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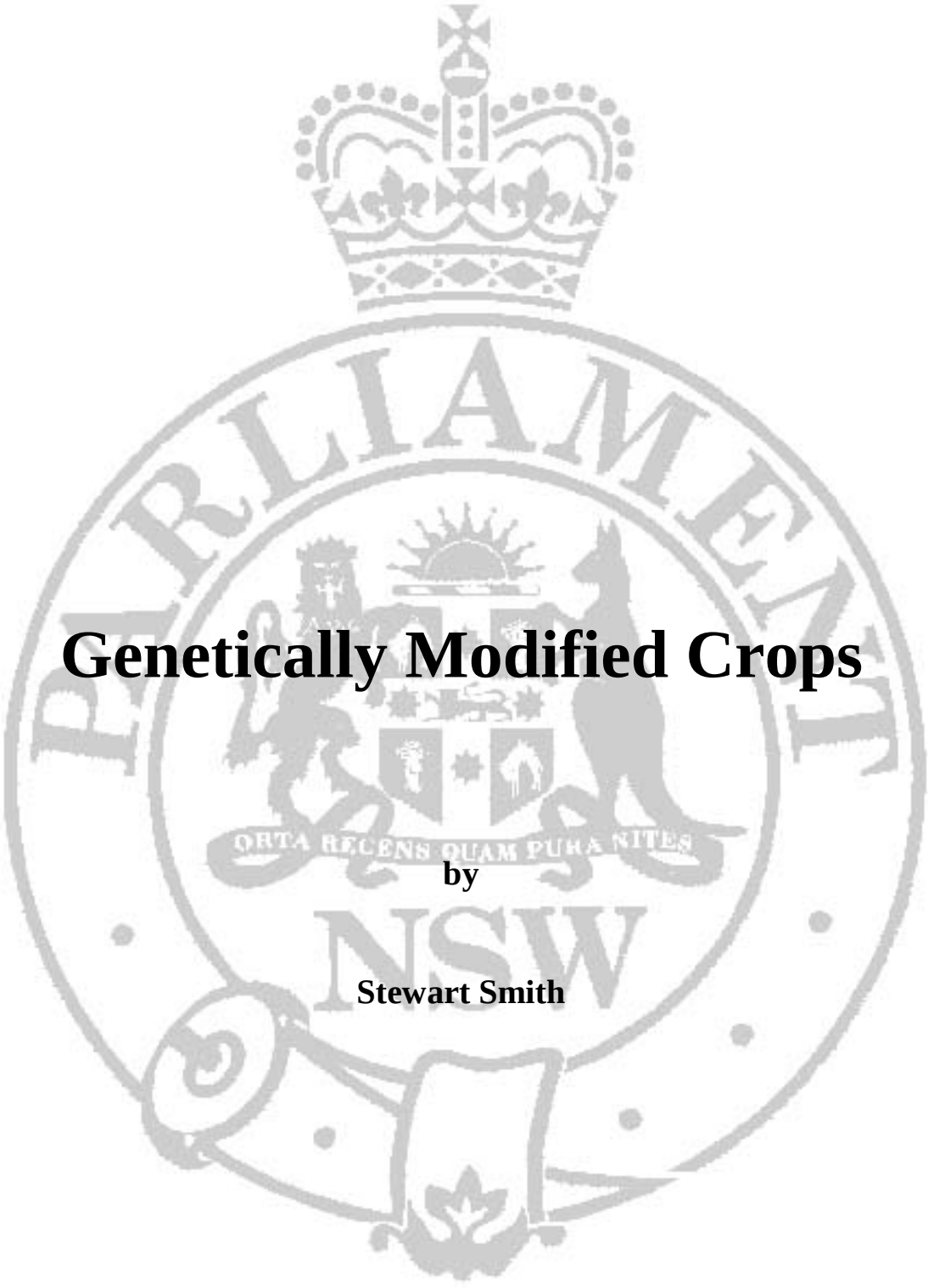

Genetically Modified Crops

by

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EXECUTIVE SUMMARY

Biotechnology is a broad term that covers the practical use of biological systems to produce goods and services. Advances in biotechnology have provided ways of introducing very precise changes to genetic material that allow, for the first time, the transfer of properties of a single gene from one organism to another. These techniques, often referred to as gene technology, involve the modification of organisms by the direct incorporation or deletion of one or more genes to introduce or alter a specific characteristic. Organisms created using gene technology techniques are commonly referred to as genetically modified organisms (GMOs).

This paper focusses on genetically modified crops (GM crops), and in particular the marketing of these crops. GM crops have been available since 1995, and the adoption of these has been most dramatic in north and south America. With the commencement of commercial plantings in the mid-1990s, the global area under GM cultivation has grown to 58.7 million hectares by 2002 (pages 1 – 4).

Of the four major GM crops (soybeans, cotton, canola and corn), Australia is a major grower of cotton and canola. To date, only five licences for the commercial release of GM plants have been granted in Australia. These are for two varieties of cotton, two varieties of carnations, and in July 2003, one variety of canola. In 2001, 33 percent of Australia's cotton crop was GM – the maximum amount permitted by regulations.

Some arguments for and against the introduction of GM crops are canvassed (pages 4 – 7), as is the regulatory environment for GMOs in Australia (pages 7 – 10). GM food in Australia must be labelled as genetically modified where novel DNA and/or novel protein is present in the final food. Up to one percent of GM material may be allowed in the final food before it has to be labelled as GM modified (pages 10 – 11).

There are several international agreements and barriers affecting the trade of GM foods, and these are discussed on pages 11 to 14. There are no distinct international standards for GMOs, countries are assessing their risks on an individual basis and applying a variety of measures. Rules that require labelling of GM products are being put in place in an increasing number of countries. Most of the important grain importing markets now have mandatory labelling regimes including China, the European Union, Japan and the Republic of Korea. However, the nature of these labelling regimes differs significantly between countries (pages 14 to 21).

An analysis of whether GM food crops should be commercially grown produces a complex matrix of parameters that need to be assessed. The assessment of environmental and public safety issues is conducted by the Office of Gene Technology Regulator, which means that once approved for release, the uptake of the GM technology is a commercial decision. The commercial analysis of such a decision is also fraught with difficulty.

The Primary Industries Ministerial Council determined on 7 May 2002 that risks to agricultural production and trade due to the production of GM foods should be self-regulated by industry supplemented by government monitoring. The industry response is

one of promoting co-existence, and the Gene Technology Grains Committee is developing guidelines to assist industry to implement a policy of co-existence of GM, conventional and organic crops. To achieve co-existence, identity preservation and segregation of crops is required, and this is expected to increase production costs by around ten percent. There is considerable concern in the agricultural community about the effectiveness of proposed identity preservation measures and their cost impact (pages 25-30).

Two case studies are presented – canola and wheat. GM canola was approved for commercial release in Australia on 25 July 2003. Some Canadian studies have shown that GM canola crops were obtaining a ten percent yield above that of conventional canola. However, other studies have proved less positive. Modelling by ABARE suggests that wide scale adoption of GM canola may not be justified if consumer acceptance problems require identity preservation requirements – although this conclusion is sensitive to the assumptions used (pages 30 – 33).

GM wheat is the next major issue for the world grain trade, with Monsanto in the United States possibly up to one year away from bringing GM wheat on to the North American market. Many of Australia's wheat customers have stated they will not accept GM wheat.

NSW, along with Western Australia, South Australia, Tasmania and Victoria, has prohibited the commercial release of GM canola. The legislative and regulatory regimes for these jurisdictions are discussed (pages 34 – 38). The views of non-government organizations are canvassed, with the major farming peak bodies broadly supporting the introduction of GM technology, whilst conservation groups and some farming organizations oppose it (pages 38 – 40).

1.0 INTRODUCTION

As do most businesses, primary producers face many risks in the pursuit of their enterprise. Primary producers must balance the vagaries of the weather, international markets and government regulation. Now there is another factor that many farmers will have to consider – the use of genetically modified organisms in their production systems. As this Paper demonstrates, there are risks in shunning the technology, and there are risks in using it.

Biotechnology is a broad term that covers the practical use of biological systems to produce goods and services. The term encompasses many techniques and includes transformation of materials by micro-organisms, (eg fermentation), methods of propagation such as plant cloning and selective breeding. More recently, advances in biotechnology have provided ways of introducing very precise changes to genetic material that allow, for the first time, the transfer of properties of a single gene from one organism to another. These techniques, often referred to as gene technology, involve the modification of organisms by the direct incorporation or deletion of one or more gene to introduce or alter a specific characteristic. Organisms created using gene technology techniques are commonly referred to as genetically modified organisms (GMOs).[1]

This paper focusses on genetically modified crops (GM crops), and in particular the marketing of these crops.

1.1 Genetically Modified Crops

GM crops have been available since 1995, and the adoption of these has been most dramatic in north and south America. With the commencement of commercial plantings in the mid-1990s, the global area under GM cultivation has grown to 58.7 million hectares by 2002, an increase of 12 percent over 2001.[2] Stone *et al* have noted the following distinctive features about the adoption of GM crops:

- The uptake of GM crops has not occurred uniformly across countries. Four countries together accounted for 99 percent of the total crop area in 2001 – with 68 percent of all GM crops grown in the United States, 22 percent in Argentina, 6 percent in Canada and 3 percent in China;
- The adoption of GM varieties has almost exclusively involved only four main crops – soybeans, corn, cotton, and canola. Of the global area of GM crops in 2001, soybeans represented 63 percent, corn 19 percent, cotton 13 percent and canola 5 percent. These four crops are extensively used as as inputs in food products, and are important in food processing and animal feeds. For example, soybeans and canola provide around 45 percent of the world's edible oils, and 75 percent of the vegetable protein meals commonly fed to livestock;
- Of the four main crops, a significant proportion of their total worldwide production

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1 Office of the Gene Technology Regulator, *Fact Sheet – What is Biotechnology? What is Gene Technology*. See website: www.ogtr.gov.au, Accessed August 2003.

2 Queensland Department of Primary Industries, Drivers of Consumer Behaviour, http://www.dpi.qld.gov.au/bsu/11364.html, Accessed July 2003.

(ie, GM and non-GM) now comprise GM varieties. Soybeans had 46 percent of the total global production planted with GM varieties in 2001. For cotton, 20 percent of the total global production was GM. For canola, 11 percent was GM varieties, and 7 percent of total corn production was GM in 2001.[3]

Of the four major GM crops, Australia is a major grower of cotton and canola. To date, only five licences for the commercial release of GM plants have been granted in Australia. These are for two varieties of cotton, two varieties of carnations, and in July 2003, one variety of canola. In 2001, 33 percent of Australia's cotton crop was GM – the maximum amount allowed under requirements by the Australian Pesticides and Veterinary Medicines Authority.[4]

1.2 An explanation of GM crop technologies

Traditional crop weed control often involved the ploughing of a field before sowing, contributing to soil degradation problems. Since the 1970s, so called 'conservation farming' used herbicides for weed control, resulting in less ploughing of fields. Herbicide tolerant crops allow the application of chemical weed control without affecting the crop itself, thus making conservation farming easier. Herbicide tolerance can be introduced into crops by traditional breeding methods, or by gene technology.[5] Currently the most sought after trait with GM crops is herbicide tolerance. In 2002, herbicide tolerant crops made up around 75 percent of total GM plantings, with insect resistent crops making up another 17 percent.[6]

In Australia, conventionally bred herbicide tolerant canola was first commercially planted in 1994. It is estimated that 80-90 percent of the Western Australian canola crop, and 30-40 percent of the eastern States canola crop, is comprised of conventionally bred herbicide tolerant canola. Conventionally bred herbicide tolerant wheat was introduced in Australia in 2001. GM herbicide tolerant cotton has been commercially grown in Australia since 2000. GM herbicide tolerant canola was approved for commercial release in July 2003.[7]

Insect resistant crops contain a gene which makes the plant resistant to insect attact. For example, the GM cotton Ingard,® developed by Monsanto, has an inserted gene which

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3 Stone,S. Matysek, A. and Dolling, A. *Modelling Possible Impacts of GM Crops on Australian Trade*. Productivity Commission Staff Research Paper, October 2002, at 3.

4 Stone,S. Matysek, A. and Dolling, A. *Modelling Possible Impacts of GM Crops on Australian Trade*. Productivity Commission Staff Research Paper, October 2002, at 6.

5 Biotechnology Australia, *Fact Sheet 29: Herbicide Tolerant Crops – the Facts*. See: http://www.biotechnology.gov.au, Accessed August 2003.

6 Foster, M., Berry, P. and Hogan, J. *Market Access Issues for GM Products, Implications for Australia*. ABARE report prepared for the Department of Agriculture, Fisheries and Forestry – Australia, July 2003. ABARE eReport 03.13.

