CANADIAN SEED TRADE ASSOCIATION
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**Innovation Through Biotechnology**
**April, 2008**

## It Starts with the Seed

***"Food security, poverty eradication, human nutrition, environmental renewal, peace and stability—they all start with a seed."*** *Africa Rice Centre, 2004*

As researchers, developers, distributors, growers, sellers and traders of seed, members of the Canadian Seed Trade Association hold the foundation and the future of agriculture and agri-food in their labs and in their seed bins. Through seed driven innovation, CSTA's members are committed to delivering quality, choice and success to farmers, and through them, to consumers in Canada and around the world.

## PART I - Innovation Through Biotechnology

***It took some 10,000 years to expand food production to the current level of about 5 billion tons per year. By 2025 we will have to nearly double current production. This increase cannot be accomplished unless farmers across the world have access to current high-yielding crop production methods as well as new biotechnological breakthroughs that can increase the yields, dependability and nutritional value of our basic food crops.*** *Norman E. Borlaug, Nobel Laureate for Peace, 1970 – Plant Physiology, October 2000*

Biotechnology is one of the tools that seed innovators use to deliver benefits to farmers, and to the health and well being of consumers and the environment.

- Farmers have benefited from increased production:
  - In 2005, the direct global farm income benefit from GM crops was $US 5 billion. Since 1996, farm incomes have increased by $US 24.2 billion.
  - The largest gains have come for soybean producers where GM soybeans generated $US2.84 billion in additional income in 2005
  - GM cotton generated an additional $1.9 billion for cotton producers in 2005
  - Significant increases in farm income have also occurred in the maize and canola sectors where GM maize has increased income by more than $US3.1 billion and GM canola has boosted income by $US 893 million since 1996
  - Total farm income gains resulting from the use of GM technology are 4 times the cost of the technology
- Farmers in poor and developing countries have benefited the most
  - 55% of the total gains from GM technology have accrued to developing countries
  - 79% of the gains from GM cotton and 58% of the gains from GM soybeans were earned by farmers in developing countries

- Biotechnology has benefited the health of humans and of the environment
  - Since 1996, the use of GM crops has resulted in reduced use of pesticides – by 224 million kg of active ingredient.
  - GM crops have allowed farmers to reduce tillage and pesticide applications, and have resulted in increased carbon sequestration in the soil. The effect in 2005 is the equivalent of removing 4 million cars from the road.
  - In China alone, farmers have reduced the use of toxic organophosphates and organochlorides by 80%. Cases of "poisoning" have declined by 400%.

**The Future is bright – What's in the Biotech Pipeline?**

***"Imagine the benefits if the genes for rust immunity in rice could be transferred into wheat, barley, oats, maize, millet and sorghum. The world could finally be free of the scourge of the rusts, which have led to so many famines over human history."*** *Norman E. Borlaug, Nobel Laureate for Peace, 1970 – Plant Physiology, October 2000*

- Improving Agronomics, Disease and Pest Resistance
  - Scientists around the world are using modern biotechnology to identify many of the genes responsible for stem and leaf rusts in cereal crops and soybeans
  - Researchers at Mendel Biotechnology and Michigan State University have created a genetically modified plant that is significantly more resistant to drought and cold
  - By introducing genes that mop up the peroxide produced by stressed plants, Texas Tech researchers have increased photosynthesis in drought affected plants by 50%
  - Researchers in India and the United States have produced transgenic plants in the lab that are capable of growing and producing flowers at salt concentrations which are lethal to wild-type plants.
  - Japanese scientists have used biotechnology to develop a plant in the mustard family that makes 30% better use of nitrogen
- Improving the Interaction with the Environment
  - Researchers at the University of Georgia have engineered a poplar tree that can remove toxic mercury from the soil
  - Researchers at the Carnegie Institution of Washington at Stanford University have used biotechnology to create plant produced plastics that biodegrade within a year.
- Improving the Diets of Consumers
  - Biotechnology is being used to increase protein levels in staple foods for the world's poor.
    - transgenic corn with 32% more protein is being developed;
    - a transgenic potato has 35% more protein
    - a genetically engineered rice with 20% more protein has been produced in the lab
- Biotechnology can Deliver Health
  - "Golden Rice" will boost vitamin A to prevent blindness caused by vitamin A deficiency in over 118 countries
  - Researchers are boosting folate content 10-fold in tomatoes
  - Scientists have genetically engineered canola and soybeans that produce fats that do not raise cholesterol and which produce fatty acids that fight cancer and improve liver function

