



Genetically Modified Organisms in Forestry

(IFA Forest Policy Statement No. 1.3)

Key Statement

The use of Genetically Modified Organisms in commercial forestry in Australia may provide opportunities to enhance the competitiveness of the forest industries, but their use needs to be carefully considered and regulated in order to minimise the potential for adverse environmental impacts.

The Issue

Transgenics, which is one component of the rapidly moving field of genetics, involves the transfer of genes from one species into another to produce Genetically Modified Organism (GMO). The objective of this technology is to deliver improved traits into commercial varieties of plants usually where this cannot be achieved by conventional breeding. In commercial forestry plantations, GMOs have the potential to deliver substantial benefits on growth rates, pest resistance and wood quality. However, there is a general lack of understanding of risks and implications of GMOs in the non-scientific community and a widespread and genuine concern over their field release based largely on the precautionary principle. To date there has been only limited use of the GMOs in forestry but it is expected that the benefits from GMOs will increase greatly as their use develops.

Background

In Australia, GMOs are regulated by “The Gene Technology Act 2000”, administered by the Office of the Gene Technology Regulator (OTGR). A GMO is defined as:

- (a) an organism that has been modified by gene technology; or
 - (b) an organism that has inherited particular traits from an organism (the *initial organism*), being traits that occurred in the initial organism because of gene technology; or
 - (c) anything declared by the regulations to be a genetically modified organism, or that belongs to a class of things declared by the regulations to be genetically modified organisms;
- where, gene technology is any technique for the modification of genes or other genetic material, but does not include:
- (a) sexual reproduction; or
 - (b) homologous recombination; or
 - (c) any other technique specified in the regulations.

Through the Gene Technology Act and the OTGR, Australia has a strong domestic regulatory regime based on scientifically founded risk assessment processes. This mandatory risk assessment is objective, transparent, consultative and conducted on a case-by-case basis.

Examples of commercially successful GMOs include:

- the introduction of the *Bacillus thuringiensis*, commonly known as Bt, gene into cotton to provide insect resistance;
- the introduction of glyphosate resistance and other physiological traits of important plant growth into various crop species;
- the introduction of the ethylene inhibitor into tomatoes to prevent premature ripening; and
- the up-regulation of oleic acid in soybeans to increase the concentration of this mono-saturated fatty acid.

In addition to modifications that seek practical outcomes, genetic modification is also used to study the function of genes by numerous means, including the introduction of a gene of interest into a test species, the creation of defined mutants to understand the function of known genes etc.

Spurred on by the rapid advances in the Human Genome Project, the study of the genetic material comprising an organism's chromosomes will continue to advance rapidly in all disciplines and, with it, the understanding and technology to create Genetically Modified Organisms. The power of this technique to transfer new traits rapidly from one species into another has the potential to underpin the future improvement of many commercial species including trees. The potential of genomics is possibly greater in forestry than agriculture, due to extremely long breeding cycles that limit the capacity to make improvements though conventional breeding techniques.

The capacity of genetic modification technology to create organisms that cross species barriers, combined with community distrust of a science that is poorly understood, has created a groundswell of public opinion opposing the technology. Popular arguments that have been raised in public debate against the use of GMOs include:

- The potential of GMOs hybridising with native plant species, resulting in the possibility of transgenes escaping into the environment, creating new weed species, disrupting gene complexes of native species populations, and potentially leading to loss of genetic diversity in native species.
- Unforeseen consequences including potential impacts of transgenic plants on birds, insects and soil biota, and even humans through honey, wild fruit and game.
- The long lifespan of trees and hence the difficulty of conclusively evaluating perceived risks over a full life cycle or rotation.
- The high cost of developing GMOs generally leads to patent protection which can be viewed as immoral from the point of view of assigning title of ownership to living organisms and genes.
- Apparent abuse of GMO patents by large companies, where action has been taken against farmers accused of illegally growing GMO crops even where the GMOs may have escaped onto their property.

A general lack of understanding of risks and implications of GMOs, particularly amongst the non-scientific community, has led to a widespread and genuine concern over their field release based largely on the precautionary principle.

The emotive rejection to GMOs negates the many potential benefits including direct modification of traits such as cold tolerance in tropical eucalypts, rust resistance in pines, nitrogen fixation in trees for degraded soils, salt tolerance, insect resistance and reduced lignin. It also ignores the potential indirect benefits of research using GMOs to understand the function of genes and gene pathways, which may lead to more effective tree improvement by conventional breeding or other non-transgenic means.

Policy

The Institute of Foresters of Australia (IFA) advocates an informed, regulated and risk management based approach to the use of Genetically Modified Organisms in commercial forestry in Australia, to minimise the potential for adverse environmental impacts while providing opportunities to enhance the competitiveness of the forest industries.

The IFA supports and encourages:

- Research and use of GMOs in Australia being properly regulated under the provisions of the Gene Technology Act;
- Australian forestry researchers maintaining active participation in laboratory and field research involving GMOs in order to retain a position at the leading edge of this field and to utilize technology which will assist the competitiveness of the Australian forest industries;
- Adoption of the precautionary principle where there is a quantifiable risk of GMOs becoming invasive weeds, or of introducing foreign genes into native forest with potential adverse impacts on biodiversity values or plant growth characteristics;

- Use of a scientifically informed decision making process, with appropriate review and risk management mechanisms as stipulated by the Australian regulatory framework, to control the deployment of GMOs; and
- Organisations undertaking research or applied work in development of GMOs undertaking a comprehensive consultative and education program to inform the general public on the nature of the technology, the rationale for developing GMOs, the potential benefits, the risks, and the measures undertaken to minimize or eliminate risk.

The IFA considers that:

- Reasoned and considered use of GMO technology may present benefits to the Australian forest industries via a number of pathways, including GMO research providing a greater understanding of the function of genes and gene pathways leading to more effective tree improvement by conventional breeding, as well as through direct deployment of transgenic trees.

Further Information

FAO (2003) Weighing the GMO arguments: against.
<http://www.fao.org/english/newsroom/focus/2003/gmo8.htm>

FAO (2003) Weighing the GMO arguments: for.
<http://www.fao.org/english/newsroom/focus/2003/gmo7.htm>

FAO (2003) Trees: long cycles, deep questions.
<http://www.fao.org/english/newsroom/focus/2003/gmo6.htm>

Forest Stewardship Council (2000) GMOs Genetically Modified Organisms. Document BM-19.22.
www.fscoax.org

El-Lakany, M. H. (2004) Are genetically modified trees a threat to forests? *Unasylva* No. 217, Vol. 55:45-48.

McLean (M. A. and Charest, P. J. (2000) The Regulation of Transgenic Trees in North America. *Silvae Genetica* 49(6) 233-239.

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