
<td>216,047.73</td>
</tr>
<tr>
<td>Balance as of March 31, 2006</td>
<td>$ (215,047.73)</td>
</tr>
</tbody>
</table>
5.0 PROPOSED WORKPLAN FOR 2007/08

The project proposals outlined below will form the basis of the work plan for 2006/2007. Additional activities including commissioned policy briefs may be included as the year progresses.

5.1 Proposed CAIRN Funded Projects for 2007/2008

CAIRN is proposing to undertake research projects in 2007/08. A brief description of the project proposals follows.

**Area 1:** International competitiveness and innovation  
*Jim Gaisford* (area leader), Bill Kerr, Wilf Keller, Hartley Furtan, and Ryan Cardwell

**Area 2:** Regional incidence of innovation  
*Mark Partridge*, James Nolan, Richard Gray, Rose Olfert, and Derek Brewin

**Area 3:** The knowledge economy and innovation  
*Kurt Klein*, Larry Stewart, John Cranfield, Richard Carew, and Stravoula Malla

**Area 4:** The structure of the agri-food sector and innovation  
*Jim Vercaumen*, Grant Isaac, Jill Hobbs, and Murray Fulton

**Area 5:** Entrepreneurship and innovation  
*David Sparling*, Mark Partridge, Bill Kerr, and Peter Phillips

5.1.1 Innovation Activity in Food Firms

**Research Area:** International competitiveness and innovation  
**Location:** Saskatoon  
**Project Leader(s):** W. H. Furtan  
**Collaborators:** K. Karantininis, University of Copenhagen, and J. Sauer, Imperial College of London  
**Duration:** April 1, 2007-Dec 31, 2007  
**Amount Budgeted:** $20,000  
**Project overview:**

A major source of economic growth is a result of innovation. This is the case because economic competitiveness is linked to the ability of firms to innovate. With much of the prosperity in the economy dependent upon the ability of firms to innovation both industry and government have determined that understanding the process of innovation is an important research question. Organizational models or organizational choice is often what gives firms comparative advantage. Organization theory gives pre-eminence to the firm rather than the industry and highlights the different types of organization. What is not known is how these choices affect the process of innovation. In this research we will examine the role of innovation within the organization of the firm.

Institutions are also important in understanding the process of innovation. The term ‘institutions’ carries at least two meanings in economics. First, institutions provide direction to research and development (R&D) and are expressed in the form of such agencies as national research institutions (an example is the research division of Agriculture and Agri-Food Canada). The analysis of R&D in such institutions focuses on the economic returns to investment in innovation activities. This framework usually treats innovation as a black box. Second, institutions also refer to the ‘rules of the game’ as described by institutional theorists (North 1996). In this case emphasis is placed on
institutions such as property rights and the ability of firms to patent the new innovations. This creates the incentive for investment in research and development. Most of the research on innovation in the agriculture and food sector places greater emphasis on institutions than on the organization of firms.

The study of innovation from an organizational viewpoint has its roots in the work of Schumpeter (1942). There are two main conjectures that come out of this work. First, larger firms are central to innovation. Large firms have the capital base to be capable of conducting the research and bringing the new products or processes to the market. Second, how firms are organized is the key to understanding the innovation process (Coriat and Weinstein 2002). Innovation is a process that is linked within the firm or between firms and makes the type of organization a critical variable. In this research we focus on how the firms are organized in terms of vertical integration, relationship to foreign investment, ownership and sector specific variables.

The agricultural economics profession has been a leader in examining the returns to investment in research. This literature is large and a number of good summaries exist such as Alston, Norton, and Pardy (1995). Agricultural economists have also examined the impact of patent legislation on research investment and innovation (Gray and Malla 2005). It is more difficult to empirically test the patent models because of the scarcity of data. Our research is a parallel piece to the institutional based papers because it focuses on the organization of the firm as the critical factor to innovation. To date this has largely been absent from the agricultural economics literature.

The purpose of this research is to build models to test conjectures based on organizational type using a unique set of data collected on the Danish food industry. The Danish food sector has been a world leader in organization and innovation. There are numerous cooperatives and private firms that are vertically and horizontally integrated. This diversity in the type of organization makes the Danish food sector an ideal lab to examine the relationship between the organization of firms and the process of innovation.