7 Biotechnology Australia, *Fact Sheet 29: Herbicide Tolerant Crops – the Facts*. See: http://www.biotechnology.gov.au, Accessed August 2003.

produces a protein that kills the heliothis caterpillar when it eats the cotton leaves. The inserted gene is taken from a naturally occurring soil bacterium, *Bacillus thuringiensis*, or Bt for short – hence this GM cotton is sometimes referred to as Bt cotton. GM cotton both herbicide tolerant and insect resistant is now commercially available in Australia.[8]

GM technologies are not limited to herbicide tolerance and insect resistance characteristics. In a 'horizon scan' of GM technologies, the United Kingdom Agriculture and Environment Biotechnology Commission identified what is in the GM 'pipe-line'. Future developments, as well as their proposed benefits and possible risks, are outlined in Table 1 below.

Table 1: A Horizon Scan of GM Technologies

Trait / Aim	Possible Benefit	Possible Risks
Fungal Resistance – to enable crops to resist fungal attack.	Reduced crop losses from fungal attacks, reduced use of fungicides.	Non-target effects, spread of genes to wild relatives, development of resistance in fungal pathogens.
Viral Resistance – to enable crops to resist viral attack.	There are no known chemical treatments for viral diseases – the pest carriers of the viruses are the targets. Benefits may be the elimination or reduction of the use of aphicides (to kill aphids, which spread viruses).	General concerns include the possible creation of more virulent viruses as a result of the re-combination of virus particles within the GM plants with wild viruses. Little is known about virus ecology.
Bacterial Resistance – to enable crops to resist bacterial attack.	Very large food losses are associated with bacterial rot of fruit and vegetables.	Spread of genes to wild relatives, possible development of resistance.
A-Biotic Stress Resistance – to make plants resistant or tolerant to stresses other than those caused by pests and weeds, eg, frost, heat, drought, salinity.	Plants able to grow in areas where they previously could not.	Plants would become adapted to previously hostile environments and thus be able to invade and colonise them.
Increased Yield – significantly higher yields from staple crops	Increased yields, more efficient use of inputs, maintaining yields with lower inputs.	Increased yields, if associated with increases in inorganic nutrients, could mean depleting the organic content of soils; gene flow issues if there is the possibility of altering the vigour of wild relatives of

[8] Biotechnology Australia, *Fact Sheet 13b: Gene Technology Techniques*. See: http://www.biotechnology.gov.au, Accessed August 2003.

		the crop
Food Product Quality – aimed at changing the qualities of crops, to improve the nutritional storage or processing qualities, and to offer benefits to the consumer	The development of 'nutraceutical' foods, ie, plants with enhanced levels of vitamins / phytochemicals to offer health benefits to people in the developed and developing world.	In crops where out crossing is possible, the implications of any modifications getting into the food chain inadvertently would require consideration.
Animal Feed Quality – the vast majority of work to produce GM broad acreage crops is directed at improving the quality of animal feed.	Economic gains for farmers and the food chain, possible consumer benefits in animal feed translates into changes to particular products, eg naturally spreadable butter produced by increasing the amount of oils in cattle feed.	There is a need to ensure products which are approved for animal feed use meet regulatory approval for human consumption as well.
Plants as Factories – to use plants as a source of chemicals and medicines	Cheaper production of chemicals and medicines, access to and delivery of cheaper vaccines especially in developing countries.	Effects on no-target species, gene flow problems in species that can outcross.
Non-Food Crops – amenity grass, flowers	Grass that needs less mowing, stays green and requires less fertiliser, flowers with new decorative and improved keeping qualities.	Potential cross polination problems.
Trees – agronomic traits like herbicide, disease or insect resistance, traits to change the quality of the wood.	Modified lignin of trees could result in a more efficient and less environmentally damaging process for turning wood into paper.	Gene flow to wild relatives could be a major problem, indirect impacts on biological diversity through changed management regimes and further changes in land use patterns.

Source: United Kingdom Agriculture and Environment Biotechnology Commission, *Looking Ahead. An AEBC Horizon Scan*, April 2002, at 31.

2.0 SOME ARGUMENTS FOR AND AGAINST THE PRODUCTION OF GM CROPS

There is a considerable amount of literature and a large number of organisations that either promote or argue against the adoption of GM crop technology. The debate is fairly polarised between the two parties, with conservation and concerned farmer groups arguing that the risks of GM technologies outweigh the benefits, whilst biotechnology companies and many research institutions argue that the technology is safe and provides an opportunity

to make agriculture more sustainable.[9] The NSW Legislative Council Standing Committee on State Development has provided a useful summary of the debate. The Committee noted that the potential advantages and risks of GM foods could be classified under three main areas:

- Commercial;
- Public health and safety; and
- Environmental.

The arguments for and against GM foods for these three areas, as developed by the Standing Committee, are reproduced below:

Commercial

Advantages

- Genetically modifying the characteristics of crops has the potential to increase production efficiency through resistance to disease and boosted yields;
- Increased production could be achieved without increasing the use of chemical pesticides that also increase production costs; and
- Gene technology provides a more accurate and precise means of introducing new characteristics into plant species and can increase the pool from which scientists can select beneficial traits.

Risks

- Contamination of traditional or organic crops by genetically modified crops may:
    - compromise domestic and international trade opportunities,
    - damage seed collected by growers through transmission of characteristics such as sterility genes from GM crops;
- Developing countries and poor people cannot afford to buy food or crop seeds grown by traditional methods and therefore are unlikely to be able to afford GM plant varieties or food derived from GM technology;
- Certain GM crops do not produce viable seed, therefore the seed cannot be used for the next season's crop as with conventional seed which is an additional cost to growers;
- Transfer to large scale production of GM food could increase supply way above demand or fail due to market resistance;
- If the market for certain conventional varieties diminishes there may be:
    - loss of biodiversity
    - loss of control by growers over seed gene pool;
- Susceptibility of GM crops to disease may result in diminished yields and profitability; and
- Target pest resistance may develop to varieties of GM crops.

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9 For Australian based arguments against gene technology, see the GeneEthics Network – http://www.geneethics.org/community/index.php, for a world perspective, see the GE Food Alert Campaign Centre - http://www.gefoodalert.org/pages/home.cfm. Australian benefits of gene technology are canvassed at Biotechnology Australia - http://www.biotechnology.gov.au/index_ba.cfm. For a biotechnology company perspective see Monsanto - http://www.monsanto.com/monsanto/layout/default.asp.

Public health and safety implications

Some potential public health and safety advantages and risks of gene technology include (but are not limited to):

Advantages

- Introduction of pesticide and pest resistant varieties of plant food crops can potentially make crop production safer for rural communities through reduced tillage, or reduced or zero application of pesticides; and
- Gene technology may introduce beneficial characteristics in staple crops such as an increased vitamin and protein content.

Risks

- The deliberate selection of genes and their transfer between species that are often completely unrelated does not happen normally among plants and animals, so we may be tampering with complex systems;
- Added genes could potentially make 'safe' plants produce poisonous or allergy-causing substances that could cause adverse effects for some people;
- Marker genes inserted into plants could potentially produce a substance that destroys certain antibiotics, or may cause antibiotic resistance; and
- There is not enough conclusive proof that gene technology is safe and there is no guarantee that scientists will not discover problems at a later stage with genetically modified food now deemed "safe".

Environmental implications

Some potential environmental advantages and risks of gene technology include (but are not limited to):

Advantages

- As indicated, gene technology could assist to reduce the usage of a range of pesticides and therefore minimising harm to the environment;
- Gene technology could provide farmers with increased flexibility in farm management and an opportunity to further implement integrated pest management strategies to reduce the volume of chemical use while maintaining and even increasing yield and quality;
- Higher agricultural productivity may reduce the need for land clearing and encourage sustainable land use;
- If crops have genes inserted from hardier plants, they may be able to tolerate situations such as salinity, drought or poor soil so that agriculture does not always need to use the best land or damage non-agricultural species in the area; and
- Reduced application of fertilisers could reduce leaching of fertilisers into watercourses.

Risks

- Where genes for the creation of pesticides are inserted into plants not naturally creating such chemicals, the modified plant could degrade into other products, which are further changed by the rest of the plant's chemical reactions, turning into a compound not normally present;

- Naturally occurring insecticides such as Bt toxin are one of few insecticides permitted for use on organic crops. Increased use of GM Bt toxin producing crops may cause resistance to develop in some insects, leaving organic farmers with less low-impact insect control methods;
- Increased use of specific types of agricultural chemicals on genetically modified pesticide tolerant crops may result in increased concentration of that chemical in soil and resultant environmental damage;
- Insect resistant crops which harm non-target insects could adversely affect Integrated Pest Management strategies; and
- Transfer of genes may occur between pesticide tolerant GM crops and related species resulting in pesticide resistant weeds.[10]

Recently, the NSW Government, as with some other State governments, has legislated to ban the commercial release of GM canola on marketing grounds. This acknowledges the diverse and evolving GM regulatory environment worldwide, and differing levels of public support and resistance for GM crop technology. Hence this paper, whilst acknowledging the important environmental and public safety issues as identified above, focuses on the domestic and international regulatory environment, and commercial ramifications for the commercial release of GM crops.

3.0 THE REGULATION OF GENETICALLY MODIFIED ORGANISMS IN AUSTRALIA

The Intergovernmental Agreement on Gene Technology 2001 underpins the system for regulating genetically modified organisms (GMOs) in Australia. The Commonwealth *Gene Technology Act 2000* came into force on 21 June 2001 as the Commonwealth component of a national regulatory scheme.

The object of the *Gene Technology Act 2000* is:

"To protect the health and safety of people, and to protect the environment, by identifying risks posed by or as a result of gene technology, and by managing those risks through regulating certain dealings with genetically modified organisms (GMOs)."

The Act prohibits all dealings (eg. for research, manufacture, production, commercial release and import) with GMOs unless the dealing is:

- Licensed by the Regulator for contained use or intentional release into the environment;
- A notifiable low risk dealing (eg. contained work which has been demonstrated to pose minimal risk to workers, the general public and the environment);
- Exempt dealing; or
- Included on the GMO Register.

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10 NSW Legislative Council, Standing Committee on State Development, *Genetically Modified Food, Interim Report (Issues Paper),* Report No 24, October 2001.

The *Gene Technology Act 2000* created the position of the Gene Technology Regulator, a statutory office holder with a high degree of independence and extensive enforcement powers. The Regulator administers the regulation of all dealings with GMOs in Australia, in accordance with the *Gene Technology Act 2000* and ensures compliance with the conditions of any approvals. The Ministerial Council on Gene Technology, comprising representatives of Commonwealth, State and Territory governments, oversees the implementation of the regulatory system, including the appointment, and if necessary the dismissal, of the Regulator. The NSW representative is the Hon Ian MacDonald MLC, Minister for Agriculture and Fisheries. The Ministerial Council was established by the Intergovernmental Gene Technology Agreement 2001.

The Ministerial Council may issue policy principles in relation to the following:

- Ethical issues relating to dealings with GMOs;
- Recognizing areas, if any, designated under State law for the purpose of preserving the identity of one or both of the following: - GM crops, non-GM crops, for marketing purposes;
- Matters relating to dealings with GMOs prescribed by the regulations.

Once issued by the Ministerial Council, the Regulator must not accept, or approve, any application that is inconsistent with the Policy Principle issued by the Council.

The Ministerial Council on Gene Technology issued its first Policy Principle at its meeting on 31 July 2003. The Policy Principle issued is designed to bring greater legislative certainty to States and Territories who wished to designate specific areas for either GM or non-GM crops, based on marketing considerations. The Chair of the Meeting, Commonwealth Parliamentary Secretary for Health Ms Trish Worth said: "This principle will mean that the Gene Technology Regulator will recognize State's rights to designate under State law special areas that are for either GM or non-GM crops for market purposes."[11] Section 9.0 of this Paper outlines regulatory initiatives of those States that have implemented such measures.

The Ministerial Council may also issue Policy Guidelines to assist the Regulator in the performance of their duties. However, these will not be prohibitive or akin to a direction, and the Regulator is not compelled to act in accordance with Policy Guidelines, but must take them into account when considering an application under the Act.

The *Gene Technology Act 2000* also established three committees to advise the Regulator and the Ministerial Council:

- The Gene Technology Technical Advisory Committee (GTTAC) – a group of experts who provide scientific and technical advice on applications;

11 Gene Technology Ministerial Council, *Joint Communique*, 31 July 2003.

- The Gene Technology Ethics Committee (GTEC) – a group of ethicists, which provides ethical advice, particularly in the areas of law, religious practices, animal welfare and population health; and

- The Gene Technology Community Consultative Committee (GTCCC) – a group of people representing the broad interests within the Australian community, including consumers, researchers, and environmentalists. This group looks beyond the science of gene technology to matters of general concern to the community in relation to GMOs.

