
Saskatoon's Success as a Global Agricultural Biotechnology Center

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Today, Saskatoon, Saskatchewan, is known as a global agricultural biotechnology center. It has reached a level of business that is not matched anywhere else in North America.

I will briefly discuss agricultural biotechnology in general — issues and benefits, then some Canadian initiatives in this area, and concluding with the Saskatchewan initiative, Ag-West Biotech.

THE AGRICULTURE AND AGRI-FOOD SECTOR

Agricultural biotechnology applications have been developed and some are entering the marketplace, even though agriculture has lagged behind the medical sector. Some key areas such as regulations and public awareness were different for agriculture. Products introduced in Canada include: herbicide-tolerant flax from the University of Saskatchewan; edible oil flax; herbicide-tolerant canola varieties from several companies; hybrid canola from AgrEvo; insect-tolerant potatoes (Nature Mark); Flavr-Savr™ tomatoes; and chymazin, an enzyme used for cheese-making.

Agricultural biotechnology offers the opportunity to increase crop production, lower farming costs, improve food quality and safety, and enhance environmental quality. Concerns have been expressed that the negative effects of biotechnology may outweigh the potential benefits. Like any new technology, there are social, economic, and political factors that influence the development, consumer acceptance, and producer adoption of agricultural biotechnology.

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Biotechnology and change are not new to agriculture. In the history of agriculture there have been constant changes produced by new technologies. In the era of mechanization the steam engine, the tractor, and mechanized equipment were introduced. Then in the chemical era pesticides and fertilizers were introduced. Hybrid varieties of crops became standard in some areas, as did feed additives for livestock. These technologies and others are still being introduced from what we today call conventional science, and they will influence production for the foreseeable future in many parts of the world. All of these changes that were often viewed as revolutionary at the time of their introduction had fundamental effects on agriculture, as well as significant social and economic impacts. Biotechnology is the beginning of the next revolution in agriculture.

The adoption of biotechnology in agriculture will be influenced by

- the relative benefits and costs of the technology compared to alternative inputs,
- producers seeking ways to increase profits by reducing production costs or satisfying changes in consumer demand,
- an expanded set of public interests, including food quality and safety, environmental quality, concerns about the impact of agricultural biotechnology on rural communities, and confidence in the regulatory system, and
- government programs and policies and their effect on the adoption of agricultural biotechnology.

Economic assessments of agricultural biotechnology reveal the type and direction of expected change and which groups (farmers, industry, consumers, regions, and countries) may be affected. A review of the studies on the economic impact of agricultural biotechnology provided two major conclusions:

- The economic impact of agricultural biotechnology is likely to be incremental rather than dramatic, and
- a significant amount of the economic benefit will be broadly distributed to consumers in increased supplies, stable prices, and higher-valued products.

Like any new technology, agricultural biotechnology has benefits and raises questions. These need to be acknowledged and addressed to make this paper complete. The issues surrounding agricultural biotechnology in Canada are:

- **Regulatory:** Ensuring that we have a scientifically sound regulatory process that meets our needs and is compatible with our major trading partners.
- **Public awareness:** At present, this is an area that is receiving a lot of attention as products enter the market.

- Finance: This is always an issue with emerging technologies — financial support for research and development and for new business start-ups.
- Research support: Ensuring the infrastructure exists to support new product development.
- Intellectual property: Two areas of concern are ownership and globally compatible patent systems.
- Human resource: As the industry expands, there is an increasing pressure on the educational system to meet the demand.

Some of the benefits surrounding agricultural biotechnology in Canada are as follows:

- Improved production: Better weed and pest control, improved fertility, and improved stress tolerance.
- Healthier animals: Improved disease control (vaccines), improved feed nutrition, diagnostics, and genetics.
- Improved quality: Quality is already good, but we will be able to tailor quality more to customer needs in the future.
- Managed exports: Guarantee quality of our exports by working with the customers to determine their needs.
- Viable agricultural industries: By the 21st century, biotechnology will be a key component of all agriculture globally. To be viable, our industry needs to be using the products of biotechnology.

In summarizing this section on agricultural biotechnology, there is one conclusion: as a tool for agricultural science, biotechnology is here and will be used globally in this industry. Countries that adopt the technology early will help ensure that their agricultural industry remains viable. Adoption of the technology includes the creation of a level of understanding by consumers within the country.

