Are GE crops profitable?

To developers, yes; not to farmers. Investment in GE biotechnology is dropping and the areas planted are not increasing significantly: a decade on, the USA, Canada and Argentina still grow about 90 percent of all GE acreages.

In 2002, Argentina announced that it would spend $200 million to reintroduce conventional crops. In 2003, China said that it would reduce its commitment to GE technology and set aside a remote area to preserve traditional soybeans. Canada acknowledges that out-of-control GE canola has become weed-like.

In 2003, 34 US farmers' organisations signed a *Declaration on GE in Agriculture* demanding of government "a suspension of all further environmental releases and government approvals of GE seeds and agriculture products."

Spain is the only European Union member to grow GE crops commercially. The wisdom of this is now in question. In India and South Africa, GE crops have not solved small-scale farmers' debt problems. Growing GE seed denies a farmer the traditional right to save seed for the next season and contracts them to use proprietary chemicals.

Some biotechnology companies are now withdrawing from GE agricultural applications; e.g. Monsanto has withdrawn its cereal business in Europe and will not proceed with GE wheat; PPL Therapeutics' NZ operation has gone into liquidation; Bayer has withdrawn its commercial maize plans for the UK.

Websites: www.psgr.org.nz; www.psrast.org; www.i-sis.org; www.sustainabilitynz.org; www.giantexperiment.co.nz; www.nzige.canterbury.ac.nz; www.bioethics.org.nz; www.gefree.org.nz; www.ucsusa.org; www.ermanz.govt.nz; www.gm.govt.nz; www.etcgroup.org; www.greenpeace.org.nz; www.foodstandards.govt.nz; www.gmcommission.govt.nz.

Good vs. the not so good – GE technology

Many benefits have come from our knowledge of DNA, genes and genomes: testing DNA to identify criminals; diagnosing carriers of genetic disorders; directly observing gene activity using micro-array technology; DNA markers assisting genetic selection for crop development.

However, many aspects of GE technology raise ethical issues needing evaluation and legislation: e.g. patenting living organisms inhibits some worthwhile medical research, and identifying genetic features associated with clinical disorders can have negative as well as positive outcomes. Doctors worry that using antibiotic resistant marker genes in GE food crops will aid in some antibiotics becoming ineffective. When a protein produced by using GE technology is prescribed as a medicine, the immune systems of some patients have treated the protein as foreign matter, leading to adverse effects, even death.

Using seed sterilization technologies to protect intellectual property rights, denies farmers their traditional right to save seed. This disrupts wise farming practice and makes farmers vulnerable to the fortunes of multi-national companies.

No long-term, independent safety tests have been carried out on the effects of daily ingestion of a variety of GE foods. A study on human volunteers proved transgenic DNA crossed to gut bacteria after just one meal of transgenic soy.

Our knowledge of DNA and its functions is still primitive. Research should continue under the strict control of laboratory confinement.

The primary Objective of PSGR is education. Its Trustees and members are willing to answer questions (NZ only). Contact Secretary, PO Box 9446, Tauranga 3112; roberta@clear.net.nz; www.psgr.org.nz

Genetic Engineering and Biotechnology Facts for Secondary Students

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Genetic engineering and biotechnology are the same thing, aren't they?

The word *biotechnology* is often used interchangeably with genetic engineering (GE). In fact, GE technology is only a part of biotechnology. *Modification* is also used in place of *engineering* to refer to procedures that change the DNA of an organism.

Modern biotechnology has added much of value to our agricultural and scientific heritage. However, the trial and error approach to evaluating the effects of GE is inappropriate and dangerous when novel organisms are released into the environment. Organisms have complex inter-relationships about which we have little knowledge.

Proponents of GE have claimed that the result of transferring a gene from one organism to another is specific, precise and predictable, and therefore safe, and that it will have only observable or predictable impact on an organism's genetics and ecology. In fact, scientists have yet to perfect the technology to accurately insert a single DNA sequence into a chosen organism's genome.

Genetic engineering technology

An organism - a crop plant for example - is usually transformed by engineering a 'cassette' or package of genetic material into its genome. This cassette can include -

- the transgene – the chosen foreign genetic information;
- a marker gene - usually conferring antibiotic resistance; and
- a promoter, often derived from a common virus - to encourage the expression of the new gene(s).

The incorporation of the above material into the target plant's genome is not precise. It is a hit and miss process.

- The insertion of genes to produce a transgenic plant can disrupt the original genome in ways that largely go undetected.
- Not all of the gene's effects can be predicted.
- A single gene can result in more than one inherited trait.
- Any artificially altered genetic system is sooner or later very likely to give rise to unintended, possibly dangerous, consequences.

Large-scale agricultural applications of GE biotechnology have thoughtlessly imposed massive impacts on our food supply that have not been adequately investigated by scientists.

Claims of safety are based on questionable assumptions that do not hold up to rigorous, independent scientific review.

Why genetically engineer crops?

Farmers were promised that growing GE crops would increase yields. In fact, yields have proven to be generally lower.

Most GE crops are resistant to an herbicide or are insect-resistant. Farmers were told GE crops would need less spray. In fact, chemical use has generally remained the same or increased. More widespread use of proprietary chemicals has also aided the development of herbicide-resistant weed species.

Examples of other unforeseen effects are -

- Glyphosate (Roundup) may also be linked to a fungal disease (fusarium blight) that causes wheat crop losses.
- The Bt toxin, engineered into crops to stop insects eating them, appears to be consumed by some pests as a food.
- Bt remains in the soil. It can bind to soil particles, persist for 180+ days, and may adversely affect beneficial arthropods and soil-dwelling decomposers.
- Some GE plants adversely affect bees' activities and longevity.

Will all this affect consumers?

Permitted residue levels of Roundup herbicide were in some cases increased 200-fold before RoundupReady® crops were marketed. Consumers ingest residues in food.

There are no definitive studies on how Bt affects human consumers.

No one knows how ingesting GE food will affect human health in the long term. This worries some consumers. Many of them are rejecting GE foods and many export customers are demanding GE-free supplies.

How are crops contaminated?

Genes move naturally between related plants. Transgenic contamination of conventional crops can occur through pollen on the wind, clothing, footwear, animals, birds, insects; in manure, rain and flood water; in transportation and handling.

Pollen can travel considerable distances. It has been shown to travel at least 26kms from a field trial site. At 2300 metres above Hawkes Bay, a glider flew through debris sucked up by thermals from corn harvesters below. At that height, pollen can travel hundreds of kilometres.

Once in the environment, a transgenic variety cannot be recalled and horizontal transfer of the transgene to other varieties and species is facilitated. Most significant are the findings of government scientists at the National Institute of Ecology in Mexico, where no commercial GE crops are grown. They found DNA from GE plants in native corn varieties. Preservation of native varieties is vital to the survival of domesticated crops.

Developers have engineered crops to produce pharmaceuticals and nutraceuticals, plastics and other industrial compounds. The crops most often used to produce these are also human food crops such as corn. Corn relies on pollen from other corn plants for fertilization and is highly susceptible to contamination. Contamination of human food crops by these products presents very real dangers to human health.

The World Health Organization publication, *20 Questions on Genetically Modified Foods*, says that GE crops may threaten biodiversity, decrease the richness and variety of foods and make farmers dependent on chemical and biotech companies through the use of sterile seed or chemical product purchases.