Tasmanian Government Department of Primary Industries, Parks, Water and Environment on the 2018 Review of Tasmania's GMO Moratorium
AgriGrowth Tasmania
Phone: 03 6165 3225

By email: GMOMoratoriumReview@dpipwe.tas.gov.au

30 January 2019

Dear AgriGrowth Tasmania,

Re: 2018 Review of Tasmania's GMO Moratorium

GrainGrowers is an independent grain farmer representative organisation with over 17,000 members across Australia. GrainGrowers' goal is a more efficient, sustainable and profitable grain production sector that benefits all Australian grain farmers and the wider grains industry.

GrainGrowers considers it is inequitable for Tasmanian growers to not have access to the same technologies that are available in other states of Australia.

GrainGrowers believes that grain farmers should have the freedom of choice for the production systems and markets they pursue – be that genetically modified organisms (GMO), conventional, organic or any combination of these. Removal of the moratorium would allow choice for Tasmanian farmers and marketers in the crops they grow and purchase. The ability to access gene technology is essential for the continued development and growth of the grains industry in Australia.

GrainGrowers supports a science-based approach to the use of any technology, including genetically modified organisms. A rigorous regulatory framework exists through the Office of the Gene Technology Regulator to assess the environmental and public health aspects of all gene technology. Coupled with this, industry supply chains across Australia manage a wide range of segregations including for GM and non-GM crops, which can accommodate crops from different farm production systems. This supply chain system already has appropriate mechanisms in place to deal with low level presence in line with international standards. On this basis, the Tasmanian supply chain would also be able to manage all segregations and ensure customer needs are met.

GrainGrowers requests that the Tasmanian Government remove of the moratorium on genetically modified crops in Tasmania to ensure all Australian growers have access to all technologies which have been approved by the national regulator.

Yours sincerely,

Mr Luke Mathews
General Manager Policy and Research, GrainGrowers

REVIEW OF

Tasmania's genetically modified organisms (GMO) Moratorium

ISSUES PAPER

MARCH 2019

Department of
Primary Industries, Parks, Water and Environment

Tasmanian Government

The Tasmanian Government has released this issues paper to frame the Review of Tasmania's GMO Moratorium.

FOREWORD

The Hodgman Liberal Government has a strong vision to grow the Tasmanian agriculture sector to $10 billion per year by 2050. We've committed significant funding through successive budgets to partner with the private sector on a range of strategic initiatives to support Tasmanian primary producers and agribusinesses to grow and prosper. The Tasmanian Government is committed to positioning our local industries to be globally competitive, helping our businesses expand their presence in markets around the world, and attract more investment to create more local jobs. International and national markets value Tasmania's premium food products because of the provenance underpinning the Tasmanian brand. Our GMO Moratorium has been a key component of Brand Tasmania in relation to food since 2001. It has served us very well, enabling market access and advantages that are the envy of other jurisdictions. As a smaller scale and often premium producer, positioning in key markets is particularly important for the Tasmanian agri-food sector. This review is being undertaken so that a decision can be made regarding the future of Tasmania's GMO Moratorium before the expiry date of the current term in November 2019. I encourage you to have your say on this important issue for our State. Please make your submission by the closing date of 26 April 2019.

Guy Barnett MP
Minister for Primary Industries and Water

INTRODUCTION

Tasmania has since 2001 maintained a moratorium on the commercial release of genetically modified organisms (GMOs) into the Tasmanian environment. The moratorium exists to distinguish Tasmanian products in the market place and deliver an economic premium to the State's agricultural and food production industries.

The *Genetically Modified Organisms Control Act 2004*, which provides for Tasmania's moratorium, expires on 16 November 2019.

The Minister for Primary Industries and Water has directed the Department of Primary Industries, Parks, Water and Environment to undertake a review of the moratorium, in consultation with the Tasmanian community, before it expires. The Tasmanian Government will determine whether to extend or amend the moratorium, or allow it to expire, taking into account the findings of the Review.

This paper outlines the scope of the review and the issues on which the Department is seeking comment and information.

CONTEXT

A GMO is an organism that has been modified by gene technology, which includes any technique for the modification of genes or other genetic material. Gene technology is used in a number of fields, including scientific research, medicine, therapeutic goods, veterinary medicine, agriculture and other industries.

The use of GMOs in Australia is regulated through a national Gene Technology Scheme administered by an independent Gene Technology Regulator.

Box 1: Overview of GMO regulation

National Gene Technology Scheme

The Gene Technology Scheme was established in 2000 and is founded on a Gene Technology Agreement signed by all Australian governments. The Scheme consists of the *Commonwealth Gene Technology Act 2000* and *Gene Technology Regulations 2001*, and corresponding state and territory laws. Together the legislation provides a nationally consistent system to regulate the development and use of gene technology in Australia.

The objective 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 GMOs. This is achieved through a licensing and prohibition scheme administered through the Office of the Gene Technology Regulator.

The Gene Technology Scheme was designed to fill the gaps between existing product-based regulatory schemes for human food, human therapeutics, agricultural and veterinary chemicals, and industrial chemicals. It focuses on live and viable GMOs and manages any risks they pose as a result of gene technology.

There is no provision for a state or territory to opt out of the Scheme on environmental or human health and safety grounds. However, each state or territory has the power under its own laws, known as 'moratoria legislation', to designate areas as 'GM crop areas' or 'non-GM crop areas' for marketing purposes.

Tasmania's GMO moratorium

The *Genetically Modified Organisms Control Act 2004* provides the current basis for Tasmania's GMO moratorium. The objective of the Act is to allow the State Government to designate areas of the State, or the whole of the State, as a GMO-free area for the purpose of preserving the identity of non-genetically modified crops and animals for marketing purposes. Through an order made under the Act, the whole of Tasmania was declared a GMO-free area, effective from 15 November 2005.

Tasmanian Gene Technology Policy

Following a review in 2013, the Government published the *Tasmanian Gene Technology Policy (2014-19)* and Tasmanian *Gene Technology Guidelines*. The Policy supported extending the moratorium until 16 November 2019, which Parliament legislated through an amendment to the GMO Control Act.

It also requires the Department to undertake Annual Environmental Scans of the gene technology environment to see if there have been any developments that may warrant an early review of the moratorium.

Copies of the Tasmanian Gene Technology Policy and Guidelines, and the GMO Annual Environmental Scans are contained in Attachments 2 and 3 and/or available on the Department's website at **https://dpipwe.tas.gov.au/agriculture/tasmanian-gene-technology-policy-2014-2019#environmentalscans**

Other jurisdictions

All states and territories except for Queensland and the Northern Territory have passed moratoria legislation. However, some states have repealed their legislation or no longer have moratoria. Only Tasmania, South Australia and the Australian Capital Territory have active moratoria legislation. South Australia's moratorium is currently subject to a separate review and parliamentary inquiry.

GMO MORATORIUM REVIEW

Purpose of the Review

The Review of Tasmania's GMO moratorium will inform the Government's decision on the future of the moratorium by assessing market advantages or disadvantages for the State's agricultural and food industries.

The consultation being undertaken as part of the Review provides an opportunity for stakeholders to have their say regarding the benefits and costs of the moratorium on market access and trade.

Scope of the Review

The Review will examine the impacts on production, marketing, trade and investment of extending or amending the moratorium, or allowing it to expire.

The Review will consider information from Tasmanian businesses and industry, market and trade data, the experience in other jurisdictions, and other relevant evidence to inform the analysis. It will also examine whether there have been gene technology developments that may warrant a reconsideration of the moratorium now or in the future.

The Review will draw on public submissions, consultation with key stakeholders, and a market analysis of Tasmania's key domestic and international trading partners commissioned by the Department of State Growth.

The implications of GMOs for human health and safety or the environment are out of scope and regulated nationally through the Gene Technology Scheme. Similarly, food produced using gene technology and the labelling of genetically modified foods are regulated nationally through the Australia New Zealand Food Standards Code and are outside the scope of this review.

Terms of Reference

The Minister for Primary Industries and Water announced the Terms of Reference for the Review on 13 December 2018. The Review will consider:

a. The potential market advantages and disadvantages of allowing or not allowing the use of gene technology in Tasmanian primary industries, including food and non-food sectors;
b. Domestic and international gene technology policy relevant to primary industries;
c. Research and development relevant to the use of gene technology in primary industries;
d. Any other relevant matters raised during the review.

Issues

The Terms of Reference are discussed in order below to inform consultation on the GMO Moratorium Review.

a. The potential market advantages and disadvantages of allowing or not allowing the use of gene technology in Tasmanian primary industries, including food and non-food sectors

Tasmania's GMO moratorium has been maintained on the basis that it differentiates Tasmanian agricultural and food products in the marketplace.

Three previous reviews of the moratorium conducted in 2003, 2007 and 2013, and three consecutive GMO Annual Environmental Scans conducted in 2015, 2016 and 2017 in compliance with the Tasmanian Gene Technology Policy found no compelling reason to lift the moratorium. However, gene technology is advancing rapidly. A new generation of techniques, including gene editing, is enabling more precise and efficient genetic modification of plants, animals and microorganisms. Furthermore, field trials of several new GM crop and pasture varieties with relevance to Tasmanian agriculture, including GM perennial ryegrass, wheat, barley and canola, are in progress interstate.

Since the last review of Tasmania's moratorium in 2013[1], several reviews have observed difficulties with quantifying the marketing advantages of state and territory moratoria. Most recently, the Third Review of the National Gene Technology Scheme, which concluded in 2018 (See Box 3), noted contrasting views regarding GMO moratoria. It recommended that states and territories give ongoing consideration to the economic effects, value and scope of moratoria, highlighting that moratoria legislation is the responsibility of the individual jurisdictions not the national scheme. This followed the Productivity Commission's Inquiry Report: *Regulation of Australian Agriculture (2017)*[2] and the House of Representatives Standing Committee on Agriculture and Industry's *Smart Farming – Inquiry into Agricultural Innovation Report (2016)*[3], both of which identified the removal of state and territory moratoria on genetically modified crops as an issue to be given Government consideration.

[1] The Final Report of the 2013 Review of the moratorium on genetically modified organisms (GMOs) in Tasmania is contained in Attachment 4 or available on the Department's website at https://dpipwe.tas.gov.au/agriculture/2018-review-of-tasmanias-gmo-moratorium

[2] Productivity Commission. (2016). *Regulation of Agriculture*. Retrieved 29 January, 2018.

[3] House of Representatives Standing Committee on Agriculture and Industry. (2016). *Smart farming – inquiry into Agricultural innovation*. Retrieved 29 January, 2019.

Acknowledging these issues, the Government is undertaking research and consultation to understand the economic costs and benefits of maintaining, modifying or ending the moratorium. This will include consideration of on-farm impacts, manufacturing and supply chain costs. The Government particularly wants to hear from producers, retailers, wholesalers and exporters on matters, including:

Questions:

1. What products do you sell in domestic or international markets as 'Tasmanian' and/or 'GMO-free'?
2. What market opportunities have you gained or lost as a result of Tasmania's GMO moratorium?
3. If Tasmania's GMO moratorium was to expire what would be the impact on your business?
4. If genetically modified crops were grown commercially in Tasmania would this impact on your business and markets? If so, in what way?
5. Can you provide evidence of the financial benefits or costs to your business as a result of the current moratorium? For example: effects on yield, price premiums or input costs.

b. Domestic and international gene technology policy relevant to primary industries

A variety of policy and regulatory approaches are adopted by our key trading partners to manage gene technology and GMOs. This is important for Tasmania as around three quarters of the State's food and beverage production by value is sold interstate or overseas.

In 2016-17, Tasmania's net interstate food sales were worth $2.44 billion and international food exports were worth $0.60 billion. Japan, China and the USA continue to be Tasmania's largest food export markets.[4]

South-East Asia also presents opportunities for Tasmanian producers and processors to expand markets due to rising income and demographic changes.

As part of this Review the Department of State Growth has commissioned an analysis of key interstate and overseas markets for Tasmanian agricultural and food products to inform the review. The analysis will assess the level of awareness in these markets of Tasmania's moratorium, the importance placed on Tasmania's GMO-free brand attribute relative to other attributes, and any impact of amending the moratorium on the purchasing behaviour of customers and consumers in these markets.

The Review will also consider the experience in other Australian and international jurisdictions to see what Tasmania could adopt or learn from, including systems for genetically modified and conventional crops to co-exist, supply chain management and liability from cross-contamination.

Question:

1. Are there any examples of innovative GMO policy and regulation from other jurisdictions that Tasmania could adopt or learn from?

[4] Tasmanian Agri-Food ScoreCard 2016-17, https://dpipwe.tas.gov.au/agriculture/facts-figures/industry-scorecards

c. Research and development relevant to the use of gene technology in primary industries

Gene technology is quickly evolving and the Government is interested in understanding the potential of new GMOs for commercial adoption by the Tasmanian primary industries sector.

The Government is also keen to look at what research and development opportunities have been lost or gained as a result of the GMO moratorium.

Box 2: Commercial release of GMOs

The only genetically modified (GM) field crops grown in Australia are canola, cotton and safflower, of which only canola is suitable for commercial cultivation in Tasmania. In addition to field crops, GM carnations have also been approved for growing or importing into Australia.

In mainland Australia a number of experimental field trials are underway or subject to post harvest monitoring involving GM banana, barley, canola, cotton, Indian mustard, perennial ryegrass, sorghum, sugarcane and wheat. Past trials have involved GM rice, clover, maize, poppy, papaya, pineapple and grapevines.[5]

In the late 1990s and early 2000, GM canola was grown on 57 field trial sites around Tasmania. Since the commencement of the State's GMO moratorium, these sites have been managed under permit to eliminate any GM canola seedlings that germinate on the trial sites.

No genetically modified animals have been approved for commercial release in Australia.

Questions:

1. Are there new GMOs that would provide positive benefits to your business or the State as whole? What are they and what would the benefits be?
2. What impact has the moratorium had on the research and development in Tasmania? If possible please provide examples.

d. Any other relevant matters raised during the review

The Government acknowledges the broad and complex nature of gene technology regulation and is keen to consider any other information relevant to Tasmania's GMO moratorium, noting that the Review will not consider issues relevant to human, health and safety, the environment or the regulation of GM food, including labelling.

A summary of the questions posed in this paper is contained in Attachment 1.

Box 3: Other recent national and state gene technology reviews

Scheme Review

- The Third Review of the National Gene Technology Scheme (Scheme Review) was initiated by the Legislative and Governance Forum on Gene Technology (the Forum), which comprises of one Commonwealth, state and territory Minister with responsibility for gene technology from each jurisdiction.

[5] A map of GM crop field trial sites is available at http://www.ogtr.gov.au/internet/ogtr/publishing.nsf/Content/map

- The Review examined the Scheme in depth to ensure that it continues to deliver on the objective of the Commonwealth *Gene Technology Act 2000* in an environment of rapid technological change.
- On 11 October 2018, Forum Ministers endorsed the 27 recommendations of the Review and a five-year Action Plan to implement the recommendations.
- The Review found that the Scheme is generally working well. Most recommendations are aimed at fine-tuning and "future-proofing" the Scheme with respect to rapidly advancing gene technologies.
- Further Information can be found at **www.health.gov.au** (Home > For Health Professionals > Gene Technology).

Technical Review

- In 2016 the independent Gene Technology Regulator initiated the Technical Review of the *Gene Technology Regulations 2001* to provide clarity about whether organisms developed using a range of new technologies are subject to regulation as GMOs, and ensure that new technologies are regulated in a manner commensurate with the risks they pose.
- The Regulator's recommendations include a proposal not to regulate a gene-editing technique known as SDN-1.
- The proposal has significant implications for Tasmania because the State's moratorium would not apply to plants, animals or microorganism developed using the technique. They could be grown or produced anywhere in Australia and are likely to be untraceable, potentially creating a risk to markets that depend on Tasmania's GMO-free brand attribute.
- The implications of the proposal for markets for Tasmanian food products are of particular concern because the agriculture, forestry and fisheries sector is proportionately very important to the Tasmanian economy. In 2017-18 the sector contributed 9.0% of Gross State Product (GSP), compared to 2.8% of Australia's Gross Domestic Product.
- Forum Ministers are yet to make a decision on the Regulator's recommended amendments. Through this process the Tasmanian Government has continued to advocate on behalf of Tasmanian industry, reinforcing the importance of our moratorium to the Tasmanian Brand.
- Further information can be found at **www.ogtr.gov.au** (Home > About the OGTR > Regulations Review).

Food Standard

- Food Standards Australia New Zealand (FSANZ) is reviewing Food Standard 1.5.2 of the Australia New Zealand Food Standard Code, *Food produced using gene technology*.
- The Review is considering the definitions of 'gene technology' and 'food produced using gene technology' in the Code, and whether the food products of certain new gene technologies require pre-assessment for safety before they can be sold as food or used as ingredients in food.
- The FSANZ Review is independent of the Scheme Review and Technical Review but is considering the alignment between the Code and the Gene Technology Scheme.
- The final report on the FSANZ Review is due to be released in 2019.

- The outcomes of the Technical Review could have implications for the FSANZ Review.
- Further information can be found at www.foodstandards.gov.au (Home > Consumer > Genetically modified foods).

South Australia's moratorium

- The South Australian Government appointed Emeritus Professor Kym Anderson AC to conduct an independent review of South Australia's moratorium on the cultivation of GM food crops.
- On 1 August 2018 the State's Legislative Council appointed a Select Committee to conduct its own inquiry into the moratorium.
- Further information on the independent review can be found at www.pirsa.gov.au (Home > Primary Industries > Genetically Modified (GM) Crops > GM Review).
- Further information on the Select Committee inquiry can be found at www.parliament.sa.gov.au (Home > Committees > Committees).

HOW TO MAKE A SUBMISSION

All submissions must be in writing and received by 5pm on Friday 26 April 2019.

Submissions can be forwarded to:

Email: GMOMoratoriumReview@dpipwe.tas.gov.au

Mail: GMO Moratorium Review, GPO Box 44, Hobart Tasmania 7001

Other than indicated below, submissions will be treated as public information and will be published on our website at https://dpipwe.tas.gov.au/gmoreview

No personal information other than an individual's name or the organisation making a submission will be published.

For further information, please contact: GMOMoratoriumReview@dpipwe.tas.gov.au

ACCESSIBILITY OF SUBMISSIONS

The Government recognises that not all individuals or groups are equally placed to access and understand information. We are committed to ensuring Government information is accessible and easily understood by people with diverse communication needs.

Where possible, please consider typing your submission in plain English and providing it in a Microsoft Word or equivalent format.

The Government cannot, however, take responsibility for the accessibility of documents provided by third parties.

IMPORTANT INFORMATION TO NOTE

Your name or the name of the organisation making the submission will be published unless you request otherwise.

If you would like your submission treated as confidential, whether in whole or in part, please indicate this in writing at the time of making your submission clearly identifying the parts of your submission you want to remain confidential and the reasons why. In this case, your submission will not be published to the extent of that request but will remain subject to the *Right to Information Act 2009.*

Copyright in submissions remains with the author(s), not with the Tasmanian Government.

The Department will not publish, in whole or in part, submissions containing defamatory or offensive material, or information that could enable the identification of other individuals.

Multiple identical submissions will not carry more weight than the merits of an argument in a single submission. As such, joint applications are supported.

GD1529

The Right to Information Act 2009 and confidentiality

Information provided to the Department of Primary Industries, Parks, Water and Environment and Water is subject to the *Right to Information Act 2009*. If you have indicated that you wish for all or part of your submission to be treated as confidential, this will be taken into account by the Department in determining whether or not the information is exempt from disclosure in the event that it is subject to an application for assessed disclosure under the Right to Information Act. The Department may contact you during this process.

APPENDIX

Attachment 1 - Summary of Questions

Attachment 2 - Gene Technology Policy and Guidelines

Attachment 3 - Annual Environmental Scans

Attachment 4 - Final Report from 2013 review

ATTACHMENT 1

SUMMARY OF QUESTIONS

a. The potential market advantages and disadvantages of allowing or not allowing the use of gene technology in Tasmanian primary industries, including food and non-food sectors

1. What products do you sell in domestic or international markets as 'Tasmanian' and/or 'GMO-free'?
2. What market opportunities have you gained or lost as a result of Tasmania's GMO moratorium?
3. If Tasmania's GMO moratorium was to expire what would be the impact on your business?
4. If genetically modified crops were grown commercially in Tasmania would this impact on your business and markets? If so, in what way?
5. Can you provide evidence of the financial benefits or costs to your business as a result of the current moratorium? For example: effects on yield, price premiums or input costs.

b. Domestic and international gene technology policy relevant to primary industries

1. Examples of innovative GMO policy and regulation from other jurisdictions that Tasmania could adopt or learn from?

c. Research and development relevant to the use of gene technology in primary industries

1. Are there new gene technologies that would provide positive benefits to your business or the State as whole? What are they and what would the benefits be?
2. What impact has the moratorium had on the research and development of new products or markets?

d. Any other relevant matters raised during the review

ATTACHMENT 2

TASMANIAN GENE TECHNOLOGY POLICY (2014-2019)

BACKGROUND

The import, use and development of Genetically Modified Organisms (GMOs) in Tasmania, along with any other dealings, are regulated by numerous laws at both Commonwealth and State levels

Tasmania has since 2001 maintained a moratorium on the commercial release of GMOs to the Tasmanian environment.

The Tasmanian *Genetically Modified Organisms Control Act (2004)* ("the Act") provides the basis for the moratorium and regulates dealings with GMOs for 'marketing purposes'.

In 2013, the Department of Primary Industries, Parks, Water and Environment (DPIPWE) undertook a comprehensive public review of the moratorium on GMOs in the State.

The Act, and hence the moratorium, expires on 16 November 2014.

A FIVE-YEAR MORATORIUM

Agrivision 2050 is the Government's plan to capitalise on Tasmania's competitive strengths and create jobs by growing the value of the agricultural sector in Tasmania to $10 billion per year by 2050.

Tasmania's GMO free status currently supports food producers to leverage the State's competitive strengths in agriculture, that is, rich soil, favorable climate, abundant water, biosecurity, innovative businesses and premium brand.

The Tasmanian Government will maintain a moratorium on the commercial release of GMOs into the Tasmania environment for five years until November 2019.

This Policy will be reviewed before November 2019 to enable technological advances and likely impacts on markets to be understood before a decision on whether to further extend or amend the moratorium is made.

Monitoring Program

GMOs may in future provide opportunities to enhance the competitiveness of the State's agricultural sector. However, the potential use of GMOs requires careful consideration to ensure there are no negative impacts on markets or on the State's brand.

AgriGrowth Tasmania in the DPIPWE will implement an evidence-based GMO monitoring program to continuously assess developments in gene technology, to build a better understanding of consumer preference and supply chain dynamics, as well as market and branding implications.

The Program will seek stakeholder views and provide an annual report to the Minister on developments in gene technology and market changes.

Specific matters to be reported on annually include:

- development of new generation GMOs that provide health or other benefits;
- consumer sentiment in important current and potential future markets; and
- new gene technologies that provide positive benefits to primary industry sectors and Tasmania as a whole.

DPIPWE will advise the Minister if based on evidence, there are significant developments in these three specific matters that warrant triggering a review of this Policy before the maximum five (5) year review date.

The Tasmanian Government will strive to ensure that measures to safeguard Tasmania's GMO free status remain appropriate to a changing risk environment, particularly as more GMOs are adopted in international and national jurisdictions and in markets that supply products to Tasmanian primary industries.

AgriGrowth Tasmania will also monitor the risks associated with maintaining Tasmania's current GMO threshold levels and any alternative options.

Pharmaceutical poppies

The Government is maintaining the existing policy, held since 2009, that allows for the use of GMOs in pharmaceuticals poppies not intended for use for food or feed, provided all statutory requirements are met and that markets for Tasmania's GMO-free food products can be maintained and appropriate co-existence arrangements developed.

In anticipation of the pharmaceutical poppy industry investing in research and development (R&D), AgriGrowth Tasmania in DPIPWE will work with the industry and key stakeholders on co-existence strategies for managing any potential risks associated with Genetically Modified (GM) non-food pharmaceutical poppies.

Other GM plants and animals

It is the Government's intention that all GM plants (other than non-food pharmaceuticals) and GM animals remain prohibited, except for gene technology used in contained research for, or production of, human medicines or therapeutics, closed loop industrial processes and animal feeds with non-viable GMO material.

The Government also wants to encourage biotechnology research innovation in Tasmania. The Government also supports research into other GMOs in Tasmania in contained facilities provided all statutory requirements are met.

Conventional Research and Development

The Tasmanian Government recognises the importance of research to primary industries in this State and acknowledges the tremendous capacity for innovation amongst local scientists, technical service providers and primary producers.

The Government is committed to better aligning research and development activities to improve productivity and industry competitiveness. Tasmania has the potential to be best in the world at conventional agricultural production.

Accordingly the Government will actively promote investment in non-GM research and development in primary industries, including non-GM crops and pastures.

GMO free marketing opportunities

The Tasmanian Government is committed to promoting an operating environment and policy settings that support our primary industries to grow. This includes protecting Tasmania's widely recognised brand attributes and unique biosecurity status.

Extending the moratorium on GMOs for a further five years enables farmers, agribusinesses and food businesses to confidently invest in their own marketing and market development activities to sell their products and to demonstrate the value of Tasmania's GMO-free status.

AgriGrowth Tasmania will also work with primary industry sectors to identify how our competitive advantages can play a greater role in Tasmania's premium brand attributes.

IMPLEMENTATION

The Gene Technology Regulator administers a national scheme for the regulation of GMOs in Australia in order to protect the health and safety of people and to protect the environment. The Regulator identifies risks posed by, or as a result of, gene technology and manages those risks through regulating certain dealings with GMOs.

Under the national scheme, States can regulate dealings with GMOs for marketing purposes.

The Tasmanian Government will continue to exercise its rights and meet its obligations under the National Scheme for Gene Technology Regulation, including the *Commonwealth Gene Technology*

Act 2000 (Cth), its subordinate legislation, the *Gene Technology Regulations 2001* and the *Gene Technology (License Charges) Act 2000 (Cth).*

This Policy, together with the Tasmanian Gene Technology Guidelines ("the Guidelines") describe the dealings that may be authorised under the Tasmanian *Genetically Modified Organisms Control Act (2004*).

The Guidelines also provide the operational details on how this policy will be implemented by DPIPWE, as the lead Agency for GMO policy for primary industries in Tasmania. The Policy and Guidelines may be amended by Cabinet.

The Guidelines will be published on the Department's website (www.dpipwe.tas.gov.au).

COMMUNICATION

DPIPWE will develop communications materials and regularly engage in activities that explain developments in gene technology, GMOs, consumers and markets for all stakeholders.

The Department's website will be used as the primary means of communication.

Effective date of this Policy: August 2014

Tasmanian Gene Technology Guidelines

The import, use and development of Genetically Modified Organisms (GMOs) in Tasmania, along with any other dealings, are regulated by numerous laws at both Commonwealth and State levels, depending on the particular application of gene technology and the end products.

The *Tasmanian Gene Technology Policy 2014-2019* is an overarching document that outlines the Government's intention to maintain a GMO moratorium.

The Guidelines describe the dealings that may be authorised under the *Genetically Modified Organisms Control Act (2004)* ("the Act").