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## PART II - Canada's Food: Keeping us Safe, Keeping us Informed, Giving Us Choice

### Keeping Us Safe, Keeping Us Informed

Canada leads the world with its food safety assessment system, including for products of biotechnology. Before it becomes available to consumers, a product of biotechnology must be approved by three government agencies operating under at least five pieces of legislation and associated regulations. Lists of all approved plants, foods and feeds derived through biotechnology are available to the public.

***The Canadian Food Inspection Agency Biosafety Office*** *(Plant Protection Act and Regulations; Seeds Act and Regulations)*

- A genetically engineered trait that is going to be part of a plant grown in Canada (a plant with a novel trait) must be assessed by the Plant Biosafety Office working with the Environmental Release Assessment Unit. Criteria for assessment are spelled out in CFIA directives which are publicly available http://www.inspection.gc.ca/english/plaveg/bio/dir/dir9408e.shtml
- The developer or importer of the trait applies for permission to test the trait in confined trials. The permission is only granted after an initial assessment of the impact on the environment and human health is completed by the CFIA. Confined trials are grown under rules specified in CFIA directives and are used to get the data required to determine the potential impact on the environment and human health.
- Information on the crops and traits being tested in confined trials is publicly available on the CFIA website at http://www.inspection.gc.ca/english/plaveg/bio/confine.shtml
- If the CFIA finds that the trait does not pose a risk to the environment or to human health, the trait can be approved to be grown in Canada. CFIA also makes public the decision documents for all of the plants with novel traits that have been approved in Canada http://www.inspection.gc.ca/english/plaveg/bio/dde.shtml
- If the novel plant is going to be grown from seed, it must be registered under the Seeds Act and Regulations. This process requires that the crop variety be grown in variety registration trials and be recommended by third party recommending committees. A special list of all of the varieties with novel traits (including those from biotechnology) is publicly available http://www.inspection.gc.ca/english/plaveg/variet/varnote.shtml

***The Canadian Food Inspection Agency Feeds Division*** *(Feeds Act and Regulations)*

- If a plant with a novel trait is going to be part of a livestock feed, it must be assessed as a novel feed under the Feeds Act and Regulations.
- The Feeds Division assesses the safety (toxicology, allergenicity, feeding exposure etc); nutritional value; potential impact on the genetics of the livestock, and the environmental impact of the feed under a strict set of rules that are publicly available http://www.inspection.gc.ca/english/anima/feebet/bio/dir95-03e.shtml
- The results or decision documents for novel feeds in Canada are also publicly available http://www.inspection.gc.ca/english/plaveg/bio/dde.shtml

***Health Canada*** *(Food and Drugs Act and Regulations; Environmental Protection Act and New Substance Notification Regulations* )

- If the plant containing a genetically engineered trait is going to become part of a consumer food product, it must be approved by Health Canada. Health Canada assesses the safety of all genetically-modified and other novel foods proposed for sale in Canada. Companies are required to submit detailed scientific data for review and approval by Health Canada, before such foods can be sold. Health Canada's safety assessment includes:
    - how the food crop was developed, including the molecular biological data which characterizes the genetic change;
    - composition of the novel food compared to non-modified counterpart foods;
    - nutritional information compared to non-modified counterparts;
    - potential for introducing new toxins; and
    - potential for causing allergic reactions

All of the novel foods, including those containing products of biotechnology are listed publicly on Health Canada's website. http://www.hc-sc.gc.ca/fn-an/gmf-agm/appro/index_e.html

**Keeping Us Informed, Giving Us Choice**

***Mandatory Labeling*** - If, using the assessment criteria listed above, Health Canada finds that the nutritional value or composition of the food, (including foods that might be products of biotechnology), has changed; or if there is an allergen present, the food must be labeled. It's the law.

