CAIRN

Canadian Agricultural Innovation Research Network

Summary Report for November 2004 to March 31, 2005

Network objectives

The objective of the *Canadian Agricultural Innovation Research Network (CAIRN)* 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 CAIRN will increase the understanding, and 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. level, 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 work.

The research network has organized itself around five main policy areas. The areas collectively recognize the multi-faceted nature of the need for a public policy, which supports the innovation process, including the commercialization process. Within each area specific projects will be funded, with at least one project that examines some existing aspect of innovation through empirical study, and one that explores an alternative to existing policy. In this way each area of research will create a multi-disciplinary knowledge base while making a contribution to the future innovation strategy.

Membership

Area 1: International competitiveness and innovation
Jim Gaisford, Bill Kerr, Wilf Keller, and Hartley Furtan,
Area 2: Regional incidence of innovation
Mark Partridge, James Nolan, Richard Gray, and Rose Olfert, Derek Brewin
Area 3: The knowledge economy and innovation
Kurt Klein, Larry Stewart, John Cranfield, and Stravoula Malla, Richard Gray
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.

Note that Dr. Derek Brewin, from the University of Manitoba joined CAIRN as part of Area 2 in December, 2005. Richard Gray joined Area 3 of the project.

CAIRN Meetings

There were three general meetings of CAIRN. The inaugural meeting was a conference call held November 9th and was used for introductory and organizational purposes.

The second meeting was a workshop held in Saskatoon January 21 and 22. At this meeting we began discussion of network objectives and selection process for 2005/06. We had a presentation of the proposals for the 5 areas and the data project This was followed by a Brainstorming session to identify additional topics and crosscutting research interests.

The third meeting was workshop held in Calgary March 18th and 19th. This meeting was attended by members, several graduate students, and Loraine Hope and Brian Freeze from AAFC. David Zilberman, from UC Berkeley opened up the workshop stimulating presentation of "**Future of research on technology in agriculture**" (his presentation slides are available). The next morning Brian Freeze gave an overview of some of the issues in ag policy from the AAFC perspective. This was followed by presentation from each of the research areas, and the crosscutting survey project, outlining current research and future research plans. We also decided that we would organize a workshop dealing with the management of public IPR, for this fall in Ottawa.

Area Research Projects for 2004/2005

The network initiated research in the five areas each with a $5,000 short-term project.

Area 1: International Trade and Innovation

Project Title: Intellectual Property Rights and Agricultural Trade Volumes
Location: University of Calgary
Project Leader: Jim Gaisford
Duration: December 2004-March 31, 2005
Project Description:

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 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. In a recent MA thesis (June 2004), Shevtsova updates the empirical analysis of Maskus and Penubarti and investigates the impact of IPR protection on total trade flows. Using the gravity model on two large samples of countries, she then tests to find which effect tends to dominate for various categories of countries. In addition to verifying many of the results of the earlier literature, Shevtsova is able to show that enhanced intellectual property protection is likely to lead to increased trade for transition economies.

The purpose of this project is to focus on whether there is a statistically significant impact of IPR protection on agricultural trade volumes and, if so, in what direction. The empirical results are expected to be of 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.

Graduate Researchers:
1. Olena Ivus, University of Calgary PhD Student. Responsible for data updates, new econometrics and writing up new results. Will present the results at the Innovation Network conference in March. (Remuneration: approximately $3500 to buy out one half unit TA, plus travel-related expenses to the Innovation Network conference in March).

2. Yevgeniya Shevtsova, EERC MA graduate, National University "Kyiv-Mohyla Academy", Kiev, Ukraine. Responsible for providing thesis data and for adapting key elements of her thesis including the comprehensive theoretical review of Maskus and Punabarti and the empirical results for trade in general. Will assist with data updates and new econometric work. (Remuneration: approximately $750, minimum 500 USD).

3. Graduate Research Assistant, University of Saskatchewan. Responsible for adding to the literature review on the agricultural side, assembling and integrating the parts of the project from Ivus and Shevtsova, and providing a high level of literary competence. (Remuneration: approximately $750)

Area 2: Regional Incidence of Innovation

Project Title: Preliminary Development of Regional Aspects of the Innovation Survey
Location: Saskatoon
Project Leader: Mark Partridge
Project Members and affiliations: Richard Gray, James Nolan, and Rose Olfert (all of University of Saskatchewan)
Duration: December 2004-March 31, 2005
Use of Funds: To fund M.Sc student (Jill McDonald)

Brief Project Description:

The full project will run into 2006 and 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.

In the initial stages of the project through March 31, 2005, a significant amount of work will be needed to help design the survey and to help plan for its implementation. Jill McDonald, an MSc student at U of S, has been recruited to work on this project. At the March ARNI meeting Calgary, we intend on presenting a complete draft survey to the entire group.

Area 3: The knowledge economy and innovation

Project Title: Factors Affecting Innovation and Biotechnology
Project Leaders: John Cranfield (UG) and David Sparling (UG)
Project Location: University of Guelph
Duration: December 2004-March 31, 2005
Use of Funds: Funding for 1 M.Sc. student, Daryl van Moorsel

Brief Project Description:
 The project is the final stage of a project analyzing the 1999 and 2001 Statistics Canada Biotechnology Use and Development surveys. The analysis extends previous analyses of the surveys by focusing on agricultural biotechnology and by performing a longitudinal analysis for firms common to both surveys. The 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 project looks at the relationship between intellectual property and firm level innovation. It also examines the role of granting or acquiring intellectual property from a variety of sources and their relationships with firm innovation.