These Guidelines also provide the operational details on how the Policy will be implemented by DPIPWE, as the lead Agency for GMO policy for primary industries in Tasmania. These Guidelines may be amended by Cabinet.

The Guidelines will be published on the Department's website (www.dpipwe.tas.gov.au).The Policy and these Guidelines do not have the force of law in the same way that legislation does, however both would be taken into account as a guide for decision making under the relevant laws.

Definitions:

Adventitious Presence – an event where GM material is unintentionally or inadvertently introduced into the State.

AgriGrowth Tasmania - a Division of the Primary Industries, Parks, Water and Environment Department.

Commercial purposes – intentional release of GMOs into the environment which take place outside of containment facilities.

Contained Facilities – research and development conducted in a laboratory or other controlled atmosphere environment.

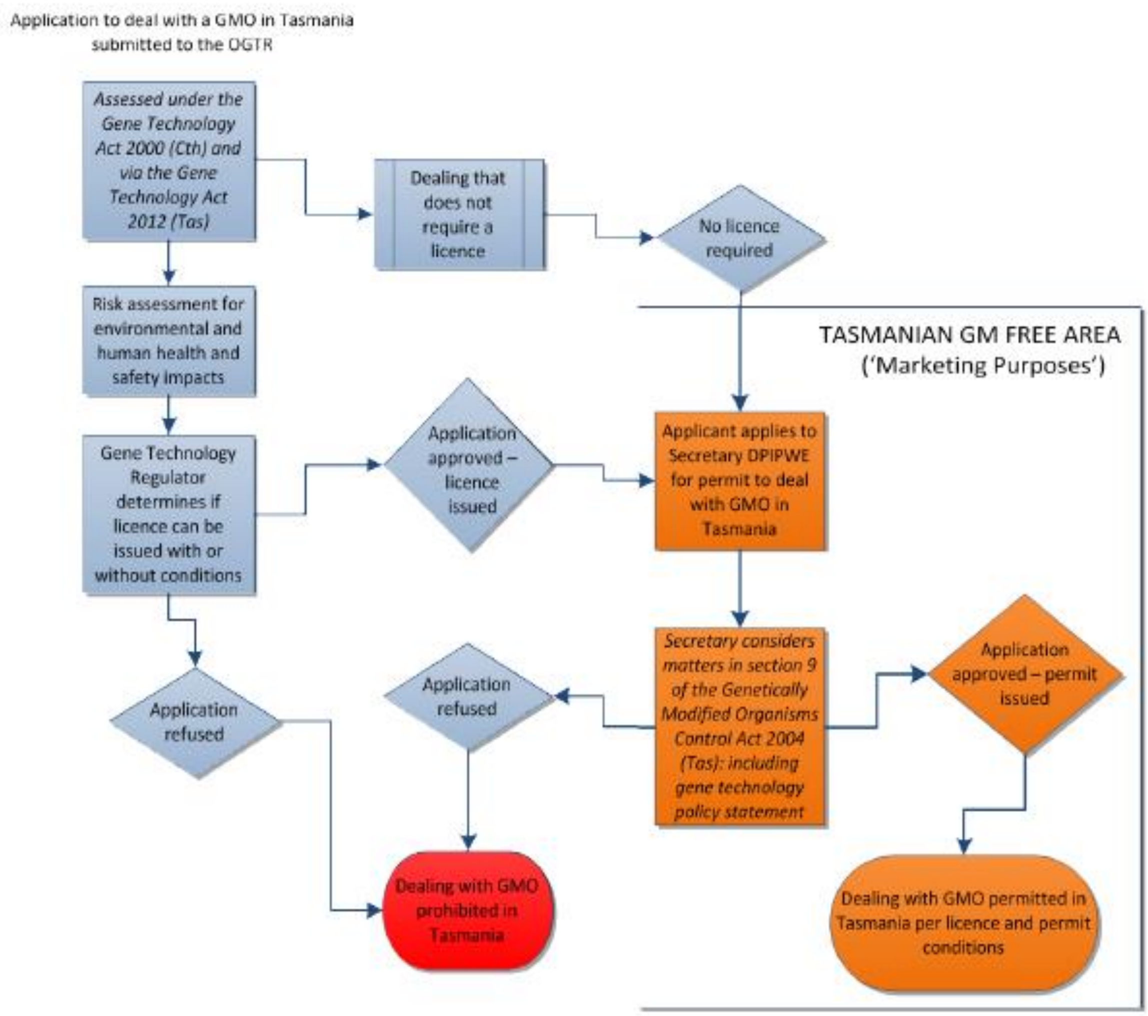
Genetically Modified Organism – (GMO or GM) an organism that has been modified by gene technology, or an organism that has inherited particular traits from an organism (the initial organism) being traits that occurred in the initial organism because of gene technology. The Commonwealth *Gene Technology Regulations 2001* specifies other techniques that do not constitute gene technology, and can declare those things that are a GMO.

Gene Technology – any technique for the modification of genes or other genetic material, but does not include sexual reproduction or homologous recombination.

Limited and Controlled Release - research and development outside contained facilities. These can range from small scale field trials (i.e. under field conditions. This is also known as open-air research).

Regulatory System:

The diagram below tracks how an application submitted to the Office of Gene Technology Regulator (OGTR) to 'deal' with a GMO in Tasmania would be assessed.



Tasmania's GMO regulatory and legislative framework fundamentally aligns with that of the Australian Government's *Gene Technology Act 2000 (Cth)*. In the Tasmanian context, the *Gene Technology (Tasmania) Act 2001 was enacted,* and in 2012, the 2001 Act was repealed and replaced with the *Gene Technology (Tasmania) Act 2012.*

The *Gene Technology Act 2000 (Cth)* is, however, modified in Tasmania by prohibiting the operation in Tasmania of any license granted by the Regulator for dealing with a GMO, if the dealing is in contravention of a GMO-free order (section 7 *Gene Technology (Tasmania) Act 2012).*

The *Genetically Modified Organisms Control Act (Tas)* came into effect in 2004. Its objective is to provide for the whole or any part of Tasmania to be declared a GMO-free area for the purpose of preserving the identity of non-genetically modified crops and animals for marketing purposes and to provide for persons to be allowed to deal with GMOs under permits.

The power of the Minister to declare GMO-free areas is provided in section five of the *Genetically Modified Organisms Control Act 2004* (Tas) and is only exercisable if the Minister considers that declaring a GMO-free area would aid in preserving the identity of non-genetically modified crops and animals for marketing purposes.

The whole of Tasmania was made a GMO-free area by the *Genetically Modified Organisms Control (GMO-free Area) Order 2005* (Tas) on 31 October 2005.

Part two of the *Genetically Modified Organisms Control Act (Tas)* prohibits a person from knowingly dealing with a GMO in a GMO-free area unless that person has a permit (granted under section 9) of the Act by the Secretary, Department of Primary Industries, Parks, Water and Environment (DPIPWE) and a license from the Regulator, or a permit when dealing with a GMO that does not require a license.

Administration costs

The costs of administering a prohibition on use of gene technology in primary industries, such as import control and eradication of GMOs, either as a result of barriers breaches or from former GM canola trial sites in Tasmania, can be substantial. Moreover, quarantine barrier and incursion response costs can be expected to increase in the event that more of Tasmania's domestic and international trading partners adopt GM crops and perhaps GM production animals.

The Tasmanian Government acknowledges this situation. Accordingly it will endeavor to administer the Policy and these Guidelines in a manner sensitive to the potential cost burdens on business and the community. The impact of increasing demands on biosecurity resources and the costs on agencies, business and consumers will be considered as part of the Government's budget development processes.

Administration

The responsibility for effective implementation of GMO policy across Government falls to DPIPWE because of its legislative obligations.

DPIPWE is responsible for administering the *Genetically Modified Organisms Control Act 2004*. The role involves:

- Assessment of and preparation of advice on applications for authorization to deal with GMOs; Oversight of authorisation to deal with GMOs, including contained laboratory research, field trails, processing to a non-viable state, disposal;

- Oversight of clearance of GM material from former GM canola trial sites, and regular status reporting;
- Oversight of clearance of GM material from properties affected by the 2005 Grace canola GMO contamination incident;
- Oversight of clearance of GM material from farm properties affected by inadvertent dealing;
- Import policy formulation, including in regard to commodities potentially contaminated with viable GM material;
- GMO incursion response; and
- Review and amendment of the *Genetically Modified Organism Control Act 2004.*

In addition, DPIPWE administers the *Gene Technology Act 2012* Tasmania's legislative component of the national scheme for gene technology regulation. DPIPWE also has an interest in national food safety regulation, in cooperation with the Department of Health and Human Services. Accordingly, DPIPWE undertakes:

- Preparation of advice in relation to participation in the national scheme for gene technology regulation via the Legislative and Governance Forum on Gene Technology (previously known as the Gene Technology Ministerial Council [Ministerial Council]), including review of GMO risk assessments and procedures and protocols generated by the national Office of the Gene Technology Regulator (OGTR); Review and amendment of the *Gene Technology Act 2012* and
- Preparation of advice in regard to GM food safety regulation, via Food Regulation Ministerial Council, including review of safety assessments conducted by Food Standards Australia and New Zealand (FSANZ), and labelling arrangements for GM food, under the *Australia New Zealand Food Standards Code.*

As well as carrying out its legislative duties, DPIPWE also engages locally and abroad by:

- Responding to requests from the public for information, or other correspondence; and
- Monitoring national and international scientific, legal and policy developments relevant to use of gene technologies in primary industries.

While DPIPWE has primary carriage for policy administration, certain measures require expertise that lies with other agencies. Implementation of those measures is agreed with other agencies as required.

Implementation

Development and use of Gene Technology that may be authorised under the Policy and these Guidelines is as follows.

Category	**Research Contained Facilities****	**Research Limited and Controlled Release****	**Commercial Purposes****
GM Food Crop	Yes*	No	No

GM Non-Food Crop *Pharmaceuticals not intended for food or feed*	Yes*	Yes*	Yes*
GM Non Food Crop *Other*	Yes*	No	No
GM Animal	Yes*	No	No
GM Microbes	Yes*	No	No

Note: *Refer to definition section for clarification on Contained Facilities, Limited and Controlled Release and Commercial Purposes.*

*Provided approval by OGTR and approval conditions by DPIPWE are met.

** The Policy on any of these areas may be subject to review by the Government as a result of the monitoring program by DPIPWE.

To deal with a GMO in Tasmania, a license from the Commonwealth is required (unless the dealing is classed as an "exempt dealing" refer www.ogtr.gov.au).

Any applications for a permit to develop and use of gene technology in Tasmania must stipulate the necessary precautions to be taken to minimise potential risks to the environment and health and safety of people. The applicant must demonstrate satisfactory capacity for compliance otherwise the permit will not be granted.

Food Plants

Importation, distribution, use or any other dealing that facilitates release of GM food plants, viable seeds or other propagules intended for use as food or feed to the Tasmanian environment is prohibited. The prohibition covers all dealings, including those for commercial purposes, and limited and controlled release.

Research in contained facilities

Dealings relevant to research or other activities in contained facilities involving GM food or feed plants, viable seeds or other propagules may be authorised under the *Genetically Modified Organisms Control Act 2004*. However authorisation will be subject to:

- Prior approval by the national Office of Gene Technology Regulator (OGTR) as required;
- Assessment by DPIPWE of the likelihood of GMO entry into the broader environment, other plants, or human or animal food supplies; and
- Conditions as required.

Former GM Canola Trial Sites

Sites in Tasmania previously used to trial GM canola will continue to be regulated under the *Genetically Modified Organisms Control Act 2004* to eradicate residual GM seed and prevent spread of GM material off-site.

DPIPWE will continue its cooperative approach with affected farmers and the biotechnology companies responsible for the trials to ensure compliance with site management plans and progression to site clearance and sign-off with least possible disruption to normal farming activity.

Grace canola sites

DPIPWE will continue to assist landholders affected by Grace canola GMO contamination to eradicate residual seed and prevent spread of GM material off-site commensurate with risk, and with least possible disruption to normal farming activity.

GMO inadvertent dealings

In the event of a land holder(s) being affected by any inadvertent dealings contamination (for example, through breaches of the *Plant Quarantine Act 1997*) DPIPWE will assist the landholder to eradicate residual seed and prevent spread of GM material off-site commensurate with risk, and with least possible disruption to normal farming activity.

Non-Food Plants

Release to the Environment

Release of plants, viable seeds or other propagules genetically modified for pharmaceutical purposes and not intended for use as food or feed, to the Tasmanian environment for limited and controlled release or commercial purposes may be authorised under the *Genetically Modified Organisms Control Act 2004.* However authorisation will be subject to:

- Prior approval by the national OGTR as required;
- Assessment by DPIPWE of the likelihood of GMO entry into the broader environment, other plants, or human or animal food supplies;
- Conditions as required.

Importation, distribution, use or any other dealing that facilitates release of GM plantation, amenity, ornamental or novelty plants, viable seeds or other propagules to the Tasmanian environment is prohibited. The prohibition covers all dealings, including those for commercial purposes, and limited and controlled release.

Research in contained facilities

Dealings relevant to research or other activities in contained facilities involving GM plants not intended for use as food or feed may be authorised under the *Genetically Modified Organisms Control Act 2004*. However authorisation will be subject to:

- Prior approval by the national OGTR as required;
- Assessment by DPIPWE of the likelihood of GMO entry into the broader environment, other plants, or human or animal food supplies;
- Conditions as required.

Contamination of Non-GM plant stocks with GM material

Tolerance thresholds

Zero tolerance for viable GMO contamination in imported canola seed and whole grain will continue to apply.

The Tasmanian Government will accept as evidence of zero contamination, a negative result from a test capable of detecting one GM canola seed in 10 000 non-GM canola seeds with 95% confidence, or an alternative import proposal which achieves an equivalent level of assurance that GMOs are absent.

The same zero tolerance approach may be applied to other imported seeds and whole grains if these are also likely to be contaminated with viable GM material, for example, as a result of increased plantings by trading partners.

Co-existence

DPIPWE's evidence-based monitoring program will continue to assess developments in gene technology as well as market and branding implications. The monitoring will include:

- arrangements for co-existence between GM and GMO free canola and other crops on the Australian mainland with particular regard to level of potential GMO contamination; and
- mainland and overseas co-existence experience including biosecurity measures and equipment and resources for segregation along the entire supply chain, particularly as relevant to potential importation of viable product from those systems to Tasmania; and
- court decisions in Australia and overseas regarding liability for GM contamination.

The Tasmanian Government will work with industry and key stakeholders on appropriate co-existence strategies for managing potential risks to ensure that measures to safeguard Tasmania's GMO free status remain appropriate to a changing risk environment.

Animal Feed derived from plants

Dealings with viable GM seed prohibited

Importation, distribution, use or any other dealing with animal feed containing viable GM seed capable of producing a GM plant is prohibited. The prohibition encompasses grain, grain mixes, fodder and any other plant product used for animal nutrition.

Animal feed containing viable GM seed may be authorised under the *Genetically Modified Organisms Control Act 2004* for processing in Tasmania to a non-viable state in an approved facility prior to further distribution and use. However authorisation will be subject to:

- Prior approval by the national OGTR as required;
- Approval of the facility by DPIPWE; and
- Conditions as required.

Dealings with non-viable GM seed

Importation, distribution, use and any other dealing with animal feed containing material derived from GM plants that is not viable and hence incapable of producing a GM plant (e.g. meal, substantially cracked or crushed grains, chaff) is not prohibited. However DPIPWE may require, or undertaken to obtain, evidence demonstrating GM material in that feed is non-viable.

Animals

Importation, distribution, use or any other dealing that facilitates release of viable GM livestock, fish, invertebrates, or other animals to the Tasmanian environment is prohibited. The prohibition covers all dealings, including those with commercial purposes, and limited and controlled release research, including in aquatic environments.

Notwithstanding, dealings relevant to release of live GM animals intended for bioremediation or biological control of pests or diseases may be authorised under the *Genetically Modified Organisms Control Act 2004*. However authorisation will be subject to:

- Prior approval by the national OGTR as required;
- Assessment by DPIPWE of the likelihood of GMO containment in the target environment, or restriction to the target pest or disease, and GMO entry to human or animal food supplies; and
- Conditions as required.

Research in contained facilities

Dealings relevant to research or other activities in contained facilities involving GM animals not intended for use as food or feed may be authorised under *the Genetically Modified Organisms Control Act 2004*. However authorisation will be subject to:

- Prior approval by the national OGTR as required;
- Assessment by DPIPWE of the likelihood of GMO entry into the broader environment, other plants, or human or animal food supplies;
- Conditions as required.

Proposals must stipulate the necessary precautions to be taken to minimise potential risk. Any research project will not proceed if the capacity for compliance cannot be satisfactorily demonstrated.

Microbes

Importation, distribution, use or any other dealing that facilitates release of viable GM microbes to the Tasmanian environment is prohibited. The prohibition covers all dealings, including those for commercial purposes, limited and controlled release research, including in aquatic environments.

Notwithstanding, dealings relevant to release of live GM animal vaccines, or microbes intended for bioremediation or biological control or pests or diseases may be authorised under the *Genetically Modified Organisms Control Act 2004*. However authorisation will be subject to:

- Prior approval by the national OGTR as required;
- Assessment by DPIPWE of the likelihood of GMO entry into the target environment, or restriction to the target pest or diseases, and GMO entry to human and animal food supplies; and
- Conditions as required.

Use in food manufacture

Importation, distribution and use in Tasmania of live GM micro-organisms to generate food processing aids or food additives is prohibited.

Dealings with food processing aids and food additives derived from GM micro-organisms are not prohibited unless the GMO remains alive and viable in the final food product.

Research in contained facilities

Dealings relevant to research or other activities in contained facilities involving GM microbes may be authorised under the *Genetically Modified Organisms Control Act 2004*. However authorisation will be subject to:

- Prior approval by the national Office of Gene Technology Regulator as required;
- Assessment by DPIPWE of the likelihood of GMO entry into the environment;
- Conditions as required.

Effective date of these Guidelines: August 2014

ATTACHMENT 3

Genetically Modified Organisms (GMO) Annual Environmental Scan

DECEMBER 2017

AgriGrowth Tasmania
Department of Primary Industries, Parks, Water and Environment (DPIPWE)

Tasmanian Government

Contents

Definitions

BIOFORTIFICATION – the development of new crop varieties with increased levels of micronutrients, by either conventional breeding practices or genetic modification[i]

BIOTECHNOLOGY - is a broad term that relates to using living organisms or parts of organisms to carry out biological processes for use in industrial processes or services. There are many examples of biotechnology in agriculture, medicine and waste recycling. It includes using microorganisms to transform materials (such as in fermentation), different methods of propagation (such as plant cloning or grafting), and may involve genetic alteration (through methods such as selective breeding)[ii].

COMMERCIAL PURPOSES – Intentional release of GMOs into the environment which take place outside of containment facilities[iii].

EPIGENEGICS – the study of heritable changes in our genome (the complete set of all of our genes) that occur without altering the DNA or genetic code[iv].

ENVIRONMENTAL SCAN – An environmental scan can help identify the trends most likely to affect a sector or an organisation. It is about gathering information on changing conditions to inform strategy.

GENETICALLY MODIFIED ORGANISM – (GMO or GM or GE) an organism that has been modified by gene technology, or an organism that has inherited particular traits from an organism (the initial organism) being traits that occurred in the initial organism because of gene technology. The Commonwealth *Gene Technology Regulations 2001* specifies other techniques that do not constitute gene technology, and can declare those things that are a GMO[v].

GENE TECHNOLOGY – Any technique for the modification of genes or other genetic material, but does not include sexual reproduction or homologous recombination or any other technique specified in the *Gene Technology Regulations 2001*[vi]

NEW BREEDING TECHNIQUES - A set of New Breeding Techniques (NBTs) can be used to introduce desired characteristics more precisely and in less time. Refer to this document for more detailed information:

http://www.foodstandards.gov.au/publications/Documents/New%20Plant%20Breeding%20Techniques%20Workshop%20Report.pdf

TRANSGENIC – describes an organism containing genes from another organism put into its genome through recombinant DNA techniques. A transgenic organism is one that contains a gene or genes which have been artificially inserted instead of the organism acquiring them through reproduction[vii].

Summary

BACKGROUND

This is the third Environmental Scan completed by AgriGrowth Tasmania since the GMO Moratorium in Tasmania was extended in 2014. It does not seek to reiterate discussion already presented in previous scans but rather to provide an update of changes that have occurred in the last year.

The most significant change since the last Scan, is the commencement of the reviews of the Gene Technology Scheme and the Gene Technology Regulations 2001. It is the third review of the Gene Technology Scheme, with phase two of the consultation process scheduled in November and December 2017. The Legislative and Governance Forum on Gene Technology is conducting this review, independent of the Gene Technology Regulator[viii].

Concurrently, the Office of Gene Technology Regulator (OGTR) is conducting the Technical Review of the Gene Technology Regulations 2001. This review is seeking to provide clarity about whether organisms developed using a range of new technologies (also known as new breeding techniques [NBTs]) are subject to regulation as genetically modified organisms (GMO) and ensure that new technologies are regulated in a manner commensurate with the risks they pose[ix].

The outcomes from these reviews have potential to change how GMOs are developed, reported and released into commercial production but these will be addressed in the 2019 moratorium review.

There are no GM crops or GM animals currently grown commercially in Tasmania.

SUMMARY OF KEY FINDINGS

There is no need to trigger a review of the moratoria on the commercial release of GM into Tasmania's environment at this time.

NBTs offer the opportunity to develop a broad range of novel traits, such as pest and disease resistance, herbicide resistance, drought tolerance, improved nutritional quality, extended shelf-life, and reduced allergenicity. The key advantages of the technology include[x]:

- precise trait development that can achieve both selectable and non-selectable traits;
- faster product development than both conventional breeding and transgenic approaches;
- simultaneous targeting of multiple traits and the capacity to combine multiple traits in a single crop; and
- the promise of a clear regulatory path and acceptance of its products among both farmers and consumers in target markets.

From a human health perspective, NBTs such as CRISPR/Cas9[1] are now revolutionising GM technology use in many areas including human health, drug development, research applications, agriculture and bioenergy. There are also developments with biological insect pest control that has potential application for fruit and vegetable growers. While all of these technologies could offer opportunities in the Tasmanian context, they are at the research stage and still have to work through regulatory approval processes.

From a consumer sentiment perspective, industry and consumer views remain divided as to how commercially released GMOs may impact on markets. The Environmental Scan highlights that NBTs continue to advance rapidly and there remains no common agreement internationally or nationally as to how to regulate them.

Agriculturally, NBTs offer the opportunity to develop a broad range of novel traits. There are already a number of plant varieties developed using NBTs that are approaching field trials, undergoing field trials, or which are already commercialised across the globe. While they could offer opportunities for Tasmanian primary producers, they will need to work through regulatory approval processes before being released into the environment in Australia.

<u>GM Pastures</u>

Ryegrass is naturalised in Tasmania as a pasture plant. There continues to be interest in development of GM perennial ryegrass in Australia. Since the Dairy Futures CRC ended in June 2016, the commercialisation of the GM ryegrass variety has been taken over by

[1] Refer to the Office of Gene Technology Regulator for definition on CRISPR http://www.ogtr.gov.au/internet/ogtr/publishing.nsf/Content/977EF3D4FDD4552ECA2580B10014663C/$File/Discussion%20Paper%20-%20Review%20of%20the%20Gene%20Technology%20Regulations%20.pdf

DairyBio which is a five year joint venture between the Victorian Government and Dairy Australia. Despite the potential benefits for dairy farmers, the commercial success of the variety is not guaranteed. Public acceptance of milk produced from GM pasture is likely to determine whether it is a commercial success and this would be considered carefully by milk processors.

Emerging Issue

There is an emerging issue regarding the organics sector and how it classes new breeding techniques. From an organic standard perspective, there remains a zero tolerance to the presence of GM organisms in organic crops in Australia. The International Federation of Organic Agriculture Movements (IFOAM) European Union (EU) Group has commenced a consultation on new breeding techniques and has released a draft position paper to be voted on at the next General Assembly of the organic movement in late 2017[xi].

Any proposed changes to the Gene Technology Scheme or Gene Technology Regulations in Australia (as a result of NBTs) would need to be considered by the organics industry. The findings of the IFOAM consultation process would have implications for the organics movement in Australia as certifying bodies Australian Certified Organic, Biodynamic Agricultural Association of Australia, National Association for Sustainable Agriculture are members of IFOAM.

Zero tolerance

The Tasmanian canola industry has indicated that there has been no shortage of non-GM canola seed (that meets Tasmania's current GMO threshold levels) for the 2017-18 growing season.

Introduction

BACKGROUND

Tasmania, has since 2001, maintained a moratorium on the commercial release of genetically modified organisms (GMO) into the environment. To this end, Tasmania has applied the Commonwealth laws (also known as the Gene Technology Scheme or 'the Scheme) in the State, first in 2001, with the *Gene Technology (Tasmania Act) 2001,* and then in 2012 when the 2001 was repealed and replaced with the *Gene Technology (Tasmania) Act 2012*.

There is no provision in the Commonwealth legislation for a State or Territory to 'opt-out' of the Scheme on environmental or human and safety grounds. However, on 5 September 2003, the *Gene Technology (Recognition of Designated Areas) Principle 2003 (Cwth)* came into force. That principle states, "*an area is recognised as an area that is designated for the purpose of preserving the identity of GM crops, non-GM crops or both GM and non-GM crops for marketing purposes, if the area is so designated under a State law*".

The then Tasmanian Minister for Primary Industries declared the whole of Tasmania a GMO-free area by the *Genetically Modified Organisms Control (GMO-free Area) Order (Tas)* on 31 October 2005. The aim was to position the State in the global marketplace as a producer of food that is genuinely GMO-free.

In August 2014, the Tasmanian Government extended the moratorium on GMO's until 16 November 2019. As a consequence, a new Tasmanian Gene Technology Policy (2014-2019) and Tasmanian Gene Technology Guidelines were also developed.

TERMS OF REFERENCE

In accordance with the Tasmanian Gene Technology Policy (2014-2019), DPIPWE is responsible for seeking stakeholder views and providing an annual report to the Minister on developments in gene technology and market changes. Specific matters to be reported on include:

1. Development of new generation GMOs that provide health or other benefits;
2. Consumer sentiment in important current and potential future markets; and

3. New gene technologies that provide positive benefits to primary industry sectors and Tasmania as a whole.

DPIPWE is to advise the Minister if, based on evidence, there are significant developments in any of these three specific matters that warrant triggering a review of the Policy before the maximum five-year review date. In addition, DPIPWE is to monitor the risks associated with maintaining Tasmania's current GMO threshold levels and any alternative options.

CONSULTATION PROCESS

The most significant change to the GMO environment in Australia (since the last Environmental Scan) is the review of the Gene Technology Scheme and the Gene Technology Regulations. DPIPWE has been in contact with the following industry bodies to alert them that the national reviews are currently underway.

Any observations raised by these bodies to AgriGrowth, at the time of contact, have been captured within this Scan.