The Act and the associated *Gene Technology Regulations 2001* provide a process for the Regulator to assess proposed dealings with live and viable GMOs ranging from contained work in certified laboratories to general releases of GMOs into the environment, and extensive powers to monitor and enforce license conditions.

The Gene Technology Regulator liaises with other regulatory agencies, including the food safety authority – Food Standards Australia and New Zealand, the Australian Pesticides and Veterinary Medicines Authority, and the Therapeutic Goods Administration (TGA), to coordinate the approval of GM products for use and sale. The Act also created a Public Record of GMO dealings and GM Products on the OGTR website.[12]

The Australian Pesticides and Veterinary Medicines Authority is an independent statutory authority responsible for the assessment and approval of agricultural and veterinary chemical products. Therefore GM crops such as cotton that incorporate chemical resistance to pests must be registered with the Authority. The Authority is required to request and have regard to the advice of the Gene Technology Regulator with respect to any application that involves a genetically modified organisms or the product of a genetically modified organism. To be approved for commercial release, the product, when used according to the label directions must not result in any appreciable risk to:

- Consumers;
- Other persons handling, applying or administering the chemical;
- The environment,
- Target crops or animals; or
- Trade in an agricultural commodity.

The Authority is also required to be satisfied that the product works effectively against the pests, diseases or conditions claimed on the label. As part of the regulatory process, an assessment of any potential agricultural or veterinary chemical residues within food is conducted.[13]

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12 This section has been adapted from the Office of Gene Technology Regulator, see: http://www.health.gov.au/ogtr/about/index.htm; and the *Handbook on the Regulation of Gene Technology in Australia, A User's guide to the Gene Technology Act 2000 and related legislation*, published by the Office of Gene Technology Regulator.

13 Australian Pesticides and Veterinary Medicines Authority, *Information Sheet - Chemicals and Food Safety*, No Date. See

Food Safety

The safety of GM foods is assessed and regulated by Commonwealth Government agency Food Standards Australia New Zealand (FSANZ), under the direction of the Australia New Zealand Food Regulation Ministerial Council. This council is comprised of Health and Agricultural Ministers from the Commonwealth, each Australian State and Territory, and New Zealand.

The responsibility for demonstrating the safety of any new food lies with the developer of that product. Therefore, when an applicant seeks approval for a new GM food from FSANZ, they must provide the Authority with the evidence that supports the safety of the product. A safety assessment by FSANZ for a GM food compares the molecular, toxicological and nutritional and compositional properties of the food to the non-GM form. The assessment is therefore a comparative analysis using the commonly consumed conventional food as a benchmark for safety.[14] To date, 21 genetically modified foods have been approved for sale in Australia.[15]

3.1 The Labelling of Genetically Modified Foods in Australia

On 28 July 2000 the Australia New Zealand Food Standards Council (ANZFSC – comprising the Health Ministers from the Commonwealth, the States and Territories of Australia, and New Zealand) formally agreed to extend the labelling provisions in Standard A18 to provide mandatory labelling of all genetically modified foods. It was noted that the decision was taken so that consumers could be provided with the information necessary to make informed choices.

From 7 December 2001, the food standard requires the labelling of food and food ingredients where novel DNA and/or novel protein is present in the final food. It also requires labelling of food and ingredients where the food has altered characteristics.
Exempt from these requirements are:

- Highly refined food, such as sugars and oils, where the effect of the refining process is to remove novel genetic material and/or novel protein;
- Processing aids and food additives, except where novel genetic material and/or novel protein is present in the final food. Processing aids are usually pure substances used in processing of raw materials, foods or ingredients, to fulfil a technological purpose during processing. They are normally not present or active in the final food. An example is the use of the enzyme chymosin to curdle milk in the preliminary steps of cheese manufacture. Chymosin is usually neutralised during

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http://www.apvma.gov.au/publications/apvma_information_sheets.shtml, Accessed August 2003. In March 2003 the National Registration Authority for Agricultural and Veterinary Chemicals changed its name to the Australian Pesticides and Veterinary Medicines Authority.

14 Food Standards Australia New Zealand, "Frequently Asked Questions on Genetically Modified Foods." August 2002.

15 Food Standards Australia New Zealand, "Gm Food Passes Labelling Tests" *Media Release*, 1 August 2003.

later stages of cheese manufacture. Food additives are generally pure substances added to foods, usually in very small quantities, to improve taste, appearance, texture, storage life and other qualities. An example is the addition of ascorbic acid (Vitamin C) as an antioxidant in fruit juices;

- Flavors which are present in a concentration less than or equal to 0.1 per cent in the final food; and
- Food prepared at point of sale (eg restaurants, hotels, take-aways).

The new standard allows any one ingredient in a food to contain up to 1 per cent of genetically modified material where its presence is in the ingredient is unintended.[16]

The Food Standards Code makes no mention on the use of negative claims such as 'GM free' and 'non-GM'. However, if a food product contains novel DNA and/or novel protein and a negative claim leads consumers to believe that it does not, a manufacturer may be in breach of the Australian Commonwealth, State and Territory and New Zealand fair trading legislation and food laws.[17]

Food Standards Australia has recently conducted a pilot survey to determine if food manufacturers are labeling GM products correctly. A sample of 51 products from commonly eaten foods containing soy or corn, including: soymilk (12 samples); cornflakes (7); tacos (4); corn chips (13) and bread (15) were tested.

The survey found that all the samples tested complied with the GM labelling standard. From the 51 samples tested, 5 soymilk, 3 taco and 2 corn chip products were found to have small traces of GM material, but well below the 1% unintentional presence permitted without being required to labeled.[18]

4.0 INTERNATIONAL AGREEMENTS AND BARRIERS AFFECTING THE TRADE OF GM FOODS

There are a number of agreements and conventions that influence the pattern of world trade of GM products. Under the World Trade Organisation agreements these include:

- The Agreement on Sanitary and Phytosanitary Measures: this establishes the circumstances under which a country may refuse access to its domestic market on the grounds of risks to the environment and to human and animal health;
- The Agreement on Technical Barriers to Trade: this seeks to ensure that technical

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16 Food Standards Australia New Zealand, *Press Release*, "Labelling Genetically Modified Foods", August 2000.

17 Food Standards Australia New Zealand, "Labelling genetically modified (GM) foods" *Fact Sheet*, August 2003.

18 Food Standards Australia New Zealand, "Gm Food Passes Labelling Tests" *Media Release*, 1 August 2003.

regulations do not create unnecessary obstacles to trade;

- International food safety and labelling standards are based on those developed by the Codex Alimentarius Commission (which is a joint Food and Agriculture Organisation / World Health Organisation undertaking). The Commission was created in 1963 by FAO and WHO to develop and standardise internationally food standards, guidelines and related texts such as codes of practice.

At their most recent meeting in Rome in July 2003, the Codex Alimentarius Commission adopted an agreement on how to assess the risks to consumers from foods derived from biotechnology, including genetically modified foods. The agreement established broad general principles intended to make the analysis and management of risks related to foods derived from biotechnology uniform across the Commission's 169 member countries – the guidelines concern food safety and not environmental risks. Provisions of the agreement include pre-market safety evaluations, product tracing for recall purposes and post-market monitoring.[19]

An international consumer organization, Consumers International, hailed the Codex agreement as a tremendous victory for consumers, and stated: "These documents provide a legal basis under World Trade Organisation rules for the European Union's strong safety regulations for genetically modified organisms." According to Consumers International, significant clauses of the agreement are as follows:

Principles for the Risk Assessment for Foods Derived from Modern Biotechnology
12. A pre-market safety assessment should be undertaken... and be performed on a case-by-case basis.
19. Risk management measures may include, as appropriate, food labelling, conditions for marketing approvals and post-market monitoring.
21. Specific tools may be needed to facilitate... risk management measures. These may include... the tracing of products... (Footnote 9. It is recognised that there are other applications of product tracing. These applications should be consistent with the provisions of the Sanitary and Phytosanitary and Technical Barriers to Trade Agreements.)

Guideline for the Conduct of Food Safety Assessment of Foods Derived from Recombinant-DNA Plants
13. The concept of substantial equivalence is a key step... However it is not a safety assessment in itself; rather it represents the starting point...
14. Unintended effects... may also arise... Safety assessment should... reduce the possibility that a food derived from a recombinant-DNA plant would have an unexpected, adverse effect on human health.
21. The goal of each safety assessment is to provide assurance, in the light of the best available scientific knowledge, that the food does not cause harm when prepared, used and/or eaten according to its intended use. The expected endpoint of such an assessment will be a conclusion regarding whether the new food is as safe as the conventional counterpart taking into account dietary impact of any changes in nutritional content or

19 "Codex Alimentarius Commission adopts more than 50 new food standards; new guidelines on genetically modified and irradiated food." M2 Presswire, 10 July 2003.

value.
36. Information should be provided to ensure that genes' coding for known toxins or anti-nutrients present in the donor organisms are not transferred...
43. The transfer of genes from commonly allergenic foods and from foods known to elicit gluten-sensitive enteropathy in sensitive individuals should be avoided unless it is documented that the transferred gene does not code for an allergen or for a protein involved in gluten-sensitive enteropathy.
58. Antibiotic resistance genes used in food production that encode resistance to clinically used antibiotics should not be present in foods. [20]

4.1 The Cartagena Protocol on Biosafety

The Conference of the Parties to the Convention on Biological Diversity adopted a supplementary agreement to the Convention known as the Cartagena Protocol on Biosafety on 29 January 2000. The Protocol, which took five years of negotiations to develop, seeks to protect biological diversity from the potential risks posed by living modified organisms resulting from modern biotechnology. It establishes a procedure for ensuring that countries are provided with the information necessary to make informed decisions before agreeing to the import of such organisms into their territory. The Protocol also establishes a Biosafety Clearing House to facilitate the exchange of information on living modified organisms and to assist countries in the implementation of the Protocol. A Living Modified Organism (LMO) is defined in the Protocol as any living organism that possesses a novel combination of genetic material obtained through the use of modern biotechnology. In everyday usage LMOs are usually considered to be the same as GMOs (Genetically Modified Organisms). Common LMOs include agricultural crops that have been genetically modified, and include: seeds; fish; trees; animals and agricultural commodities such as grains, soyabeans, canola; corn and rice. However, it does not apply to processed foods derived from LMOs, such as vegetable oils.

The Protocol deals separately with LMOs intended for direct introduction into the environment, (seeds, fish, trees or animals), and LMO commodities such as grains, intended for direct use for food, feed or processing. The key feature of the Protocol is a prior notification and consent regime for trade in LMOs for direct introduction into the environment. This will require exporters to notify an importing country of a first shipment of an LMO of this type. Accompanying the shipments must be documents specifying the identity and characteristics of the LMO, with a declaration that 'the movement is in conformity with the requirements of the Protocol'. The importing country would then make a decision on the import of the LMO on the basis of a science-based assessment of any risk to the environment. The prior notification provisions apply only to a small proportion of traded LMOs. They do not apply to LMO agricultural commodities for food, feed or processing, which make up the bulk of trade in LMOs. However, these shipments will in the interim have to be identified in accompanying documentation with 'may contain' LMOs and 'not intended for intentional introduction to the environment'.[21]

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[20] Media Release, 'New UN standards on GM foods a `victory for consumers', 1 July 2003, See the Consumers International website: http://www.consumersinternational.org/HomePage.asp?regionid=135, Accessed July 2003.

[21] See Australian Department of Foreign Affairs and Trade website, *Cartagena Protocol on*

A Press Release from the United Nations Environment Program noted: "Governments will exchange information through a Biosafety Clearing House and are to base their decisions [on whether to permit an LMO import] on scientifically sound risk assessments. In cases where scientific certainty is lacking due to insufficient scientific information about a LMO's potential adverse effects, a government may take a decision based on a desire to avoid or minimise such potential adverse effects."[22]

The Protocol required 50 member countries to ratify it before it comes into effect. Palau was the 50th country to ratify the Protocol on June 13 2003, and the Protocol comes into effect on 11 September 2003. M. Foster of the Australian Bureau of Agricultural and Resource Economics notes that whether the Protocol results in additional costs to producers is debatable. He also notes that commercial trading activities increasingly require similar documentation as that required by the Protocol. If the Protocol increases costs beyond those commercially incurred, then the impact could be considered as a tax on all grain exports from countries that produce GM crops, and any additional costs would be largely passed on to consumers in the form of higher prices.[23]

In relation to the Cartagena Protocol, the Australian Department of Foreign Affairs and Trade states on its website: "The Australian Government has no timetable for consideration of accession to the Protocol."[24]

5.0 GMO REGULATORY AND LABELLING REGIMES IN OTHER COUNTRIES

There are no distinct international standards for GMOs, countries are assessing their risks on an individual basis and applying a variety of measures. Rules that require labelling of GM products are being put in place in an increasing number of countries. Most of the important grain importing markets now have mandatory labelling regimes including China, the European Union, Japan and the Republic of Korea. However, the nature of these labelling regimes differs significantly between countries, some of the most important of which are explained below. [25]

5.1 United States and Canada

The United States and Canada do not require the labelling of GM foods that have the same properties and characteristics as the conventionally produced counterparts. The US government focuses on the safety of the product rather than the process. By examining the

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Biosafety, http://www.dfat.gov.au/environment/bsp/index.html, Accessed July 2003.