**Research Plan:**
This research project will be carried out from May 2007 to December 2007. It will be a collaborative effort between the three individuals at their respective universities. The research will consist of a detailed theoretical model of how organizational type of firm affects innovation. The models will then be tested using data collected on the Danish food sector. A research paper will be available (and submitted for publication) by or before December 2007.

**Budget:**
The budget for this project is $20,000. Major expenses include travel for the authors, research assistance in the form of students, and some data expenses.

**References:**

5.1.3 IPRs and (International) Spillovers and Novel/Functional Food in Canada

Research Area: Area 3: Entrepreneurship and Innovation
Location: University of Saskatchewan/University of Lethbridge
Project Leader(s): Stavroula Malla
Graduate Student/ Research Associate: TBA
Duration: April 1, 2007- March 31, 2008
Amount Budgeted: $20,000

Project overview:
Agricultural research is an important driver of economic growth. Post war growth in agriculture has exceeded the growth in other sectors (Jorgenson and Gollop, 1992). Alston et al., (1998) estimate that the average reported rate of return for agricultural research and development worldwide is 73 per cent per year. Agricultural research has been important in Canada: advances in technology have allowed the Canadian agricultural sector to remain competitive in the global market place. One example of a research success in Canada is canola, which developed from a small crop in 1960 to the second largest crop in Canada at the current time. Canola is now an important source of income for many producers and is the basis for a dynamic food processing industry.

Governments have traditionally funded most of the agricultural research (Alston et al., 1995). Recently, the private sector has been attracted by the creation of intellectual property rights (IPRs) and has significantly increased investment. As a result of these property rights many of the biotechnology processes involved in genetic research are now private goods (Fulton, 1997). Agricultural producers are now required to sign agreements to use particular technologies. The public sector has further stimulated the growth in private investment by providing matching research funds. Advances in biotechnology, genomics, medicine, nutrition, and other sciences have also enhanced the potential to develop healthier foods. It is now even easier to genetically modify crops and animals so that the derived food products are healthier and contain more (fewer) nutrients that are currently deficient (in excess) in diets (e.g., Mackey 2002). In addition to genetic transgenic modification, conventional crop breeding and advances in food processing have the potential to create healthier foods, in other words, novel and functional foods. The combined effect has been an increase in research investment by the private sector and very different rules for the use of new technologies.

A number of studies have shown that IPRs and research spillovers have important implications on the research intensity, industry structure, and the distribution of the research benefits. Specifically, research spillovers are a very important determinant of economic productivity and patenting (e.g., Griliches 1992, Adams 1999). Evenson and Kislev (1976) introduce the notion of basic research spillovers and showed that the outputs of basic research (i.e., scientific knowledge) can improve the productivity of applied research. Spillovers also have important implications for behavior/performance.

1 In the definition of “novel foods” the Government of Canada includes substances that have no history for use as a safe food, food products manufactured with new processes and foods that have been genetically modified. (http://www.hc-sc.gc.ca/food-aliment/mh-dm/ofb-bba/nfi-ani/e_definition_of_novel_food.html). Functional food term stands for food items that have health benefits beyond nutrition (Health Canada 1998). We define a “novel functional food” as food that is both novel and functional.
(e.g., Adams 2000) and market structure/industrial organization of the firm (e.g., Spence 1984). Finally, property rights have also affected the rules for the use of new technologies, the pricing of genetics, the distribution of the gains from research and the incentives for private research (e.g., Fulton and Keyowski, 1999, Malla and Gray, 2003).

The goal of this study is to examine how IPRs and research spillovers have affect the returns to agricultural research, the distribution of benefits and the development of novel/functional foods in Canada. Specifically, the objectives of this study are to model and estimate the distributional impact of changing IPRs and funding sources of agriculture research; and to model and estimating the international spillovers in agricultural research. The study will provide several insights on how globalization, biotechnology, research spillovers and changes to IPRs have affected the structure and incidence of agricultural research, and the development of novel/functional foods in Canada. If Canada is going to realize its economic potential in the global market-place, it must create a policy environment in which the agricultural research sector remains vibrant. The distribution of research benefits also is important, as it will affect social well being in Canada.