- Dairy Australia (through DairyTas)
- Fruit Growers Tasmania
- Poppy Growers Tasmania
- Tasmanian Agricultural Productivity Group
- Tasmanian Beekeepers Association
- Tasmanian Farmers and Graziers Association
- Tasmanian Institute of Agriculture
- Tasmanian Organic-Dynamic Producers Inc
- Tasmanian Salmonid Growers Association
- Wine Tasmania

Findings

EMERGING ISSUE – ORGANICS SECTOR AND NEW BREEDING TECHNIQUES

Organic farms can be found state-wide in Tasmania and are involved in varying enterprises. There are 126 certified operations (79 are producers) in Tasmania representing 3 per cent of the nation's total certified operations[xii]. The producers comprise approximately a dozen large enterprises but the majority of the organic farms are small-scale[xiii].

From an organic standard perspective, there remains a zero tolerance to the presence of GM organisms in organic crops in Australia, with the growing markets for Australia (China, Korea, Japan) having no tolerance for GM in their organic standards[xiv].

While advocates of GM crops point to a number of benefits from the on-farm commercialisation of GM varieties, including enhanced farm productivity, improved weed control, reduced energy and chemical usage, and agronomic improvement of farm systems[xv], the global organic movement officially continues to oppose the release of GMOs into the environment and their use in agriculture.

In a statement issued prior to the European Commission's High Level Conference on Modern Biotechnologies in Agriculture, the Vice President for Policy of the International Federation of Organic Agriculture Movements (IFOAM) European Union (EU) Group was quoted as saying that:

> *All new genetic engineering techniques should be, without question, considered as techniques of genetic modification leading to GMOs and fall within the scope of the existing legislation on GMOs. There are no legal or technical reasons to exclude these techniques from risk assessment, prior authorisation and mandatory traceability and labelling, which apply to current GMOs.*
>
> *Deregulation of new genetic engineering techniques would jeopardise the ability of the organic sector to remain GMO-free and would threaten the freedom of farmers and consumers not to use these new GMOs. The European Commission should guarantee that no product obtained through new genetic engineering techniques will be marketed before detection methods are available, and should fund EU research projects to develop these detection methods.*[xvi]

The statement reaffirmed the IFOAM-EU Group's position on NBTs, which is detailed in a position paper released in December 2015. IFOAM has commenced a consultation on NBTs and has released a draft position paper to be voted on at the next General Assembly of the organic movement in late 2017[xvii]. The draft paper has ten recommendations and advocacy messages. One of them says that NBTs should be considered the same as GMOs. Another one says that, because NBTs will not be detectable, there needs to be an obligatory prerequisite to disclose the breeding technique used to avoid certain strains entering the organic system, and to guarantee freedom of choice for farmers and consumers[xviii].

Any proposed changes to the Gene Technology Scheme or Gene Technology Regulations in Australia (as a result of NBTs) would need to be considered by the organics industry. The findings of the IFOAM consultation process would have implications for the organics movement in Australia as certifying bodies Australian Certified Organic, Biodynamic Agricultural Association of Australia, National Association for Sustainable Agriculture Australia, Organic Federation of Australia are all members of IFOAM[xix].

SECTION UPDATES

This section now discusses in more detail the three areas as specified by the Terms of Reference.

SECTION 1: DEVELOPMENT OF NEW GENERATION GMOS THAT PROVIDE HEALTH OR OTHER BENEFITS

It is worth nothing that on 31 October 2017, it was the 35th anniversary of the approval in the United States of America of the world's first recombinant DNA drug product – GE insulin[xx]. Since then, NBTs such as CRISPR/Cas9[2] are now revolutionising GM technology use in many areas including human health, drug development, research applications, agriculture and bioenergy[xxi].

A new CRISPR trial, which hopes to eliminate the human papillomavirus (HPV), is set to be the first to use the technique inside the human body. In the non-invasive treatment, scientists will apply a gel that carries the necessary DNA coding to the cervixes of 60 women. The aim is to disable the tumour growth mechanism in HPV cells. This method is different to the usual CRISPR method of extracting cells and re-injecting them into the affected area. Twenty further trials are set to begin in late 2017 and early 2018. The research will focus on disabling cancer's PD-1 gene that fools the human immune system into not attacking the cells. Different trials are focusing on different types of cancer including breast, bladder, oesophageal, kidney, and prostate cancers[xxii].

Dengue fever outbreaks occur each year in north Queensland following cases imported from overseas. The Aedes aegypti mosquito is the main vector of dengue and its presence is currently limited to parts of Northern, Central and Southwest Queensland[xxiii]. There is still no cure for dengue. However, Sanofi Pasteur has had its vaccine Dengvaxia approved and endorsed by the World's Health Organization (WHO) on 15 April 2016[xxiv]. As of 11 October 2017, the vaccine is now available in 19 countries including Australia[xxv]. Sanofi-Aventis Australia Pty Ltd is, as of 27 June 2017, the licenced commercial supplier of Dengvaxia in Australia[xxvi].

[2] Refer to the Office of Gene Technology Regulator for definition on CRISPR http://www.ogtr.gov.au/internet/ogtr/publishing.nsf/Content/977EF3D4FDD4552ECA2580B10014663C/$File/Discussion%20Paper%20-%20Review%20of%20the%20Gene%20Technology%20Regulations%20.pdf

Oxitec, a pioneer in genetic engineering of insect control, developed the self-limiting Aedes aegypti called Friendly™ Aedes: a genetically modified male mosquito that does not bite and does not transmit viruses. Released into nature they mate with wild females. Their offspring inherit the self-limiting gene that causes them to die before they reach functional adulthood. They also inherit a fluorescent marker that enables tracking and monitoring. In addition, the Friendly™ Aedes die along with their offspring, therefore do not persist in the environment or leave any ecological footprint[xxvii].

In five separate trials in Brazil, Panama, and the Cayman Islands, Oxitec's environmentally-friendly solution has reduced the wild Aedes aegypti population by more than 90%[xxviii]. In January 2017, India joined in and launched a Friendly™ Aedes project in Dawalwadi as other available methods have not been effective to date to fight dengue which has had devastating effects on Indian citizens every year[xxix].

Fortunately, Tasmania is not affected by dengue or any other mosquito transmitted diseases. However, the principle method of self-limiting insects is being explored for agricultural pest control by Department of Agriculture and Food, Western Australia[xxx].

Research and development in biofortification seem to be a promising way to prevent nutrition disorders in humans living in poorer countries where supplements and fortified food are unaffordable or difficult to access[xxxi] [xxxii]. World-wide up to 700,000 children die as a result of vitamin A deficiency each year. Researchers in Queensland recently developed a Vitamin A-enriched banana to address the worsening vitamin A deficiency in Africa. Nutrient poor cooking bananas are the main food staple in many rural areas of Africa. In July 2017 the first Vitamin A-enriched crop was produced in Uganda. The target was to deliver 50 per cent of the estimated average requirement of vitamin A in vulnerable populations equal to β-carotene equivalents of 20 μg/g dry weight banana[xxxiii]. Remarkably, they achieved four times the amount of their targeted level.[xxxiv]

Agriculture and Food:

The global population is estimated to reach 9.7 billion by 2050. Nutrient denser crops may be needed to help feed this growing population, particularly if global warming and climate change continue to impact on crops in some regions. Gene-editing technologies such as CRISPR systems as well as epigenetic technologies may help to address these challenges. The precision of gene editing will further improve over time, but most importantly the technology needs to be approved and accepted by regulators, producers and consumers[xxxv] if it is to be freely used to advance quality of human life. More on consumer sentiment is presented in Section 2.

CRISPR/Cas9, one of the NBTs, continues to be explored in the agri-food sector. Self-limiting insect populations are being explored to tackle agricultural pests and they could prove to be the most environmentally friendly and sustainable form of pest control currently available. However, there are concerns about what long-term effects there may be on ecosystems when potentially eradicating entire insect species[xxxvi] although the response may be different in relation to exotic and native species.

In December 2016, Oxitec announced its advancement from contained environment to open field trials with its self-limiting Mediterranean fruit fly (Medfly). One of the trial sites is located in south Perth, Western Australia (WA)[xxxvii]. Fruit fly costs the WA horticulture industry millions of dollars annually in lost production and control costs[xxxviii].

Tasmanian horticulture relies heavily on the State's fruit fly pest free area status for Queensland fruit fly (Qfly) and Medfly. The risk of entry, establishment and spread of Qfly and Medfly is assessed as very low, however the estimated economic consequences will be high. The current technically sound biosecurity arrangements for mitigating risks of fruit fly entry into Tasmania are working. It is also important to recognise that Tasmania's risk profile is changing. Tasmania's *Maintaining Tasmania's Freedom from Fruit Fly: A strategy for the future 2017-2050'*[xxxix] provides an overarching timeframe to assess risk areas in Tasmania's fruit fly management strategy until the year 2050. Biosecurity Tasmania will conduct five yearly tactical reviews and validations of the Strategy. This iterative process will provide effective horizons for forward risk predication, analysis and mitigation measures.

On 5 September 2017, Oxitec announced it was starting field trials of the self-limiting Diamondback Moth. The Diamondback Moth is another highly invasive pest, foraging in brassicas and other vegetables that costs farmers globally over $4 billion per year in crop losses and control management[xl]. The diamondback moth is an important insect pest of Tasmanian agriculture.

The idea of self-limiting insects is not new. In the mid-1980s, there was successful trials of sterile blow flies (irradiation method) to prevent fly strike in sheep on Flinders Island. However, the success was largely due to the geographical isolation. Failed trails on open land and larger islands in addition to high rearing and release costs ceased the funding of the project.[xli]

Tasmania, while relatively pest-free, could benefit from self-limiting insects if proven effective after trials. The technology could increase the State's harvest yields, reduce control management costs and make farming practices more environmentally friendly however these benefits would only be realised if GM insects are not considered the same as GM feed and food from a regulatory and consumer point of view.

Epigenetics (see definitions) is the newest avenue of technology being explored in the agri-food sector. Studies in the field of epigenetics (including information about DNA) has implications for the application of NBTs and potential for crops in the field[xlii]. US company Epicrop found a unique way to improve crop yields and stress tolerance without making any changes to the plant's DNA. Epicrop discovered the MSH1 gene which, when silenced, tricks plants into 'believing' they are growing under stressful conditions such as drought, heat and cold. This causes them to compensate by activating a number of survival mechanisms, resulting in higher yields and more robust growth. More remarkably, the attributes carry through about five generations of offspring. Epicrop believes that this technique could be applied to virtually any plant. To date, there are far fewer regulations for epigenetic crops and therefore, epigenetic seeds may be available soon to help farmers address drought, heat, cold and climate change[xliii].

Traditionally hornless traits in cattle are achieved through selective breeding. In February 2017, United States (US) researchers successfully bred hornless (polled) calves after inserting DNA from hornless breeds into dairy cow embryos that would normally produce horned calves. Although these polled calves are still kept in quarantine researchers are determining whether their offspring will also be polled. The aim is to increase work and public health and safety and reduce global fatalities caused by horned cattle[xliv]. This year, CSIRO scientists discovered a way to make the Australian Poll Gene Marker test more accurate and able to be used across a range of breeds[xlv].

Polled cattle breeds also remove the need of disbudding and dehorning. It would save farmers time and money as well as improve animal welfare and maintenance of social licence. This flows-on to improved meat and leather quality because of reduced stress and bruising. Handling and other aspects of animal management such as feeding and animal health, are critical determinants of meat eating quality[xlvi].

Finding:

While all of these technologies could offer opportunities in the Tasmanian context, they are at the research stage. There will need to be trials and regulatory approvals before these technologies proven in real life farming situations.

SECTION 2: CONSUMER SENTIMENT

Globally, consumer sentiment remains unchanged over the past twelve months with consumers having diverse views over the use of GM in foods. While research over the last year has not indicated any heightened human health or environmental risk from GMOs, European government policy reflects the strong anti-GM public opinion among European consumers[xlvii].

Globally, non-GMO provenance is the fastest growing clean label claim, increasing 49 per cent over the past five years and in the United States alone, sales data of non-GMO products growing by 270 per cent in the past three years[xlviii].

The continued growth in sales for non-GMO provenance products has positive implications for this State. The 2017 Legislative Council Select Committee inquiry into the dairy industry in Tasmania noted that companies such as Fonterra are marketing Tasmania separately so that they can demonstrate attributes (non GMO) with traceability that are preferred in their markets[xlix]. Tasmanian beef brands like Cape Grim Tasmania continue to expand their market share presumably in response to consumers valuing their attributes including GMO freedom. Cape Grim were the first Australian food brand to be certified by the USA based NON-GMO Project protocol[l].

Sentiment within Tasmania's key international trading partners:

According to the 2015-16 Tasmanian Agri-Food Scorecard, beef was the most valuable international food export from the state in 2015-16. Tasmania's pasture-based red meat production system with the ban on Hormone Growth Promotants (HGP) and moratorium on GMOs have been important factors in securing US export contracts for premium grass fed beef[li].

The table below highlights the key export destination for a number of our key commodities.

Commodity	Country	Export destination by value $10 million or over
Meat	Japan	$62 million
	Republic of Korea	$21 million
	United States of America (USA)	$95 million
Dairy	Japan	$21 million
	Malaysia	$10 million
	Sri Lanka	$27 million
	Vietnam	$11 million
Fruit	China	$15 million
	Taiwan	$10 million
	Hong Kong	$12 million

Tasmanian beef is actively promoted as GM free. As an example if Tasmania changed its GM moratorium status, then the value of Tasmanian beef exports that could be affected would be in the vicinity of $178 million (out of total exports of $194 million for 2015-16).

The table below summarises some of the key activities with respect to consumer sentiment, government policy and regulation (with respect to GMOs) in Tasmania's key trading partners over the last twelve months.

Country	Sentiment
Japan	In September 2017, the Consumer Affairs Agency of the Government of Japan held its fifth meeting on labelling of food containing GM food and ingredients. Consumer groups at the meeting expressed their view that all food items should be included for mandatory labelling. However, they also expressed some level of understanding that this might increase food business risks and costs. The expert committee is expected to summarise their review by the end of 2017 and this may contain draft new regulations for mandatory labelling for GE food. Currently there are eight crops and 33 processed food items that require GE labelling in Japan. No analysis has been made on specific crops and whether they are grown in Tasmania.
Hong Kong	Hong Kong has no commercial production of biotechnology crops nor does it conduct field trials. Biotechnological research studies are being conducted in local universities.

	The country has a mandatory pre-market safety assessment to ensure the safety of GM food and has a set of guidelines for voluntary labelling for trade reference. The labelling would assist Hong Kong consumers who have concern regarding GMO foods. The Agriculture, Fisheries and Conservation Department regularly conducts surveys for presence of GMOs in various imported and locally grown crops from local markets and farms in Hong Kong.
United States of America (USA)	GM foods are available in the USA. Food processors are wary of consumer reaction to products containing GM wheat, so no GM wheat is commercially grown in the United States. Depending on the Federal agency, the USA has different terms to describe organisms created through recombinant DNA techniques. The United States Department of Agriculture (U.S.D.A.) Agricultural Marketing Service is currently looking at new rules that will form part of the National Bioengineered Food Disclosure Standard however it has not given a compliance date for labelling GMO ingredients. The U.S.D.A. is also looking at areas of potential overlap relating to recombinant DNA techniques.
Singapore	Singapore recognises the potential of synthetic biology as a future economic driver with wide-reaching applications from agriculture to bio-manufacturing to ground breaking cancer treatments and medicines. The Government aims to position the country as a global biological hub for synthetic biology. There are no vocal consumer groups actively campaigning against the imports of GE products. No barriers exist to imports as long as they are approved as safe for public consumption in their countries of origin before being allowed into Singapore.
The United Kingdom (UK)	From a survey conducted in mid-2016, half of the UK population do not feel well informed about GM crops and a further six per cent have not heard of them. The current license to use glyphosate will expire in the EU in 2017 with member States deciding to extend the product's license for another 10 years. The National Farmers Union has linked glyphosate to the GMO debate and has indicated that if there is a ban on the herbicide use, they will wish access to the use of GMOs instead[lii]. In 2017, the Rothamsted Research Institute in the UK applied for permission for a new trial of GM wheat. Several high profile groups including the Bakers Food and Allied Workers Union submitted a pledge to the Department for Environment, Food and Rural Affairs that was signed by over 350 bakers, millers, farmers and consumers saying they refused to use GM wheat[liii]. Once the UK leaves the European Union, there will be four markets with Scotland, England, Wales and Northern Ireland all delivering different regulatory frameworks and which may cause some issues if the devolved administrations disagree. Northern Ireland and Scotland have indicated they wish to be GM free.
China	China is the world's largest importer of GM crops however is yet to approve any major GM food crops for cultivation. The Chinese Ministry of Agriculture released the Revised Administrative Measures for Safety Assessment of Agricultural Genetically

	Modified Organisms in 2016. The 13th Five-year plan for Science and Technology Innovation aims to push forward the commercialisation of new domestic types of Bt corn, Bt cotton and herbicide resistant soybean by 2020. At the same time, delays in import approvals continue to increase, causing unpredictability for traders. GE crop cultivation is approved on a province-by-province basis. China has not approved any GE food or feed crops by foreign biotechnology firms for domestic commercial production. As an example, it reported that when foreign companies have asked to submit an application for domestic cultivation, the Ministry of Agriculture informs them that China's foreign direct investment restrictions prohibit them from doing so. China does not have a co-existence policy. China's Food Safety Law incorporates existing regulations on biotechnology labelling. China has zero tolerance for the presence of unapproved biotechnology traits in imported products. Although PCR testing is voluntary, it is believed that PCR testing is de-facto mandatory and imports to China are strictly held to import thresholds.
Republic of Korea	On 9 June 2017, Korea's Ministry of Food and Drug Safety (MFDS) made changes to labelling laws relating to GMOs and decided to exempt U.S. organic processed products from the mandatory biotech labelling requirements. For products that do not have biotech counterparts (such as non-GM banana) the use of non-GMO or GMO free claims are prohibited on product labels. Foods subject to GM food labelling requirements have been expanded from top-five ingredients to all ingredients. Non-detectable products are exempt from mandatory biotech labelling. The MFDS allows up to three per cent of unintended presence of approved biotech components in unprocessed non-biotech products.
Indonesia	In the past, GM maize, GM soybean, and GM sugarcane have received food safety approval. The majority of consumers prefer fresh foodstuffs which are readily available in their neighbourhood at affordable prices with 'healthy eating' becoming more popular among educated consumers. There is broad support for the technology from farmer organisations. Due to a lack of information and general knowledge about biotechnology, consumers are more hesitant if they know their food contains GE products. Indonesians have widely consumed GE soybean derived tempeh and tofu for the last three decades. GMO derived ingredients are required to be labelled.
Taiwan	Taiwanese regulators continue to remain very cautious about domestic cultivation of biotech crops however GM canola, GM Cotton, GM Maize, GM Soybean and GM Sugar Beet have been approved.
New Zealand (NZ)	The New Zealand Government announced in late 2016 that it would review the appropriateness of councils being involved in regulating GMOs. This was prompted after a high court decision in September that ruled councils with a GMO prohibition in their resource management plan have jurisdiction under the Resource Management Act to regulate their use.

Sources: Abridged from www.ers.usda.gov and http://gain.fas.usda.gov, and www.pir.sa.gov.au and www.cfs.gov.hk and www.ams.usda.gov and www.royalsociety.org

Labelling and public concern

Public pressure can shape regulations relating to the adoption of technology. Examples include public controversies over GMOs, which have had major influences on regulation and approval of new Crops in Europe[liv]. At a forum in New York in October 2017, leaders of companies developing GMOs indicated that agriculture needs to do a better job at explaining gene editing technologies to consumers[lv]. Governments also will need to anticipate public concerns around the most recent biotechnological advances, especially gene editing[lvi]. Increasingly, more voices are asserting that new technologies should be regulated not only on their benefit-risk profiles but also on their societal context and need[lvii].

Gluten-free, non-GMO and convenient/easy to prepare attributes have led product innovation plans of speciality food manufacturers for 2017[lviii]. At an international level, GMO labelling is applicable for pre-packaged food, packaged food and for food additives. Many countries are now considering trade regulations for GMO foods through labelling[lix]. In regions such as Asia Pacific, there is a lack of standardisation with labelling, however there is also a view that mandatory food labelling would burden the food industry with unwieldy and costly requirements[lx].

Labelling can lead to varied results. While some labels provide useful information that is not readily detectable by consumers, labels can also contain misleading claims that exploit a knowledge gap, for example labelling a bottle of water "gluten free' and 'non-GMO'[lxi].

In a recent study by the University of Florida Institute of Food and Agricultural Sciences, consumers were not able to distinguish between the terms 'organic' and 'non-GMO' on food labels, mistaking them as synonymous.[lxii] According to the research, consumers paid more for a 'Non-GMO Project' verified label products with the 'USDA Organic' label not holding as much weight[lxiii]. This research finding could influence manufacturers as to how they invest in non-GMO or consider organic certification (within organic standards across the globe, the use of GMOs in foods is prohibited).

Globally, different approaches continue to be taken in rolling out GM foods to consumers. Cargill has been working with the NON-GMO Project to verify several of its non-GMO ingredients because of demand for non-GMO foods[lxiv]. The rollout of the first GM food animal (4.5 tonnes of GM salmon) has been released into the Canadian food market, however the Canadian Government does not require GM foods to be labelled.

Consequently some consumers are concerned that they do not have choice in being able to avoid purchasing the product[lxv].

In contrast, the GM 'Arctic' Apple (non-browning apple) is being sold in retail stores with distinctive packaging that highlights how the apples are produced and where the fruit is sold[lxvi]. The company is promoting its product with key messages such as reducing waste and tackling obesity by increasing consumption[lxvii].

Growers in Australia feel they are being left behind in the global rollout of the GM non-browning apples and GM potato that offer industry gains in reducing wastage, consequently Horticulture Innovation Australia has commissioned a major study investigating the likely acceptance of these new breeding technologies in the local industry[lxviii]. The major grower concern is consumer acceptance followed by the cost of applying new breeding techniques to the relatively small vegetable market in Australia[lxix].

Consumer sentiment within Australia:

Food Standards Australia New Zealand consider the importation of GM food and over time has approved sixty foods derived from GM crops imported into Australia[lxx]. Research on consumer attitudes over the last decade indicates that views have shifted from a lack of knowledge of gene technologies that drive negative attitudes, to confirming that attitudes are driven more by personal risk-benefit perceptions and values[lxxi].

Recent research into perceptions of harm versus safety noted that even the highly science-literate women who worked in health science saw GM food as being in conflict with their core food values with all the women surveyed preferring food that was 'natural' (as in unprocessed), locally produced, healthy and nutritious and free from additives[lxxii].

Former Deputy Prime Minister John Anderson has reflected on the debate about new technology and the need for calm, reasoned discussion as discussion driven by emotions can hinder access to GM technologies,[lxxiii] while others emphasise the need for clear communication and consultation with the public through appropriate channels[lxxiv].

A recent inquiry by the Parliament of Tasmania Legislative Council Select Committee into the Tasmanian Dairy Industry reported that there remains diverse views from the dairy sector on the benefits (or otherwise) of GMOs[lxxv]. As part of the submissions, two agricultural consultants stated the potential to improve farmer profits by adoption of dual systems (GMO and non GMO) in Tasmania, with the Chair of the TFGA Dairy Council stating that Tasmania had not yet realised any measurable benefit from remaining GMO free[lxxvi]. However dairy processor Fonterra, urged caution with any decision to change Tasmania's GMO free status[lxxvii].

In October 2017, the OGTR released a Report into community attitudes to gene technology[lxxviii]. The findings of this Report indicate that attitudes to GMOs in Australia have settled and do not show any degree of change, with about 13 per cent of the population strongly opposed to GMO[lxxix]. There are wide differences in support of GMOs in medical (63 per cent), industrial (55 per cent), environmental (54 per cent) and food and crops (38 per cent)[lxxx]. Of those who supported GM foods, almost half the respondents were open to the production of GM food as long as regulations were in place to make sure it was safe, however knowledge about what foods in Australia were GM foods is generally poor[lxxxi].

Non-GM Canola

GM canola and GM cotton are the only two commercially grown GM crops in Australia. With non-GM canola, the only canola crop that can be grown in Tasmania, it is worth noting the following trends.

There has been expansion in the area of GM canola grown in three mainland States[lxxxii]. In 2015-16 there was 983 hectares of non-GM canola planted in Tasmania, producing 1,983 tonnes from 33 agricultural enterprises[lxxxiii]. This represents less than one per cent of the national total production for 2015-16. Irrigation expansion in Tasmania creates further opportunity to increase the area planted given appropriate market signals.

More than 80 per cent of Australia's canola oil is likely to end up in the fuel tanks of European cars and trucks this year, rather than as human food as EU buyers are largely interested in buying non-GM canola due to the negative consumer sentiment towards GM products[lxxxiv]. The demand for certified non-GM canola outside Australia is high, with some non-GM canola attracting a higher premium[lxxxv]. This creates further opportunities for Tasmanian growers.

Other domestic matters

Like Tasmania, South Australia will continue the moratorium on all GM crops as a point of difference that allows South Australia to represent its produce to the world as being grown in a GM-free State[lxxxvi]. A Bill tabled in the South Australian Parliament seeking to extend the moratorium in that State until 2025 (the current moratorium expires in September 2019) passed in mid-November 2017[lxxxvii lxxxviii].

In Western Australia, the Environment and Public Affairs Committee of the Western Australian Legislative Council has commenced in December 2017, an inquiry into compensation mechanisms for farmers who lose money because of contamination from GM material. The public submission period opened on 7 December 2017 and will close on 16 February 2018[lxxxix].

Finding:

In respect to consumer sentiment, government policy and regulation in Tasmania's key trading partners, opinion remains divided as to how commercially released GMOs may impact on markets. The Environmental Scan shows that NBTs continue to advance rapidly and there remains no common agreement internationally or nationally as to how to regulate them.

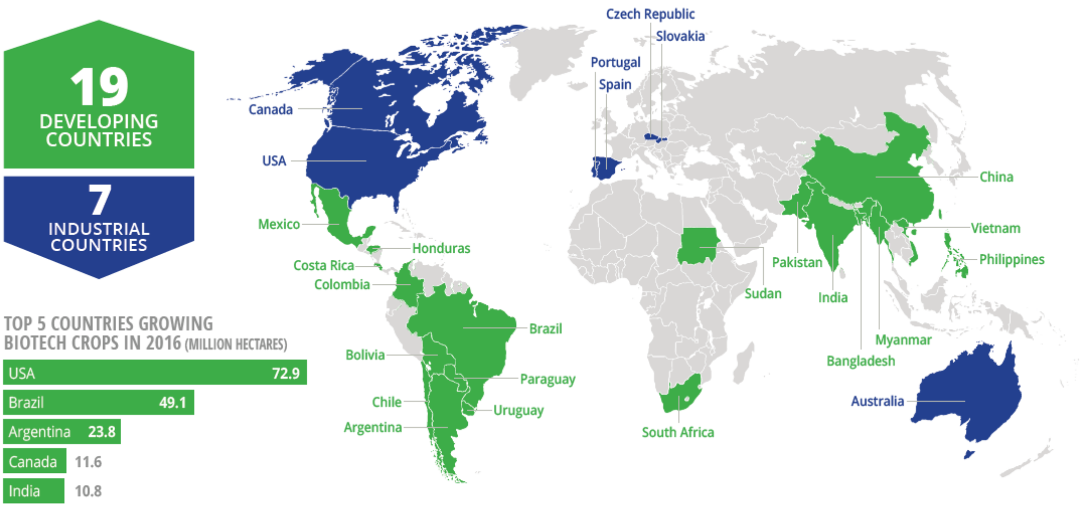
SECTION 3: NEW GENE TECHNOLOGIES THAT POTENTIALLY PROVIDE POSITIVE BENEFITS TO PRIMARY INDUSTRY SECTORS AND TASMANIA AS A WHOLE

As with many of the technologies that underpin agricultural advancement, the basic scientific understanding and practical applications of gene technologies are moving rapidly. The 2016 Environmental Scan served as an introduction to the technologies and their application to agriculture, and in particular Tasmanian agriculture. This section builds on that introduction to provide a more in-depth commentary.