***Voluntary Labeling*** – Where there isn't a health or allergen concern, there are still provisions for labeling. The Standards Council oif Canada has adopted a standard for the voluntary labeling and advertising of foods that are or are not products of genetic engineering. This standard ensures that the labels are truthful and provide information that is understandable for consumers. The standard is publicly available.

***Another Choice: Organic Labels*** – On November 14, 2008, new Canadian regulations governing the use of organic labeling will come into effect. These regulations, under the Canadian Agricultural Products Act, create a new Canadian organic certification system, and by December 2008 will require that all organic products must be certified for interprovincial and international trade as organic. When consumers see the new Canadian certified organic label, they will know that the food they are purchasing has been produced to the greatest degree possible, without chemical fertilizers and pesticides, and do not contain products of biotechnology. The criteria for certification of a product as organic are publicly available on the Canadian General Standards Board website
http://www.pwgsc.gc.ca/cgsb/on_the_net/organic/index-e.html

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## Innovation Through Biotechnology

**PART III – Biotechnology In Our Every Day Lives**

- The word "biotechnology" was first used in print in 1919, and the first time the phrase "genetically engineered" was used was in 1941.
- The first genetically engineered product to be developed was human insulin in 1978, and it was approved for sale in 1983.
- The first genetically engineered food product was an enzyme named Chymosin which is used in cheese making. Chymosin is a substitute for rennet, an extract from the stomach lining of calves. It was approved in 1990.
- In 1995, Canada became the first country in the world to produce crops developed through modern biotechnology, and in 1996 became the first country to commercially produce GM canola, corn and soybeans
- By 1999 Health Canada listed 42 approved foods derived from biotechnology, including canola, corn, flax, potato, soybean, squash and tomato.
- In 2007, crops derived from biotechnology for improved productivity, disease and pest control and improved characteristics, were produced on over 144 million hectares (over 355 million acres) by 23 countries around the world. Genetically modified corn, canola and soybeans are produced on over 7 million hectares (17 million acres) in Canada.

**Where products of GM crops can be found**

- ***GM varieties make up 66% of the Canadian corn market***. According to the Ontario Corn Producers, corn is used as an ingredient or to produce more than 2,500 products from batteries to yogurt. Corn starch and corn syrup are ingredients in baked goods, candies, granola bars, canned vegetables, salad dressings, beer and whiskey, soft drinks, snack foods and even instant tea and coffee. Corn is also used as a feed for livestock and is found in many different pet foods. Other corn products are found in cosmetics, toothpaste, shaving cream, soaps and many pharmaceuticals.
- ***65% of the Canadian soybean market is GM varieties*** – ingredients made from soybeans are found in a very wide variety food and non-food products. Soy products can be found in many different baked goods, desserts, gravy, noodles, peanut butter, salad dressings, whipped toppings, margarine and mayonnaise. Soybean products are fed to livestock directly and as protein supplements and they can also be found in many industrial products from adhesives to waxes.
- ***GM varieties account for 85% of Canada's canola production*** – internationally recognized as one of the healthiest vegetable oils available, canola oil is used in the preparation of many of the products on the grocery store shelves. And canola meal is one of the best sources of protein for livestock feed.

Other crops are also being produced with biotechnology innovation. GM crops produced around the world include: sugar beets, cotton, tomatoes, sweet peppers, squash and papaya.

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