22 United Nations Environment Programme, *Press Release, Treaty on International Trade in GMOs to Become Law. Cartagena Protocol on Biosafety will enter into force in September*. 13 June 2003.

23 Foster, M. *Genetically modified grains. Market implications for Australian grain growers*. ABARE Research Report 01.10, 2001, at 65.

24 See http://www.dfat.gov.au/environment/bsp/index.html, Accessed July 2003.

25 Commonwealth Department of Agriculture, Fisheries and Forests - Australia, *Draft Biotechnology Strategy For Agriculture, Food And Fibre*, September 2002, at 7.

product, the United States Department of Health and Human Services issued regulations in 1992 stating that GM foods did not have to be labeled if the food product had the same characteristics as their non-GM counterparts.[26]

In 1999 the US Food and Drug Administration began a review of the 1992 labeling regulations, as governed by the Federal *Food, Drug, and Cosmetic Act*. In issuing a guidance note in January 2001 the Administration stated:

> The agency received more than 50,000 written comments about its policy regarding safety and labeling of bioengineered foods. The theme related to labeling in those comments and the testimony at the meetings was that there are very strongly held but divergent views as to whether bioengineered foods should be required to bear special labeling. However, there was general agreement that providing more information to consumers about bioengineered foods would be useful.[27]

Nevertheless, the Administration maintained the 1992 labeling regime, and noted:

> The agency is still not aware of any data or other information that would form a basis for concluding that the fact that a food or its ingredients was produced using bioengineering is a material fact that must be disclosed under sections 403(a) and 201(n) of the act [Federal Food, Drug and Cosmetics Act]. FDA is therefore reaffirming its decision to not require special labeling of all bioengineered foods.[28]

However, in issuing the guidelines the FDA emphasised that GM foods need to adhere to labeling laws as per the Federal *Food, Drug, and Cosmetic Act*. Under this Act, the label of the food must reveal all material facts about the food. Thus:

- If a bioengineered food is significantly different from its traditional counterpart such that the common or usual name no longer adequately describes the new food, the name must be changed to describe the difference.
- If a bioengineered food has a significantly different nutritional property, its label must reflect the difference.
- If a new food includes an allergen that consumers would not expect to be present based on the name of the food, the presence of that allergen must be disclosed on

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26 Rousu, M. and Huffman,W. "GM Food Labelling Policies of the US and its Trading Partners." Department of Economics, Iowa State University, September 2001.

27 US Food and Drug Administration, *Guidance for Industry Voluntary Labeling Indicating Whether Foods Have or Have Not Been Developed Using Bioengineering*, January 2001. See http://vm.cfsan.fda.gov/~dms/biolabgu.html, Accessed July 2003.

28 US Food and Drug Administration, *Guidance for Industry Voluntary Labeling Indicating Whether Foods Have or Have Not Been Developed Using Bioengineering*, January 2001. See http://vm.cfsan.fda.gov/~dms/biolabgu.html, Accessed July 2003.

the label. [29]

- Brazil - Labeling requirements set down by Presidential Decree came into force on 1 January 2002. Originally GM labeling was required for all foods intended for human consumption where more than four percent of the ingredients are derived from GMOs. However, the threshold was lowered to 1 percent from June 2003.[30]
- China – In December 2001 China passed new rules to regulate GM foods. Under these rules, production and imports of GM food and food additives are subject to examination and approval. This requires the trading parties to obtain safety certificates, labelling permits and quarantine permits before any foreign GM grain could be brought into China.[31] However, there has been considerable confusion over the import requirements, and the Chinese Government mandated a simpler temporary measure. This temporary measure was originally due to expire in December 2002, was extended to September 2003, and it has been reported that it will be extended to April 2004.[32] The temporary measure provided that interim safety certificates could be issued based on valid safety assessments issued by the relevant authority in the GM product's 'home' country. Safety assessments based on field trials in China are necessary for permanent approval. The regulations for accidental contamination with GM material have not been determined.[33]
- Japan - A finished food must be labeled as "GM ingredient used" or "GM non – segregated" if it contains more than 5% approved GM product by weight. A finished food may be labeled as "non-GM" if it contains less than 5% approved GM product by weight and the vendor can show that its production and processing used an "identity preserved" approach. Reflecting the international focus on food safety, in early July 2003 the Japanese Government established a new Food Safety Council. The Council will take charge of evaluating a wide range of food materials, including genetically modified food.[34]
- Korea - Foods containing soybeans, corn or bean sprouts in the top 5 ingredients by

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29 US Food and Drug Administration, *Guidance for Industry Voluntary Labeling Indicating Whether Foods Have or Have Not Been Developed Using Bioengineering*, January 2001. See http://vm.cfsan.fda.gov/~dms/biolabgu.html, Accessed July 2003.

30 Foster, M., Berry, P. and Hogan, J. *Market Access Issues for GM Products, Implications for Australia*. ABARE report prepared for the Department of Agriculture, Fisheries and Forestry – Australia, July 2003. ABARE eReport 03.13, at 4.

31 Western Australia Department of Agriculture, *Assessment of the International Trade for Genetically Modified Canola*, March 2003, at 33.

32 "China may extend GMO interim rules to April – source." *World Environment News*, Reuters News Service, 12 March 2003.

33 Foster, M., Berry, P. and Hogan, J. *Market Access Issues for GM Products, Implications for Australia*. ABARE report prepared for the Department of Agriculture, Fisheries and Forestry – Australia, July 2003. ABARE eReport 03.13, at 4.

34 "Japan sets up new council for food safety." *Xinhua News Agency*, 1 July 2003.

weight must be labeled as "containing GM" if the level of one of these ingredients is greater than 3% by weight in the final food. The Republic of Korea is essentially a non-GM market as retailers avoid placing 'GM' labels with soybean and maize products on store shelves to avoid consumer reaction.[35]

- Taiwan - A finished food must be labeled as "GM" or "containing GM" if it contains greater than 5% approved GM product by weight.[36]

5.2 European Union

Foster *et al* note that the influence of the European Union on the worldwide adoption and acceptance of GM crops is pivotal. This is for two reasons. Firstly, EU human health and environmental safety concerns over GM products seem to spill over to influence attitudes in other countries, particularly poorer countries that do not have the resources to carry out their own safety assessments of GM crops. Secondly, countries with EU markets need to meet EU import standards, which as described below, are restrictive.[37] A detailed review of the EU regulatory environment is therefore required.

European Community legislation on GMOs has been in place since the early 1990s, and the regulatory framework has been further extended and refined, with the most recent amendments in July 2003. The EU now has amongst the most stringent and wide ranging regulations on GM food in the world. This has been described as a reaction to the incidences of mad cow and foot and mouth disease, which has damaged consumer confidence in government regulatory agencies and agribusiness groups.[38]

The main legislation dealing with the deliberate release of GMOs is Directive 2001/18/EC of the European Parliament and Council, effective from 17 October 2002. This Directive puts in place a step-by-step approval process on a case-by-case assessment of the risks to human health and the environment before any GMO or product consisting of or containing GMOs can be released into the environment or placed on the market. The Directive introduces:

- Principles for the environmental risk assessment;
- Mandatory post-market monitoring requirements, including on long-term effects

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35 Foster, M., Berry, P. and Hogan, J. *Market Access Issues for GM Products, Implications for Australia*. ABARE report prepared for the Department of Agriculture, Fisheries and Forestry – Australia, July 2003. ABARE eReport 03.13, at 12.

36 Commonwealth Department of Agriculture, Fisheries and Forests - Australia, *Draft Biotechnology Strategy For Agriculture, Food And Fibre*, September 2002, at 7.

37 Foster, M., Berry, P. and Hogan, J. *Market Access Issues for GM Products, Implications for Australia*. ABARE report prepared for the Department of Agriculture, Fisheries and Forestry – Australia, July 2003. ABARE eReport 03.13, at 3.

38 Foster, M., Berry, P. and Hogan, J. *Market Access Issues for GM Products, Implications for Australia*. ABARE report prepared for the Department of Agriculture, Fisheries and Forestry – Australia, July 2003. ABARE eReport 03.13, at 35.

associated with the interaction with other GMOs and the environment;
- Mandatory information to the public;
- A requirement for Member States to ensure labelling and traceability at all stages of placing on the market;
- First approvals for the release of GMOs to be limited to a maximum of ten years;
- The consultation of the Scientific Community to be obligatory;
- An obligation to consult the European Parliament on decisions to authorise the release of GMOs; and
- The possibility for Council of Ministers to adopt or reject a Commission proposal for authorisation of a GMO by a qualified majority.[39]

Under Directive 2001/18/EC, a company intending to market a GMO must first submit an application to the national authority of the Member State where the product is to be first placed on the market. This application must include a full environmental risk assessment. If the national authority gives a favourable opinion on the placing on the market of the GMO concerned, this Member State informs the other Member States via the European Commission. If there are no objections, the authority that carried out the original evaluation grants the consent for placing the product on the market. The product may then be placed on the market throughout the European Union.

However, if objections are raised and maintained, a decision has to be taken at Community level. The Commission firsts asks for the opinion of its Scientific Committees. If this opinion is favourable, the Commission then proposes a draft Decision of the Regulatory Committee composed of Member States. If the Regulatory Committee agrees, the Commission adopts the decision. If the draft is not adopted, the draft is submitted to the Council of Ministers for adoption by qualified majority or rejection.

Since the original Directive in October 1991, the commercial release of 18 GMOs have been authorised in the EU, mostly by a Commission Decision following a qualified majority vote in the Regulatory Committee. However, since October 1998, no further authorisations have been granted, which left 13 applications pending at the time of its repeal.

Since 1997 labelling to indicate the presence of GMOs as such or in a product was mandatory. In January 2000 the Commission adopted another regulation ensuring that additives and flavourings were also labelled if they contain DNA or protein of GMO origin is present in the final product. Also in 2000, a regulation was passed which limited presence of GM material in conventional food to one percent, below which labelling is not required.

On 25 July 2001 the European Commission adopted two legislative proposals on GMOs, which targeted traceability, reinforced the labelling regime and introduced the labelling of

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39 European Commission, "Question and Answers on the regulation of GMOs in the EU." Memo/02/160 –Rev, Brussels, 1 July 2003, see: http://europa.eu.int/comm/dgs/health_consumer/library/press/press298_en.pdf, Accessed July 2003.

GM feed. These proposals were formally adopted by the European Council of Ministers on 22 July 2003, and have the following effects:

- GM Food – the new laws will extend the current labelling requirements to cover all foods produced from GMOs, irrespective of whether there is DNA or protein of GM origin in the final product. For example, maize oil produced from GM maize, previously not required to be labelled, will now need to be. Food manufactured with ingredients that have been produced from GMOs, for example biscuits with maize oil produced from GM maize will have to be labeled. The GM material in conventional food does not have to be labelled if it can be shown to be adventitious and technically unavoidable, with the threshold reduced to 0.9 percent (from 1.0 percent).
- GM Feed – the regulation introduced for the first time comprehensive labelling requirements for GM feed based on the same principles as for GM food.
- Traceability Requirements – this new regulation requires business operators when using or handling GM products to transmit and retain information at each stage of production. Information concerning the presence of GMOs in products must be transmitted throughout the commercial food chain and must be retained for five years. The industry will have to ensure that systems are in place to identify to whom and from where GM products are made available.
- Authorisation Procedures – these were streamlined to establish a 'one door one key' procedure the scientific assessment and authorisation of GMOs and GM food and feed, where the operator is able to file a single application. The newly established European Food Safety Authority will carry out the scientific risk assessment. On the basis of the Authority's opinion, the Commission will draft a proposal for granting or refusing authorisation, which will be approved through a qualified majority of Member States within the Regulatory Committee (ie, as per previous arrangements).[40]
- Co-existence – measures to ensure the production of organic and conventional crops can co-exist with GM crops were introduced, allowing Member States to take appropriate measures to avoid cross contamination. Guidelines promoting such measures were identified as:
    - On farm measures such as isolation distances, buffer zones, and pollen barriers;
    - Co-operation between neighbouring farms, including monitoring and notification schemes, farmer training and advisory services;
    - Cross contamination measures of a regional scale (ie, GM free regions) could also be considered if they are proportioned and if sufficient levels of purity cannot be achieved by other means.[41]

In a statement about the revised legislative framework, the European Commission Health

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40 European Commission, *Media Release*, 'European legislative framework for GMOs is now in place.' Brussels, 22 July 2003.