Despite the rapid uptake of several GM crops and numerous GM varieties in some countries, the development and commercialisation of new GM crop varieties and traits has tended to be slow[xc]. The average time to market for a new GM crop variety, 13 years, includes over five years for regulatory and registration activities[xci]. This compares to 7-12 years to produce a new variety through conventional plant breeding, which is more laborious and time-consuming but less burdened by regulation[xcii].

As is apparent in Section 2 of this Environmental Scan, GM crops face significant consumer resistance and opposition from non-government enterprises in many Organisation for Economic Cooperation and Development (OECD) countries. This opposition has slowed the commercialisation and adoption of GM crops by lessening the incentives for biotechnology companies to invest in developing new GM crops and varieties, and for farmers to adopt the varieties.

In spite of the time to market, a record 185.1 million hectares of GM crops were grown globally in 2016 in twenty six countries involved in the production of biotech crops in 2016 (see below).



Source: www.isaaa.org Note that with the above graphic, the ISAAA have incorporated Tasmania and South Australia in the country where crops are grown, however both these States have a moratorium on the commercial release of GMO's into the environment.

Around 88 per cent of crops are grown in the Americas and 10 percent in Asia[xciii]. More than half (54 per cent) was grown in developing countries, with three countries (Brazil, Argentina and India) accounting for around 84 per cent of developing country production[xciv].

Of the 18 countries that grew at least 50,000 hectares of GM crops in 2016, 4 were high income OECD countries, including the USA, Canada, Australia and Spain. The USA and Canada accounted for almost 99 per cent of GM crop production by area in these countries. The USA alone accounted for around 85 per cent, equivalent to 39 per cent of world GM crop production by area[xcv].

Australia's GM crop production increased from 0.7 million hectares in 2015 to 0.9 million hectares in 2016, an increase of 29 per cent - the largest percentage increase of any country and the fifth largest increase in absolute terms after Brazil, the US, Canada and South Africa[xcvi].

A Report by GP Economics into the global economic benefits of GM crops, has found that over the last 20 years, crop biotechnology has significantly reduced agriculture's environmental impact and stimulated economic growth in the 26 countries where the technology is used[xcvii].

Since 1996, the development and commercialisation of GM crops has proceeded from first generation varieties with single traits, such as herbicide tolerance or pest/disease resistance, to second generation varieties with two or more 'stacked' herbicide tolerance and/or insect resistance traits, or tolerance of abiotic stress such as drought[xcviii]. In 2016 stacked 'GM events' (specific genetic modifications in a specific species) made up 82.6 per cent of all approved GM events globally[xcix].

The focus of so-called 'third generation' GM crops is on the development of output traits, such as modified starch or oils (e.g. high omega-3 fatty acids, oleic acid or stearic acid), non-browning or bruising flesh, reduced woodiness (low lignin), and increased micronutrients (e.g. beta-carotene, ferritin and vitamin E) [c].

With some recent exceptions, the GM crops in cultivation around the world are transgenic GMOs produced using gene technologies originally developed in the 1980s. These technologies have enabled not only the genetic modification of crop varieties but also the acceleration of conventional breeding programs through a process known as marker-assisted selection (MAS) that uses genetic markers linked to agronomic traits[ci].

Advances in DNA sequencing and the mapping and characterisation of genes and their functions have resulted in a substantial increase in the number of genetic markers being available to crop and livestock breeders. Genomic selection is a technique related to MAS that uses large sets of genome-wide genetic markers (up to hundreds of thousands of individual markers) to predict the breeding value of an animal or plant[cii]. It enables plant and animal breeders to target complex traits controlled by large numbers of genes, whereas MAS is limited to use with less complex traits controlled by one or a few genes.

In 2010, two United States companies (Cargill USA and Branhaven LLC) filed a patent describing a method for identifying genetic traits in cattle using 2,510 genetic markers known as Single Nucleotide Polymorphisms[ciii]. In June of this year, the Federal Court finished hearing an appeal (launched by Meat and Livestock Australia) against the patent, which claims that the patent could restrict access to genomic testing and research into cattle genetics by giving the companies the right to licence service providers or charge licence fees for genomic testing[civ]. The outcome of the appeal could have important implications for the use of genomic selection in Australian livestock breeding programs.

Genetic manipulation in all its forms is a technically complex area of science hence any meaningful discussion must contain a degree of scientific complexity including use of standard scientific terminology. Complexity has therefore been minimised in the following discussion, particularly in respect to the practical agricultural applications of science.

New Breeding Techniques (NBTs)

NBTs offer the opportunity to develop a broad range of novel traits, such as pest and disease resistance, herbicide resistance, drought tolerance, improved nutritional quality, extended shelf-life, and reduced allergenicity. The key advantages of the technology include[cv]:

- precise trait development that can achieve both selectable and non-selectable traits;
- faster product development than both conventional breeding and transgenic approaches;
- simultaneous targeting of multiple traits and the capacity to combine multiple traits in a single crop; and
- the promise of a clear regulatory path and acceptance of its products among both farmers and consumers in target markets.

Scientific understanding

Over the past two decades a range of new gene technologies have been developed that are commonly referred to as 'New Plant Breeding Techniques' or simply 'New Breeding Techniques' (NBTs). The term encompasses diverse technologies[3], including:

- Site-directed nuclease (SDN) techniques;
- Oligo-directed mutagenesis (ODM);

[3] Refer to the Office of Gene Technology Regulator for definitions on new breeding techniques http://www.ogtr.gov.au/internet/ogtr/publishing.nsf/Content/977EF3D4FDD4552ECA2580B10014663C/$File/Discussion%20Paper%20-%20Review%20of%20the%20Gene%20Technology%20Regulations%20.pdf

- Cisgenesis (transferring a gene from the same or closely related species) and intragenesis (inserting a reorganised regulatory coding region of a gene from the same species)[cvi]
- RNA-dependant DNA methylation (RdDM) – a technique that uses RNA interference (RNAi) to interrupt or suppress gene expression, also known as 'gene silencing';
- Grafting of non-GMO scion on to GMO rootstock;
- Reverse breeding; and
- Agro-infiltration.

NBTs have significantly increased the range of options available in breeding programs, beyond conventional breeding techniques and the genetic modification techniques used since the 1980s. While several NBTs are restricted to use in plants or are not currently used in farm animals or microorganisms (including grafting, agro-infiltration, RdDM and reverse breeding)[cvii], SDN and ODM can be used in plants, animals and microorganisms[cviii].

The application of NBTs is resulting in the emergence of novel products that raise fundamental questions about the definition of a GMO and how best to regulate gene technology to protect the health and safety of people and the environment, without unduly stifling innovation. SDN and ODM techniques are so precise that they can be used to produce organisms that are (in practice) indistinguishable from the products of conventional breeding or spontaneous mutations[cix]. It is likely to be almost impossible to detect these organisms, unless they are deliberately genetically 'barcoded' to facilitate detection.

In the case of agro-infiltration, reverse breeding and RdDM, transgenes are only present during an intermediate step in the technique and not in the final product[cx]. The techniques may also result only in changes to the *expression* of target genes through the spread of small RNA molecules, instead of changes to the DNA sequence of the plant's genome[cxi]. The resulting organism is therefore indistinguishable from conventionally bred crop lines using DNA-based analytical methods including Polymerase Chain Reaction (PCR) and DNA sequencing.

Increasingly, research is turning to the use of sprays containing chemically synthesized short RNA molecules to induce gene silencing in plant pathogens or the host plant as a method of controlling pests and diseases[cxii].

Genome editing

Crop improvement requires the continuous production of new biological diversity from which desirable variants can be selected[cxiii]. In conventional breeding programs, genetic variation is produced through crossing existing plants, which results in new combinations of existing variation, or through the generation of new genetic variations using chemical- or radiation-induced mutagenesis[cxiv cxv].

Chemical or radiation-induced mutagenesis, results in random changes to the genome (and the process of growing and crossing plant populations and selecting desirable variants) is laborious and time-consuming[cxvi]. It can also be difficult to separate desirable genes from closely linked genes that may have neutral or negative effects[cxvii].

ODM and SDN, which are commonly referred to as 'genome editing', offer significant advantages over other breeding methods, including speed, precision, versatility and cost[cxviii]. Genome editing enables targeted modification of the genome of an organism at precise locations by either producing random point mutations or directed changes to the DNA sequence. Depending on the technique used, the directed changes can range from the deletion, addition or substitution of one or several nucleotides in the DNA sequence through to the insertion of large DNA fragments that can include genes, regulatory elements and selectable markers[cxix]. Such precision is virtually impossible with the more established genetic modification techniques[cxx].

SDN techniques use a cutting enzyme (nuclease) to produce a double-stranded break in the DNA at a specific location in the genome and utilises the cell's DNA repair machinery to produce changes at the target site. A variety of enzymes can be used to achieve the targeted DNA breaks, including meganucleases (MNs), zinc finger nucleases (ZFNs), transcriptional activator-like effector nucleases (TALENs), and clustered regularly-interspaced short palindromic repeats (CRISPR)-associated proteins such as CRISPR-Cas9[cxxi,]. The techniques can be used to produce changes ranging from random mutations (SDN-1), predefined mutations (SDN-2), to the addition of large DNA sequences that can include genes and regulatory elements (SDN-3)[cxxii]. Whereas SDN-1 results in random insertions, deletions and substitutions, often of only a few nucleotides, SDN-2 and SDN-3 work on the principle of using a supplied template to guide the cell's repair machinery[cxxiii].

Among the genome editing techniques in use, CRISPR-Cas9 has become the most widely used because of its relatively low cost, versatility and ease of use[cxxiv].

Unintended effects

Chemical or radiation-induced mutagenesis, induces random mutations at a rate several hundred times higher than the spontaneous mutation rate in plants[cxxv]. In comparison, ODM and SDN result in one or a few predefined mutations and possibly some ‘off-target’ mutations[cxxvi]. End products containing a desired mutation can be produced much more quickly and precisely through gene editing than through conventional breeding, and through the use of whole genome sequencing it is possible to check that these products contain only the desired mutation(s)[cxxvii].

Unlike cisgenesis, intragenesis[4] and the more established genetic modification techniques, most genome editing techniques (including ODM, SDN-1 and SDN-2) do not result in end products containing exogenous DNA[cxxviii] and the predefined mutations generally bring about very limited modifications to one or more pre-existing genes[cxxix]. Conversely, SDN-3 results in the introduction of one or more new genes and/or regulatory elements. Whereas the more established genetic modification techniques lead to the uncontrolled insertion of transgenes into the plant genome, which can lead to undesired effects on the expression of non-target genes or the gene itself (so-called ‘position effects’), SDN-3 enables the targeted insertion of the gene to a specific location in the genome, thereby minimising the potential for unintended effects[cxxx]. Nonetheless, when a new gene is introduced into an organism through either SDN-3 or the more established genetic modification techniques, its interactions with the endogenous genes of the recipient organism cannot always be predicted[cxxxi].

Although genome editing techniques result in a much lower number of unintended effects, the frequency of these ‘off-target’ mutations and the risks they pose continues to be debated. A 2015 Norwegian study into the current status of scientific knowledge concerning SDN and ODM concluded that the techniques “are not fully scientifically understood and thus pose many uncertainties connected to mode of action as well as potential unintended effects”[cxxxii]. In theory, with the rapid development of synthetic ‘designer’ nucleases and the ability to use DNA sequencing to confirm the presence or absence of off-target mutations, it should become increasingly possible to minimise the occurrence of off-target effects.

[4] Refer to the 2016 Environmental Scan Appendix Two for explanation
http://dpipwe.tas.gov.au/Documents/GMO%20Annual%20Environmental%20Scan%202016.pdf

Australia's peak life sciences organisation, AusBiotech Ltd, asserts that ODM, SDN-1 and SDN-2 introduce changes to the organism's own DNA and are essentially chemical mutagenesis techniques and therefore should be regulated in the same way as chemical mutagenesis"[cxxxiii]. Opponents of this position argue that unlike chemical or radiation-induced mutagenesis, which results in random mutations, genome editing techniques can be used sequentially to make profound, targeted changes to the genome, and could be deliberately misused to create entirely new diseases and poisons[cxxxiv].

The Gene Technology Technical Advisory Committee (GTTAC) established under the *Gene Technology Act 2000* (Cwth) to provide scientific and technical advice to the Gene Technology Regulator and Ministers, has resolved that the risks posed by organisms altered by SDN-1 are unlikely to be different to naturally mutated organisms, and that SDN-2 and ODM are unlikely to pose risks that are different to natural mutations, conventional breeding or mutagenesis[cxxxv]. However, the Committee also resolved that successive rounds of modifications using SDN-2 and ODM may pose risks similar to inserting new genes or SDN-3, and that off-target effects do pose risks different to the intended effects[cxxxvi].

Regulatory uncertainty

There continues to be no global uniformity in the regulation of NBTs. Most countries, including Australia, have process-based regulatory schemes which regulate novel organisms based on the biotechnology process used to develop them. Canada and the USA are unusual in having regulatory schemes that focus on the properties of the product, although process frequently comes into consideration for regulatory assessments of GM crops in the USA[cxxxvii]. Canada's strong adherence to a product-based regulatory scheme means that the products of conventional breeding, mutagenesis, transgenesis or genome editing are all subject to a similar regulatory approval process[cxxxviii].

Despite being process-based, the regulatory systems in Australia, Argentina and Brazil have delivered regulatory approvals in a manner relatively consistent with that seen in North America[cxxxix]. In comparison, the European Union's (EU) process-based regulatory system has had the effect of stifling the commercialisation and adoption of GM crops. This has led to the current situation in which only one GM crop (a variety of maize) is able to be commercially grown in the EU, despite its member states being among the world's largest importers of GM crops for use in food, animal feed or other products.

The USA and Canadian regulators have already approved or exempted from regulation, several genome edited crops and this has led to the rapid commercialisation of these varieties in North America. However, there continues to be uncertainty surrounding the regulation of the products of genome editing and other NBTs in countries with process-based regulatory schemes.

The EU has been considering whether to regulate the products of NBTs as GMOs for over a decade with no clear outcome as yet. Along with regulation, consumer sentiment will also have a major impact on the incentives to develop, commercialise and adopt GM crops and livestock developed using NBTs.

In October 2016, Australia's Gene Technology Regulator initiated a Technical Review of Australia's *Gene Technology Regulations 2001* (Cwth) to clarify whether organisms developed using a range of new technologies are subject to regulation as GMOs and ensure that new technologies are regulated in a manner commensurate with the risks they pose[cxl]. The focus of the review is on genome editing techniques, but it also considered other NBTs.

In October 2017, the Gene Technology Regulator put forward a draft proposal under which organisms modified using site-directed nucleases without templates to guide genome repair (i.e. SDN-1) would not be regulated as GMOs. However, if a template is used (i.e. SDN-2, SDN-3 or ODM), the resulting organism will continue to be regulated as a GMO[cxli]. Under a separate proposal, the use of RNA molecules to induce gene silencing (e.g. in a spray) would not constitute gene technology provided the RNA cannot give rise to changes to genomic sequence and cannot be translated into proteins. On the other hand, gene silencing techniques that involve inserting DNA sequences into the genome or the use of viruses would continue to result in GMOs subject to regulation. The Regulator is consulting on these draft proposals until late January 2018.

In parallel with the Technical Review, the Commonwealth, State and Territory Ministers with portfolio responsibility for gene technology (known as the Legislative and Governance Forum on Gene Technology) have initiated a review of the policy settings of Australia's Gene Technology Scheme. The Review is considering (among other things) whether Australia should adopt a product-based regulatory scheme or a hybrid scheme.

Applications of new gene technologies

There are already a number of plant varieties developed using NBTs that are approaching field trials, undergoing field trials, or which are already commercialised across the globe[cxlii], including herbicide resistant canola developed using ODM, a soybean with modified oil composition developed using SDN-2 that is intended to be commercialised in 2018, disease-resistant potatoes developed through cisgenesis, and scab-resistant apples modified to contain the vf gene of the Japanese flowering crab apple (*Malus floribunda*)[cxliii]. The development of genome edited farm animals is also a rapidly emerging field.

In microorganisms SDN-3 has been successfully used in bacteria, yeast and fungi[cxliv]. Microorganisms edited with CRISPR-Cas technique are already commercially used for food and feed applications, for example in starter cultures for dairy fermentation (yoghurt and cheese)[cxlv].

Innate Potatoes

In July and August 2017, the J. R. Simplot Company (known as Simplot) received the necessary approvals from Canadian regulatory authorities for three new Innate genetically modified varieties of Russet Burbank, Ranger Russet and Atlantic potatoes to be imported, planted and sold in Canada for both human and animal consumption[cxlvi]. The varieties, which were developed in the United Kingdom and approved by USA regulators in February 2017, are the second generation of Innate potato varieties developed by Simplot. The newest varieties have been developed to be resistant to the disease Late Blight (also known as Irish Blight) through the insertion of a gene from an Argentine variety of potato into commercial varieties using cisgenesis. Late Blight is a major disease of Tasmanian potato crops grown in wetter conditions, and both Russet Burbank and Ranger Russet are varieties grown to supply Simplot's Tasmanian potato processing operations.

Simplot claims that the Innate Generation 2 potatoes reduce the use of fungicide by half, have reduced bruising and black spots and enhanced cold storage capacity, produce less acrylamide (a carcinogen) when cooked at high temperatures, but still have the same taste, texture and nutritional qualities as conventional potatoes. Production of the first generation of Innate potatoes began in the USA in 2015 and since then, the area planted has increased to approximately 2,428 hectares in 2017[cxlvii]. However, McDonald's decision in 2014 not to use the genetically modified potatoes in its French fries, is likely to have limited the adoption of the varieties. This has particular relevance for Tasmania as the fast food market is a significant customer for Tasmanian-grown potatoes.

SU Canola

The first NBT derived product to be commercialised was a variety of herbicide-resistant canola, SU Canola, developed by Cibus Global using ODM to induce a single base mutation, which occurs naturally in related species[cxlviii]. SU canola gained market approval in the USA and Canada in 2014 with commercial cultivation commencing in the USA in 2015[cxlix] and in Canada in 2017[cl]. Canada accounts for around 90 per cent of North America's canola production.

Cibus Global is reportedly looking to introduce SU Canola introduce into China, Europe, and Australia while also working to add more specialized traits to canola and expand its product line by introducing other crops with improved characteristics[cli]. While several regulatory bodies in EU member states have concluded that ODM is a form of mutagenesis that can be excluded from GMO legislation[clii], the final decision on the matter may rest with the European Court of Justice.

Other genome edited crops

There have been a number of genome edited plant varieties developed using the ZFN, TALEN and CRISPR-Cas9 SDN techniques[cliii]. The first genome edited crop produced using CRISPR-Cas9 was a corn variety developed by DuPont Pioneer through the inactivation of a single gene leading to corn with a high concentration of amylopectin starch, an ingredient in processed foods and adhesives.

In April 2016, the U.S.D.A. decided to forego regulation of the corn and a variety of button mushroom (*Agaricus bisporus*) genome edited to resist browning on the basis that the organisms do not contain foreign DNA[cliv]. In the case of the mushroom, CRISPR-Cas9 was used to delete a handful of base pairs in the mushroom's genome, inactivating one of six genes involved in the expression of an enzyme responsible for browning[clv].

Arctic Apples

In November 2017, the world's first genetically modified non-browning apple, Arctic Golden (a variety of Golden Delicious), was due to go on sale in the United States[clvi]. Arctic Golden is one of three varieties known collectively by the trade name Arctic Apples (Arctic Golden, Arctic Fuji and Arctic Granny). The varieties were developed using a double-stranded RNA gene silencing technique to suppress the activity of an enzyme, polyphenol oxidase, responsible for the browning in apple flesh when the fruit is cut or bruised[clvii].

Arctic Golden apples will initially be available exclusively as 10-ounce bags of pre-cut apple slices to highlight the apple's non-browning trait and convenience to consumers. The marketing of Arctic Apples is being seen as an important test of consumer acceptance of GM foods in that the varieties have been intentionally developed to primarily benefit consumers and the food service industry rather than producers, as has been the case with most GM crops.

Livestock breeding

Genome editing is an important new tool in livestock breeding. By December 2015, it had already been used to produce more than 300 differently edited pigs, cattle, sheep and goats worldwide[clviii]. Some well-publicised recent applications include hornless dairy cows; 'double-muscled' pigs, sheep and cattle (obtained through changes to the myostatin gene that controls muscle growth[clix]) and increased resistance to diseases, including African swine fever virus, Porcine Reproductive and Respiratory Syndrome (PRRS) virus[clx] and tuberculosis in cattle[clxi]. PRRS is one of the most significant diseases in intensively reared pigs in Europe, North America and Asia. Although Australia currently remains free of PRRS, its introduction could devastate Australia's commercial pig industry[clxii].

In October, Chinese scientists reported creating 12 healthy pigs with about 24 per cent less body fat than normal pigs using the CRISPR-Cas9 technique[clxiii]. Reducing dietary animal fat could make a significant contribution to addressing the world obesity epidemic, however there is doubt that products from the genome edited pigs would be allowed to enter the food chain in the United States where GM salmon has met with intense opposition from environmental and food safety groups[clxiv].

Notwithstanding rapid advances in the application of the technology, the commercialisation of genome edited farm animals for food is in its infancy and none have reached the market, although gene edited animals are being used to produce pharmaceutical proteins in milk and eggs[clxv]. The use of genome editing in animals also raises significant animal welfare considerations. For example, genome edited double-muscled pigs produced using an SDN-1 technique reportedly experienced birthing difficulties, and only one of 32 cloned piglets survived and developed into a healthy animal[clxvi]. There remains considerable uncertainty globally around the regulation of genome edited animal products and whether they will achieve public acceptance.

As with plant breeding, the potential applications of genome editing in livestock are only limited by knowledge of the genomes of farm animals. While genome editing in animals has initially focused mainly on disease resistance and a small number of other traits through the creation of gene variants that exist in the same or similar species, other changes to animal physiology have been suggested[clxvii]. Examples include the production of offspring of a single sex, improved welfare by avoiding castration, and the prevention of the production of allergens or disease-causing prion proteins[clxviii], such as those implicated in bovine spongiform encephalopathy, commonly known as 'mad cow disease'.

Genome editing promises the possibility of producing commercial livestock with precise genetic changes that would be difficult or impossible to achieve with conventional selective breeding[clxix]. Although early genome editing in animals has tended to focus on inducing a mutation in a single gene, there is considerable scope for innovation. Compared to more established genetic modification techniques, SDN-3 offers a simpler, more precise and efficient way of introducing DNA fragments containing genes and/or regulatory elements into the genome of animals and the simultaneous induction of multiple genetic modifications is possible[clxx].

Transgenic Atlantic salmon

2017 marked the first commercial sale of a genetically modified animal for food. The AquAdvantage Atlantic salmon produced by AquaBounty Technologies has been engineered to grow faster on less feed and reach a marketable size in 16-18 months (instead of three years) through the introduction of a growth-hormone gene from Chinook salmon and genetic regulatory elements from a third fish species. Despite being first demonstrated in 1989, the salmon was only approved for human consumption by the United States Food and Drug Administration (FDA) in November 2015, and by Health Canada in 2016[clxxi]. While the first Canadian sale of the salmon was announced on 4 August 2017, sales of the product are currently prohibited in the US until the FDA institutes labelling guidelines and a program to disclose to consumers whether a fish has been genetically altered[clxxii].

Globally, aquaculture is increasingly important as a source of protein. Marine biotechnology is seen as an important enabling technology at different steps in the value chain as it can significantly enhance breeding and can be used for vaccine development and the development of fish feed[clxxiii].

Australian research and development

Australia's Office of Gene Technology Regulator (OGTR) is responsible for administering the *Gene Technology Act 2000* (Cwth) and corresponding state and territory laws, including the licensing system under which a person can apply to the Regulator for a licence authorising certain dealings with GMOs. Dealings with GMOs that take place outside of containment facilities are known as Dealings involving an Intentional Release (DIR) of GMOs into the Australian environment.

Most DIR licences issued by the Regulator are for experimental field trials (limited and controlled releases) or general/commercial releases of GM plants. The Regulator maintains a record of DIR licence applications and authorisations, and consultations on licence applications, through which it is possible to monitor the pipeline of new applications of gene technology relevant to Tasmanian agriculture[clxxiv].

During the twelve months to the end of October 2017, the OGTR issued nine licences for dealings involving the intentional release into the environment of several GM crop varieties including cotton, banana, Indian mustard (Juncea canola), potato, wheat, barley and sorghum. The following licences are broadly relevant to Tasmanian agriculture:

- Licence DIR 149 issued to Nuseed Pty Ltd in February 2017 authorised field trials of Indian mustard genetically modified to produce long chain omega-3 oils at various sites in New South Wales, Victoria and Queensland between April 2017 and 2022. Mustard can be grown in Tasmania.
- Licence DIR 150 issued to the Queensland University of Technology in February 2017 authorised a two-year field trial in Queensland to assess the agronomic characteristics and disease response of a potato variety genetically modified to be resistant to potato virus X, which is currently not found in Tasmania.
- Licence DIR 151 issued to the CSIRO in May 2017 authorised a five-year field trial of wheat genetically modified for disease resistance, drought tolerance, altered oil content and altered grain composition at two sites in the Australian Capital Territory and New South Wales.
- Licence DIR 152 issued to the University of Adelaide in July 2017 authorised field trials of wheat and barley varieties genetically modified for frost tolerance and enhanced yield at up to five sites in South Australia, Western Australia and New South Wales between July 2017 and January 2021.

Each of the GM wheat lines to be used in the CSIRO trials will contain up to three introduced genes derived from wheat, barley, maize or rice. Of the 37 introduced genes to be used in the trial, 22 are intended to give the GM wheat tolerance to rust disease or drought while 15 are intended to alter the starch, oil or dietary fibre content of the grain and/or leaves. The field trial will assess the agronomic characteristics of the wheat lines, as well as the nutritional characteristics of flour derived from the wheat.

Some of the GM wheat lines in the University of Adelaide field trials of GM wheat and barley varieties will contain up to three introduced genes for yield enhancement, derived from rice and thale cress, while other lines will contain one of seven frost tolerance genes. The GM barley lines will contain one of two frost tolerance genes.