The project develops an econometric model regressing alternative measures of innovation performance and financing success on various firm and industry factors. The firm level

data used in this analysis originates from the Statistics Canada's Biotechnology Use and Development Surveys (BUDS) for 1999 and 2001. In addition to analyzing the complete datasets for each year we were able to perform a longitudinal analysis for the subset of respondents which were present in both the 1999 and 2001 BUDS. Of the 358 biotechnology firms in 1999 and 375 in 2001, 194 were common to both surveys. We were particularly interested in sub-sector differences since policy may be more effective if applied to sub-sectors, in this case agriculture and food processing, human health, environment. We also examine the performance based on firm strategic focus. The strategic focus of firm is a result of the segregation based on firm competencies and resources. Firms were separated by their strategic focus at different levels of the product and process development chain and are characterized as early, comprehensively or late focused.

Area: 4 Industrial Organization

Project Title: An Economic Analysis of DNA Marker-Assisted Trait Selection for Beef Cattle
Project Leader: Jim Vercammen
Project Members and affiliations: Grant Isaac, Murray Fulton and Jill Hobbs, University of Saskatchewan
Duration: January 1 – March 31, 2005

Use of Funds: Funding for Douglas Akhimienmhonan, who is a MSc student in UBC's Agricultural Economics graduate program. He is currently taking his final set of courses and he is working on a review of the literature for the project described below.

Brief Project Description:
One of the primary challenges in beef livestock breeding is the lack of differentiation of beef products. Companies currently have access to the same tools and animals, and even if unique genetic improvements are created, it is very difficult to prevent other companies from freely using the genetic improvement. With emerging DNA marker technology, beef products can be more easily differentiated and certified, and this differentiation will induce firms in the livestock industry to more aggressively invest in quality-enhancing R&D. Large-scale product differentiation in the beef industry, combined with emerging DNA technologies for beef traceability, will substantially alter the beef supply chain and the distribution of economic rents within this supply chain.

The proposed research has three specific objectives:

1. Industry experts will be interviewed and the literature on DNA marker-assisted trait selection in beef cattle will be reviewed to determine the range of scientific opinion about the potential commercial value of this technology. As part of this review, the science which integrates conventional performance-based selection tools with DNA marker-assisted trait selection will be explained in terms that can be understood by a non-scientist.

2. Specific commercial applications of DNA marker-assisted trait selection in beef cattle such as GeneSTAR Marbling and GeneSTAR Tenderness 2 will be examined. The specific procedures required for implementation of these technologies will be described and the range of estimates of the economic value of these technologies will be presented. Interviews with industry experts, a review of the relevant literature and an examination of the associated patent documents will be used to obtain the required information.

3. An economic model of a representative supply chain for the western Canadian beef industry will be created. The model will consist of seed stock firms, ranchers and feedlots, processors and retailers. The model will allow for product heterogeneity so as to capture the supply chain impacts of quality-enhancing innovations. Two versions of the model will be created, one with and one without vertical coordination mechanisms such as contractual agreements and integration. Estimates of relevant derived supply and demand elasticities will be incorporated into the model such that the resulting simulation results will be illustrative of potential real-world impacts of DNA marker-assisted gene selection technologies. The model will also allow for endogenous changes in industry structure (e.g., the emergence of product branding and contractual arrangements). Of particular interest is the size of the new economic rents which are created from this innovation, how these new rents are distributed and how existing economic rents are redistributed.

Area 5: Entrepreneurship and Innovation

Project Title: Clustering Effects and Firm Strategy
Location: University of Saskatchewan
Project Leader: Peter Phillips
Duration: Jan 1- March 31, 2005

Use of Funds: Funding an MSc student, Jeremy Karwandy

Description: Jeremy Karwandy is examining the effects of clustering on firm strategy and performance. The student has completed his course work and is writing his conceptual framework (due in late Jan).

Effectively his project involves an empirical assessment of how firms access and use the functions of a cluster in improving firm performance (e.g. innovation success). He will construct a set of cross sectional variables from the ISRN database on biotech clusters and firms from across Canada (est 350 entities and min 140 firms). He will then assess firm strategic choices against their position in a cluster and their ability to bring new products, technologies and services to the local, regional, national or global market.

Innovation survey

The network will undertake a major data collection project, which will be part of a database for agricultural innovation in Canada. The data will 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.

A decision was made to concentrate on innovation in the food processing industry. A survey was designed and presented at the March workshop a review of the available data and innovation surveys used elsewhere. CAIRN will fund the survey for the prairie provinces. Working through CAIRN members at Guelph, the same survey will be delivered in Ontario and Quebec.

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 U. of S. 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.

Genome Research Proposal

In addition to the activities outlined above, Drs. Furtan, Gray, Partridge, Phillips, Sparling and Vercammen, developed an extensive proposal for a GELs Genome Canada III project. The project would match the CAIRN and other research funding for total value exceeding $2 million dollars. The selection process should be complete by July 31, 2005.