41 European Commission, *Media Release*, 'GMOs: Commission publishes recommendations to ensure co-existence of GM and non-GM crops.' Brussels, 23 July 2003.

and Consumer Protection Commissioner David Byrne said: "European consumers can now have confidence that any GM food or feed marketed in Europe has been subject to the most rigorous pre-marketing assessment in the world. Consumers will also have a clear choice of products to buy as GM food will now be clearly labelled. For the first time farmers will see labels on GM-feed. Europe will now have a comprehensive and transparent system of authorisation and labelling that can only enhance business and consumer confidence."[42]

On 13 May 2003 the United States announced their intention to request World Trade Organisation consultations on the European Union's authorisation system for genetically modified organisms. The United States was joined by Argentina and Canada, with Australia, Chile, Colombia, El Salvador, Honduras, Mexico, New Zealand, Peru and Uruguay joined as third parties. United States corn farmers have argued that they are losing about $300 million in sales to the European Union each year because of the effective moratorium since 1998. President George W. Bush is reported to have said: "Acting on unfounded, unscientific fears, many European governments have blocked the import of all new biotech crops. Because of these artificial obstacles, many African nations avoid investing in biotechnology, [and receiving United States food aid which contains GM material] worried that their products will be shut out of important European markets."[43]

However, with the adoption of the European Union regulations on 22 July 2003, as described above, it is not clear whether the United States will persist in the World Trade Organisation complaint.[44] The United States Department of State had this comment about the new European regulations:

> The United States believes that the objective of any regulation should be to protect consumer health and safety while maximizing informed consumer choice. We agree that consumers should have information about the products they purchase so they can make choices. That is what the United States has done for years, but this information should be non-prejudicial in presentation and feasible for producers to provide. We are concerned that the regulations that the European Parliament approved do not meet this standard. The European Union's practice may lead other countries to block trade by imposing similar needlessly burdensome labeling, traceability and documentation requirements, and thus could prompt a host of new, non-tariff barriers just when we are trying to stimulate global trade. We have conveyed our concerns to the European Union and hope they will modify their proposal before adoption. If and when these regulations are adopted, we will examine them in light of the European Union's World Trade Organization obligations.
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> The European Union's five year moratorium on new biotech approvals is not based on scientific analysis, it blocks consumer choice, and jeopardizes the benefits

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42 European Commission, *Media Release*, 'European legislative framework for GMOs is now in place.' Brussels, 22 July 2003.

43 "Bush urges Europe drop resistance to biotech foods." In *World Environment News*, Reuters News Service, 24 June 2003.

44 "EU passes GM labelling laws, US unimpressed." In *World Environment News*, Reuters News Service, 3 July 2003.

> biotechnology offers to the environment and to feeding the world's hungry. It conflicts with the analysis of six national academies of science, including the French Academy of Science and Medicine; and over 3,200 scientists, including 20 Nobel Laureates. We urge the European Union to lift this moratorium immediately.[45]

5.3 The Labelling of Livestock Reared on GM Feed

Currently no country mandates labeling of livestock product produced using GM materials although the European Union was considering this at one stage, but rejected it. However, a number of large supermarket chains in Europe require their suppliers of food animal products, such as meat, milk and eggs, not to use GM feedstuffs. Many animal products in Europe are labeled as being produced from only non-GM feedstuffs. In Australia, the beef industry is largely based on grass fed animals, but substantial quantities of grain are used in feedlots or to finish grass fed cattle for the market. Supplementary grain feeding of dairy cattle is also increasingly common. However, there is anecdotal evidence that some buyers of Australian livestock products are seeking assurances that GM feedstuffs have not been used in the production process.[46]

5.4 Conclusion

It is evident that the GM regulatory environment worldwide is in a state of change and evolution. Foster *et al* note that key developments to watch for with both import restrictions and labeling requirements are tolerances specified by governments for adventitious presence of GM material – zero or very low tolerances would make it difficult, if not impossible, to operate a mixed production system of GM and non-GM crops in a way that enable the diverse range of consumer requirements to be met. Other key developments are whether GM labeling is required with animal feeds or with products where the modified DNA or protein is detectable, such as oils – both these actions would substantially increase the amounts of grain products that would require labeling.[47]

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45 United States Department of State, Office of the Spokesman, *EU: European Parliament Legislation on Biotech Food*, July 3 2003. See http://www.state.gov/r/pa/prs/ps/2003/22236.htm, Accessed August 2003.

46 Foster, M., Berry, P. and Hogan, J. *Market Access Issues for GM Products, Implications for Australia*. ABARE report prepared for the Department of Agriculture, Fisheries and Forestry – Australia, July 2003. ABARE eReport 03.13, at 16.

47 Foster, M., Berry, P. and Hogan, J. *Market Access Issues for GM Products, Implications for Australia*. ABARE report prepared for the Department of Agriculture, Fisheries and Forestry – Australia, July 2003. ABARE eReport 03.13, at 18.

6.0 PUBLIC ATTITUDES TO GM FOODS

Public attitudes to GM foods are important because they strongly influence the regulatory regime. Stone *et al* have noted that consumer attitudes towards GM products vary significantly between regions, and that attitudes are influenced by several factors:

- Information available to consumers about GM food, which is likely to vary with health and environmental safety concerns and community understanding of the technology;
- Consumer choice concerns;
- Consumer confidence in food safety authorities; and
- Income levels.[48]

The Commonwealth Government Agency Biotechnology Australia has commissioned regular surveys on public attitudes towards genetically modified crops. A survey in 2001 noted that there is a potential relationship between the perceived benefits of an application and its acceptance - the more perceived benefits the more likely the application is likely to be accepted.[49] A yearly GMO public attitudes survey, commissioned by Biotechnology Australia since 2001, found the following in May 2003:

In regard to the risks of genetically modified food and crops outweighing the benefits:

- 54% believe risks are higher than benefits (compared with 51% in 2002 and 49% in 2001);
- 27% believe that the benefits are higher than the risks (32% in 2002, 20% in 2001);
- 19% are uncertain (17% in 2002, 31% in 2001).

The results demonstrate the high level of public uncertainty about the technology, 31 percent were unsure in 2001, reduced to 19 percent in 2003. The percentage of respondents believing the risks are higher than benefits has increased each year, whilst those who believe the benefits are higher than the risks has varied dramatically from 20 percent in 2001, up to 32 percent in 2002, and down to 27 percent in 2003.

The survey also sought the key benefits and risks of GM foods, with the highest perceived benefits as follows:

- More efficient use of agricultural land – 55%;
- Decreased use of pesticides and chemicals – 54%;
- Higher crop yields resulting in less expensive food – 44%;
- Improved nutritional value of food – 41%.

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48 Stone,S. Matysek, A. and Dolling, A. *Modelling Possible Impacts of GM Crops on Australian Trade*. Productivity Commission Staff Research Paper, October 2002, at 23.

49 Biotechnology Australia, *Biotechnology Public Awareness Survey Final Report*, July 2001, at 15. Research conducted by Millward Brown Australia.

In comparison, the highest perceived risks were:

- Potential allergens in food – 65%;
- Multinational control of food supply – 59%;
- Unknown long term environmental effects – 55%;
- Unknown long-term health effects – 45%.

The survey found that overall 90% of respondents felt that biotechnology would be important to the nation's future and 86% felt that Australia should be actively involved in biotechnology developments if it would lead to improved standards of living.[50]

The Queensland State Government (Department of Primary Industries) surveyed attitudes of Queensland consumers to a range of GM food issues in May 2000 and again in May 2002. The results showed that of six food purchase decision factors:

- only 9% of respondents rated 'not genetically modified' as the most important in 2000 and this reduced to 5% in 2002 - on a par with environment (9 and 7%) and organics (4 and 5%);
- 'Produced in Australia' (33 and 34%), 'price' (24 and 26%) and 'health benefits' (21 and 22%) were seen as the most important of the six attributes provided;
- When asked how important different factors are in deciding to buy GM food: 'major health benefits', 'good for the environment' and 'better taste' were seen as the most important;
- 'Price' and 'appearance' were less important factors in deciding to buy GM food, as was 'slight health benefits' and 'a well known brand' but these last two increased in importance from 2000 to 2002;
- Those surveyed showed a level of confusion about the meaning of the term 'Genetically Modified Food' with a range of answers given and 10 per cent of consumers not having heard of the term.[51]

The review by the Queensland Department of Primary Industries noted that consumer related benefits affect the acceptability of GM products. The benefits include factors such as price, quality and purity. Other factors such as product availability, advertising and convenience also affect consumer behaviour toward a product. However, the benefits a consumer associates with these attributes does not appear to be the main drivers of GM consumption, and it was identified that this may be due to risk issues. When confronted with risk, people behave differently. Each individual places their own degree of importance on food product attribute and each consumer exercises a product attribute trade-off with respect to risk. A range of risk triggers can deter acceptance of food products. This risk/benefit analysis is one of the major keys to understanding what drives consumer behaviour. In assessing consequences, consumers appraise unknown future risks against

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50 "Slight rise in concerns about GM foods and crops" *Media Backgrounder*, Biotechnology Australia, 17 June 2003.

51 Queensland Department of Primary Industries, Drivers of Consumer Behaviour, http://www.dpi.qld.gov.au/businessservices/11429.html, Accessed July 2003.

current benefits.[52]

The Queensland Department of Primary Industries report concluded:

- Where the risks of negative effects from genetically modified (GM) food technology offset closely held beliefs, consumers are likely to react negatively to positive information supplied about GM food;
- Where consumers are largely uncertain about biotechnology, and where GM foods may have negative associations, addressing the concerns directly is essential;
- Mandatory labelling is strongly favoured by all consumers but labels need to be clear and unambiguous. However, there is no guarantee consumers will read them or react favourably to the information provided;
- There may be many benefits of GM products such as price and health. However, consumers want the power of choice. Separate supply chains may be required to provide this choice. This is at the centre of the debate on GM free zones and GM and non-GM product differentiation;
- A number of companies and countries have already positioned themselves as GM free zones. However, the effectiveness of this approach and the economic advantages and unforeseen consequences of restricting trade are yet unknown;
- It is becoming increasingly important to consider the effects on trade access when devising policies to handle GM food issues;
- For industries willing to accept risks involved, there may be substantial rewards for positioning themselves as pioneers, taking first mover advantage either as GM or non-GM providers.[53]

Stone *et al* in a review of the literature concluded that consumer surveys indicate that:

- There is greater acceptance of GM food technology where it is used specifically to improve foods;
- Consumer resistance is lower where a direct benefit from consumption is easily identifiable; and
- There is considerable variance in consumer responses to several GM food issues, both through time and between countries. For instance:
    - US consumers have the most relaxed views about the use of biotechnology in food production, and this attitude has been consistent over time;
    - European consumers are more cautious about GM food, and this caution has been strengthening over time; and
    - Australian consumers' attitudes to GM food fall between attitudes held by

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52 Queensland Department of Primary Industries, Drivers of Consumer Behaviour, http://www.dpi.qld.gov.au/businessservices/11429.html, Accessed July 2003. See also the work of Wansink, B. & Kim, J. (2001). The marketing battle over genetically modified foods: False assumptions about consumer behaviour. *American Behavioural Scientist,* vol 44,1405-1417. and Nelson, C. H. (2001). Risk perception, behaviour, and consumer response to genetically modified organisms: toward understanding American and European public reaction. *The American Behavioral Scientist,*Vol. 44, Issue 8, 1371-1388.

53 Queensland Department of Primary Industries, Drivers of Consumer Behaviour, http://www.dpi.qld.gov.au/businessservices/11429.html, Accessed July 2003.

US and European consumers, with resistance appearing to decline over time.[54]

7.0 SHOULD AUSTRALIA GROW GM FOOD CROPS?

An analysis of whether GM food crops should be commercially grown produces a complex matrix of parameters that need to be assessed. The assessment of environmental and public safety issues is conducted by the Office of Gene Technology Regulator, which means that once approved for release, the uptake of the GM technology is a commercial decision. Whilst this reduces the number of parameters that need to be assessed before a decision is made on whether to grow a GM food crop, the commercial analysis of such a decision is also fraught with difficulty.