A dynamic analytical framework will be developed to address the objectives of this paper. This includes an examination of the incentives created, the distribution of benefits created from the research and from the spillovers, and the efficiency losses. Empirical evidence from the Canadian canola research industry and/or prospective crop innovations that will improve human nutrition in Canada will be examined. Specifically, the empirical methodology (econometric analysis) will combine a number of data sources to create a firm-by-firm panel data set for the costs and returns for research in Canada. The data set will be analyzed in a number of ways to address the issues outlined above. The results of the econometric analysis will quantitatively estimates the magnitude of the spillovers, distribution of research benefits, the rent dissipation, efficiency losses, and so on. This research project will also examine the implications of the results for the formulation of research policy, and how alternative management of public intellectual property rights could enhance overall research productivity and economic growth.

References
5.1.4 Long-Term Contracting Decisions by Farmers in Emerging Biofuel and Carbon Markets

Research Area: The structure of the agri-food sector and innovation  
Location: University of British Columbia  
Team Members: James Vercammen & Murray Fulton  
Timeline: April 1 2007 to March 31, 2008  
Requested Funds: $20,000  
Disposition of Funds: Funding for one M.Sc. graduate student, including travel to present thesis research.

Project Description: During the 2006/2007 fiscal year, Area 4 provided $2500 to Rozita Jalili to continue analyzing the dataset of producer association levies, which was originally collected by UBC MSc student Zoe Campbell. Rozita is currently completing the course-work component of her Agricultural Economics MSc. She will begin working on her thesis full-time starting in May, 2007, and she hopes to have her thesis complete by December, 2007. Professor Jim Vercammen will serve as her principle supervisor.

Area 4 is proposing to provide Rozita with $10,000 of CAIRN funding for the 2007/2008 fiscal year. The funding will allow Rozita to complete her thesis in the area described below. Any funding in excess of the $10,000 that Area 4 receives will be allocated to MSc or PhD students working on CAIRN projects at the University of Saskatchewan under Murray Fulton.

Farm production contracts are generally short-term (e.g., one year). Short-term contracts work well for farmers because flexibility is a valuable option due to rapidly changing prices, disease constraints and land use commitments. As supply chains develop, and the needs of downstream firms become more specific, contract duration will undoubtedly


lengthen. Indeed, long term supply contracts will in many cases be necessary for downstream firms to make specific investments in agricultural regions.

Farmers have increasing opportunities to supplement their income by signing biofuel and carbon sequestration contracts. These contracts are relatively long-term in duration (e.g., 5 years for a biofuel straw contract, and 15 years for a carbon contract). The value of the contract has comparatively low value, so adoption decisions are likely to be price sensitive. A major objective of this research is to examine the sensitivity of farmer contracting decisions to implicit prices, which are associated with the contracting decision.

Suppose a farmer who produces a combination of wheat, barley and canola signs a 5-year contract to supply wheat or barley straw to a local biofuel firm. For a given set of parameters (e.g., production costs, crop rotation constraints, expected yield and prices), is it possible to derive a contracted-acreage supply schedule? It is expected that the farmer’s marginal supply price is an increasing function of contracted acreage due to a rising option value associated with the contract. If the contract limits canola production in some feasible price scenarios, then the value of the lost option must be reflected within the supply price. Consequently, a comparatively large contract commitment, which implies a comparatively large value for the loss in acreage allocation flexibility, will result in a comparatively large supply price.

Rozita is currently constructing a stochastic dynamic programming model of acreage allocation by a farmer who faces fluctuating commodity prices. The model will be solved first without and then with the contract, which specifies a minimum acreage commitment. The minimum acceptable contract price will make the dynamic programming value functions (with and without the contract) equal. Rozita will attempt to calibrate her model using data from real-world probability distributions. Rozita will ultimately attempt to estimate the price premium required by farmers to enter into long-term contracts that impose restrictions on future acreage allocation decisions.