None of the GM crops produced through any of the field trials will be permitted to enter the commercial human food or animal feed supply chains, however some GM material from the Nuseed and CSIRO trials may be used for small-scale experimental animal nutritional studies. Some GM material from the CSIRO trials may also be used for human nutrition trials.

Conventional wheat and barley varieties are currently grown extensively in Tasmania with the gross margin largely being driven by yield and quality.

The OGTR is also currently consulting on licence applications for the commercial release of GMOs into the environment relating to canola (DIR 155), cotton (DIR 157), safflower (158) and perennial ryegrass (DIR160).

DIR 155 concerns an application from Nuseed Pty Ltd for the commercial release of a GM canola line, DHA canola, which has been modified to produce long chain omega-3 polyunsaturated fatty acids (predominantly docosahexaenoic acid, DHA) in the seed oil through the introduction of seven yeast and marine algae genes involved in fatty acid biosynthesis. If the application is approved, the GM canola and its products would enter general commerce, including use in human food and animal feed. The GM canola oil has the potential to be used in place of fish and algal oils, including in animal feed, aquaculture feed, food additives, pharmaceuticals and nutraceuticals.

Application DIR 155 follows field trials conducted in New South Wales, Victoria and Western Australia from 2014 to 2016 under licence DIR 123. DHA canola has also been released for field trials in Canada from 2016.

DIR 158 concerns an application by GO Resources Pty Ltd for the Australia-wide commercial release of two safflower (*Carthamus tinctorius* L.) lines genetically modified for high oleic acid composition through the insertion of two gene fragments derived from safflower that work to lower the expression of two fatty acid biosynthesis genes. The GM safflower lines also contain an antibiotic resistance gene used in the development of the lines.

Safflower is cultivated commercially as a minor oilseed crop, primarily in NSW and Victoria and to a lesser extent South Australia and Queensland. The aim of the proposal is to introduce the GM safflower into the Australian cropping system. If a licence is issued, the GM safflower and its derived products would enter general commerce, with the oil derived from the GM safflower intended for commercial industrial oil production. Products derived from the GM safflower are not intended for use in human food.

GM safflower lines have previously been approved for field trials in Australia under licences DIR 121 and DIR 131 and there have been field trials of cotton genetically modified for the same trait (increased levels of oleic acid composition) under licence DIR 039/2003 and DIR 085/2008. Field trials of GM safflower with different traits have also been approved in the USA and Canada.

Agronomically, safflower could be grown in Tasmania with the decision to grow driven by relative gross margins. While it is not a commercial crop in Tasmania, the GM safflower lines are notable in that they contain ‘gene silencing’ constructs that suppress the expression of two endogenous safflower fatty acid biosynthesis genes involved in the conversion of oleic acid to linoleic acid or palmitic acid. As a result, the GM safflower produces seeds that accumulate a high proportion of oleic acid (approximately 92 per cent) and very low linoleic acid (less than 2 per cent).

GM ryegrass

DIR 160 concerns an application by the Victorian Government to conduct field trials of a perennial ryegrass (*Lolium perenne*) line genetically modified to contain two introduced genes from perennial ryegrass involved in the biosynthesis of fructan (a type of sugar found in cool-season grasses), in order to assess its agronomic characteristics and multiply seed for future trials. The GM perennial ryegrass line also contains a bacterial gene encoding antibiotic resistance used in the development of the line, and short regulatory sequences derived from perennial ryegrass, rice and the Cauliflower Mosaic virus that control expression of the genes. If approved, the trials would be conducted in Southern Grampians Shire in south-west Victoria over two growing seasons from May 2018 to June 2020. The GM perennial ryegrass line proposed for release has been previously approved for limited and controlled release into the Australian environment under licence DIR 082. Ryegrass is naturalised in Tasmania as a pasture plant.

The perennial ryegrass line that is the subject of DIR 160 is a variety of transgenic GM 'high-energy' perennial ryegrass developed in Victoria in 2003 through the Centre for AgriBioscience (AgriBio), and later the Dairy Futures Cooperative Research Centre (CRC). The variety is continuing to undergo field trials in Victoria and Argentina in preparation for an application to the Gene Technology Regulator for a licence to commercially release the variety in 2020[clxxv]. Meanwhile, New Zealand researchers are reportedly beginning trials in the US of a different ryegrass variety genetically modified to contain an increased fat and oil content.

In 2015 it was predicted that the high-energy ryegrass variety could increase productivity in the dairy industry by 10-15 per cent per hectare[clxxvi]. The final 2016 report of the Dairy Futures CRC notes that the variety is able to produce an extra megajoule of metabolisable energy per kilogram of dry matter, with modelling indicating that it could boost dairy annual productivity in northern Tasmania by $750 a hectare[clxxvii] [clxxviii]. According to the report, the impact of this change has been confirmed as the largest generator of value from all current innovations that are under development.

Since the Dairy Futures CRC ended in June 2016, the commercialisation of the GM ryegrass variety has been taken over by DairyBio, a five year joint venture between the Victorian Government and Dairy Australia. Despite the potential benefits for dairy farmers, the commercial success of the variety is not guaranteed. Any application to commercially release the variety is likely to attract opposition from some agricultural producers, agri-businesses and community groups, including organic dairy farmers concerned about the potential impact on their organic certification. If the variety is approved for commercial release, public acceptance of milk produced from GM pasture is likely to determine whether it is a commercial success.

Among the major dairy processors, Murray Goulburn has a long-held position of not accepting milk containing GM material[clxxix], however the likely buyer of Murray Goulburn, Canadian dairy giant Saputo, does not have a policy on the issue. Fonterra's policy is nuanced, recognising both the possibilities offered by new and emerging technologies such as genome editing, and the value of New Zealand's global reputation for its GM status[clxxx]. While the co-operative is not anti-GM, its products do not contain GMOs and nor has it released or commercialised any GMOs. The policies of the other major milk processors in Tasmania, Lion and Mondelez (Cadbury), are unclear.

DairyBio is reportedly continuing to fast-track the development of other new perennial ryegrass varieties at Hamilton, Victoria, through the world's largest precision-planted perennial ryegrass field trial looking at conventionally bred cultivars and F1 hybrid grasses[clxxxi]. The trial includes the use of sensors to identify elite plants and genomic selection to make DNA-based decisions. In addition to conventional breeding, research is being conducted at AgriBio's Melbourne laboratories using genome editing techniques to reduce lignin production and increase pasture digestibility[clxxxii]. DairyBio's work on ryegrass involves a joint investment by Agriculture Victoria, Dairy Australia, DairyNZ and Heritage Seeds.

If the SDN-1 genome editing technique is deregulated, as proposed by the Gene Technology Regulator, genome edited perennial ryegrass varieties developed using the technique would avoid regulation as GMOs. Given the relative speed of genome editing techniques and the potential opposition to transgenic GM ryegrass, it is conceivable that a genome edited perennial ryegrass could be successfully commercialised before a transgenic variety.

One final note, the 2017 Legislative Council Select Committee Final Report on the Tasmanian Dairy Industry reported that "…they now have a GMO rye grass…what this means that because they have got access and we don't it halves our profit"[clxxxiii]. This statement could be construed by some that GMO ryegrass is available now for release into the environment. This is not the case. GMO ryegrass remains in trial with no license issued by the OGTR for its commercial release into the environment.

Other Australian developments

In April 2017, an international team involving researchers from Australia announced that it had sequenced the entire barley genome, thus providing researchers with a map to work out which genes control specific traits[clxxxiv]. The map will facilitate the development of new barley varieties using both conventional breeding and modern biotechnologies. It is hoped that this development will ultimately lead to more stable and sustainable yields and improved malting, resulting in reduced farmer risk and increased profitability. Given the importance of barley as a cereal crop in Tasmania, and the recent growth in Tasmania's brewing and distilling industries, it has the potential to deliver significant long-term benefits and opportunities for Tasmanian agriculture and the broader agri-food sector.

In July 2017, Queensland University of Technology researchers announced that they have worked on a 'proof of concept' technology required to produce a vitamin A bio-fortified Cavendish dessert banana, with field trials conducted in the Northern Territory[clxxxv]. The realisation of this concept could have significant nutritional benefits for Australians and people in developing countries for whom bananas form a significant component of their diet.

In October 2017, researchers at the University of Adelaide reported that they had identified a naturally occurring wheat gene that when turned off eliminates self-pollination but still allows cross-pollination, thereby opening the way for streamlined breeding of high-yielding hybrid wheats[clxxxvi]. Traditional hybridisation has been recognised as an effective plant breeding technology for the past half century and delivered quantum improvements in maize varieties. Adoption of this technology in Australia could have significant benefits for wheat production.

Zero Tolerance

As noted in the introduction, the *Tasmanian Gene Technology Policy (2014-19)* also commits DPIPWE to "monitor the risks associated with maintaining Tasmania's current GMO threshold levels and any alternative options".

Thresholds or tolerance levels specify the maximum allowable level of adventitious (unintended) presence of GM material permitted by regulators and/or markets. Different countries apply different adventitious presence threshold depending on their production conditions for agricultural products[clxxxvii]:

Europe = 0.9 per cent
Japan = 5 per cent
Taiwan and **Korea** = 3 per cent
Australia and **New Zealand** = 1 per cent
United States of America – Not-defined

The *Tasmanian Gene Technology Guidelines* maintain a 'zero tolerance' threshold for viable GMO contamination in imported canola seed and state that the Tasmanian Government will accept as evidence of zero contamination (i) a negative result from a test capable of detecting one GM canola seed in 10 000 non-GM canola seeds (i.e. 0.01% contamination) with 95% confidence, also known as testing to the limits of detection, or (ii) an alternative import proposal which achieves an equivalent level of assurance that GMOs are absent.

The importation of GMOs into Tasmania is regulated in accordance with import requirements specified in the Plant Quarantine Manual Tasmania issued pursuant to section 68 of the *Plant Quarantine Act 1997 (Tas)*. Import Requirement 32 requires all imported canola seed and grain to be accompanied by a certificate or statement of analysis demonstrating freedom from GM contamination. Imported products that do not comply with these import requirements are held and dealt with by Biosecurity Tasmania.

Tasmania's zero tolerance threshold is more stringent than the threshold of 0.9% (canola crop and 0.5% seed for commercial sale) adopted by all other States that have specified a threshold (Victoria, South Australia, New South Wales and Western Australia). Testing to the limits of detection (0.01%) is more costly than testing to the standard employed by other States and, for importers of canola seed, there is a risk that consignments will be rejected if they do not comply with the Tasmanian threshold.

Industry bodies connected with the growing of canola in Tasmania have confirmed that there has been no shortage of suitable canola seed for sowing this growing season. AgriGrowth Tasmania will continue to monitor the situation.

Appendix I[clxxxviii]:

Schedule 1A—Techniques that are not gene technology

Item	Description of technique
1	Somatic cell nuclear transfer, if the transfer does not involve genetically modified material.
2	Electromagnetic radiation-induced mutagenesis.
3	Particle radiation-induced mutagenesis.
4	Chemical-induced mutagenesis.
5	Fusion of animal cells, or human cells, if the fused cells are unable to form a viable whole animal or human.
6	Protoplast fusion, including fusion of plant protoplasts.
7	Embryo rescue.
8	*In vitro* fertilisation.
9	Zygote implantation.
10	A natural process, if the process does not involve genetically modified material. Examples: Examples of natural processes include conjugation, transduction, transformation and transposon mutagenesis.

Schedule 1—Organisms that are not genetically modified organisms

Item	Description of organism
1	A mutant organism in which the mutational event did not involve the introduction of any foreign nucleic acid (that is, non-homologous DNA, usually from another species).
2	A whole animal, or a human being, modified by the introduction of naked recombinant nucleic acid (such as a DNA vaccine) into its somatic cells, if the introduced nucleic acid is incapable of giving rise to infectious agents.
3	Naked plasmid DNA that is incapable of giving rise to infectious agents when introduced into a host cell.
6	An organism that results from an exchange of DNA if: (a) the donor species is also the host species; and (b) the vector DNA does not contain any heterologous DNA.
7	An organism that results from an exchange of DNA between the donor species and the host species if: (a) such exchange can occur by naturally occurring processes; and (b) the donor species and the host species are micro-organisms that:

Item	Description of organism
	1. (i) satisfy the criteria in AS/NZS 2243.3:2010 for classification as Risk Group 1; and 2. (ii) are known to exchange nucleic acid by a natural physiological process; and (c) the vector used in the exchange does not contain heterologous DNA from any organism other than an organism that is involved in the exchange.

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Genetically Modified Organisms (GMO) Annual Environmental Scan

DECEMBER 2016

AgriGrowth Tasmania
Department of Primary Industries, Parks, Water and Environment (DPIPWE)

Tasmanian Government

Contents

Definitions

BIOTECHNOLOGY - is a broad term that relates to using living organisms or parts of organisms to carry out biological processes for use in industrial processes or services. There are many examples of biotechnology in agriculture, medicine and waste recycling. It includes using microorganisms to transform materials (such as in fermentation), different methods of propagation (such as plant cloning or grafting), and may involve genetic alteration (through methods such as selective breeding)[i]

COMMERCIAL PURPOSES – Intentional release of GMOs into the environment which take place outside of containment facilities[ii].

ENVIRONMENTAL SCAN – An environmental scan can help identify the trends most likely to affect a sector or an organisation. It is about gathering information on changing conditions to inform strategy.

GENETICALLY MODIFIED ORGANISM – (GMO or GM or GE) an organism that has been modified by gene technology, or an organism that has inherited particular traits from an organism (the initial organism) being traits that occurred in the initial organism because of gene technology. The Commonwealth *Gene Technology Regulations 2001* specifies other techniques that do not constitute gene technology, and can declare those things that are a GMO[iii].

GENE TECHNOLOGY – Any technique for the modification of genes or other genetic material, but does not include sexual reproduction or homologous recombination or any other technique specified in the *Gene Technology Regulations 2001*[iv]

NEW BREEDING TECHNIQUES - A set of New Breeding Techniques (NBTs) can be used to introduce desired characteristics more precisely and in less time. Refer to this document for more detailed information: http://www.foodstandards.gov.au/publications/Documents/New%20Plant%20Breeding%20Techniques%20Workshop%20Report.pdf

Summary

This is the second Environmental Scan completed by AgriGrowth Tasmania since the GMO Moratorium in Tasmania was extended in 2014.

There are no GM crops or GM animals grown commercially in Tasmania.

SUMMARY OF KEY FINDINGS

There is no need to trigger a review of the moratoria on the commercial release of GM into Tasmania's environment at this time.

Development of new generation GMOs that provide health or other benefits

Globally, the major focus of research with GM and NBTs appears to be on reducing the risk of human disease. This is consistent with the Australian situation where the Regulator is dealing with an application for the trials of an attenuated GM Dengue vaccine.

Consumer sentiment in important current and potential future markets

Consumer sentiment in the major export markets for Tasmania has not changed. Research indicates that many consumers in developed countries demonstrate a clear preference for non-GMO crops and that, in general, attitudes and reactions to the topic of GM foods is not positive.

New gene technologies that provide positive benefits to primary industry sectors and Tasmania as a whole

Emerging technologies such as NBTs are rapidly advancing. There is no common agreement at an international level about how to regulate around these new technologies. This has the potential to increase challenges from a market and trade perspective and highlights the need for consideration of the legislative definitions of GMOs in Australia.

The Office of Gene Technology Regulator (OGTR) is in the process of completing a technical review of the *Gene Technology Regulations 2001*. The Technical Review aims to focus on new technologies and does not alter the policy settings of the regulatory scheme.

Zero tolerance

Industry has indicated that there has not been an issue relating to supply of non-GM canola seed, that meets Tasmania's current GMO threshold levels, for this growing season.

Introduction

BACKGROUND

Moratoria on the commercial release of GM material around the globe, including in Australia, have historically been established to allow time for examination and review of the potential market access and trade implications of the introduction of GMO crops[v]. Tasmania has maintained a moratorium on the commercial release of genetically modified organisms (GMOs) into the environment since 2001.

Australia has a nationally consistent legislative scheme for regulating gene technology, consisting of the Commonwealth *Gene Technology Act 2000* and *Gene Technology Regulations 2001*, and corresponding State and Territory legislation. The legislation was developed in consultation with all Australian jurisdictions and the scheme is supported by the inter-governmental Gene Technology Agreement between the Australian Government and each State and Territory. In Tasmania, the Commonwealth legislation is applied through the *Gene Technology (Tasmania) Act* 2012, which replaced the *Gene Technology (Tasmania) Act 2001*.

There is no provision in the Commonwealth legislation for a State or Territory to 'opt out' of the national scheme on environmental or health grounds. Gene Technology (Recognition of Designated Areas) Principle 2003[vi] allows a State or Territory to declare an area (free of GMOs) for marketing purposes.

Under section 5(1) of the *Genetically Modified Organisms Control Act 2004 (Tas)*, the Minister for Primary Industries and Water may, by order, declare the whole or any part of Tasmania to be an area that is free of GMOs if he or she considers that to do so would aid in preserving the identity of non-GM crops and animals for marketing purposes. Accordingly, through the *Genetically Modified Organisms Control (GMO-Free Area) Order 2005*, the then Minister declared the whole of Tasmania to be a GMO-free area, effective from 15 November 2005.

In August 2014, the Tasmanian Government published the *Tasmanian Gene Technology Policy (2014-2019)* and *Tasmanian Gene Technology Guidelines*, extending the moratorium until 16 November 2019. The Guidelines specifically prohibit importation, distribution, use and any other dealings that facilitate release of genetically modified (GM) food plants, viable seeds or other propagules intended for use as food or feed to the Tasmanian environment.

The Policy commits DPIPWE to implementing an evidence-based GMO monitoring program to continuously assess developments in gene technology in order to build a better understanding of consumer preference and supply chain dynamics, as well as market and branding implications.

This is the second Environmental Scan completed by the AgriGrowth Tasmania Division of DPIPWE since the Moratorium was extended in 2014. The 2015 Environmental Scan, which was informed by industry consultation, did not reveal any new issues or technologies that warranted a review of the moratorium at that time.

TERMS OF REFERENCE

In accordance with the Tasmanian Gene Technology Policy (2014-2019), DPIPWE is responsible for seeking stakeholder views and providing an annual report to the Minister on developments in gene technology and market changes. Specific matters to be reported on include:

1. Development of new generation GMOs that provide health or other benefits;
2. Consumer sentiment in important current and potential future markets; and
3. New gene technologies that provide positive benefits to primary industry sectors and Tasmania as a whole.

DPIPWE is to advise the Minister if, based on evidence, there are significant developments in any of these three specific matters that warrant triggering a review of the Policy before the maximum five year review date. In addition, DPIPWE is to monitor the risks associated with maintaining Tasmania's current GMO threshold levels and any alternative options.

CONSULTATION PROCESS

The following organisations were contacted for input into this Scan:

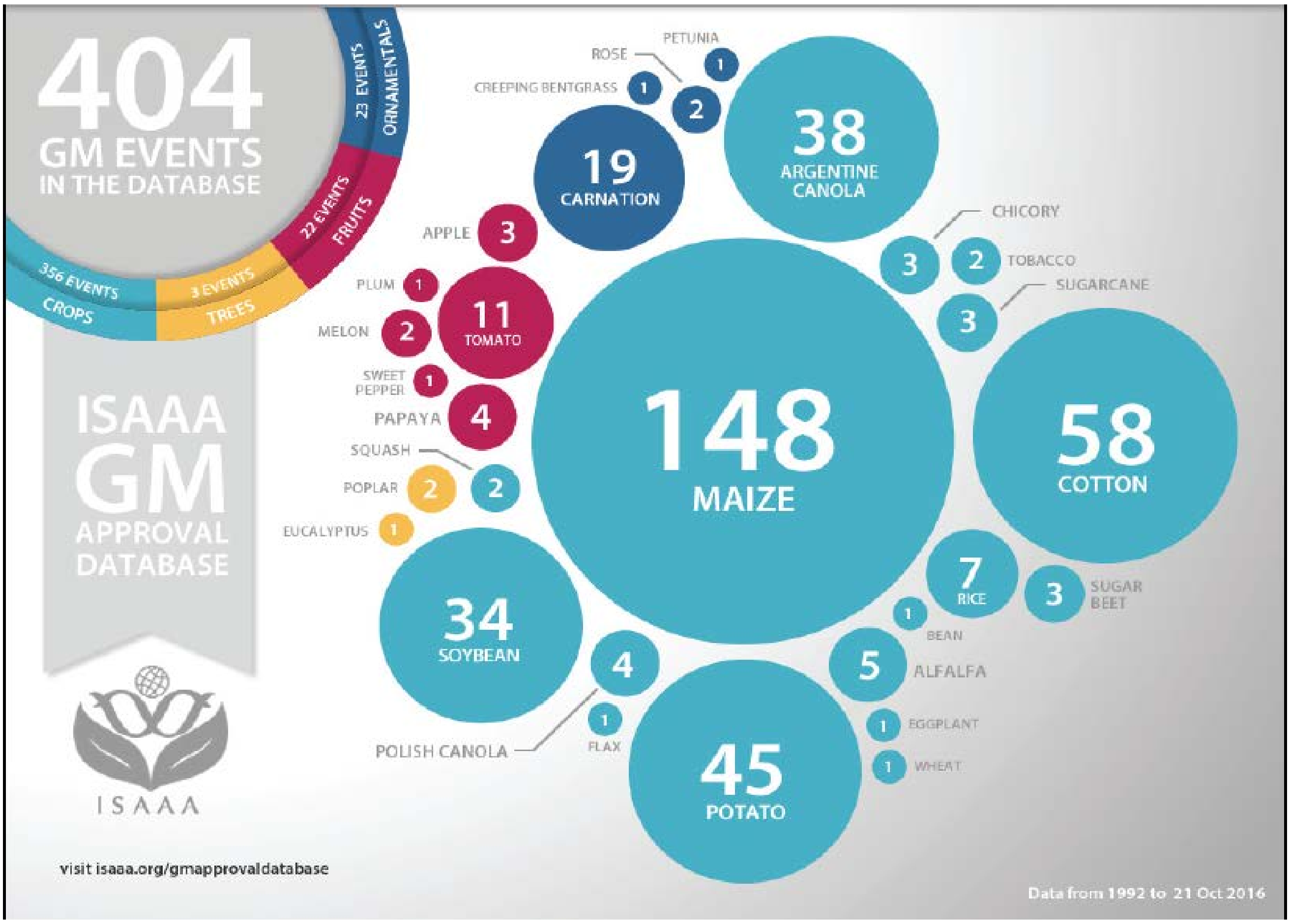
- Dairy Australia (through DairyTas)
- Fruit Growers Tasmania
- Poppy Growers Tasmania
- Tasmanian Agricultural Productivity Group
- Tasmanian Beekeepers Association

- Tasmanian Farmers and Graziers Association
- Tasmanian Institute of Agriculture
- Tasmanian Organic-Dynamic Producers Inc
- Tasmanian Salmonid Growers Association
- Wine Tasmania

Findings

OVERVIEW OF GMOS GLOBALLY

The infographic from the International Service for the Acquisition of Agri-Biotech Applications (ISAAA) below highlights the number of transgenic GM plants on the GM approval database from 1992 to October 2016[vii].



The global plantings of GM or biotech crops has increased from 1.7 million hectares in 1996 to 179.7 million hectares planted in 2015 by up to 18 million farmers, making biotech crops the fastest adopted crop technology in recent times[viii]. In a landmark decision in November 2015, the Federal Department of Agriculture in the United States approved the first GM animal for commercial food production and human consumption (GM Salmon), which is anticipated to enter the food chain in the United States before 2018[ix].

Source[x]

FIGURE S-1 Type and location of commercially grown genetically engineered (GE) crops in 2015.[1] NOTE: In 2015, almost 180 million hectares of GE crops were planted globally. Over 70 million hectares were planted in the United States. GE crops produced in Brazil, Argentina, India, and Canada accounted for over 90 million hectares. The remaining hectares of GE crops were spread among 23 countries.

As the diagram on page ten highlights, there are 12 (twelve) GM crops under commercial production throughout the world, representing 180 million hectares. The ISAAA notes a range of new GM crops that were approved in 2015 and planned for commercialisation in 2016 and beyond in countries other than the United States[xi]. These include:

Argentina – drought tolerant soybean and a virus resistant potato

Brazil – 20 per cent higher yielding home-grown eucalyptus and commercialisation of a virus resistant bean and a herbicide tolerant soybean.

Myanmar – Bt cotton

Canada – non-browning apple

Golden Rice has been bred into mega varieties and confined field tests are in progress in the Philippines and a field trial has been approved in Bangladesh. Around 100 to 150 grams per day of the Golden Rice is said to provide more than half the needs of people suffering from vitamin A deficiency[xii].

Interestingly, the ISAAA note that the high rates of adoption of current major biotech crops leaves little room for expansion into mature markets in principle crop countries however the pipeline of new biotech crop products (approximately 85 potential GM crops) that could be available during the next five years or so (subject to regulatory approval for planting and import) creates future prospects[xiii].

EMERGING ISSUE – NEW BREEDING TECHNIQUES

Molecular biology has made significant advances since GE crops were first introduced over 20 years ago. Gene technology is a rapidly developing field of science. Emerging technologies or NBTs are blurring the distinction between genetic engineering and conventional plant breeding[xiv]. The Tasmanian Institute of Agriculture (TIA) has provided input into this section of the Scan. Refer to Appendix 1 for a summary of techniques and organisms not currently classed as GMO in Australia and to Appendix 2 for an outline of the science relating to some of these NBTs.

NBTs are being considered by various countries. Regulators in some countries such as Germany, Sweden and Argentina, have made a distinction between GMOs and gene editing with tools such as clustered regularly interspaced short palindronomic repeats (CRISPR) and there are signs that the U.S. Food and Drug Administration might follow suit[xv]. Members of the ethics advisory councils of Germany, France and the UK, met on 21 October 2016 in Berlin to discuss genome editing and its potential uses in a range of applications in plants, animals and humans[xvi].

Although many of the countries below may not be key trading partners, it is worth noting how NBTs are being considered in those jurisdictions. See Table 1 below and Appendix 3.

Table 1 – Overview of expected regulatory status of NBTs in selected countries:

Country	Detail
United States of America	In the process of review. The regulation of GMOs in USA is defined by the verifiable characteristics of a product.
Japan	NBT's considered on case-by-case basis. Japan has a distinct product-based approach in that any product that does not contain a transgene is not considered to be a GMO. Products derived through the use of biotechnologies are not by default treated as a GMO unless proven otherwise.
China	Unknown
European Union	The term "GMO" is defined by the process used to create it and not by verifiable characteristics of a product. The EU has not finalised its assessment. However the EU Member State 'New Techniques' expert working group (Podevin et al., 2012) clarified and documented where new breeding techniques fall outside the scope of the current GMO legislation, concluding that the legal

	definition of a genetically modified organism did not apply to most of the new breeding techniques.
Germany	The responsible authorities have already declared that certain genome-edited varieties are in principle the same as products of conventional breeding.
New Zealand	The definition of a GMO as maintained in New Zealand addresses both product and process. Regulation is considered on a case-by-case basis. The existing legislation and regulatory framework is considered adequately cover regulation of (products derived from) plants through the use of NBTs.