The Primary Industries Ministerial Council determined on 7 May 2002 that risks to agricultural production and trade due to the production of GM foods should be self-regulated by industry supplemented by government monitoring. The industry response is one of promoting co-existence, and the Gene Technology Grains Committee is developing guidelines to assist industry to implement a policy of co-existence of GM, conventional and organic crops.[55]

Indeed, the Gene Technology Grains Committee notes that the grains industry seeks to enable coexistence of different production systems and supply chains so that they can operate together in a responsible, harmonised, profitable and sustainable manner, as well as being responsive to changing market, environmental, agronomic and technological requirements. The Grains Committee notes that participants in different parts of the supply chain will face different market requirement due to varying levels of consumer acceptance and regulatory requirements of GM technology, but noted: "In the long term, products with novel traits (including GM) are expected to be in demand by consumers and, as such, Australia must have the capacity to successfully realise these opportunities."[56] To achieve this, the development of identity preservation and segregation of GM and non-GM crops is required.

7.1 IDENTITY PRESERVATION AND SEGREGATION

The overall trend in regard to food safety is toward greater disclosure of: sources; methods of production; and the content of processed foods. The increasingly global nature of the food supply chain has put pressure on governments to enhance and harmonise food safety standards. Issues such as foot and mouth disease, bovine spongiform encephalopathy (BSE – mad cow disease) and hormone injected beef have raised the level of concern about food safety in many countries, and increased the demand for greater traceability in the food

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54 Stone,S. Matysek, A. and Dolling, A. *Modelling Possible Impacts of GM Crops on Australian Trade*. Productivity Commission Staff Research Paper, October 2002, at 29.

55 Commonwealth Department of Agriculture, Fisheries and Forests - Australia, *Draft Biotechnology Strategy For Agriculture, Food And Fibre*, September 2002, at 5.

56 Gene Technology Grains Committee, *A Strategic Framework for Maintaining Coexistence of supply chains – Draft for Discussion*, 31 July 2002, at 3.

chain.[57] The result is greater reliance on 'traceability' – the ability to determine what parts of the food supply chain have come from where. Traceability generally takes the form of segregation or identity preservation. Segregation systems generally deal with segregating one crop from another and tend not to involve high levels of precision. Identity preservation systems require documentation to guarantee certain traits or qualities are maintained throughout the supply chain. These standards are more rigorous and costly to apply.[58]

The cost of an identity preservation system is relative to the complexity and number of actions in the chain to meet the information and physical segregation requirements. A key factor influencing the complexity of the identity preservation requirements is the tolerance level for 'contamination' or 'unintended presence'. Current identity preservation / segregation systems in the United States are increasing costs by 10 – 15% through the production and supply chain, equating to A$25–$35/t for bulk commodities such as grains.[59]

The Australian grain industry has developed a draft strategic framework under which the initiative of crop coexistence can be developed. The *Strategic Framework for Achieving Coexistence* aims to meet the following objectives:

- To enable each grain supply chain participant to competitively meet the requirements of their chosen market, recognising that these requirements will ultimately be determined by consumer preference and regulatory requirements;
- To enable the release of genetically modified crops into the environment in a manner that maintains or enhances the natural resource base and minimises the offsite impacts of agricultural and related activities;
- To enable producers to utilise technologies most appropriate to the chosen farming system;
- To enable the incorporation of genetically modified crops into individual farming systems using crop management techniques that maximise the effective life of the technology.[60]

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57 Stone,S. Matysek, A. and Dolling, A. *Modelling Possible Impacts of GM Crops on Australian Trade*. Productivity Commission Staff Research Paper, October 2002, at 32.

58 Stone,S. Matysek, A. and Dolling, A. *Modelling Possible Impacts of GM Crops on Australian Trade*. Productivity Commission Staff Research Paper, October 2002, at 32.

59 Leading Dog Consulting and Peter Flottman and Associates, *Segregating Gene Technology Products – Requirements, Costs and Benefits of Identity Preservation, Segregation and Certification*. Prepared for Agriculture, Fisheries and Forestry – Australia, May 2001, at 3. Whilst farmer adoption levels of GM corn and soybean are high in the United States, slightly less than 10 percent is currently segregated.

60 Gene Technology Grains Committee, *A Strategic Framework for Maintaining Coexistence of supply chains – Draft for Discussion*, 31 July 2002, at 1.

Industry initiatives for the development of a coexistence framework will be with the following principles:

- Transparency and consultation;
- Freedom of choice: whereby producers are able to choose the production system that they implement, and the supply chain in which they operate, and consumers and purchasers along the supply chain have access to their preferred product;
- Reasonable measures: whereby measures implemented: are based on customer and regulatory requirements; are flexible, practical and cost effective; are science based and supported by risk assessment; and incorporate and reference relevant industry, government, regulatory and research initiatives;
- Responsibility to act: whereby participants in one supply chain are responsible for implementing measures that prevent their activities from unduly interfering in the operation of another supply chain;
- Monitoring and review;
- Case-by case planning: whereby plans are developed that address identified risks associated with the introduction of crops into a particular grains industry sector, these plans will incorporate, as required, the following elements:
    - Government, industry or co-regulatory standards;
    - Management plans that incorporate risk management strategies;
    - Systems that provide for traceability or identity preservation;
    - Sampling and testing regimes;
    - Market dynamics;
    - Remedial actions; and
    - Education of supply chain participants.

There is considerable debate within the agricultural industry whether identity preservation / segregation will work in practice. In a public policy position paper, Australian grains marketer AWB Limited noted a contamination episode in February 2003, where Australian wheat bound for Colombia was contaminated with GM maize that had been recently imported from the United States. AWB noted that this contamination brought into focus the impact of the commercialisation of GM varieties of grain in the Australian market and the potentially negative impact this may have on AWB's ability to conduct its wheat export program. It then noted:

> AWB is not anti-GM. We believe that there may be potential benefits to consumers and farmers from this technology and we support the ongoing research and development in this area.
>
> However, AWB also recognises that many consumers, both domestic and international, currently have concerns relating to the commercialisation and subsequent sale and consumption of product made with this technology.
>
> This concern is also being expressed to AWB by its customers who are becoming increasingly wary of potential contamination from grain produced with GM technology. Subsequently, they are requiring documented evidence of the nature of the product being shipped and its "GM free" status.
>
> Therefore, AWB needs an "iron clad" guarantee that the handling of this grain, and the

> protocols which govern it, are sufficiently rigorous to ensure that contamination of wheat destined for export does not occur.
>
> We acknowledge that the current "Canola Industry Stewardship Protocols" is only in draft form and we are actively involved in working with the Gene Technology Grains Committee in this process….
>
> The Grains Council of Australia has also indicated that any protocols must up-hold the "co-existence" principle. …
>
> This is what we want the protocols to achieve. Unfortunately, in their current form, they do not.
>
> The scientific analysis of these products to ensure their human and environmental safety is obviously of paramount importance. However, we believe that it is equally important to assess the impact on the industry's continued ability to conduct its export marketing program and the ability of the supply chain to ensure no contamination occurs.
>
> This is a $4 billion dollar wheat industry and, as a nation, we cannot put this at risk.
>
> **Recommendation**
>
> AWB does not believe that it would be prudent for policy makers to allow the commercial release of GM canola at this point in time.[61]

It is clear that the segregation and identity preservation of GM and non-GM crops in Australia will result in significant changes to the current operating standards in the food and fibre industries. Writing on the outlook for grains to 2006-07 in *Australian Commodities*, Connell *et al* noted: "What has been shown from the US experience is that it is costly to establish testing procedures to determine the presence or otherwise of genetically modified varieties (identity preservation), and then to maintain a segregation system through the marketing chain (product integrity) to guarantee supply against buyer requirements. Premiums do not appear to have been established in the market place as yet to justify the large scale adoption of such testing procedures."[62]

However, it is also clear that an identity preservation / segregation system that fails can also be extremely costly. For example, in the United States Starlink corn is an insect resistant variety of GM corn that was released only for animal feed. It was not registered for human consumption due to a chemical it contains that has similarities to a known allergen. However, in September 2000 testing of corn taco shells by Friends of the Earth in Washington D.C. found traces of the Starlink corn, and a product recall commenced. It

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61 AWB Limited, *Public Policy Papers – GM Canola Release*, See http://www.awb.com.au/AWB/user/publicPolicy/pp_gm_canola_policy.asp, Accessed August 2003.

62 Connell, P., Barrett, D. and Andrews, N. "Grains. Outlook to 2006-07." *Australian Commodities*, Vol 9, No 1, March quarter 2002, at 40.

became apparent that the Starlink corn had become mixed throughout the food chain, and it was reported that more than 28,000 truckloads, 15,000 rail cars and 285 barges of corn tested positive for Starlink.[63] Aventis, the company that developed the Starlink crop, estimated its costs to buy back Starlink corn from farmers to exclude further contamination at around $100 million. United States corn exports to Japan were affected, and testing and identity preservation procedures to ensure US corn exports do not contain Starlink are adding an estimated US$3-7 a tonne to the cost of shipping US corn to Japan.[64] In February this year it was reported that farmers, who did not grow Starlink corn and claimed to have suffered financially from a drop in corn prices due to the Starlink contamination, reached a US$110 million settlement in a class action lawsuit.[65]

Peter Portmann of the Grain Pool of Western Australia has outlined three possible solutions to the introduction of GM crop technology: passive mode; resistance mode; and insurance mode. He defines the passive mode as adopting the attitude that the production of GM crops does not matter – the market will sort itself out and that GM crops will be saleable. However, the risk is that the industry, particularly producers, could seriously suffer if present consumer attitudes dominate long term outcomes.

The resistance mode is to oppose the release of GM crops until the market settles down and it becomes evident how consumers are going to respond and what the price signals are. Portmann also considers this option to be risky. The insurance mode is that whilst not resisting the release of GM crops, strategies could be implemented to manage their introduction to maximise future options. Strategies identified included:

- To restrict the release of GM crop to quality assured growers (at least in the first instance) to provide confidence in on-farm and delivery management of identity preservation by growers and to provide adequate control over GM grain;
- To rationalise receival points for GM and non-GM crops, with initially most product being non-GM and then reallocating to GM as dictated by market demand;
- To implement a strong identity preservation system from receival point to port and / or customer;
- To implement pre-delivery GM testing of crop at the delivery point;
- To implement the capacity for retrospective load by load checking non-GM crop;
- To ensure a strong legal basis for penalising growers who misclassify grain on delivery; and
- To confirm agreement by markets of their adoption of practical levels of tolerance to GM contamination in non-GM grains.

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63 Bucchini,L. and Goldman, L. "Starlink Corn: A Risk Analysis." In *Environmental Health Perspectives*, January 2002, Vol 110, No 1, at 11.

64 Foster, M. *Genetically modified grains. Market implications for Australian grain growers*. ABARE Research Report 01.10, 2001, at 28.

65 "Farmers in $110 million StarLink deal – Lawyers." *World Environment News*, 10 February 2003.

The risk identified in working in the insurance mode is what happens if the system fails, and the industry moves beyond the point of no return to GM-free in a hostile consumer market? Portmann concludes that the issue of how best to market GM crops will remain complex until: market signals provide clearer pictures of what consumers are prepared to pay for non-GM compared to GM crops; and the benefits and costs of the technology become more understood. In the meantime, the Grain Pool of WA is operating in the 'insurance mode'.[66]

8.0 CASE STUDIES

8.1 Canola

Since the introduction of canola into Australia over 20 years ago, it has become the third largest oilseed field crop, and is one of four major winter crops. The area of canola harvested has increased from around 400,000 ha in the mid-1990s, to 1.9 million ha in 1999-2000, producing 2.4 million tonnes of canola. Western Australia and NSW have experienced the most rapid growth of canola production.[67] Canola is the third most field trialed GM crop after corn and potatoes. Genetic modification of canola has focussed on herbicide tolerance and product quality. At the field trial stage in Australia, GM canola is the most trialed crop, behind cotton. Genetic modification for herbicide resistance, fungal resistance, and oil and nutritional quality characteristics are being sought.[68]

In Australia on 25th July 2003 the Office of the Gene Technology Regulator approved the commercial release of Bayer CropScience's InVigor® hybrid canola. InVigor® canola has been genetically modified to contain two new characteristics – a hybrid breeding system and tolerance to the herbicide glufosinate ammonium. The InVigor® hybrid canola is intended to be used as oil in human food, or in animal feed, in the same way as conventional (non-GM) canola. Following extensive assessment, the Gene Technology Regulator concluded that the GM canola is as safe to humans and the environment as non-GM canola. The reasons for the Regulator's conclusion from its evaluation included:

- InVigor® hybrid canola is no more toxic or allergenic than non-GM canola;
- InVigor® hybrid canola will not become any more of a weed than non-GM canola and can be effectively managed with the wide range of herbicides already used to control non-GM plants and weeds; and
- InVigor® hybrid canola will only cross with a small group of related plant species at a *very low level* and which would not cause a weed problem.[69]

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66 Portmann, P. and Tucek, M. "Marketing GM Crops. Market issues facing Australia if it moves into GM crops" in *Outlook 2001, Agriculture and Regional Australia, Proceedings of the National Outlook Conference* 27 February – 1 March 2001, at 195.