5.1.5 Factors Affecting Innovation in the Canadian Bioproducts Industry 2005 vs 2003

Research Area: Area 5 Entrepreneurship and Innovation
Location: Guelph
Project Leader(s): David Sparling (Institute of Agri-Food Policy Innovation) and John Cranfield
Graduate Student: Pamela Laughland
Duration: April 1, 2007- March 31, 2008
Amount Budgeted: $15,000

Project overview: The project will extend an ongoing research partnership by the project researchers with Statistics Canada and AAFC. The relationship includes an ongoing analysis of the first Bioproducts Development Survey 2003. In this project the analysis will be extended to include analysis of the second bioproducts development survey completed in 2006 based on 2005 data. Extending the analysis to 2005 will provide an opportunity to follow the evolution of the industry during these critical early years of development. It will also allow a comparison of the factors affecting innovation in the 2003 study with those affecting innovation in 2005. The analysis will begin with
an analysis of the summary tables and then will be extended to regression analyses of the factors affecting innovation and financing success of all bioproducts firms, and specifically for those firms using agricultural biomass as the primary input. MSc student Pamela Laughland has been involved in all of the previous bioproduct analyses and will continue this research through her relationship with Statistics Canada. An additional research assistant may be added in the summer to undertake case study analyses of Canadian bioproduct firms. This will allow the researchers to explore the findings in more depth.

**Budget:** Funding for one research assistant/M.Sc. student as well as travel and living expenses to spend part of the year with AAFC and Statistics Canada in Ottawa. Travel expenses to disseminate the results. The project may also involve an additional research assistant to do some case study analysis into the use, or lack of participation, in of federal and provincial programs.

5.2 Food & Fuel: The Implications for Agricultural Research Conference Program
<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>7:00 - 10:00 pm</td>
<td>Evening Mixer</td>
<td>Atrium, College of Agriculture and Bioresources</td>
</tr>
<tr>
<td>7:00 am - 8:30 am</td>
<td>Registration</td>
<td>Marquis Hall, U of S Campus</td>
</tr>
<tr>
<td>7:30 am - 8:15 am</td>
<td>Breakfast</td>
<td>Marquis Hall, U of S Campus</td>
</tr>
<tr>
<td>8:15 am - 8:25 am</td>
<td>Welcome &amp; Opening Remarks</td>
<td>Marquis Hall, U of S Campus</td>
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</table>

Proceed over to Convocation Hall for Speaker Presentations

**SESSION 1: GLOBAL OVERVIEW OF AGRICULTURE**

<table>
<thead>
<tr>
<th>Time</th>
<th>Topic</th>
<th>Speaker(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:30 – 9:00 am</td>
<td>Global Biofuel Demand</td>
<td>Amani El Obeid, CARD, Iowa State</td>
</tr>
<tr>
<td>9:00 – 9:30 am</td>
<td>Ag Science Funding</td>
<td>Phil Pardey, University of Minnesota</td>
</tr>
<tr>
<td>9:30 – 10:00 am</td>
<td>Discussion</td>
<td>Moderator TBA</td>
</tr>
<tr>
<td>10:00 – 10:30 am</td>
<td>Networking Break</td>
<td>Green Room, Rm 280 College Bldg</td>
</tr>
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</table>

**SESSION 2: DEMAND DRIVERS FOR AG SCIENCE**

<table>
<thead>
<tr>
<th>Time</th>
<th>Topic</th>
<th>Speaker(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:30-11:00 am</td>
<td>Private Sector Ag Science Focus</td>
<td>Lorne Hepworth, CropLife Canada</td>
</tr>
<tr>
<td>11:00-11:30 am</td>
<td>Public Sector Ag Science Focus</td>
<td>Brian Freeze, AAFC</td>
</tr>
<tr>
<td>11:30-12 noon</td>
<td>Discussion</td>
<td>Moderator TBA</td>
</tr>
<tr>
<td>12:00-1:30 pm</td>
<td>Lunch</td>
<td>Marquis Hall, U of S Campus</td>
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**SESSION 3: U.S. AND CANADIAN AG PRODUCTIVITY & RETURNS TO RESEARCH**