INITIATIVES ON AGRICULTURAL BIOTECHNOLOGY IN CANADA

In Canada there are a variety of initiatives that focus on agricultural biotechnology regulations, research, public awareness, and industry support. I will not provide details in this section but will provide a concept of the breadth of activity. Organizations involved with awareness of biotechnology include

- Industrial Biotechnology Association of Canada (IBAC)

130 Albert Street, Suite 420

Ottawa, Ontario, Canada, K1P 5G4

Phone: 613-233-5586 Fax: 613-233-7541

Contact: Joyce Groot, President

IBAC is an industry organization that deals with issues, regulations, and other concerns on behalf of industry.

- Canadian Institute of Biotechnology (CIB)
130 Albert Street, Suite 420
Ottawa, Ontario, Canada, K1P 5G4
Phone: 613-563-8849 Fax: 613-563-8850
Contact: Rick Walters, Executive Director

CIB is an institutional organization that provides its members with project support and awareness of issues on all aspects of biotechnology.

- Food Biotechnology Communications Network (FBCN)
1 Stone Road West
Guelph, Ontario, Canada, N1G 4Y2
Phone: 519-826-3440 Fax: 519-826-3441
Contact: Diane Wetherall, Executive Director

FBCN deals specifically with public awareness of biotechnology and food.

- Global Agricultural Biotechnology Association (GABA)
201-407 Downey Road
Saskatoon, Saskatchewan, Canada, S7N 4L8
Phone: 306-668-6639 Fax: 306-668-5564
Contact: Bob Morgan, Chair

GABA is an international organization that uses the Internet to communicate about agricultural biotechnology and international issues.

- Toronto Biotechnology Initiative (TBI)
51 Hillside Drive
Aurora, Ontario, Canada, L4G 6E1
Phone: 905-727-3492 Fax: 905-713-0768
Contact: John Clement, President

TBI is a public forum organization dealing with a broad base of awareness issues.

- Bio-Atlantech Inc.
P.O. Box 6000
Fredericton, New Brunswick, Canada, E3B 5H1
Phone: 506-453-2366 Fax: 506-453-7170
Contact: Bernier Roger

Bio-Atlantech is just getting established and will deal with agriculture, forestry, and aquaculture.

- Ontario Agri-Food Technologies Inc. (OAFI)

1 Stone Road West

Guelph, Ontario, Canada, N1G 4Y2

Phone: 519-826-4195

Fax: 519-826-3389

Contact: Murray McLaughlin

OAFI is a new organization designed to focus on the biotechnology aspect of the agri-food sector, with a primary interest in research and commercialization.

- British Columbia Biotechnology Association (BCBA)

1122 Mainland Street, Suite 450

Vancouver, British Columbia, Canada, V6B 5L1

Phone: 604-689-5602

Fax: 604-689-4198

Contact: Theresa McCurrey

BCBA is an industry organization for British Columbia that focuses on commercial development and awareness of all aspects of biotechnology.

- Ag-West Biotech Inc. (AWB)

111 Research Drive, Suite 230

Saskatoon, Saskatchewan, Canada, S7N 3R2

Phone: 306-975-1939 Fax: 306-975-1966

Contact: Peter McCann, President

AWB's mandate is to facilitate commercial development of agricultural biotechnology in Saskatchewan.

Besides these organizations, Canada has a strong research infrastructure that is primarily made up of Agriculture and Agri-Food Canada (AAFC), the National Research Council (NRC), and several universities across the country. AAFC has 18 centers of excellence located in various parts of Canada. The NRC primarily has the Plant Biotechnology Institute (PBI) in Saskatchewan that focuses on agriculture. Two of the key agricultural universities are the University of Guelph in Ontario and the University of Saskatchewan.

SASKATCHEWAN'S AGRICULTURAL BIOTECHNOLOGY INITIATIVE

The Saskatchewan agricultural biotechnology community is the best established in Canada and is an example of how working together can create dividends. The community has a very strong research base made up of independent institutions. That community, combined with Innovation Place, a research park, created the catalyst for Saskatoon to become a leading center in agricultural biotechnology. The next few sections will look at the components of Saskatoon that went into creating this global center.

AG-WEST BIOTECH, INC.

