



Gene technology around the world

Australia's future prosperity is still strongly linked to the success of the agriculture sector. It is important for Australian farmers to have access to new technologies being used by other countries in order to remain competitive. Many of Australia's exporting competitors have been using genetically modified (GM) crops for more than a decade.

GM crops around the world

Globally, the focus to-date, in developing GM crops, has been crops resistant to attack by insects and viruses, or crops tolerant to herbicides. However, gene technology is also being used as a tool to develop crops that can tolerate climatic and soil stresses, such as drought, salinity and frost. The aim is for more consistent production and fewer seasonal fluctuations. The production of healthier foods is also in the pipeline.

According to the International Service for the Acquisition of Agri-Biotech Applications (ISAAA), in 2007, 114.3 million hectares of GM crops were grown by approximately 12 million farmers in 23 countries. The four main countries that grew GM crops were the United States of America (USA), Argentina, Brazil and Canada. The remaining 19 countries, including Australia, grew approximately 16 per cent of the global area of GM crops.

In 2007, the dominant GM crops were soybean, corn, cotton and canola. These crops have herbicide tolerance and/or insect resistance characteristics.

Impacts to date

According to a report by PG Economics, GM crops have resulted in economic benefits at the farm level of over US\$27 billion. This is coupled with environmental benefits such as a reduction of pesticide use equivalent to a 15.5 per cent reduction in the associated environmental impact and significant reductions in the release of greenhouse gas emissions from agriculture through reduced pesticide use and changed soil cultivation practices.

Through the use of herbicide tolerant GM crops, farmers acquire an additional option for weed management. According to the Conservation Technology Information Centre in the USA the

adoption of **herbicide tolerant GM soybean**, is a major factor in allowing soybean growers to implement conservation tillage practices, with a 35 per cent increase in the no-till crop area since GM crops were introduced in 1996.

Conservation tillage, the practice of reducing soil cultivation to minimise the loss of topsoil, has led to reductions in soil erosion caused by wind and water by almost one billion tons per year in the USA. This is translated into benefits not only for the environment in relation to erosion, water quality, and wildlife, but also for farmers in relation to moisture available to plants, reductions in fuel use, and healthier soils.

A report produced by the National Centre for Food and Agricultural Policy, stated that "if soybean growers were to switch [back] from planting GM varieties ... costs would increase by US\$20 per acre." Genetically modified soybean cultivation allowed growers to save US\$1 billion in 2001 because the herbicide tolerant variety meant growers could use one herbicide instead of three or four, and easier weed management meant a reduction in production costs such as fuel.

The canola industry in Canada has surveyed conventional and **GM canola** growers in order to quantify the impacts of GM herbicide tolerant canola. Over 50 per cent of GM canola growers said the key benefits for adopting GM varieties were more efficient weed control and ease of herbicide management in preventing weed resistance. Nineteen per cent noted better yield, better return and more profit.

Insect resistant GM Bt corn, which contains a gene from a soil bacterium, protects corn against corn borer pests, which are responsible for half of the corn losses attributed to insect pests worldwide. Yield increases of five per cent have been achieved using Bt corn in the USA, six per cent in Spain, and 10 per cent in South Africa and Argentina according to the ISAAA. The insect resistant corn is also being attributed to improving the safety of the food and feed supply because it minimises the insect damage that causes the incidence of harmful fungal mycotoxins.

A GM **virus-resistant papaya** is being attributed to saving the Hawaiian papaya industry. Between 1992 and 1998 papaya production halved because of Papaya Ringspot virus, and in 1998 GM virus-resistant varieties were commercialised. Half of the papayas now produced in Hawaii are GM. The USA is now seeking broader export approvals for the product to expand the industry.

Insect resistant cotton has allowed significant economic, environmental and social benefits according to a report by ISAAA. The report states that a survey undertaken by the Centre for Chinese Agricultural Policy found that GM cotton growers in China have seen a yield increase of almost 10 per cent; a 60 per cent decrease in the number of sprays required on the crop, and a US\$220 per hectare gain.

The Australian experience

Insect resistant cotton, known as Bollgard® II, has reduced pesticide use by 85 per cent per annum over conventional varieties. Herbicide tolerant cotton and cotton combining herbicide tolerance and insect resistance are also grown in Australia to offer growers more weed control options. Genetically modified cotton accounts for approximately 90 per cent of the national cotton crop.

Herbicide tolerant GM canola varieties were grown on a small commercial scale in New South Wales and Victoria for the first time in 2008. Initial farmer feedback has indicated better weed control. Plantings of GM canola in these states are likely to increase in the future.

Environmental benefits

A report produced by the US-based Council for Agricultural and Science Technology, states “the currently commercialised biotechnology-derived soybean, corn and cotton crops yield environmental benefits”. Examples of these benefits include:

- conservation of soil and water, through increased ability to adopt low-till farming with GM soybean;
- the substitution of less harmful and persistent pesticides for use on GM crops is particularly beneficial for waterways; and,
- reduced energy/fuel use because of increased weed management options in relation to herbicide tolerant GM crops.
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Despite all the evidence to support grower and environmental benefits attributed to the introduction of GM crops, continued evaluation of the impact of GM crops on a case-by-case basis is vital.

Further information

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