Source: Abridged from http://www.nbtplatform.org/background-documents/rep-regulatory-status-of-nbts-oustide-the-eu-june-2015.pdf and http://www.interacademies.net/File.aspx?id=28130 and http://gain.fas.usda.gov/Recent%20GAIN%20Publications/Govt%20Agencies%20argue%20about%20classification%20of%20CRISPR%20and%20other%20NBT%E2%80%99s_Berlin_Germany_11-30-2015.pdf and https://tuebingen.mpg.de/en/homepage/detail/proposal-for-the-assessment-of-new-methods-in-plant-breeding.html and http://ensia.com/voices/crispr-is-coming-to-agriculture-with-big-implications-for-food-farmers-consumers-and-nature/ and https://www.nap.edu/download/23395# and www.gain.fas.usda.gov

What is evident from Table 1 and Appendix 3 is that there is no consensus across jurisdictions at an international level about how to regulate around emerging technologies. This has the potential to increase challenges from a market and trade perspective.

There is a view in the scientific community that genome editing offers a timely and powerful unique set of significant advantages over conventional and GM crops in four domains (precision, speed, cost and regulation)[xvii]. The industry body representing the Australian plant science industry (CropLife Australia) position is that in many cases, NBTs result in products which are similar to or indistinguishable at the genome level from products developed through traditional breeding methods and as such, should be regulated in the same way as conventionally bred plants[xviii]. Alternatively, Gene Ethics Australia has lobbied the Australian Government to amend and extend existing laws and regulations under a COAG agreement between relevant national and state regulators responsible for the assessment, licensing and monitoring of all new genetic manipulation techniques technologies and their products, including those badged as genome editing[xix].

Similarly to the European Union, the term "GMO" in Australia is defined not by verifiable characteristics of a product but by the process used to create it. The Office of Gene Technology Regulator (OGTR) is aware of differences of opinion among regulated stakeholders as to whether organisms modified using some new technologies are subject to regulation as GMOs. In October 2016 the OGTR called for a technical review of the *Gene Technology Regulations 2001* to provide clarity around these new technologies and organisms and whether they are subject to regulation[xx].

This Environmental Scan makes no analysis as to how NBTs such as CRISPR[xxi] would be regulated (or otherwise). This will be dealt with by the review to be undertaken by the OGTR.

SECTION UPDATES

Tasmanian industry stakeholders were contacted to seek an update on the three key areas that the Tasmanian Government has asked AgriGrowth Tasmania to monitor. The broad view reported by these industry bodies is that their position has not changed since the moratorium was extended in 2014. Many expressed appreciation that the Department is monitoring the position relating to GMOs.

The Tasmanian industry stakeholders consulted in undertaking this Scan were notified that the Regulator is conducting a review into options for regulating new technologies with the public submission closing date of 16 December 2016.

SECTION 1: DEVELOPMENT OF NEW GENERATION GMOS THAT PROVIDE HEALTH OR OTHER BENEFITS

The major focus of research with GM or NBTs appears to be on reducing the risk of disease to humans, although there is no doubt that these techniques are being explored for crop genetic improvements. NBTs are seen as a promising field for the agri-food sector with the first likely applications to be fungal resistance in potatoes, herbicide tolerance in oilseed rape and maize, drought tolerance in maize and scab resistant apples and potatoes with reduced amylase content[xxii].

From a health perspective, researchers in laboratories over the past three years have already used CRISPR technology to correct major genetic flaws including the mutations responsible for muscular dystrophy, cystic fibrosis and one form of hepatitis and it has also been used in an attempt to eliminate HIV from the DNA of human cells[xxiii].

In December 2015, the US Food and Drug Administration broke new ground when it authorised the world's first human clinical trial for an in vivo genome editing application[xxiv]. This has been followed up with Chinese scientist pioneering gene-editing trials using CRISPR-Cas9 on patients with lung cancer[xxv] In November 2016, a Chinese group became the first to inject a person with cells that contain genes edited using the CRISPR-Cas9 technique with the aim of defeating the patient's cancer. However, the scalability of the technology is unknown as it is early in the trial stage[xxvi].

Research is currently being conducted to reduce malaria transmission with the use of GM techniques. The idea of using GM mosquitoes to help wipe out malaria has been around for some time with British based company Oxitec conducting field experiments in 2010-

2011 in Asia with the aim to reduce the mosquito numbers and limit the spread of diseases which are transmitted through the bite of females[xxvii]. It was anticipated that this research would continue for at least another 10 years before malaria-resistant mosquitoes would ever be considered for broad release in the wild[xxviii].

In a response to fight the Zika virus, Oxitec planned to evaluate the effectiveness of their GM Mosquitoes in October 2016 by releasing male insects across a 17 hectare region of Key Haven in Florida[xxix]. A poll was held with the majority of residents rejecting the proposed trial, with the Florida Keys Mosquito Control District considering the results mid-November 2016 to decide whether to proceed with the trial[xxx].

Dengue fever is the most prevalent mosquito transmitted disease infecting humans. Here in Australia, Sanofi-Aventis Australia applied for a License in September 2016 to import, transport, store and dispose of a GM dengue vaccine as part of its commercial supply as a human therapeutic product[xxxi]. Under the regulatory system in Australia, the Therapeutic Goods Administration must assess its quality, safety and efficacy before it can be registered as a human therapeutic. The draft Risk Assessment and Risk Management Plan is set to be released by the Regulator for public comment in March 2017[xxxii].

In the United States, Holstein cows have been genetically modified to produce human antibodies, proteins that fight pathogens with the aim that one day they may treat infectious diseases like Ebola, Influenza and Zika[xxxiii].

CRISPR technology has now moved into agriculture with Monsanto signing a licensing deal in September 2016 with the Broad Institute of MIT and Harvard to use CRISPR-Cas genome-editing technology to help develop new seeds and crop improvements[xxxiv]. There are restrictions in the use of the technology, with Monsanto not allowed to create sterile seeds and not being able to force a trait onto an organism and its line of descent[xxxv]. Ecologists are also exploring ways to use CRISPR technology to help protect endangered species[xxxvi].

The first non-GM, genome-edited product to be approved and commercialised is SU Canola™ developed by Cibus and grown on 4,000 hectares in the USA in 2015 with Canada also approving SU Canola™ for planting[xxxvii].

SECTION 2: CONSUMER SENTIMENT

Many consumers in developed countries demonstrate a clear preference for non-GMO crops[xxxviii] with recent quantitative research into consumer attitudes in Canada[xxxix] finding that attitudes and reactions to the topic of GM foods is not positive. The research concluded that there are some challenges for health communicators and policy makers in addressing the level of confusion as basic consumer understanding of food science and technology is low[xl]. Consumer demand has prompted Scandinavian dairy co-operative Aria Foods to pay farmers four per cent increase in their milk payments if they move away from GM feeds…although they are not saying that one type of milk is necessarily better, they are looking to supply to different needs and demands in the market[xli].

In Australia, Food Standards Australia New Zealand (FSANZ) base labelling relating to GM foods on the final 'product'[xlii]. GM foods monitors scientific literature and other information about GM foods. FSANZ examines any new information, particularly if a study has cited as evidence of adverse effects from GM foods to see if it needs to revise its previous safety assessments[xliii]. All applications for GM food in Australia are assessed by FSANZ on a case-by-case basis, with recent applications including food derived from soybean, canola, corn, potato, sugarbeet, cotton, wheat, lucerne and rice[xliv].

Non-GM Canola

Although this scan is about GM related matters, it is worth noting the consumer sentiment around non-GM canola as this crop can be grown in Tasmania. A recent South Australian Report into added-value export market opportunities has highlighted the potential to add more value to non-GM canola production for the State[xlv]. Even with the discounted GM canola exports moving into EU, there is still a demand for certified non-GM canola oil outside Australia. As an example a New South Wales company based in Riverina is supplying 1000t of verified non-GM canola into California each month alone[xlvi].

Consumer sentiment within Tasmania's key international trading partners:

As part of the annual monitoring program, a desktop study has again been completed to explore whether consumer sentiment has changed within Tasmania's key trading markets since the 2013 Departmental review into the Moratorium.

The 2016 South Australian Government commissioned Report[xlvii] claims the South Australian GM-free status, combined with overseas demand for non-GM foods and crops, could provide a huge economic benefit for SA, driven by markets looking for ‘naturally healthy’ foods with non-GM ingredients. The Report notes that the greatest opportunity lies in developing a platform around ‘naturally healthy’ underpinned by a sophisticated verification system[xlviii]. An outline of the consumer sentiment in those export markets relevant to Tasmania is presented in the table below. This information draws from the South Australian Report and other sources as referenced.

Country	Sentiment
Japan	Japanese consumers have a high concern about food safety. The country is one of the world’s largest per capita importers of GE products and it has labelling requirements for products containing GE materials. The most recent in-country survey (2013-14) on food safety indicates 49 per cent of those polled indicated they have a level of concern (ranging from some to high) regarding GE foods. However, actual consumption of products could be a sign that consumers passively accept GE products (such as oil). Industry sources estimated that approximately 40-50 per cent of food corn is either non-segregated or GE. Japanese industry is unwilling to test consumer acceptance of GM soybean.
Hong Kong	Hong Kong has no commercial production of biotechnology crops nor does it conduct field trials. The few soybean users in Hong Kong require non-GE soybeans because of market-driven factors. Green groups and consumer organisations have been advocating for mandatory labelling of GE foods for many years. Their rationale is not based on food safety or science, but on the consumer ‘right to know’. In 2013, the Hong Kong Consumer Council renewed its call for mandatory labelling for GE foods. Hong Kong retailers have said they would not import any products that carried a GE label as they believe that consumers would not choose GE products when there are other choices available. Despite calls for mandatory labelling the Hong Kong Government has ruled out an initiative on the grounds that there is no international consensus.
United States of America (USA)	GM foods are available in the USA. There is evidence that non-GM labelled foods represent a small share of retail food markets and consumer demand is for healthier products leading to cleaner labels and more non-GMO segments. Major retailers are increasingly demanding non-GMO products and going non-GMO with their own brands. USA food manufacturers are committing to transparency and voluntarily seeking non-GMO Project verification and seal.
Singapore	There are no vocal consumer groups actively campaigning against the imports of GE products. No barriers exist to imports as long as they are approved as safe for public consumption in their countries of origin before being allowed into Singapore.

The United Kingdom (UK)	The UK's exit from the European Union (EU) has the potential to change many policy areas, including agricultural biotechnology. However, in the short to medium term, the current landscape for cultivation and import of genetically engineered (GE) products is not expected to alter. Scotland, Ireland and Northern Ireland have 'opted-out' of cultivating GE crops under EU legislation and these stances will not change post Brexit. Products containing soy, corn, glucose or other sugar components of biotech sugar beet or oilseed rape (Canola) must be labelled. At the premium end of British shopping, the discerning customer is demonstrating that they will pay for the provenance of their food. However, the British public appears to feel that GM as an issue has lost impetus or has at least been managed out of the food supply. There is a vocal minority against GM but most rely heavily on supermarket chains to provide them with safe quality food. All of the retail chains publically declared their private label to be "GM free" in the early 2000s consequently very few biotech derived ingredients/products have made it onto British shelves. However, since 2013 Tesco, Marks and Spencer, and Sainsbury have been communicating to their customers that for those who wished to avoid biotech fed livestock, they must now look at organic options. Price is still uppermost in mind for the majority of UK consumers.
China	China is a fragmented market but has a rapidly growing segment for 'naturally healthy' products. China is the world's largest importer of biotech crops such as soybeans, cotton, corn and soybeans for feed and processing, however is yet to approve any major biotech food crops for cultivation. Biotechnology is designated as a strategic emerging industry in China and the Government invests heavily in research. The Government is in the process of revising its biotechnology regulatory system and is reportedly preparing to submit Bt corn events for approval for domestic cultivation – the approval process is expected to take between 3-5 years. In May 2015, the Ministry of Agriculture released a draft revision to its regulatory processes that would remove timelines for approvals and add economic and social factors to the approval process for the first time. New regulations are in place around labelling. Foods made of crops where GMO varieties exist (such as Canola) must provide evidence they are GMO-free before they can be advertised as such. China does not have a consistent approach on detection limits. Import tolerance can range from 0.1 per cent to 0.01 per cent or even less. This can result in cases where an export shipment tests negative for unapproved events but tests positive when it arrives in China.
Korea	There remain contradictory views in the market place. The public holds positive views on the use of biotechnology in human and animal research, bio-medicine and the treatment of disease while they tend to be negative towards the use of the technology to produce food. Consequently there is a limited number of food products made from biotech ingredients. Local retailers are reluctant to carry GM labelled foods since they do not want to put product on their shelves that will not sell and would inevitably draw public scrutiny.

	Korea imports substantial amounts of biotech grains. In 2015, the Government announced plans to expand mandatory biotech labelling to include all products with detectable biotech ingredients and was revising its labelling standards. Mandatory GMO labelling is in place with a 3 per cent threshold for soybean.
Indonesia	The majority of consumers prefer fresh foodstuffs which are readily available in their neighbourhood at affordable prices with 'healthy eating' becoming more popular among educated consumers. There is broad support for the technology from farmer organisations. Due to a lack of information and general knowledge about biotechnology, consumers are more hesitant if they know their food contains GE products. Indonesians have widely consumed GE soybean derived tempeh and tofu for the last three decades. GMO derived ingredients are required to be labelled.
Taiwan	Taiwanese regulators remain very cautious about domestic cultivation of biotech crops. They are enacting mandatory labelling law and 3 per cent GM threshold. Coexistence farming among organic, biotech and conventional crops is a sensitive topic due to small farm sizes and the amount of arable land. A series of local food safety scandals including mis-labelled rice and adulterated cooking oil created an opportunity for anti-GE activities to push for increased regulations. The demand for non-GMO soybean is increasing. In 2015, the Government introduced mandatory labelling for processed GE food products and GE raw materials
New Zealand (NZ)	NZ continues to be regulated with cautious policy settings. A GE equine influenza vaccine is the only GE product approved for use in New Zealand. Media articles since 2013 are evenly divided between pro and anti GE pieces. Some primary sector organisations and farmers remain cautious about the use of biotechnology out of concern that it will tarnish New Zealand's 'clean and green' image and negatively impact on the ability to market products overseas. One of the major supermarket chains "Foodstuffs" has taken a stance on GE whereby it insists on non-GE food ingredients to be used in its private branded products including non-GE feeds as inputs to animal products which are sold under their private brand. It has no stance on third party or regular products sold through its stores as long as they are approved and labelled as regulated by FSANZ. Most New Zealand consumers express caution about GE foods.

Sources: Abridged from www.ers.usda.gov and www.gain.fas.usda.gov, and www.pir.sa.gov.au and http://ussec.org/wp-content/uploads/2015/10/MarketSnapshot-1.pdf

Consumers in developed countries, do not view all applications of biotechnology uniformly[xlix]. When it comes to medical biotechnology, it is considered that we accept each production method, provided the pill actually cures, but that does not hold true in the case of food…as long as there are no adverse health effects, fashion is the strongest factor[l]. Health-related products are generally quickly accepted by consumers with fashion and ethics less predictable and more variable[li]. From a wellness perspective, what consumers consider 'good for you' has shifted and consumers are now taking a more holistic perspective by weighing more product attributes…as an example roughly half of Americans weigh health and wellness, safety, social impact, experience and transparency in their purchasing decisions, in addition to traditional drivers of taste, price and convenience….only 26 per cent look at non-GMO[lii].

From a social media perspective, labelling appears to be the most frequent sub-topic of GMOs, far exceeding mentions of 'banning'…so it appears that whilst the debate over the safety of GMO's continues in social media, many consumers want labelling so they can make fully informed purchase decisions'[liii]. In 2015, Whole Foods USA set a target to be the first national grocery chain to set a deadline for GMO transparency for food products by 2018[liv]. Now other large corporations in America such as General Mills, Kellogg, Mars and Campbell Soup are shifting to label GMO ingredients (after the 'Vermont Law[lv]' requiring the labelling of GM foods). However, they note that this will be costly and could lower sales[lvi]. The increasing consumer demand for healthier foods or at least products that appear wholesome add a new dimension to consumer sentiment…with GMO labelling said to be turning away some shoppers because GM evokes something unnatural[lvii].

At an international level, negative sentiment against GMO can tend to focus on large institutions such as Monsanto Co. Monsanto is the world's largest producer of GMO crops and the maker of the glyphosate based herbicide Roundup. During October 2016, an international civil tribunal was held (known as the Monsanto Tribunal) at The Hague. The Monsanto Tribunal's goal was to research and evaluate all of the allegations made against Monsanto in connection to its products and impacts to human health and the environment. The Tribunal received considerable media attention and had over 750 witnesses representing 30 nationalities who provided information. The judges at the Tribunal looking to deliver an advisory opinion later in the year[lviii].

In September 2016 Berlin based pharmaceutical and chemical firm Bayer AG agreed to purchase Monsanto Co. The merger means that crop science will replace health care as Bayer's biggest business. There are some that consider that this merger will reshape the crop and seed industry as it will create the world's largest agrichemical firm[lix]. However, consumer advocates and environmental organisations are concerned that there will be a greater concentration of corporations that dominate the seed and pesticide market[lx]. In commenting about the proposed merger, the CEO of Bayer indicated that if "politics and society in Europe do not want genetically modified seeds, then we will accept that, even if we disagree on the substance"[lxi].

In China, genetically modified crops are largely banned from food destined for dinner tables even though China has ambitions to be a major player in GM food by seeking to invest in Syngenta[lxii].

Consumer sentiment within Australia:

Research recently conducted in South Australia revealed that retailers do not consider non-GM a category opportunity in the Australian retail market as most consumers are ambivalent to the presence of GM ingredients[lxiii]. Notable exceptions are biodynamic dairy products, carob products and speciality flours and pre-mixes. Health continues to be a high priority when it comes to food and drinks with consumer attitudes, from a health perspective, that food and drinks should be GMO free[lxiv].

In 2016 Australian Organic Ltd launched its certification program to provide companies with an independent certification service which verifies that their procedures and products exclude GMOs and derivatives of GMOs as far as reasonably possible[lxv].

The Productivity Commission (PC) review into Regulation into Agriculture[lxvi] Draft Report 2016 noted that the regulation of GMOs for marketing purposes was unclear as there is evidence that industry can successfully manage coexistence…with little evidence of GMO-free marketing benefits at the bulk trade level[lxvii]. The PC noted that moratoria for marketing purposes were unwarranted and that they deny farmers access to technological advances that are critical to remaining competitive internationally[lxviii]. Subsequently the PC recommended removal of the existing moratoria by jurisdictions[lxix].

However, in reviewing the submissions by Tasmanian entities to the PC Draft Report, there remain divergent views from a Tasmanian perspective. One submission[lxx] called for a discontinuing of the Tasmanian moratoria, subject to guidelines, policies and regulations to allow potential benefits to be realised. However, the majority of industry and food based submissions to the Draft Report (from the Tasmanian Farmers and Graziers Association[lxxi] Tasmanian Beekeepers Association[lxxii], Slow Food Hobart[lxxiii], Tasmanian Red Meat Industry Council[lxxiv] Harvest Launceston[lxxv] and TasFoods[lxxvi], believe that there is value in maintain the existing moratoria. This sentiment can be best summed up by TasFoods[lxxvii] which notes the potential damage to Brand Tasmania and the possible lost opportunities for TasFoods that lifting the GMO moratorium would represent and that:

> *TasFoods accepts that there are currently no documented tangible economic benefits; and there is little substantiated evidence that suggests a well-regulated and monitored introduction of GMOs would have any negative environmental, social or health impacts.*

> *Tas Foods does note that food science has quickly developed to the point where GMO technology is not necessarily required to create the improvements in yield for modern farming; and largely, the alleged benefits derived from the use of GMO technologies has been driven by production focused interests, with little appreciation for market demand or consumer-led need.*
>
> *…It is our view, particularly in light of expanding markets in China and other international markets that the Tasmanian brand is gaining traction and is on the cusp of long-term tangible benefits. Our hope is that those results will become evident prior to the planned review of the Tasmanian moratorium and its expiry in 2019.*

Other domestic matters

In January 2010 it became lawful in Western Australia for farmers to grow GM canola as the Minister could exempt persons from growing certain GM crops under the *Genetically Modified Crops Free Areas Act 2003 (WA)*. In February 2016, the High Court of Australia made a ruling regarding the Appeal in the Marsh versus Baxter case. This case involved GM canola and the loss of organic certification for a neighbouring property, due to crop drift. In making the ruling, the Supreme Court of Western Australia dismissed Stephen and Susan Marsh's application for leave to appeal a decision from The Court of Appeal (WA[lxxviii]) and an application for leave to appeal to the High Court of Australia was also dismissed .

In February 2016 as a result of the Marsh versus Baxter case, an application to alter the National Standard for Organic and Bio-Dynamic Produce was unsuccessfully made to the Standard Sub-Committee in February 2015 by the Department of Agriculture and Food Western Australia[lxxx]. One of the six certifiers Australian Organic also elected to seek a change if GM material unintentionally came onto an organic farm . A petition was organised by Food Freedom Australia to raise concerns regarding this proposed move .

In September 2016, the National Standard for Organic and Bio-Dynamic Produce was released noting that….procedures in accordance with the standard will ensure the lowest possible risk of contamination of organic or bio-dynamic products…[lxxxiii] with GMO products not compatible...certification will be withdrawn where GM crops, livestock or agricultural products are grown or produced on the same farm[lxxxiv]. At the same time, the Australian Organic Group established a new non-GMO certification which is designed to build on the strict certified organic guidelines for traceability and segregation that are already in place, with the added requirements for additional testing and verification, based on the level of risk that GMOs pose to an individual product[lxxxv].

On 21 October 2016, the Western Australian (WA) Government repealed its *Genetically Modified Crops Free Area Act (2003)*[lxxxvi]. This means that WA growers now have access to new GM crops approved by the OGTR. There are mixed views about this decision with some farmers pleased about the opportunity it creates and others feeling it was a missed opportunity to retain exclusive isolation .

SECTION 3: NEW GENE TECHNOLOGIES THAT PROVIDE POSITIVE BENEFITS TO PRIMARY INDUSTRY SECTORS AND TASMANIA AS A WHOLE

During 2016, the National Academies of Sciences, Engineering and Medicine based in the United States of America completed a comprehensive Report into genetic engineered crops. The Report found there was "no substantiated evidence that foods from GE crops were less safe than foods from non-GE crops….that sweeping statements about GE crops are problematic because issues around them are multidimensional[lxxxviii]….that national regulatory processes vary greatly for GE crops[lxxxix]…and that these regulatory differences are likely to continue and cause trade problems[xc].

The National Academy of Sciences 2016 Report into GE crops indicates that "on available evidence, GE soybean, cotton and maize have generally had favourable economic outcomes for producers who have adopted these crops, but outcomes have been mixed depending on pest abundance, farming practices and agricultural infrastructure[xci]".

At an international level, there have been some recent investments with both animals and plants. In September 2016, the United States Department of Agriculture[xcii] approved a new line of GM apple (the third to be approved) known as Arctic Fuji, which has been engineered to be resistant to browning. A previously approved Arctic Golden apple line is to be sold in test marketing in grocery stores in the Western United States[xciii]. There are already 300,000 trees in nursery production[xciv].

New breeding techniques are now being used to produce food. During 2016, gene editing technology moved into canola cooking oil with this product being marketed as non-GM in the United States[xcv]. United States regulators indicate that cutting DNA from a plant is not the same as adding genes from another organism[xcvi] and as a consequence the US Department of Agriculture gave a green light for the first CRISPR edited organism - mushrooms[xcvii].

In July 2016, GE Wheat found its way into an unplanted agricultural field in Washington State. However, after investigation the United States Department of Agriculture Animal and Plant Health Inspection Service found no evidence of GE wheat in commerce (the farmer's full wheat harvest tested negative to GE wheat)[xcviii].

In May 2016, GM salmon ('AquAdvantage Salmon') was approved for sale as food in Canada, however it is likely to be at least one year before it will be available to consumers[xcix]. Health Canada will not require the AquAdvantage Salmon to be labelled as GM product as there are no demonstrated health risks, such as the potential to cause new food allergies or significant changes to the nutritional qualities of the food[c].

In 2016, Australia still only has two crops approved for commercial release GM canola and GM cotton (refer schematic on page 10). GM Canola seed companies are experiencing strong demand for canola seed for the 2017 season, with plantings in Western Australia alone expected to be up between 6-10 per cent from 2016[ci].

In 2016, exports of GM canola from Australia to Europe were expected to hit record highs…with heavy discounts on the crop changing EU demand preferences…the non-GM premium had reached a point where canola buyers were willing to accept the GM product[cii].

Interest in other GM crop trials remains in Australia. During the period October 2015 to October 2016, the OGTR dealt with applications relating to GMOs for GM Banana, GM Canola, GM Cotton, GM Potato, GM Safflower, GM Sugarcane and GM Wheat[ciii]:

Trials are also underway for barley, perennial ryegrass, and white clover[civ]. During the same period, the OGTR has also dealt with an application for an attenuated GM Dengue vaccine.

In addition, some GM products can be used:

• as ingredients in foods — including GM varieties of soybean, corn, potato, sugar beet, wheat and rice

• for the production of stockfeed — including GM cottonseed meal, imported GM soybean and GM canola meal.

The dairy industry in Australia sees significant opportunities from the use of new gene editing technologies and the Australian Dairy Industry Council is currently considering its engagement with the OGTR *Technical Review of Gene Technology Regulations 2001*.

Dairy Australia and DairyNZ have jointly launched a new project to independently evaluate the benefits of all new plant breeding technologies in Australia and New Zealand (including genomic selection, gene editing, genetic modification and hybridization). An independent Panel of experts has been appointed to establish a common basis for assessing the value of these new technologies and examine the costs forgone if some innovations are not commercialized or adopted. This dairy industry project will deliver tools to encourage engagement across the dairy supply chain and will be completed by mid-2017. The dairy sectors in both Australia and New Zealand will then have the opportunity to review outcomes, build further understanding of the issues and be better informed to participate in discussion.

Tasmania is maintaining the existing policy, held since 2009, that allows for the use of GMOs in pharmaceutical poppies not intended for use for food or feed, provided all statutory requirements are met and that markets for Tasmania's GMO-free food products can be maintained and appropriate co-existence arrangements developed.

In an increasingly competitive international market, the Tasmanian poppy industry has a focus on strengthening the industry and this includes an investment in research and development (R&D). Should future R&D include exploring the role that potential GM varieties could play, the industry would work with AgriGrowth Tasmania in DPIPWE and key stakeholders on co-existence strategies for managing any potential risks associated with GM.

ZERO TOLERANCE

As noted in the introduction, the *Tasmanian Gene Technology Policy (2014-19)* also commits DPIPWE to "monitor the risks associated with maintaining Tasmania's current GMO threshold levels and any alternative options".

Thresholds or tolerance levels specify the maximum allowable level of adventitious (unintended) presence of GM material permitted by regulators and/or markets. The *Tasmanian Gene Technology Guidelines* maintain a 'zero tolerance' threshold for viable GMO contamination in imported canola seed and state that the Tasmanian Government will accept as evidence of zero contamination (i) a negative result from a test capable of detecting one GM canola seed in 10 000 non-GM canola seeds (ie 0.01% contamination) with 95% confidence, also known as testing to the limits of detection, or (ii) an alternative import proposal which achieves an equivalent level of assurance that GMOs are absent.