67 Parkinson, A. and Hindmarsh,R. "Farmers reject GM canola." In *Australasian Science*, Vol 24, No 6, July 2003, at 20.

68 Foster, M. *Genetically Modified Grains. Implications for Australian grain growers*. ABARE, 2001, at 51.

69 Office of Gene Technology Regulator, *Media Release*, *Rigorous Assessment Confirms Gm Invigor® Canola Safe As Non-Gm Canola*, 25 July 2003. http://www.health.gov.au/ogtr/rtf/media/canola2.rtf

Presently, Canada is the only producer of GM canola, apart from small quantities produced in the United States. Canada has around 41 percent of world canola trade, Australia around 13 percent, and the European Union 38 percent. The main export destinations for unprocessed Canadian canola are Japan, Mexico, United States and China. The bulk of Canadian canola oil and meal go to the United States, with smaller markets in Japan, Korea, Hong Kong and China. The destinations for Australian exports of canola are similar to those for Canadian canola, except that Australia has the ability to export to the European Union.[70]

Currently the world canola grain market is described as being in turmoil due to extremely low production worldwide and deteriorating stocks. The GM status of canola grain has therefore not been an issue. The majority of Australian exporters have reported that most importers overseas are not paying premiums for non-GM canola. It has been suggested that one reason for the lack of price premiums between GM and non-GM canola could be that canola oil contains no genetic material regardless of whether it is sourced from conventional or GM canola grain. However, in 2001, the European Union, following its poor 2000 canola crop, was paying market premiums of up to A$12 - $14 per tonne for Australian non-GM canola.[71]

The Canadian canola industry, in a survey of 650 growers and 13 case studies using information from 1997 to 2000, found that GM canola crops were obtaining a 10 percent yield above that of conventional canola grown. The study concluded that GM canola was providing Canadian farmers with an increase in net return of A$38.25 per ha compared to conventional canola, and the following additional cost advantages in 2000 were found:

- 40 percent lower herbicide costs or A$22.25 per ha cost saving; and
- Required less tillage and less fuel – 31.2 million litres of diesel fuel reduction, equating to A$12.60 per ha in fuel consumption.[72]

However, other studies have proved less positive, with a study by Fulton and Keyowski finding that whilst Roundup Ready canola offered lower input costs of around US$5.00 per acre compared to conventional varieties, it was also associated with lower yields of around 7.5 percent. However, the authors emphasised that yield differences for GM canola vary from farm to farm due to farm size, product specialisation, geographical location and farm management skill.[73]

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70 Foster, M. *Genetically Modified Grains. Implications for Australian grain growers*. ABARE, 2001, at 53.

71 Western Australia Department of Agriculture, *Assessment of the International Trade for Genetically Modified Canola*, March 2003, at 24.

72 Canola Council of Canada, *An Agronomic and Economic Assessment of Transgenic Canola*, January 2001. See http://www.canola-council.org/production/gmo_toc.html, Accessed August 2003. Australian dollar calculations as from Western Australia Department of Agriculture, *Assessment of the International Trade for Genetically Modified Canola*, March 2003, at 25.

73 Fulton, M. and Keyowski, L. "The Producer Benefits of Herbicide Resistant Canola."

An analysis of the world canola market by the Victorian Department of Primary Industries concluded:

- Questions regarding the GM status of canola are common from customers in Japan, China and Europe**;**
- There are no premiums for 'cargo' or bulk non-GM canola shipments. This accounts for most of the international trade in canola - 83% in 2001/02.
- Some premiums exist for container trade of non-GM canola. Premiums for the seed are in the order of US$5-10 and a small premium exists for the oil. The market is mostly Japan and the size is still around 40,000-50,000 tonnes, with Victoria sending an estimated maximum of 37,000 tonnes to this non-GM market in 2001/02.
- The existence of GM canola is having a significant impact on world trade. Market entry is being made more difficult by China and Europe, as evidenced by import restrictions and GM tolerance levels in these two markets respectively. The European market is important to Victoria and Australia in some years. China is a vital market with evolving import regulations, considered by the trade to be 'non-tariff barriers'.
- The Canadian industry is committed to production and marketing of GM canola. The industry is undertaking little segregation and has maintained access to Japanese markets through formal approval and continued government and industry consultation and liaison.[74]

Foster of ABARE used the AGLINK model of world agricultural trade to assess the market implications of wide scale adoption of GM canola in Australia. Two scenarios were assessed: agronomic benefits alone (assumed that GM canola has a yield advantage of 7 percent, a decrease in weed control costs and an adoption rate by farmers of 50 percent); and secondly, the impact of the agronomic benefits combined with the additional costs of keeping GM and non-GM product separate in the handling and storage process (assumed to add 10 percent to the cost of delivering all canola to the export level).

Assuming only agronomic benefits, the adoption of the GM variety would lead to Australian canola production increasing by 8.7 percent by 2010, compared to the baseline, and Australian oilseed exports by 11.8 per cent. However, with identity preservation costs included, Australian canola production is estimated to fall by 1.2 percent, and Australian oilseed exports are estimated to fall by 2.3 percent. Foster concludes that, given the assumptions, the model suggests that wide scale introduction of herbicide tolerant canola may not be justified if consumer acceptance problems require identity preservation arrangements, or at least a significant premium for non-GM over GM canola could be necessary to offset the additional costs. However, Foster warns that these conclusions are sensitive to the assumptions, and that higher yields for GM canola, greater input cost

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AgBioForum, Vol 2 No 2, 1999, as reported in Stone,S. Matysek, A. and Dolling, A. *Modelling Possible Impacts of GM Crops on Australian Trade*. Productivity Commission Staff Research Paper, October 2002, at 32.

74 Victorian Department of Primary Industries, *World Market Brief on Genetically Modified Canola 2002,* see: http://www.dpi.vic.gov.au, Accessed August 2003.

savings and lower identity preservation costs could change these findings.[75]

Similarly, modelling work by Stone *et al* found that Australia's overall trade position would only be significantly affected by expansion of GM technology into the non-wheat and oilseeds sectors if current market conditions change. When identity preservation costs and consumer resistance factors are added to the model, total trade effects are still small and Australia's economic welfare declines slightly. Their modelling also suggested that the composition of trade will alter in favour of GM commodities at the expense of their non-GM counterparts, both in Australia and globally.[76]

8.2 Wheat

GM wheat is the next major issue for the world grain trade, with Monsanto in the United States possibly up to one year away from bringing GM wheat on to the North American market. The GM wheat has been modified to be herbicide resistant to Monsanto's Roundup herbicide, and can possibly increase yields by more than 11 percent according to the Company.[77]

South Korean wheat millers, who are major buyers of United States wheat, have recently stated that they would boycott US wheat if genetically modified varieties were approved for commercial production. Currently, the US supplies more than half of South Korea's wheat imports, with Australia supplying about 40 percent and Canada six percent. Last year, South Korea imported 2.37 million tonnes of milling wheat, which is turned into noodles, bread and other products.

Mr Hi Sang Lee, chairman of the Korea Flour Millers Association, which represents all South Korean flour mills, stated: "If GM wheat comes, consumers will boycott all wheat," and it is feared that consumers will abandon wheat with rice being the main staple part of their diet.[78]

Similarly, it has been reported that the Japanese Food Agency has stated that Japanese millers would not import GM wheat, with the United States currently supplying about half of the six million tonnes of wheat imported into Japan each year.[79] In early June 2003 Britain's biggest flour miller Rank Hovis said it would stop using North American wheat if the United States or Canada began commercial planting of GM varieties as it might

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75 Foster, M. *Genetically Modified Grains. Implications for Australian grain growers*. ABARE, 2001, at 56.

76 Stone,S. Matysek, A. and Dolling, A. *Modelling Possible Impacts of GM Crops on Australian Trade*. Productivity Commission Staff Research Paper, October 2002, at 79.

77 "South Korean wheat buyers warn US against biotech." *World Environment News*, Reuters News Service, 5 May 2003.

78 "South Korean wheat buyers warn US against biotech." *World Environment News*, Reuters News Service, 5 May 2003.

79 "GM wheat seen getting mixed reception in Asia trade." *World Environment News*, Reuters News Service, 17 June 2003.

contaminate non-GM grain during shipment. Peter Jones, Wheat Director of Rank Hovis, was reported as saying that if large scale opposition to GM food continued among Britons, the company would have to import high protein grain from countries such as Germany or Australia to avoid gene altered material 'creeping' into its bread.[80]

In contrast, some developing countries have indicated that price is more of an issue than origin of the wheat. For instance, Mr Philip Purnama, of Indonesia's biggest flour mill, Bogasari Flour Mills, which buys more than half of its three million tonnes of imported wheat a year from Australia, said it would by GM wheat, and stated: "In developing countries…the cost-benefit equation for GM products should remain favourable to offset any kind of opposition."[81]

Australian wheat exporter AWB Limited has indicated that the first commercial wheat crop in Australia is at least seven years away, and spokesman Peter McBride stated: "Overwhelmingly our customers have indicated they want a product that is GM free."[82]

9.0 THE REGULATION OF GMOS BY AUSTRALIAN STATES, AND STAKEHOLDER VIEWS

9.1 New South Wales

On 25 June 2003 the cognate Bills *Gene Technology (New South Wales) Bill* and *Gene Technology (GM Crop Moratorium) Bill* were assented to. The *Gene Technology (NSW) Act 2003* provides the NSW component of the nationally consistent regulatory scheme, and ensures that the national regulator of gene technology established by the Commonwealth *Gene Technology Act 2000* has the power to act in all circumstances in NSW wherever gene technology is used.

On 3 March 2003 the Premier Hon Bob Carr MP announced a three year moratorium on the commercial production of certain GM food crops. The *Gene Technology (GM Crop Moratorium) Act 2003* implements the Premier's commitment. The Act, which expires on 3 March 2006, enables the Minister for Agriculture, to Gazette a moratorium order to prohibit the cultivation of a GM food plant. In his Second Reading Speech, the Minister for Agriculture Hon Ian Macdonald MLC stated: "The science is moving so fast, as is the world situation in regard to the importation of GM crops and food products, and food labelling regimes, that three years is an adequate time to stop and take stock. A moratorium lasting any longer would pose a substantial risk of New South Wales farmers and consumers potentially missing out on the economic and other benefits promised by this technology."[83]

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80 "Top UK miller to cut N. America wheat if GM okayed." *World Environment News*, Reuters News Service, 5 June 2003.

81 "GM wheat seen getting mixed reception in Asia trade." *World Environment News*, Reuters News Service, 17 June 2003.

82 "GM wheat seen getting mixed reception in Asia trade." *World Environment News*, Reuters News Service, 17 June 2003.

83 *NSWPD*, 21 May 2003, at 763.

To date, the Minister has issued a moratorium order for GM canola, (InVigor® hybrid canola) which as noted, has recently been approved for intentional release into the environment by the Office of the Gene Technology Regulator.[84]

9.2 Tasmania

The Tasmanian Government first released its Gene Technology Policy concerning the use of gene technology in primary industries in July 2001. This policy was based on the recommendations of the Parliamentary Joint Select Committee on Gene Technology, which included the establishment of a two year moratorium on the commercial release of genetically modified (GM) crops in Tasmania. This policy was to be reviewed prior to July 2003.

A subsequent review released in February 2003 found that there have been no significant developments requiring a change to the State's approach to the use of gene technology.

As a result of the review, the Tasmanian Government decided to extend the moratorium on the commercial release of GM animals and GM crops as currently prescribed under the Tasmanian *Plant Quarantine Act 1997*, until June 2008. Current provisions for research trials using GM non-food crops will continue to be enforced. Research associated with GM food crops will not be allowed in the open environment and will only be permitted within appropriately accredited facilities.

In announcing the results of the review, the Tasmanian Government stated that it will develop tailored, marketing-based State legislation for regulation of gene technology in primary industries. This legislation will be specifically designed to 'dovetail' into existing Commonwealth and State Gene Technology Acts that have been developed to manage any risks that genetically modified organisms (GMOs) may pose to the environment or human health and safety.