In 1989 Ag-West Biotech, Inc. (AWB), was established with a mandate to facilitate commercialization of agricultural biotechnology for the benefit of Saskatchewan. The objectives of AWB are

- to identify and enhance the development of emerging technology for the advantage of Saskatchewan,
- to facilitate a high level of commercialization of technology from local and foreign sources,
- to help establish commercial partnerships, particularly between public and private sectors
- to establish an international leadership position for Saskatchewan,
- to promote positive awareness of agricultural biotechnology in the public forum, and,
- to facilitate the development of support systems for establishment of agricultural biotechnology

Over the last eight years, the agricultural biotechnology industry has grown from a base of five companies to more than 30 today. The companies are a mix of multinational and local start-up businesses, many of which are located at Innovation Place. AWB is a facilitator that has created the interface between industry, government, and the research and academic communities. The Saskatchewan community has come together to create the leading agricultural biotechnology community in Canada and has become a world leader in the field. AWB was the catalyst that brought all the players together. Having research, business, and government all working together has made Saskatchewan recognized globally.

The Saskatchewan community is made up of more than 700 people involved in public sector research and more than 400 in the private sector. The private sector is the one that is growing. Annually, well over \$100 million is spent on research related to agriculture and biotechnology in Saskatoon. Three years ago the city of Saskatoon established a Regional Economic Development Authority. Its two main priorities for new business were agricultural biotechnology and value-added food production. In Canada, Saskatoon has been the only city with agricultural biotechnology as a priority. Others are starting to look at it.

THE FARM SCENE IN SASKATCHEWAN

Agriculture is a primary business in Saskatchewan and has seen major changes over the years. During this century, these include mechanization and the use of chemicals. Biotechnology is leading the charge as we approach the next century. Farm size is growing, diversification is critical, and new technology is important for farming today and tomorrow, as the business of farming truly becomes a business.

Today, less than two percent of the Canadian population is on the farm. In 1950, it was more than 25 percent. This has created larger farms, improved production, and changes in technology. This trend is expected to continue for the foreseeable future. But I expect that biotechnology will also help maintain smaller farms, as well.

To continue to be viable in a global environment, Canadian agriculture will need to continue to adopt new technologies and to diversify. In Saskatchewan, the industry is actively diversifying and adding value.

Saskatchewan is the largest agricultural producer in Canada, of crops: wheat, barley, canola, oats, lentils, mustard, peas, fruits, vegetables, and others; and of animals: beef cattle, chickens, swine, bison, elk, deer, and wild boar.

Because of this large production, we have a very strong research community in the province. This research is focused on improved production, value-added processing, and new technologies. Linked with this production is the fact that Saskatchewan is a major exporter of agricultural products, therefore, we are constantly looking for opportunities to diversify and to add value to meet the needs of existing and new clients. To accomplish this, we work in partnership with the clients to ensure we are doing the right things to meet their needs.

OUR BUSINESS — AGRICULTURE

To ensure our future, we need to know our business, but support for the business is just as critical. In Saskatchewan, our business is agriculture, and therefore, the decision to get involved in the agricultural aspects of biotechnology made sense. In a province with one million people and sixty million acres of agricultural land, it is sensible to focus on agriculture.

In agricultural biotechnology we have developed a direction and have worked together to create a competitive position. The effort has made Saskatchewan the leading province in agricultural biotechnology in Canada, and it gives us global recognition.

The following activities have helped develop and maintain that leadership position:

- Bio-products Center: Bio-pesticides and bio-herbicides are the primary targets for this center. The benefit is that center members are industry researchers at universities and federal labs, working together to facilitate the commercialization of technologies.
- Canadian Value-Added Cereal Consortium: This center focuses on cereal technology.
- Nutraceutical Center: This is a center is still in its planning stage, but it will focus on the concept of nutraceuticals.
- Global Agricultural Biotechnology Association (GABA): This is a global initiative designed to provide information on agricultural biotechnology issues and global bases.

- The Agricultural Biotechnology International Conference 98: The first conference was held in 1996, with representation from 24 countries and 700 attendees.
- Ag-West Biotech, Inc.: Other activities are managed by AWB.
- Information resources: Networking, bulletins, workshops, trade, and seminars.

The key to all of these activities is the establishment of a sense of working together in a team effort.

