

**9th International Conference on  
Agricultural Biotechnology: Ten Years After**

organized by the:

**International Consortium on Agricultural Biotechnology Research  
(ICABR)**

and the:

**Catholic University of Leuven**

**CEIS - University of Rome "Tor Vergata"**

**Centre of Sustainable Resource Development, University of California at Berkeley**

**Economic Growth Centre, Yale University**

**Ravello (Italy), July 6-10, 2005**

**“Innovation and Development in Canadian Agricultural  
Biotechnology Firms”**

**Authors:** David Sparling, Daryl van Moorsel and John Cranfield

David Sparling (Corresponding Author)  
Associate Professor,  
Department of Agricultural Economics and Business,  
University of Guelph  
Guelph, Ontario, Canada N1G 2W1  
Phone: 519 824-4120 ext 52775 Fax: 519 767-1510  
Email: [dsparlin@uoguelph.ca](mailto:dsparlin@uoguelph.ca)  
URL: [www.uoguelph.ca/~dsparlin](http://www.uoguelph.ca/~dsparlin)

Daryl Van Moorsel  
MSc. Candidate  
Department of Agricultural Economics & Business  
University of Guelph  
Guelph, Ontario, Canada N1G 2W1  
E-mail: [dvanmoor@uoguelph.ca](mailto:dvanmoor@uoguelph.ca)

John Cranfield, Ph.D.  
Assistant Professor, Department of Agricultural Economics & Business  
University of Guelph  
Guelph, Ontario, Canada N1G 2W1  
Phone: 519 824-4120 ext Fax: 519 767-1510  
E-mail: [jcranfie@uoguelph.ca](mailto:jcranfie@uoguelph.ca)

## **ABSTRACT**

### **Innovation and Development in Canadian Agricultural Biotechnology Firms**

Agricultural biotechnology has revolutionized the production of attractive product traits. The unique nature of the science and the challenges associated with commercializing agricultural biotechnologies have also led to a completely restructuring of the agricultural input industries, particularly for genetics, seeds and chemical. Canada's highly educated population, proximity to the U.S. and relative costs of conducting research and development have created a fertile environment for biotechnology firms. Canada ranks second in the number of biotechnology firms in the world, trailing only the United States.

However, biotechnology in Canada is a relatively young industry and its constant evolution presents challenges for firms through a combination of factors. Increasing market competition, lacklustre performance as investments and a strict regulatory environment have led to a decline in industry funding. However, even though only 20% of biotechnology firms in Canada are breaking even or recording positive profits, the prospects for biotechnology in Canada appear to be improving. Recently the industry has seen increases both in the number of firms and in the number of firms generating biotechnology revenue. The number of firms has grown from 282 in 1997 to 375 in 2001 and 413 presently in 2004. The number of firms declaring biotechnology revenue in 2001 has increased to 252 firms up from 232 in 1999 and 237 in 1997.

The evolution of the agricultural biotechnology sub-sector has occurred against significant challenges. Revenue generation has become essential for all biotechnology firms as external financing in 2002 dropped to 40 percent and 45 percent of funding levels for 2001 and 2000, respectively. Individual biotechnology firms are fighting over a smaller pool of available

funds compared to recent industry history. Agricultural biotechnology firms face a particularly challenging task as investors are more interested in investing in technologies related to human health. In a study of biotechnology IPOs Sparling (2005) found no examples of Canadian biotechnology IPOs where the firm's leading technology was an agricultural biotechnology. Sparling and Vitale (2003) found a similar result in Australia. Firms have had to adjust their product and revenue strategies to address the reality of low interest in financial markets for funding agricultural biotechnologies. This situation has been exacerbated by increasingly stringent government regulations for the agricultural biotechnology sector.

Although a number of studies have examined the Canadian biotechnology sector, few have done an in-depth analysis of the unique characteristics of Canadian agricultural biotechnology firms and their impact on firm innovation and business development. The characteristics of firms in this sector have not been analysed in sufficient depth to reduce the risk associated with the transformation of inventive biotechnology ideas into product and process innovations.

We examine 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. We do so by developing 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 Statistics Canada's Biotechnology Use and Development Surveys (BUDS) for 1999 and 2001. In addition to analysing 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 relative to human health, environment. We further sub-divide the analysis of innovation and firm performance based on firm strategic focus, the application of a firm's competencies and resources to a specific segment of the biotechnology development and commercialization process. Firms were characterized by their strategic focus as early, comprehensively or late focused.

The paper examines firm characteristics and sub-sector and business and innovation performance. It examines the unique characteristics and challenges of agricultural biotechnology firms and the implication for managers and policy makers. The study revealed very strong sub-sector differences and significant impacts of relationships, size and strategic focus. The results will assist in directing the focus of biotechnology managers and policymakers in developing and targeting growth-enabling strategies at the firm, industry and national levels.

Sparling, D. (2005) "Canadian Biotechnology IPOs 1998-2003 – Assessing Financing and Business Strategies", University of Guelph working paper.

Sparling, D. and M. Vitale (2003) "Australian Biotechnology – Do Perceptions and Reality Meet?" Report to the Australian Stock Exchange on biotechnology IPOs 1998-2002.