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Plant Biotechnology

Protecting Our Planet

Today's farmers have access to many plant science innovations to help them achieve sustainability on their farms, and in turn contribute to the sustainability of our planet.

PLANT BIOTECHNOLOGY BENEFITS OUR ENVIRONMENT BY:

- **Protecting and improving the soil**
- **Conserving water**
- **Preserving biodiversity**
- **Reducing greenhouse gases**
- **Creating more efficient biofuels**
- **Increasing crop productivity per hectare**

Modern plant biotechnology products help our farmers produce a safe, healthy and abundant food supply, while reducing agriculture's environmental footprint. This technology allows farmers to produce more food on the same amount of land, reducing the need to expand land for crop production. Higher yields from biotech crops have saved the equivalent of over 62 million hectares from being turned into farmland[1] – one of the biggest threats to our world's plant and animal life.

From higher yields that produce more food and help preserve biodiversity to the promise of drought-tolerant crops that will help conserve water, plant biotechnology is an earth-friendly technology that has been quickly adopted in Canada and is now viewed as part of the EverGreen Revolution around the world. It offers solutions to help us meet the need for more food, conserve our limited natural resources and respond to the challenges of climate change.

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Conservation tillage is now practiced on 70 per cent of Canada's farmland covering a range of crops including soybeans, corn and canola.

Protecting & Improving the Soil

Soil is a vital natural resource that needs to be protected. Historically, farmers have used tillage to control weeds, leading to greater wind and soil erosion and significant water evaporation. Thanks in part to plant biotechnology and the adoption of herbicide-tolerant crops, farmers are able to switch to conservation or no-till systems (growing crops with minimal or no soil cultivation). These methods reduce soil erosion, help conserve water and minimize run-off by increasing moisture penetration and retention in the soil.

According to a recent survey of Canadian farmers planting herbicide-tolerant canola using zero and minimal tillage practices, 86 per cent have reduced soil erosion and 83 per cent indicated greater soil moisture.[2]

Reducing Greenhouse Gases

Rising greenhouse gas (GHG) levels and global temperatures are challenging our ability to meet food production goals and preserve our environment. It is expected that climate change will cause significant crop yield losses, more frequent droughts, increasing water scarcity and new pest pressures. Innovations in plant biotechnology have contributed significantly to reducing GHG emissions from agriculture and offer solutions for further savings.

Thanks to fewer passes over the field with equipment and less soil disturbance, conservation tillage plays a major role in reducing GHG emissions and sequestering soil carbon. In 2008 alone, emission reductions achieved by farmers who adopted biotech canola in Canada were equal to removing over one million cars from the road for a year. Globally, this switch in farming systems had the impact of removing nearly seven million cars.[3]

Future innovations include using biotechnology to develop plants with improved nitrogen use efficiency that will reduce the need for added fertilizer and further reduce GHG emissions.

Creating More Efficient Biofuels

The development of biofuels, including ethanol and biodiesel, has created a vital new value-added market for corn, canola and other commodities while providing cleaner, environmentally friendly sources of renewable energy. The increased use of ethanol helps reduce greenhouse gas and other harmful emissions related to smog, pollution and acid rain. Through the use of plant biotechnology, crops can be improved to meet both food and biofuel demands.

New crop varieties are being developed for more efficient processing into biofuels. Corn hybrids that contain higher levels of fermentable starch allow ethanol plants to obtain higher fuel yields. Corn has also been developed with high levels of amylase, a naturally occurring enzyme which is typically supplemented in the ethanol production process, leading to higher ethanol yields and reduced water and energy use during processing.

In addition to providing higher yields for more food and fuel, biotechnology can help develop plants that can thrive in land affected by environmental factors such as salinity or acidity. These plant traits can allow previously unproductive land to be used to grow renewable energy.

Preserving Biodiversity

It is estimated that food production needs to increase by 70 per cent if we are to feed the nine billion people expected to populate the world by 2050.[4] The challenge of meeting this rising global demand for food is compounded by limited land resources. Forests contain more than half of our land's animal and plant species, and expansion of farmland to grow more food places serious pressure on biodiversity worldwide.

By helping farmers grow more food per hectare, wildlife habitats can be kept free from cultivation – thus preserving wildlife habitat and our world's plant and animal life. During the period 1996 to 2008, higher yields from biotech crops are equivalent to the production from over 62 million hectares of land.[5] Increasing crop productivity on the same amount of land takes pressure off of the need to convert natural habitats into farmland in order to feed a growing population.

Conserving Water

Over one billion people currently live without access to a safe water supply and sanitation – and the incidence and duration of droughts is expected to rise. By 2030 it is estimated that about 3.9 billion people will be living under severe water stress.[6]

With 70 per cent of the world's water used for agriculture, finding ways to conserve water in food production is an urgent priority. In addition to the increased water retention capacity of soils due to conservation tillage, innovations in plant biotechnology are being used to develop crops that are heat-, drought- and salt-tolerant.

Biotech developments to improve plant tolerance to environmental stress and drought will improve the water efficiency of our crops and enhance yield stability during times of low moisture levels. Canadian farmers can look forward to drought-tolerant corn and canola varieties in the near future.

In the drought-prone continent of Africa, water efficient maize is expected to provide yield increases of 20 to 50 per cent under moderate drought conditions compared to current varieties. This translates into the potential production of two million more tonnes of food, without requiring more land or precious water resources.

Did You Know?

The transition of Canadian canola farmers to zero and minimum tillage sequesters nearly one million tonnes of carbon annually, valued at about $5 million.[7]

Over eight million hectares of biotech crops including canola, corn and soybeans are being grown in Canada.[8]

Higher yielding crops have lessened the pressure to clear land and reduced emissions by up to 13 billion tons of carbon dioxide a year. Since 1961, this adds up to 590 billion metric tons.[9]

Agriculture is making great progress toward reducing its environmental footprint. From 1987 to 2007:

- GHG emissions from soybean farming have fallen 38 per cent per bushel.
- 50,000 fewer gallons of water are needed to grow an irrigated acre of corn.
- Soil loss has decreased 69 per cent in corn and 49 per cent in soybeans.[10]

Plant biotechnology, the use of living organisms to give plants new beneficial traits, has been in practice for centuries. The term is very broad and includes traditional applications such as selective breeding and modern techniques like genetic modification or genetic engineering.

Genetic modification (GM) or **genetic engineering (GE)** involves altering the genetic material of a plant to create a crop with specific beneficial traits.

Visit www.whybiotech.ca to learn more about the benefits of plant biotechnology.

THE COUNCIL FOR BIOTECHNOLOGY INFORMATION

The Council for Biotechnology Information is a non-profit association whose mandate is to communicate science-based information about the benefits and safety of agricultural and food biotechnology. CBI members are the leading agricultural companies.

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1 James, Clive. 2009. Highlights of "Global Status of Commercialized Biotech/GM Crops: 2009" ISAAA: Ithaca, NY.

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4 Food and Agriculture Organization of the United Nations

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6 OECD (2009) Water and Agriculture: Future Trends and Policy Issues.

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