<table>
<thead>
<tr>
<th>Time</th>
<th>Topic</th>
<th>Speaker(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:30-1:50 pm</td>
<td>U.S. Agricultural Productivity &amp; Returns to Research</td>
<td>Julian Alston, UC Davis</td>
</tr>
<tr>
<td>1:50-2:10 pm</td>
<td>Canadian Agricultural Productivity</td>
<td>Terry Veeman, U of Alberta</td>
</tr>
<tr>
<td>2:10-2:30 pm</td>
<td>Canadian Returns to Research</td>
<td>Jim Unterschultz, U of Alberta</td>
</tr>
<tr>
<td>2:30-3:00 pm</td>
<td>Discussion</td>
<td>Moderator TBA</td>
</tr>
<tr>
<td>3:00-3:30 pm</td>
<td>Networking Break</td>
<td>Green Room, Rm 280 College Bldg</td>
</tr>
</tbody>
</table>

**SESSION 4A: CHECK-OFF FUNDING AND OTHER FINANCING**

<table>
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<tr>
<th>Time</th>
<th>Topic</th>
<th>Speaker(s)</th>
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</thead>
<tbody>
<tr>
<td>3:30-3:50 pm</td>
<td>U.S. Producer Check-offs</td>
<td>Jenni James, U of Minnesota</td>
</tr>
<tr>
<td>3:50-4:10 pm</td>
<td>Canadian Producer Check-offs</td>
<td>James Vercaamen, UBC</td>
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<tr>
<td>4:10-4:30 pm</td>
<td>Producer Funded Research</td>
<td>Speaker TBA</td>
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<tr>
<td>4:30-5:00 pm</td>
<td>Discussion</td>
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**EVENING GUEST SPEAKER**

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<th>Location</th>
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<tbody>
<tr>
<td>6:00-7:00 pm</td>
<td>Cocktails</td>
<td>Centennial Hall C, TCU Place</td>
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<tr>
<td>7:00-8:00 pm</td>
<td>Banquet</td>
<td>Centennial Hall C, TCU Place</td>
</tr>
<tr>
<td>7:30-8:00 pm</td>
<td>Guest Speaker</td>
<td>Jim Halford, Founder of Conserva Pak</td>
</tr>
</tbody>
</table>
Financial support for this conference has been provided by the Saskatchewan Council for Community Development through the Advancing Canadian Agriculture and Agri-Food Saskatchewan (ACAAFS) program. Funding for the ACAAFS program is provided by Agriculture and Agri-Food Canada.

---

**Wednesday, June 6**

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Location</th>
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</thead>
<tbody>
<tr>
<td>8:00-8:45 am</td>
<td>Breakfast</td>
<td>Marquis Hall</td>
</tr>
<tr>
<td>9:00-9:30 am</td>
<td>FTO, IPRs and Alternative Structures</td>
<td>Gregg Graff, PIPRA</td>
</tr>
<tr>
<td>9:30-10:00 am</td>
<td>GRDC’s R&amp;D Financing Model</td>
<td>Terry Enright, Board Chairmen, GRDC</td>
</tr>
<tr>
<td>10:00-10:30 am</td>
<td>Discussion</td>
<td>Moderator TBA</td>
</tr>
<tr>
<td>10:30-11:00 am</td>
<td>Networking Break</td>
<td>Green Room, Rm 280 College Bldg</td>
</tr>
</tbody>
</table>

**SESSION 4B: OTHER FINANCING AND RESEARCH ARRANGEMENTS**

**SESSION 5: POTENTIAL POLICY DIRECTIONS – PANEL DISCUSSION**

<table>
<thead>
<tr>
<th>Time</th>
<th>Topic</th>
<th>Presenter</th>
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<tbody>
<tr>
<td>11:00-11:20 am</td>
<td>Private Sector Perspective</td>
<td>Malcolm Devine, Performance Plants Inc.</td>
</tr>
<tr>
<td>11:20-11:40 am</td>
<td>Public Sector Perspective</td>
<td>Wilf Keller, PBI-NRC</td>
</tr>
<tr>
<td>11:40-12 noon</td>
<td>Producer Perspective</td>
<td>Jim Moen, SK Pulse Growers</td>
</tr>
<tr>
<td>12:00-1:00 pm</td>
<td>Panel Discussion During Lunch</td>
<td>Moderator TBA</td>
</tr>
<tr>
<td>1:00-1:15 pm</td>
<td>Closing Remarks</td>
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</tbody>
</table>