The importation of GMOs into Tasmania is regulated in accordance with import requirements specified in the Plant Quarantine Manual Tasmania issued pursuant to section 68 of the *Plant Quarantine Act 1997 (Tas)*. Import Requirement 32 requires all imported canola seed and grain to be accompanied by a certificate or statement of analysis demonstrating freedom from GM contamination. Imported products that do not comply with these import requirements are held and dealt with by Biosecurity Tasmania.

Tasmania's zero tolerance threshold is more stringent than the threshold of 0.9% (canola crop and 0.5% seed for commercial sale) adopted by all other States that have specified a threshold (Victoria, South Australia, New South Wales and Western Australia). Testing to the limits of detection (0.01%) is more costly than testing to the standard employed by other States and, for importers of canola seed, there is a risk that consignments will be rejected if they do not comply with the Tasmanian threshold.

In the 2014-15 growing season these factors contributed to a shortage of canola seed in Tasmania however, industry bodies connected with the growing of canola in Tasmania have confirmed that there has been no shortage of suitable canola seed this growing season. AgriGrowth Tasmania will continue to monitor the situation.

Appendix 1[cv]:

Schedule 1A—Techniques that are not gene technology

Item	Description of technique
1	Somatic cell nuclear transfer, if the transfer does not involve genetically modified material.
2	Electromagnetic radiation-induced mutagenesis.
3	Particle radiation-induced mutagenesis.
4	Chemical-induced mutagenesis.
5	Fusion of animal cells, or human cells, if the fused cells are unable to form a viable whole animal or human.
6	Protoplast fusion, including fusion of plant protoplasts.
7	Embryo rescue.
8	*In vitro* fertilisation.
9	Zygote implantation.
10	A natural process, if the process does not involve genetically modified material. Examples: Examples of natural processes include conjugation, transduction, transformation and transposon mutagenesis.

Schedule 1—Organisms that are not genetically modified organisms

Item	Description of organism
1	A mutant organism in which the mutational event did not involve the introduction of any foreign nucleic acid (that is, non-homologous DNA, usually from another species).
2	A whole animal, or a human being, modified by the introduction of naked recombinant nucleic acid (such as a DNA vaccine) into its somatic cells, if the introduced nucleic acid is incapable of giving rise to infectious agents.
3	Naked plasmid DNA that is incapable of giving rise to infectious agents when introduced into a host cell.
6	An organism that results from an exchange of DNA if: (a) the donor species is also the host species; and (b) the vector DNA does not contain any heterologous DNA.
7	An organism that results from an exchange of DNA between the donor species and the host species if: (a) such exchange can occur by naturally occurring processes; and (b) the donor species and the host species are micro-organisms that:

Item	Description of organism
	1. (i) satisfy the criteria in AS/NZS 2243.3:2010 for classification as Risk Group 1; and 2. (ii) are known to exchange nucleic acid by a natural physiological process; and (c) the vector used in the exchange does not contain heterologous DNA from any organism other than an organism that is involved in the exchange.

Appendix 2

NEW GENE TECHNOLOGIES

Abridged - Tasmanian Institute of Agriculture

As highlighted in the OTGR Discussion paper (2016)[cvi] and the GMO Environmental Scan document (Dec 2015)[cvii] there are new technologies that are revolutionising the treatment of diseases and the breeding of crops and animals.

For instance, the CRISPR/Cas9 technology has already been used successfully to produce non-GM food products (e.g. mushrooms and potatoes) and is currently revolutionising medical practice by providing pathways towards cures for HIV (Kaminski, 2016), Hepatitis B and lung cancer (see highlights below). There is already precedence of rulings by regulators in the US (APHIS, 2016) that clearly state that these technologies can produce

On 28 October 2016, a team led by oncologist Lu You at Sichuan University in Chengdu delivered modified cells into a patient with aggressive lung cancer. The researchers removed immune cells from the recipient's blood and then disabled a gene in them using CRISPR–Cas9, which combines a DNA cutting enzyme with a molecular guide that can be programmed to tell the enzyme precisely where to cut. The disabled gene codes for the protein PD1, which normally puts the brakes on a cell's immune response: cancers take

non-GMO products that are indistinguishable from conventionally bred products and that do not contain any foreign DNA. Indeed many of these are analogous to currently accepted and non-regulated approaches including mutation breeding (e.g. production of the Thebaine poppy), and somaclonal cell selection (common scab resistant potatoes).

Extract from a letter by USDA's Animal and Plant Health Inspection Service (APHIS) in response to a request for confirmation that transgene-free, CRISPR-edited mushroom is not a regulated article:

… Based on the information cited in your letter, APHIS has concluded that your

Genome editing

CRISPR technologies use a synthetic RNA molecule (oligo) to enable genomic editing of organisms without incorporation of foreign DNA into the resultant plant or animal.

CRISPR/Cas9-mediated Targeted Genome Engineering Approach
Targeted gene insertion at a specific genetic locus (Safe-harbor/pre-determined locus)
No disruption of native gene function
Position and structural effects can be eliminated
Targeted gene disruption can be achieved without integrating foreign DNA (analogous to conventional breeding approaches)
More efficient generation of desired events

Transgene-free plants can be generated with desired modifications (knockouts and base pair substitutions)
Relatively less or no regulatory requirement

The scientific explanation

There are three different types of CRISPR gene editing identified but the most commonly studied is type II, the CRISPR/Cas9 system. In the process a synthetic guide RNA is produced that matches the sequence of the genomic DNA to be modified. The native system uses two short RNA molecules, one sequence specific CRISPR RNA (crRNA) and a conserved transactivating crRNA (tracrRNA) that interact through partial homology to form a complex. The crRNA:tracrRNA complex guides and activate the Cas9 nuclease to cleave double stranded DNA targets (a double strand break) at a site determined by homology within the crRNA. The crRNA and tracrRNA can be fused into a single chimeric guide molecule (sgRNA).

The cleaved DNA can be allowed to self-repair by non-homologous end joining, and through normal error mutation lead to insertions or deletions that result in disruption of the gene (gene silencing/knockout). A correct repair would of course be cleaved again – only once a change is induced would the sequence remain stable. **This is analogous to other forms of mutagenesis that are not regulated as GMOs (e.g. chemical or UV) except that the cleavage point is not random. No new DNA is incorporated into the organism. Mutagenesis occurs spontaneously in nature and is the natural process that drives evolution.** This is annotated as SDN-1 (site-directed nuclease) in the OTGR document (2016). Note, two closely positioned cleavage sites may also direct a specific deletion of the intervening sequence as another directed mutation.

An example of the use of such processes is the work of Dr Yang whom produced a white button mushroom with disrupted polyphenol oxidase gene that stops browning following bruising. In an application to the USDA this was approved as not subject to regulatory processes for GMOs in the USA as it contained no introduced genetic material.

The future of CRISPR/Cas9

The rapid progress in developing Cas9 into a set of tools for cell and molecular biology research has been remarkable, likely due to the simplicity, high efficiency and versatility of the system. Of the designer nuclease systems currently available for precision genome engineering, the CRISPR/Cas system is by far the most user friendly. It is now also clear that

Alternatively, the double stranded break can be repaired through homology directed repair using a donor DNA template provided as part of the CRISPR/Cas9 system. This will direct the repair process to incorporate specific nucleotide changes. This can allow specific repair of dysfunctional genes (e.g. as a treatment for genetic disease). This is annotated as SDN-2 and SDN-3 in the OTGR document (2016). SDN-2 involves small sequence changes that may be identical to those induced by SDN-1 processes, whilst SDN-3 uses a longer template to insert new sequences.

Intragenics

Similar to CRISPR, intragenics based on RNA interference (RNAi) technology can silence undesirable genes. This is already used for commercially important crops such as potatoes, improving their quality, shelf life and health attributes. This is particularly relevant for Tasmania.

Clasen et al. (2015) showed that problems with cold storage of potato tubers can be overcome through this technology. Cold storage is used to reduce sprouting and extend postharvest shelf life. However, cold temperature stimulates the accumulation of reducing sugars in potato tubers. Upon high-temperature processing, these reducing sugars react with free amino acids, resulting in brown, bitter-tasting products and elevated levels of acrylamide, a potential carcinogen. To minimize the accumulation of reducing sugars, Clasen et al. (2015) used RNA interference (RNAi) technology to silence the vacuolar invertase gene (VInv), which encodes a protein that breaks down sucrose to glucose and fructose. They used transcription activator-like effector nucleases (TALENs) to knockout

VInv within the commercial potato variety, Ranger Russet. The tubers from full VInv-knockout plants had undetectable levels of reducing sugars, and processed chips contained reduced levels of acrylamide and were lightly coloured. Several of the modified plant lines contained no foreign DNA, providing a framework for using the technology to quickly improve traits in commercially relevant, autotetraploid potato lines.

The scientific explanation

Intragenic approaches to genetic manipulation use GMO technologies and incorporate new genetic material into the recipient plants or animals. Yet the introduced DNA can be sourced from the recipient organism species or closely related species. For example, the "Innate" potato produced by Simplot (USA) uses DNA sequences from potato genomes only.

The innate potato uses RNAi (RNA interference or gene silencing) technologies to regulate expression of genes within the potato plant. By expressing repeat looped sequences corresponding to the mRNA of the target genes the plant will turn off or silence these genes using natural genetic sRNA regulatory systems avoiding their translation and production of the respective enzymes. The target genes (in the generation 1 Innate potato) are associated with bruising (polypehonl oxidase) and asparagine synthesis (asparagine synthase) with high asparagine content associated with the accumulation of acrylamide on cooking at high temperatures. Acrylamide is a potential carcinogen and thus minimising its production provides potential health benefits to consumers. Generation 2 Innate potatoes include a gene for resistance to late blight derived from a wild Solanum species (close potato relative).

In the past such approaches had issues with the requirement for the use and incorporation of marker genes (often antibiotic resistant genes of exogenous source) and incorporation of small flanking regions of tDNA from the bacterial plasmid vectors. However, it is now possible to avoid or remove the antibiotic gene and avoid bacterial sequences in the DNA transferred to the recipient host.

As mentioned above GMO techniques can be used to silence genes using RNA interference (gene silencing). The process of RNAi is driven by the presence of double stranded RNA that is cleaved by DICER enzymes into short interfering RNA molecules (siRNA's) of 21-25 nt length which are recruited by a RISC enzyme complex and used as a template to identify and facilitate cleavage of homologous RNA sequences. This results in mRNA degradation and failure to transcribe and express genes (gene silencing).

Traditionally this has been achieved using a GMO approach (more commonly with foreign DNA or using an intragenic approach as outlined above). Here either multiple forward and reverse copies of the gene sequence of interest (which form dsRNA upon transcription), or a genetic sequence that is transcribed to produce a hairpin-loop structure with complementary sequences (pseudo dsRNA) are incorporated into the organism by engineering approaches. These are then recognised, sliced and recruited by the RISC to facilitate silencing.

However, in recent times attempts have been made to directly introduce siRNA's into organisms to stimulate silencing without genetic transformation. These siRNA's may be introduced on nanoparticles and are released in cells and recruited by the RISC complex. The effect may be transient.

In this instance there is no transgene or genetic engineering involved, but change in gene regulation (gene silencing) is produced. This has wide applications including disease control (targeting essential pathogen gene expression), reduced oxidation/bruising etc.

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Appendix 3 - Overview of expected regulatory status of the products resulting from the use of NBTs in selected countries

(source: http://www.nbtplatform.org/background-documents/rep-regulatory-status-of-nbts-oustide-the-eu-june-2015.pdf

Technique / Country	ZFN1	ZFN2	ZFN3	ODM	Cisgenesis	RdDM	Reverse Breeding	Grafting	Agro-infiltration
Argentina	#	#	#	#	#	#	#	#	#
Australia		#	#	#	#			#	#
Brazil									
Canada	#	#	#	#	#	#	#	#	#
China									
India	#	#	#	#	#	#	#	#	#
Japan									
Rep of Korea									
New Zealand	#								
Russia									
South Africa									
Switzerland									
USA	#	#	#	#	#	#	#	#	#

Legend

White	Information not available
Blue	Non-regulated or exempted from applicable GM legislation
Black	Regulated under applicable GM legislation
#	Case-by-case review

ZFN1/2/3 = Zinc Finger Nucleases more commonly referred to as Site Directed Nucleases (SDN) including among others ZFN-1/2/3, TALENs, Megancleases and CRISPR-Cas. **ODM** = Oligoncleotide Directed Mutagenisis. Cisgenis. RNA-Dependent DNA methylation (**RdDM**). Grafting (non-GMO scion on GMO rootstock), Reverse Breeding, Agro Infiltaration (agro-infiltration, sensu stricto, agro-inoculation)

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Genetically Modified Organisms (GMO) Annual Environmental Scan

DECEMBER 2015

AgriGrowth Tasmania
Department of Primary Industries, Parks, Water and Environment

Tasmanian Government

Contents

Glossary

ADVENTITIOUS PRESENCE – An event where GM material is unintentionally or inadvertently introduced into the State.

BIOTECHNOLOGY - is a broad term that relates to using living organisms or parts of organisms to carry out biological processes for use in industrial processes or services. There are many examples of biotechnology in agriculture, medicine and waste recycling.

COMMERCIAL PURPOSES – Intentional release of GMOs into the environment which take place outside of containment facilities.

CONTAINED FACILITIES – Research and development conducted in a laboratory or other controlled atmosphere environment.

DEALINGS INVOLVING INTENTIONAL RELEASE – (DIR) used by the Office of Gene Technology Regulator (OGTR) to describe dealings involving an intentional release into the Australian environment with GMOs which take place outside of containment facilities.

DEALINGS NOT INVOLVING INTENTIONAL RELEASE – (DNIR) used by the OGTR to describe dealing with GMOs in a contained facility. They must not involve release into the environment.

GENETICALLY MODIFIED ORGANISM – (GMO or GM or GE) an organism that has been modified by gene technology, or an organism that has inherited particular traits from an organism (the initial organism) being traits that occurred in the initial organism because of gene technology. The Commonwealth *Gene Technology Regulations 2001* specifies other techniques that do not constitute gene technology, and can declare those things that are a GMO.

GENE TECHNOLOGY – Any technique for the modification of genes or other genetic material, but does not include sexual reproduction or homologous recombination. Recent advances in biotechnology provide ways of introducing very precise changes to genetic material—the sets of instructions in the cells of all living creatures—which can include genes, parts of genes, groups of genes and so on.

LIMITED AND CONTROLLED RELEASE – Research and development outside contained facilities. These can range from small scale field trials (i.e. under field conditions. This is also known as open-air research).

LOW LEVEL PRESENCE - Low level presence refers to the unintended presence, at low levels, of minute amounts of genetically modified (GM) material that has been approved in at least one country but not in the country that is importing the product.

NOTIFIABLE LOW RISK DEALING – (NLRD) used by the OGTR to describe dealing with GMOs that have been assessed as posing low risk to the health and safety of people and the environment provided certain risk management conditions are met.

SYNTHETIC BIOLOGY – (also known as synbio) Refers to both:

- the design and fabrication of biological components and systems that do not already exist in the natural world
- the re-design and fabrication of existing biological systems.

TERMINATOR TECHNOLOGY[i] - Engineered plants to produce seeds that are sterile so they are unable to reproduce. It is most commonly referred to as "terminator technology" because the plant's ability to reproduce has been 'terminated' at the genetic level (i.e. the plant produces a crop but the seeds of the crop will fail to germinate in the subsequent generation).

VIABLE PLANT – one that can live and thrive in the environment.

Summary

SUMMARY OF KEY FINDINGS

There is no need to trigger a review of the moratoria on the commercial release of GM into Tasmania's environment at this time.

GM crops are still largely grown in the Americas (United States, Brazil, Argentina and Canada). Four commodity crops account for 99 per cent of GM plantings globally – soy, maize, canola and cotton. Soy and maize are around 80 per cent of all plantings[ii]. Most GM crops today end up as animal feed, biofuel feedstock or in highly processed food ingredients that do not need to be labelled[iii].

There are no GM crops or GM animals grown commercially in Tasmania.

Development of new generation GMOs that provide health or other benefits

Advances in the use of biotechnology are rapid. This is particularly evident in the health arena. In Australia, the Office of Gene Technology Regulator (OGTR) has issued four Dealings Not involving Intentional Release (DNIR) for GM retroviruses. The OGTR have also asked for comment on the submission for the commercial supply of attenuated GM influenza (flu) vaccine. This GM vaccine is intended to be a nasal spray and the OGTR will need to consider the potential release into the environment carefully.

For Tasmania's poppy sector, the development of a yeast to make fully synthetic opiates that are non-addictive is one to watch. It is anticipated that the first versions of this fully synthesized morphine are at least 2-3 years away. Scientists suggest that batches of GM yeast could produce the drugs at one tenth of the cost of conventional poppy routes[iv].

Consumer sentiment in important current and potential future markets

A snapshot review of Tasmania's ten major trading partners has been conducted. It reveals that for the majority of our significant trading partners, consumer attitude remains sensitive to GE food products. The primary reason that there are no GM crops grown in New Zealand is consumer resistance to GM foods.

Interestingly, here in Australia, sentiment in the dairy processing sector is changing around the potential use of GM pastures with the Australian Dairy Products Federation stressing caution as their future use due to the potential to provide a non-tariff barrier for Australia's milk products[v].

<u>New gene technologies that provide positive benefits to primary industry sectors and Tasmania as a whole.</u>

In the 2013 Departmental review, apart from GM canola, three GM crops (GM pharmaceutical poppies, GM wheat and GM pastures) were identified as the most likely gene technology applications that Tasmania would need to consider for commercial release between the years 2015-2020.

There has been no commercial release of GM wheat in Australia, and the OGTR has not received any licence applications for the commercial release of GM wheat. Licences for trials have been granted, with trials proposed (March 2015 DIR130) to be planted in Murdoch University's Katanning Western Australia facility[vi].

The Victoria Dairy Futures CRC research project into GM ryegrass has finished. The CRC is now working with the state body responsible for intellectual property, Agriculture Victoria Services, who will work on the commercialisation elements for the use of GM ryegrass crops[vii].

<u>Zero Tolerance</u>

Tasmania's current policy position on zero tolerance is more stringent to that of other States. Canola growers in Tasmania have advocated for a change to the zero tolerance threshold to the nationally recognized non-GM standard, as it would speed up access to newer non-GM varieties and reduce costs.

The argument to maintain the existing zero-tolerance threshold is that it reduces the likelihood of contamination of seeds by non-authorised GMOs. Recent analysis[viii] shows that the production benefits on-farm in Australia cannot be considered in isolation of consumer perceptions in Asia. Reducing barriers to access to non-GM canola may improve productivity gains, however the potential higher risk of contamination of GM material could 'taint' the brand position of our products in Asian markets.

As the 2013 Departmental Review revealed, there is no collective viewpoint across industry sectors as to whether there is an imperative to change the current policy position on the GMO moratorium for marketing purposes.

Introduction

BACKGROUND

Tasmania, has since 2001, maintained a moratorium on the commercial release of genetically modified organisms (GMO) into the environment. To this end, Tasmania has applied the Commonwealth laws in the State, first in 2001, with the *Gene Technology (Tasmania Act) 2001,* and then in 2012 when the 2001 was repealed and replaced with the *Gene Technology (Tasmania) Act 2012.*

There is no provision in the Commonwealth legislation for a State or Territory to 'opt-out' of the scheme on environmental or human and safety grounds. However on 5 September 2003, the *Gene Technology (Recognition of Designated Areas) Principle 2003 (Cth)* came into force. That principle states, "*an area is recognised as an area that is designated for the purpose of preserving the identity of GM crops, non-GM crops or both GM and non-GM crops for marketing purposes, if the area is so designated under a State law".*

The Tasmanian Minister for Primary Industries declared the whole of Tasmania a GMO-free area by the *Genetically Modified Organisms Control (GMO-free Area) Order (Tas)* on 31 October 2005. The aim was to position the State in the global marketplace as a producer of food that is genuinely GMO-free.

In August 2014, the Tasmanian Government extended the moratorium on GMO's until 16 November 2019. As a consequence a new Tasmanian Gene Technology Policy (2014-2019) and Tasmanian Gene Technology Guidelines were also developed.

TERMS OF REFERENCE

As part of the Gene Technology Policy 2014-2019, the Minister has asked DPIPWE to report against the following:

1. Development of new generation GMOs that provide health or other benefits;
2. Consumer sentiment in important current and potential future markets; and
3. New gene technologies that provide positive benefits to primary industry sectors and Tasmania as a whole.

DPIPWE are to provide the Minister if based on evidence, there are significant developments in these three specific matters that warrant triggering a review of this Policy before the maximum five (5) year review date.

In addition, AgriGrowth Tasmania is to monitor the risks associated with maintaining Tasmania's current GMO threshold levels and any alternative options.

METHODOLOGY

A desktop study has been undertaken by AgriGrowth over the last 12 months to record developments with GMOs.

The following industry bodies were also consulted for this environmental scan:

- Dairy Australia
- Fruit Growers Tasmania
- Poppy Growers Tasmania (PGT)
- Tasmanian Agricultural Productivity Group (TAPG)
- Tasmanian Beekeepers Association
- Tasmanian Farmers and Graziers Association (TFGA)
- Tasmanian Institute of Agriculture (TIA)
- Tasmanian Organic-Dynamic Producers Inc (TOP)
- Tasmanian Salmonid Growers Association (TSGA)
- Wine Tasmania

AgriGrowth also held meetings with the OGTR and the Australian Biotechnology Council of Australia (ABCA).

Findings

OVERVIEW

Moratoria on the commercial release of GM material around the globe, including Australia, have historically been established to allow time for examination and review of the potential market access and trade implications of the introduction of GM crops such as GM canola[ix].

SECTION 1: DEVELOPMENT OF NEW GENERATION GMOS THAT PROVIDE HEALTH OR OTHER BENEFITS

Advances in science and technology have been progressing in recent years with synthetic biology paired with genetic engineering in areas of food additives and food flavours. These projects include where genes from plants are inserted into bacteria or yeast that is then fed sugar to produce a chemical substance to be made in food[x]. Products such as Synbio Vanillin have been released in the United States of America in 2014[xi] however it is unknown as to which food companies are using the technology. The main purpose of these synbio foods is not from a health perspective, rather they are made in a lab and thus not subject to unpredictable variables like weather[xii].

The Australian Wine Research Institute (AWRI) has been developing wine yeasts that produce wine with less alcohol than those currently available to winemakers. AWRI are approaching their research in several ways with both non-GM and GM technology. In the case of GM technology, yeasts are being genetically modified to divert metabolism away from ethanol production, thus decreasing ethanol concentration by 3.5 per cent[xiii]. These yeasts are not currently commercially available.

New scientific developments include clustered regularly interspaced short palindromic repeats (CRISPR). It is a method for genetic manipulation that is rewriting the way scientists change DNA[xiv]. Scientists say that someday they will be able to use CRISPR to fight cancer, neuter disease carrying insects or even to directly fix genetic defects in humans[xv]. CRISPR has already been used to tweak the genes of human embryos[xvi].

Other developments that can lead to health benefits but may have an impact on production of poppies in Tasmania include the development of a yeast to make fully synthetic opiates that are non-addictive; the first versions of this fully synthesized morphine are at least 2-3 years away[xvii]. However, the next step for the researchers is to boost the efficiency of the GM yeast. The yields of yeast-based painkillers need to rise 100,000 times to challenge traditional opium poppy farming.[xviii]

The OGTR continues to have applications for dealings that relate to health and medical related activities.

It has issued four DNIR for GM retroviruses in the last half of 2014. These included:

1. DNIR 550 – Generation of flurorescent lentiviral transduced tumour cell lines
2. DNIR 551 – Human Immunodeficiency Virus anti-viral development
3. DNIR 552 – Use of N11 murine microlgia for drug discovery
4. DNIR 553 Assessing HIV vaccine efficacy.

The OGTR is also in the consultation phase for a DIR for commercial supply of attenuated GM influenza (flu) vaccine.

SECTION 2: CONSUMER SENTIMENT

From an agricultural producer perspective, consumer concerns regarding GMOs are seen as secondary to the interests of producers, however it remains that most consumers would rather not eat GM foods[xix]. In 2013, the Department's review into the GMO moratorium revealed that GM freedom may serve as a hedge against potential future shifts in consumer sentiment and buying behaviour concerning the attribute[xx].

It appears that the views on niche market positioning captured by the 2013 Departmental review are still recognised as an important factor in growing Tasmania's economy. The Parliament of Tasmania Legislative Council Select Committee on Growing Tasmania's Economy (2015) noting a combined submission from the NW Chambers of Commerce and Industry that *"maximising our GMO status and a push for organic farming ventures is the right direction the world is taking and Tasmania should be on the leading edge. Look at Cape Grim Beef – taking full advantage of the world's cleanest air and rain to raise premium, grass fed, non-GMO, hormone free beef"*[xxi].

Consumer acceptance of GM ingredients still varies with the product characteristics, geography, and the information that consumers are exposed to[xxii]. Globally, within the income growing middle class category, consumer's preferences are changing towards environmentally friendly, sustainable and ethical production[xxiii].

Of particular relevance to agriculture is the sentiment in Tasmania's ten major trading partners. As part of the environmental scan, a desktop study was completed to explore whether consumer sentiment had changed with these key trading partners since the 2013 Departmental review into the Moratorium. The table below summarises the most recent information to-hand.

Country	Sentiment
Japan	Japan is one of the world's largest per capita importers of GE products. However, somewhat contradictory, the most recent in-country survey on food safety indicates 49 per cent of those polled indicated they have high or some concern regarding GE foods.
Hong Kong	Green groups and consumer organisations have been advocating for mandatory labelling of GE foods for many years. Their rationale is not based on food safety or science, but on the consumer 'right to know'. In 2013, the Hong Kong Consumer Council renewed its call for mandatory labelling for GE foods. Hong Kong retailers have said they would not import any products that carried a GE label as they believe that consumers would not choose GE products when there are other choices available.
United States of America (USA)	GM foods are available in the USA. There is evidence that non-GM labelled foods represent a small share of retail food markets.
Singapore	There are no vocal consumer groups actively campaigning against the imports of GE products. No barriers exist to imports as long as they are approved as safe for public consumption in their countries of origin before being allowed into Singapore.