The recommendations from the review of the 2001 Gene Technology Policy, and analysis of emerging gene technology issues included:

1. The moratorium on commercial release of agricultural genetically modified organisms (GMOs) will be continued for five years, to underpin Tasmania's reputation for 'clean, green and quality' products. The moratorium will be reviewed by 30 June 2008.
2. The Minister will have the ability to re-evaluate aspects of the policy prior to 30 June 2008.
3. Open air trials on genetically modified (GM) non-food crops will be permitted subject to existing requirements.
4. Open air trials of food GMOs will be prohibited.
5. Trials of GM food crops and GM animals will only be permitted within appropriately accredited research facilities.
6. Research that provides information on GMOs will continue to be encouraged, subject to

84 *NSW Government Gazette*, No 119, 25 July 2003, at 7513.

the conditions outlined in 3 and 5 (above).
7. The Tasmanian Government will remain opposed to the use of GM livestock feed on marketing grounds.
8. All relevant legislative measures, both State and Commonwealth, will be pursued in order to enforce the moratorium.
9. Tasmania will remain part of the national regulatory regime and be a full participatory member of the Gene Technology Ministerial Council and its underpinning committees, to actively seek the accommodation of Tasmania's views.
10. The Interdepartmental Committee on Gene Technology will continue to ensure that the Tasmanian Government is kept informed on gene technology issues.
11. The Gene Technology Scientific and Technical Advisory Committee (STAC – A State based Tasmanian initiative) will continue to undertake assessment of gene technology issues.
12. The Experts Group on Gene Technology will be incorporated into STAC.
13. DPIWE will seek a bilateral agreement with the Gene Technology Regulator to assist in the administration and enforcement of the national regulatory scheme in Tasmania.
14. DPIWE will continue to monitor the management of previous GM trial sites by the companies involved in those trials, and the actions of the Gene Technology Regulator in overseeing these companies' site management activities. [85]

9.3 Victoria

On 8 May 2003 the Victorian Minister for Agriculture Hon Bob Cameron MP announced a one year moratorium on the commercial production of GM canola. The Minister said: "This decision is the next step in our careful and cautious approach to addressing marketing issues relating to GM Canola…A full market impact assessment for Victorian produce will be done before the 2004 season commences. There have been concerns about the impact of the commercialisation of GM Canola on Victorian export markets. These issues need to be satisfactorily resolved before we can confidently move forward."[86]

9.4 Western Australia

In May 2001 the Western Australian Minister for Agriculture Hon Kim Chance MLC announced a five year moratorium (ie, to May 2006) on the commercial growing of GM food crops in Western Australia. The moratorium was to allow issues of marketing, identity preservation and the feasibility, risks and benefits of establishing GM free and GM zones to be debated. The moratorium does not relate to any field trials undertaken in accordance with a license issued by the Gene Technology Regulator.[87]

Minister Chance has recently noted that legislation giving effect to this moratorium is expected to be introduced later this year. The Minister said the moratorium was important

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85 Tasmanian Government, Gene Technology Policy Review, February 2003.

86 "No Commercial GM Canola This Year." *Media Release*, Hon Bob Cameron MP, Victorian Minister for Agriculture, 8 May 2003.

87 Western Australia Department of Agriculture, *Assessment of the International Trade for Genetically Modified Canola*, March 2003, at 16.

for WA consumers and for the State's reputation overseas for clean and green produce, and stated: "The Government and industry does not want to compromise that well-deserved reputation which is aimed at protecting our unique environment for future generations…I am disappointed the current process has led to a decision on the commercial release of a GM crop without community support and with no regard to the risks posed to the agricultural industries…We will use our powers to ensure that risks to markets and farm businesses relying on these markets are addressed prior to considering modifying the moratorium."[88]

9.5 South Australia

In August 2002 the South Australian Government established a Parliamentary Select Committee to examine whether GM crops should be grown in the State. The Committee reported on 17 July 2003, and recommended the introduction of legislation to prevent the release of GM crops into South Australian agriculture until issues about protecting the State's market position are resolved.

The Chair of the Committee the Hon Rory McEwen MP stated: "For industry to meet the conditions of successful co-existence, the whole of the production and supply chain, from seed producers to marketers, will need to work together to resolve a number of significant issues." However the report noted that South Australian agriculture has, historically, only remained competitive due to its ability to rapidly access new technological innovations, including new crop varieties. Mr McEwen said the Select Committee was therefore of the unanimous view that "South Australia should ensure it is poised to respond at the right time, should these supply chain issues be resolved." The Committee recommended the establishment of a broadly representative committee to advise Government on when industry can guarantee co-existence to satisfy market demands and when the release of GM crops can be permitted. The Select Committee report had the following recommendations:

- That the commercial release of GM crops should not be permitted until industry can guarantee co-existence to satisfy market demands, for GM, non-GM and GM free products. This will require the use of secure segregation and identity preservation systems that are "rigorous, robust and cost effective";

- That the release of GM crops be prohibited on the Eyre Peninsula and Kangaroo Island, due to their isolation and unique geography, until the communities have been provided with the opportunity to decide whether they want their regions to be declared GM-free for marketing purposes;

- The release of GM crops should be prohibited in GM-crop-free areas under all circumstances;

- The conditional release of a GM crop should be granted in other areas of the State for a limited release or field trial, provided it can meet strict conditions to manage market risks;

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88 "Moratorium on commercial release of GM crops remains in place." *Media Statement*, Hon Kim Chance MLC, Minister for Agriculture, 29 July 2003.

- Exporters and marketers enter into discussion and negotiate with trading partners to determine what tolerances for unintentional contamination are acceptable;

- In the event that industry can satisfy the co-existence conditions, protocols must be agreed by the whole of the agricultural production and supply chain;

- The proposed legislation establish robust and transparent mechanisms for determining if the commercial release of a GM crop could be permitted on the grounds that industry has met co-existence conditions;

- The proposed legislation also establish robust and transparent mechanisms for considering whether a conditional release should be granted.[89]

9.6 Federal Government Views

With the release of the ABARE report *Market Access Issues for GM Products: Implications for Australia* in July 2003,[90] the Federal Agriculture Minister Hon Warren Truss MP said: "The finding that there are ready export markets for GM farm produce is good news for Australian farmers, particularly in light of the Gene Technology Regulator's decision last Friday (25 July) to grant the first licence in this country to commercially plant GM canola. One of the major considerations for farmers in deciding whether to use GM crops is the concern that any potential market access difficulties might outweigh the agronomic and environmental benefits. In the case of GM canola, the ABARE report clearly suggests that they do not. In light of the ABARE report, the States and Territories should seriously reconsider any plans for the introduction of additional regulation of GM canola in the belief that they are protecting our markets. The Federal Government firmly believes that, once a science-based decision has been made by the Gene Technology Regulator, all commercial decision-making should be left to the industry." [91]

9.7 Non-Government Organisation Views.

The National Farmers' Federation released a Biotechnology Position Statement in March 2003. Some of the key points from their Position Statement include:

- Farmers should retain the opportunity to adopt the method of production best suited to their business needs – be that GM, conventional or organic. In protecting the integrity of a farmer's decision, it is important that agricultural supply chains are implemented to allow all producers to continue to meet the expectations of their chosen markets;
- The commercial introduction of GM crops must be market driven, where there is a

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89 Hon Rory McEwen MP, *News Release*, "Select Committee says SA is not ready for GM crops." 17 July 2003.

90 The Minister is referring to the report: Foster, M., Berry, P. and Hogan, J. *Market Access Issues for GM Products, Implications for Australia*. ABARE report prepared for the Department of Agriculture, Fisheries and Forestry – Australia, July 2003. ABARE eReport 03.13, as referred to throughout this Briefing Paper.

91 "ABARE report finds ready export markets for GM crops." *Media Release*, Hon Warren Truss MP, Federal Minister for Agriculture, 29 July 2003.

clear commercial justification for the release of such varieties;
- The production decisions of one farmer should not unreasonably impinge upon the ability of another farmer to produce a commodity meeting the requirements and expectations of their chosen market;
- NFF is supportive of ongoing controlled field trials of GM crops;
- NFF opposes any measures from government imposing barriers to the commercial release of any GM crop, which is deemed by the Office of Gene Technology Regulator as fit for release, and assessed by industry as favourable;

The Federation concluded that the emergence of agricultural biotechnology will offer significant opportunities for Australian farmers, helping producers to remain competitive within distorted and highly competitive global markets.[92]

The NSW Farmers Association has developed their GMO policy over a number of years. The Association supports the release of GM products provided that:
- The appropriate regulatory authority has assessed all risks; and
- The release offers substantial benefits to the nation's agricultural industries.

The Association called for the postponement of the general release of GM canola until such time as all identity preservation issues affecting marketing and trade are fully addressed, and supported a three year trial of GM canola (of up to 5,000 hectares per annum planted) before any commercial release is approved.[93]

The Network of Concerned Farmers has called for a moratorium on the introduction of GM canola pending the following:
- Assessment of economic impact, both domestic and export, including implications on other primary industries such as honey, meat and dairy products, as well as other grain industries;
- Protection of existing systems:
    - legislation that guarantees protection to organic and non-GM farmers of the right to continue to farm unrestricted and market their crops as non-GM, GM free or organic;
    - legislation that guarantees that any additional costs which result from the introduction of GM canola be either the responsibility of the GM canola grower or the technology providers, not the whole of the grain supply chain;
    - the development of a legal framework to ensure that the technology providers and users of GM grains will be accountable for liabilities and costs of cleanup or recall arising from genuine unintentional contamination and any resultant loss in market access;
    - the development of a 'recall strategy' to ensure that if GM canola is introduced and segregation fails, the Australian grains industry can effectively return to and maintain conventional and organic supply chains.

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92 National Farmers' Federation, *Biotechnology Position Statement*, March 2003.

93 NSW Farmers Association, *Association GMO Policy*, June 2003.

- Industry preparedness – each segment of industry must identify GM related problems and indicate preparedness and a suitable management plan prior to consideration for commercial release.[94]

The Australian GeneEthics Network, which campaigns against the introduction of GM technology, criticized the Gene Technology Regulator's approval for the commercial release of GM canola. The Network compared the scourges of prickly pear and cane toads approved last century to the release of GM canola 'when it goes feral'. The Director of the Network Bob Phelps stated: "We ask the Gene Technology Ministerial Council, … to create a national consensus on GE canola by joining Tasmania's ban on commercial GE crop releases for five years… Five years at least is needed to see if GE canola survives rejection by food processors and shoppers world-wide. … Once GE canola is released our GE-free status will be lost forever."[95]

10.0 CONCLUSION

It is evident that arguments against the introduction of GM crops are based on two grounds – environmental and commercial / marketing. The agricultural community faces significant challenges in the implementation of GM food crops. Issues that need consideration include: identity preservation and traceability; different and evolving regulatory environments worldwide; the development of 'at the farm gate' GM testing technologies; customer demand for GM and non-GM products; and legal liability for consequences of GM contamination. The Australian grains industry is preparing for the co-existence of GM crops and non-GM crops, and it is important that industry protocols to achieve this are successful. In this regard, comments by Porter of the Grain Pool of WA are salient:

> It is not difficult to envisage scenarios where a grower delivering a crop in error, or a bulk handler pushing the wrong button, or a road haulage operator getting instructions wrong could seriously challenge this tolerance limit [ie, tolerance of adventitious GM in a non-GM crop]. Along the grain chain from grower to market there are multiple critical points at which serious contamination could be effected….There are potentially major legal and financial liabilities associated with contamination problems. Distressed cargo on the water is every exporting grain trader's worst nightmare and has the potential to destroy a business. Add downstream processing liabilities in a non-GM value chain caused by late detection of a problem, and the damage bill could be multiplied well past the value of the grain.[96]

It is possible that consumer resistance will decline and GM crops will deliver economic and other benefits. However, this will not overcome the resistance of those with concerns about the long term environmental effects of GM crops.

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94 See the Network for Concerned Farmers website, *Network Objectives*: http://www.non-gm-farmers.com/index.asp, Accessed August 2003.

95 GeneEthics Network Australia, *Media Release: GE Canola Should be Banned.* ND, See http://www.geneethics.org/community/modules.php?name=Sections&op=viewarticle&artid=79, Accessed August 2003.

96 Portmann, P. and Tucek, M. "Marketing GM Crops. Market issues facing Australia if it moves into GM crops" in *Outlook 2001, Agriculture and Regional Australia, Proceedings of the National Outlook Conference* 27 February – 1 March 2001, at 192.