KEYS TO SUCCESS

The success of the Saskatchewan biotechnology community has been attributed to three things:

- flexibility
- knowing your business
- knowing your customer

I believe that these three keys have been critical to our success in creating a viable agricultural biotechnology industry in Saskatchewan. If you combine them with the eight qualities identified in the book *In Search of Excellence* by Tom Peters, you will end up with a competitive position in the global marketplace.

The eight qualities Peters lists are:

- A bias for action: Excellent companies do not spend years planning new strategies. They are devotees of the do it, try it, fix it approach.
- Close to the customer: Excellent companies stay in touch with their customers and learn from them.
- Autonomy and leadership: Excellent companies foster leaders and innovators throughout the organization.
- Productivity through people: Top firms treat the rank and file as the root of quality and productivity gains.
- Hands on, value-driven: The most successful firms are driven by a sense of values they insist employees share.
- Stick to the knitting: All the excellent firms analyzed restrict themselves to fields they know well.
- Simple form, lean staff: Most of the excellent companies, although big, have simple forms with minimal layers of bureaucracy.
- Simultaneous loose-tight properties: Excellent companies know when to centralize and when to discourage conformity.

The following are excerpts on Saskatchewan from Ernst and Young's Fourth Report, on *Canadian Biotechnology Industry: Canadian Biotechnology 97 — Coming of Age*.

Saskatchewan is one of the world's key ag-bio players. These are some of the factors that put it ahead:

- **Focus:** Saskatchewan is one of the world's largest producers of agricultural products and has access to leading-edge research and development in the ag-bio field.
- **Leadership:** Roy Romanow, premier of Saskatchewan, is strongly supportive of ag-bio. The provincial government has provided infrastructure. Ag-West Biotech, Inc., formed in 1989 with the support of the provincial government, acted as a catalyst for teams of stakeholders in the community. There has been consistent focus on biotechnology from the federal and provincial governments, which the biotech community has succeeded in leveraging. In 1994, Saskatoon established the Economic Development Authority, whose first two priorities for economic growth were ag-bio and value-added agriculture.
- **Infrastructure:** The University of Saskatchewan provides a very strong and supportive environment, through the College of Agriculture and the Western College of Veterinarian Medicine as well as its involvement in life sciences. The Plant Biotechnology Institute of NRC, VIDO, Agriculture Canada, POS, SRC, and several other institutes and organizations enhance the infrastructure. Innovation Place, the research park, is a big component of the infrastructure, providing facilities and services for the growing business community in ag-bio.
- **Financing:** Large global corporations invest in Saskatchewan because there is a global market for its products. Saskatchewan benefits from several venture funds, including the Agri-Food Equity Fund and Ag-West Biotech, Inc. Two major banks, Royal Bank and the Canadian Imperial Bank of Commerce (CIBC), have established special financing arrangements for biotech in Saskatoon, and other initiatives are available through the Western Diversification Program (federal) and Saskatchewan Agriculture and Food (provincial).
- **Technology transfer:** The University of Saskatchewan has enabled and encouraged technology transfer and is establishing training programs that will provide scientists with the necessary business skills to prepare them for careers in ag-bio. The technology transfer effort of all the research institutes in Saskatoon is an important asset.
- **Integration:** The research community in ag-bio is well integrated vertically, enabling efficient and coordinated research along the entire value chain. This allows the sector to go beyond selling a commodity product to being the purveyor of value-added identity preserved products from DNA to the dinnerplate .

- International profile: Saskatoon is recognized globally as a key ag-bio center. In 1996, it hosted the world's first international ag-bio conference, ABIC 96, attended by more than 700 people from 24 countries. Nothing succeeds like success.

SUMMARY

In Canada, 26 percent of the core biotechnology companies are devoted to agricultural biotechnology, compared with five percent in the United States. Their activities include the use of microorganisms, plant cells to create commercially viable products, and transformation of plants to improve specific qualities. Their goals are to increase the world's food supply, enable crops and animals to resist pests and diseases, increase the nutritional content of food, and improve production efficiency, while at the same time improving the environment.

Saskatoon is world-recognized for what it is today in agricultural biotechnology. Corporations are looking at ways to participate. Saskatoon's development as an agricultural biotechnology center happened because the ingredients were right — people, facilities, and resources.

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