The United Kingdom (UK)	Products containing soy, corn, glucose or other sugar components of biotech sugar beet or oilseed rape (Canola) must be labelled. There is a vocal minority against GM but most rely heavily on supermarket chains to provide them with safe quality food. All of the retail chains publically declared their private label to be "GM free" in the early 2000s consequently very few biotech derived ingredients/products have made it onto British shelves. However since 2013, Tesco, Marks and Spencer and Sainsbury communicated to their customers that for those who wished to avoid biotech fed livestock, they must now look at organic options. However price is still uppermost in mind for the majority of UK consumers.
China	China is a large importer of biotech soybeans, cotton, corn and soybeans for feed and processing. New regulations are in place around labelling. Foods made of crops where GMO varieties exist (such as Canola) must provide evidence they are GMO-free before they can be advertised as such. China does not import biotech seeds for cultivation. China has a zero tolerance for GMOs that have not been approved and tests for contamination. China's increasingly slow and unpredictable approval level and lack of a low level presence (LLP) policy has resulted in a large increase in rejected shipments and trade disruptions. China has a lack of consistent approach on detection limits. Import tolerance can range from 0.1 per cent to 0.01 per cent or even less. This can result in cases where an export shipment tests negative for unapproved events but tests positive when it arrives in China. For example, all hay to China has to be certified GMO-free with a 0.2 percent threshold for containing the Roundup Ready Trait[xxiv].
Korea	There are contradictory views in the market place. The public holds positive views on the use of biotechnology in human and animal research, bio-medicine and the treatment of disease while they tend to be negative towards the use of the technology to produce food. Local retailers are reluctant to carry GM labelled foods since they do not want to put

	product on their shelves that will not sell and would inevitably draw public scrutiny. Korea imports substantial amounts of biotech food ingredients that are currently exempt from the GM food labelling requirements.
Indonesia	There is broad support for the technology from farmer organisations. Due to a lack of information and general knowledge about biotechnology, consumers are more hesitant if they know their food contains GE products. Indonesians have widely consumed GE soybean derived tempeh and tofu for the last three decades.
Taiwan	Taiwan regulators remain very cautious about domestic cultivation of biotech crops. A series of local food safety scandals including miss-labelled rice and adulterated cooking oil created an opportunity for anti-GE activities to push for increased regulations. Taiwan's consumers and authorities are often sensitive to sensationalistic media claims.
New Zealand	Media articles since 2013 are evenly divided between pro and anti pieces. Some primary sector organisations and farmers remain cautious about the use of biotechnology out of concern that it will tarnish New Zealand's 'clean and green' image and negatively impact on the ability to market products overseas. One of the major supermarket chains "Foodstuffs" has taken a stance on GE whereby it insists on non-GE food ingredients to be used in its private branded products including non-GE feeds being fed to animal products which are sold under their private brand. It has no stance on third party or regular products sold through its stores as long as they are approved and labelled as regulated by FSANZ. Most New Zealand consumers express caution about GE foods.

Sources: Abridged from www.ers.usda.gov and www.gain.fas.usda.gov

In summary, apart from the USA and Singapore, the majority of Tasmania's major trading partners have consumers that remain sensitive to GE foods. This concern extends to synthetic technologies. Developers of synthetic technologies are having to work with environmental and consumer groups to address concerns about labelling so that consumers are aware of what they are buying. Consumer groups contend that these products should not be labelled 'natural'[xxv].

It is worth noting that although China has an inconsistent approach towards importation of GMOs, Chinese President Xi Jinping has backed China's development of GM crops as a means of strengthening food security with agricultural minister Han Changbin following up with measures for promoting GM food to the public[xxvi].

In March 2015, 17 experts from 11 countries assessed that Glyphosate as "probably carcinogenic to humans[xxvii]", causing Colombia to ban spraying the herbicide glyphosate on illegal plantations of coca, the raw ingredient for cocaine[xxviii].

Countries are still looking to a point of difference regarding their markets and branding and GMO free can be one of these attributes. In August 2015, Scotland announced that it is looking to prohibit GMO crops as the Government is worried that GMO crops could damage the country's "clean and green" brand. The country is utilising new European Union rules that allow countries to opt out of EU-approved GM crops[xxix].

Domestically, many Australian consumers still believe that labelling associated with GM does not allow them to make well-informed purchasing choices[xxx]. Uncertainty about the GM policy in some jurisdictions of Australia continues. Approximately 12 months ago, the Western Australian (WA) Premier indicated that the WA State Cabinet had flagged considerations for a review of their Act which could be repealed in light of party policy to cut excess red tape. Premier Colin Barnett and Minister for Agriculture and Food Ken Baston are now being lobbied by WA growers to repeal State legislation that could be used to cut-off their future access to GM crop technologies, however in the lead-up to the WA election (March 2017) it is widely held by the industry that if Labor wins the next State election, its GM-free policy would make growing GM canola illegal the following year[xxxi].

SECTION 3: NEW GENE TECHNOLOGIES IN PRIMARY INDUSTRIES

Industry consultation did not reveal any new issues or technologies that would trigger a review of the existing moratorium.

During 1 January to 31 March 2015, the OGTR [xxxii]completed the following:

- 2 licenses issued for Dealings involving the Intentional Release (DIR) of GMOs into the environment
- 1 licence issued for Dealings Not involving the Intentional Release (DNIR) of GMOs into the environment.
- 17 physical containment facilities were certified
- 24 instruments surrendered
- 49 certificates, four DIR licences and 10 DNIR licenses were varied.

The OGTR in 2013 gave Nuseed a licence to conduct field trials of a GM canola, currently under development, which contains healthy long-chain omega-3 oils. The licence for the trials is for five years and their pre-commercialisation work continues[xxxiii]. If commercially released, this GM canola would have major benefits to the dietary supplements and pharmaceuticals industries as well as and DHA-rich aquafeed markets (of interest to Tasmanian salmon growers).

The GM safflower has been modified to alter the oil profile in the seed, specifically to increase the level of oleic acid and decrease the levels of other fatty acids. The OGTR anticipate that with the trials commercial release is likely to be 4-5 years away.

GM apples that have enzymes removed to reduce browning have been approved for commercial release in the United States and JR Simplot have developed the GM potatoes, which will be marketed under the name Innate and have been modified in a similar way—except with the addition of reducing acrylamide (said to increase rate of cancer)[xxxiv]. As yet, there has been no application to the OGTR to introduce these particular GM plants in Australia.

There are those that are suggesting that GM is running out of steam with the growth in plantings of corn, cotton and oilseed flattening[xxxv] however more promising for broad acre agriculture is the technology used to introduce nitrogen-fixing abilities into plants. Although early days, this approach could have the potential to reduce applications of nitrogen fertilisers, however it is in early stages of developmentxxxvi.

It remains that separate industry sectors can have differing views to use of GM technology. Globally, GM Lucerne is available to be planted commercially. The dairy industry is watching the developments of this fodder crop with interest. The Australian lucerne seed industry has a moratorium on GM so that producers are unable to grow GM lucerne in Australia. One of the biggest concerns that the Lucerne industry has is the potential impact on the industry's export markets, the biggest of which is Saudi Arabia, a country that does not accept GM seed[xxxvii].

Synthetic biology is not just genetically engineering compounds like algae and yeasts to produce useful compounds, it can also be designing and printing genes from scratch[xxxviii]. Synthetic biology has been used to develop algae oil that is replacing palm kernel oil. The environmental benefits of this are considered significant as palm oil production has significant implications for the rainforest where it is sourced[xxxix].

The use of GM animals has so far been mainly used for biomedical research or for the production of human proteins with GM cattle, sheep, pigs and chickens now being produced experimentally[xl]. Through gene editing applications, researchers have engineered pigs that are immune to African swine fever virus, as well as gene editing to develop double-muscled pigs[xli]. Although researchers hope that the double-muscled pigs could become the first GM animals to be approved for human consumption, other examples (such as GM salmon) highlight the ongoing lengthy time frame for regulatory approvals. The transgenic salmon produced in the United States of America, has remained in regulatory approval processes since 2013 and is yet to be commercially released[xlii].

The development of a GM chicken in the United Kingdom could solve avian flu crisis as the bird does not pass the avian flu virus onto other birds. The researchers do not foresee the GM chicken being introduced into the United Kingdom any time soon but rather in countries which have more pragmatic views of GM such as China[xliii].

In January 2014, a patent application as lodged in the United States where genes of Holstein dairy cattle are edited to remove their horns by the use of the genetic sequence that naturally causes Angus cattle to lack horns. Although conventional breeding can achieve the same results, GM techniques are being used to save time in cross breeding[xliv]. There are synthetic biology developments into animal-free dairy products. The start-up company Muufri is producing animal-free milk through adding cow DNA sequences into yeast cells. After they grow the cultures, the resulting milk proteins are ready for harvest[xlv]. This synthetic modified food is only in early development phase and yet to be released. Other research continues into ‘lab-grown meat’ (also known as ‘cultured meat’) however funding of the research has become a major issue as it sits between the medical and food related areas[xlvi].

In August, 2015, Australian Government Senators backed a motion supporting GM crops for being an environmentally friendly farming technology supported by scientific rigor. The federal Senate motion was raised by influential crossbench Senators David Leyonhjelm, Bob Day and Dio Wang. Despite the Greens having a long-held anti-GM policy position, the motion was passed without needing a division or debate over the potentially controversial topic[xlvii].

SECTION 4: ZERO TOLERANCE THRESHOLD FOR GM CANOLA

Adventitious presence

Around the globe, a GM crop can be grown only after it has been extensively tested and approved as safe for humans, animals and the environment under rigorous approval processes[xlviii].

Adventitious presence – or technically unavoidable presence – may occur in all arable farming, and at any step in the production of seed or grain, or in processing of harvested product in the food/feed chain[xlix]. Adventitious presence of GM material is not a crop safety issue but relates solely to the production and marketing of crops approved for use[l].

Globally, countries have recognised that adventitious presence of unauthorised GM material has the potential to cause significant economic impacts[li]. In an ideal world, unwanted mixing with GM canola would be avoidable simply through separation of GM and non-GM material across all stages in the supply chain, however almost nobody expects that 100 per cent separation would be practical[lii]. Consequently, regulators and/or markets have set thresholds or tolerance levels at maximum allowable level of adventitious (unintended) presence of GM material[liii]. Many countries, like Australia, enforce a zero tolerance threshold policy for unapproved GM crops, including those that have been deemed to be safe through a comprehensive safety assessment in another country[liv].

ZERO TOLERANCE

The setting of tolerance levels came after the introduction of GMOs. As the introduction of GMOs to the environment is almost impossible to reverse, thresholds are instruments introduced to manage market implications and are an attempt to deal with primary production systems already contaminated and to bring clarity to industry about how to deal with adventitious presence.

Tolerance levels in grain are different to tolerance in seed for sowing due to the end-point use. Markets may accept grain tolerance due to the process/extraction end point. For example, GM presence at any level should not be an issue if products like oil are being extracted through a process to make them non-viable. Tolerance in seed for planting means that viable GMO will persist in the environment at low levels and be capable of reproducing, unless it carries terminator technology.

In Australia, industry believes that establishment of adventitious presence thresholds are critical for delivery of market choice[lv]. GM labelling is triggered by GM levels above 0.9 per cent. Industry accepts low levels of impurity with seed of plants of a different variety or seeds of other crops[lvi]. However, new technology such as GM presents a new challenge in controlling conventional seeds for adventitious presence of GM seeds.

International legislation and threshold levels

The European Union (EU) has a zero-tolerance policy on the marketing of food containing GMOs or ingredients produced from GMOs if they are not approved for food use in the EU[lvii] (although the EU sets out that technical zero is at the level of 0.1%[lviii]). For trade purposes, the Members States of the EU has established different thresholds for adventitious and technically unavoidable presence of approved GMOs in non-GM harvests, taking into account the demands of consumers and their markets[lix]. For example, EU regulation 2010/c200/01 recognises that the market demand for particular food crops may result in economic damage to operators who would wish to market them as not containing GMOs even if GMO traces are present at a level below 0.9 per cent[lx].

Directive 2001/18/EC and 1829/2003 provide the legislative basis in the EU on GM food and feed and ensure strict control of placing on the market GMOs in the EU[lxi]. The current EU legislation requires the labelling of products that contain GM higher than a 0.9 per cent threshold[lxii]. Products containing GM material in proportions higher than this have to be labelled. Products derived from livestock (i.e. milk, meat or eggs) are not subject to labelling[lxiii]. The European Commission formulated a policy that coexistence measures should not go beyond what is necessary in order to ensure that adventitious traces of GMOs stay below the labelling threshold in order to avoid unnecessary burden for the operators concerned[lxiv].

The International Seed Testing Association (ISTA) and the International Organization for Standardization (ISO) aim to achieve uniform application of procedures for evaluation of seed and grain moving in international trade. These agencies are non-government standard-setting bodies that have developed guidance documents, rules and/or standards on sampling for seeds and grains (ISO and ISTA), testing for foodstuffs (ISO), and testing for seeds (ISTA). Test methods for specific GM events are not provided in these standards; the focus is on defining principles, describing general methods, and specifying definitions and performance requirements[lxv].

For seed and grain, the following table highlights some examples of current international tolerance levels:

Table 1 = Labelling and country tolerance levels for adventitious presence of unauthorised GM material (ingredient)[lxvi]

Country	Threshold level
Canada	Not more than 1.0% for grain[lxvii]
European Union /United Kingdom	EU approved GMOs in non-GM seed and grain for use in food and feed is 0.9 per cent. This is also the threshold for labelling. The threshold level for GMO content in seed has not yet been determined. The EU has suggested thresholds from 0.3 to 0.7 per cent depending on the crop. For the interim period, threshold was set up to 0.5 per cent.
Australia/New Zealand	Up to 1 per cent of unintended contamination is permitted (some exemptions).
Japan	If an ingredient is at least 5 per cent of the total weight of the product
Korea	3 per cent or higher

All thresholds set for adventitious presence of GM in seed and grain in Australia's canola export markets are equal to or higher than the thresholds set in Australia for adventitious presence in non-GM canola[lxviii]. Some countries have adopted a marked-based approach (Canada and the United States) where co-existence measures are described in industry best practice guidelines or equivalent[lxix]. In Canada for example, the technology use moved so quickly that by the time thresholds were looked at, zero tolerance was just not possible.

Organic certification is based on certifying the production method rather than giving an end product guarantee as to the product's freedom from GMOs or excluded products[lxx]. The United States of America National Organic Program does not have regulations established for GMO tolerance thresholds, with no federal agency establishing tolerance levels for the inadvertent presence of organic products of excluded methods (GMOs).[lxxi] Against a backdrop of no organic sector-specific legal threshold existing for the presence of GMOs in organic product in both North America and the EU, the EU 0.9 per cent labelling threshold applicable to GM presence in any product applies equally to organic produce[lxxii].

In Australia, the Organic Industry Standards and Certification Council (OISCC) is assessing an application from the Australian Organic Ltd[lxxiii] to develop a procedure for dealing with adventitious or accidental GM contamination. This appears to have arisen from the Marsh versus Baxter ruling in 2014. As yet, OISCC has not released its decision, although in December 2014 OISCC rejected a submission by the Western Australian Department of Agriculture and Food to increase the allowable threshold of GM material in certified organic food[lxxiv]. China has indicated that if Australia waters down the GMO tolerance laws in any way then it could have impacts on the importation of Australian organic products[lxxv].

In the case of honey exports to the EU, in September 2012, pollen was re-classified as a natural constituent of honey. Pollen from GM plants is only permitted if the plants are authorised for food use in the EU. Pollen must be mentioned as an ingredient on honey labels if the amount of GM pollen is higher than 0.9 per cent (labelling threshold) of the total pollen in the honey[lxxvi].

Commonwealth Legislation

The legislative framework in Australia is made up of the Commonwealth *Gene Technology Act 2000* (the Act), the *Gene Technology Regulations 2001* and corresponding State and Territory legislation. All Australian jurisdictions contributed to developing the scheme and legislation. The scheme is supported by the Intergovernmental Gene Technology Agreement 2001 between the Australian Government and each State and Territory.

The Act started on 21 June 2001. The object of the Act is to protect the health and safety of people, and 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)[lxxvii].

In 2005, the Primary Industries Ministerial Council (PIMC) noted that trace levels of GM canola had been detected in Australia's non-GM canola production systems. PIMC agreed to a nationally consistent definition of threshold levels in canola grain and seed for traces of those GM events approved by the OGTR. PIMC agreed to adopt a threshold level set at:

Box 1:

- 0.9 per cent for canola crop, (noting this threshold is applicable to the EU)
- seed (for commercial seed for sale) should be 0.5 per cent for 2006 and 2007 seasons and therefore after the intention was to set a limit of 0.1 per cent[lxxviii]

The above thresholds for canola seed and grain were adopted in 2005 by all Australian States and territories except Queensland and the Northern Territory (which did not have moratoria in place on the commercial cultivation of GMOs) and Tasmania, which differed from the mainland States in that it adopted a GM-free stance on GM canola, an option available under the PIMC agreement[lxxix].

In Australia, the standards for thresholds are set by industry for adventitious presence of approved GM canola in conventional canola. They are put in place for marketing purposes for co-existence. Grain standards are set by Grain Trade Australia, with oil seeds by the Australian Oilseed Federation (AOF) and pulses (Pulse Australia), utilising consultative processes[lxxx]. In the case of canola, the following standards have been set by the AOF[lxxxi].

Box 2:

- The adventitious presence of up to 0.9% of GM events (approved by the Australian Government Office of the Gene Technology Regulator) is allowed in non-GM canola. Canola is rejectable over this limit.
- The adventitious presence of up to 5% of GM events (approved by the Australian Government Office of the Gene Technology Regulator) is allowed in non-GM canola meal. Canola meal is rejectable over this limit.

- Where required, genetic modified seed or meal is to be expressed as the percentage by weight of the clean seed or meal and reported to the nearest 0.1%.

A summary of each State's position in growing GM canola is as follows:

Table 2: Jurisdictions ability to grow Canola

	Other Australian States	Tasmania
Ability to grow GM Canola	√	×
Ability to grow non-GM canola that meet national accepted standard thresholds.	√ **Note includes South Australia who have Moratorium**	×
Ability to grow lowest possible detection (0.0001 per cent) non-GM canola	×	√

Although South Australia, like Tasmania has a moratorium on GMO commercial cultivation, it allows GM canola field trials in the State's mainland regions. Kangaroo Island (KI) promotes being GMO-free. Its branding includes KI Pure Grain and KI Pure Honey. In the case of KI Pure Grain, they have up to 70 growers producing grain and legumes on a total of 40,000 ha. They promote that farmers on KI grow non-GM food quality grains, oilseeds, pulses and honey. KI Pure Honey promote that "the bees are assisting the canola farmers by pollinating their crops, while the increasing canola crop is helping to produce non-GM canola honey to meet demand in the order of 60 tonnes for this specialised premium market". However the threshold for KI and South Australia more broadly is not zero, they rely on the national recognised standards for non-GM[lxxxii].

In Australia, adventitious presence is only allowed for GM foods that are approved by the FSANZ standard. Zero tolerance is applied for GM presence that is not approved for human consumption[lxxxiii].

Tasmanian Legislation

In 2009, the Tasmanian Government policy noted that it would accept as evidence of zero contamination a negative result from a test capable of detecting one GM canola seed in 10,000 non-GM canola seeds with 95 per cent confidence or an alternative import proposal which activities are an equivalent level of assurance that GMOs are absent. This is also known as testing to the limits of detection.

In Tasmania, imports of GMOs into Tasmania are regulated through import requirements contained in the Plant Biosecurity Manual Tasmania, issued under section 68 of the *Plant Quarantine Act 1997 (Tas*). Import Requirement 32: Canola Seed and Grain – Freedom from Genetically Modified (GM) Brassicaceae Seed, requires all imported canola seed and grain to be accompanied by a certificate or statement of analysis demonstrating freedom from GM contamination.

Import Requirement 36: Seed for Sowing is also relevant in that it prohibits importation of viable genetically modified seed unless authorised under the *Genetically Modified Organisms Control Act 2004 (Tas)*. Imported products that do not comply with these import requirements are held and dealt with by Biosecurity Tasmania.

Biosecurity Officers enforce a zero tolerance policy on GMOs at the State barrier for imported products. If imported products are suspected of posing a risk to Tasmania's GMO-free status, the importer will be asked to produce evidence the product contains no GMOs before being released by Biosecurity Tasmania. The exception to the zero tolerance level is GMOs imported for use in scientific research under permit with risk mitigation conditions imposed.

Sampling

A recent survey by the Food and Agricultural Organisation of the United Nations (FAO) has been conducted to evaluate the issue of adventitious presence to examine the impact on trade flows. Of the countries that responded to the survey that produce GM crops, only 47 per cent indicated that they have the technical capacity to detect GMOs in imports[lxxxiv]. The survey concluded that most countries do not have a threshold level for adventitious for food[lxxxv].

The ISTA has developed and published rules for the sampling and testing of seeds, with the aim of achieving uniform application of procedures for evaluation of seeds moving in international trade[lxxxvi]. The sampling and testing needs of the Australian seed and grain industry for GM events in non-GM seed and grain depends on the market demand for differentiated products[lxxxvii.]

Real-time PCR is used widely for GM threshold testing scenarios – it is a quantitative test giving quantifiable results. Most literature references for seed lot testing are using Real-time PCR.

The Tasmanian testing procedure requirements are very similar to New Zealand Ministry of Agriculture and Forestry (MAF) test protocols but with detection requirements of 1 in 10 000 seeds rather than 1 in 1000 seeds as required by MAF. The current testing provides DPIPWE with the highest level of confidence (95%) that the inadvertent presence of 1 GM seed in 10,000 seeds will be detected and is of greater sensitivity than the Australian Seed Federation tests that are considered a minimum standard for industry.

Canola Industry profile in Tasmania

Canola (*Brassica napus*) is an oilseed crop that has been grown in Tasmania since the early 1990s for oil and seed. The State's comparatively mild finishing conditions allow for a longer flowering period, better seed set and higher oil content relative to mainland growing areas. Markets for locally grown seed include crushing for oil and whole grain for stockfeed.

Most growers are using canola as a rotation crop in cereal cropping systems. Canola is seen by growers in the new irrigation regions of Tasmania as an excellent break crop opportunity because of its weed reduction potential. With the benefit of bio fumigation from canola the rotation before poppies is more relevant than ever with the systemic downy mildew issue.

The three non-GM cultivars grown in Tasmania are Conventional, Triazine Tolerant (TT) and Clearfield canola cultivars. Most growers are using TT and Clearfield due to their weed control. Industry anecdotally reports that the inferior varieties being sourced (as a result of our strict testing threshold) is in the region of a 30 per cent yield penalty compared to mainland growers and their access to new conventional varieties.

According to market based research in 2012[lxxxviii], non-GM canola seed (spring sown) has a gross margin similar to that of poppies ($2,000 to $2,500ha) which is well above gross margins for standard cereal or canola crops. Non-GM canola seed (autumn sown) is largely aimed at the Japanese buyer cooperatives. Tasmania is supplying this market along with producers in South Australia (Kangaroo Island) and Western Australia[lxxxix]. It has additional benefits in a rotation in terms of weed and disease control.

In 2012-13, the Australian Bureau of Statistics (ABS)[xc] indicated that the area grown was 555 hectares with 850.6 tonnes of production from 17 agricultural enterprises. At a 2012-13 stable price of $563/tonne[xci] this equates to an estimated gross value of $478,550.

Demand for growing canola has increased in Tasmania and is mainly driven by irrigation expansion.

Restriction and Impacts

The current zero tolerance level is restricting national seed companies to supply the State with non-GM canola seed. This is because of the cost and high risk of failure at the test repetition levels required to meet the lowest possible detection levels.

Growers at a 2014 meeting facilitated by TFGA indicated that they are losing the potential for productivity gains because of the reduced ability to access new seed lines.

SUMMARY ON ZERO TOLERANCE THRESHOLD

Tasmania's current policy position on zero tolerance is more stringent to that of other States. Canola growers in Tasmania have advocated for a change to the zero tolerance threshold to the nationally recognized non-GM standard, as it would reduce costs. South Australia's position of maintaining their non-GM status with the national threshold standard presents as the case for lifting the threshold as they are able to sell their non-GM canola into similar markets to Tasmania, such as Japan.

At present, Tasmanian farmers are able to purchase non-GM canola seed if it clears the testing threshold requirements. The issue is the testing. Maintaining the existing zero tolerance level for contamination of GM material will require maintaining the same testing regime at present (testing to limits of detection). The risk with maintaining the status-quo is that it may incur an increase in testing costs to industry if more varieties of GM seed and grain crops are grown commercially interstate.

The argument to maintain the existing zero-tolerance threshold is that it reduces the likelihood of contamination of seeds by non-authorised GMOs. In addition, the 2013 Departmental Review into the GMO Moratorium revealed that the State's GM-free status provides a platform for the organic and biodynamic systems. Compliance costs to this sector would increase if there were any changes to the threshold because of the current zero tolerance to GM material required by Australian organic certifiers.

Recent analysis[xcii] also shows that the production benefits on-farm in Australia cannot be considered in isolation of consumer perceptions in Asia. Reducing barriers to access to non-GM canola may improve productivity gains, however the potential higher risk of contamination of GM material could 'taint' the brand position of our products in Asian markets.

As the 2013 Departmental Review revealed, there is no collective viewpoint across industry sectors as to whether there is an imperative to change the current policy position on the GMO moratorium for marketing purposes.

Appendix 1: Comparison of other State Canola Regulations

Jurisdiction	Legislation	Scheme
NSW	*Gene Technology Act (Cth) and via the Gene Technology Act 2003 (NSW)*	Minister can declare an order for approval of a licensed GM food plant for commercial cultivation in NSW. GM canola has been grown commercially in NSW since 2008. The State is a signatory to the thresholds set by PIMC 2005 regarding non-GM canola thresholds.
Victoria	*Gene Technology Act (Cth) and via the Gene Technology Act (2001) Vic*	Minister may grant an exemption to cultivate under section 6 of the *Control of Genetically Modified Crops Act 2004*. GM canola has been commercially grown in Victoria in 2008. The State agreed to the thresholds set by PIMC in 2005. The Victorian Government also allows the market to determine whether segregation of non-GM canola from GM canola in the grain supply chain is required, acknowledging that the tolerance level agreed by PIMC provides a sound basis for the co-existence in the supply chain.
South Australia	*Gene Technology Act (Cth) and Gene Technology Act 2001 (SA)*	Minister may confer an exemption from GM Moratorium under section 6 of the *Genetically Modified Crops Management Act 2004*. GM crops are not commercially grown in South Australia. The State agreed to the thresholds set by PIMC in 2005.

Western Australia	*Gene Technology Act (Cth) and the Gene Technology Act 2006 (WA)*	Minister may grant an exemption from GM moratorium under section 6 of the *Genetically Modified Crops Free Areas Act 2003*. GM canola has been grown since 2008 and 2010 respectively. The State agreed to the thresholds set by PIMC in 2005.
Queensland	*Gene Technology Act (Cth)*	Not implemented any other legislation. GM canola has been grown since 2008. The State did not sign the agreement set by PIMC in 2005 as it does not have any specific State based legislation.

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ATTACHMENT 4

Review of the moratorium on genetically modified organisms (GMOs) in Tasmania

Final Report

16 December 2013

Department of Primary Industries, Parks, Water and Environment

Tasmania
Explore the possibilities

Further information about the Review

Please refer to the Department's website: www.dpipwe.tas.gov.au

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Executive Summary

The Tasmanian Government has maintained a moratorium since 2001 on the commercial release of genetically modified organisms (GMOs) to the environment. This policy is intended to position the State in the global marketplace as a producer of food that is genuinely GMO-free. In June 2013, to allow due consideration prior to the legislation expiring in November 2014, the Department was directed by the Minister for Primary Industries and Water to conduct a review of the moratorium on GMOs in Tasmania and to provide a report by the end of the year.

The terms of reference for the Review were to report on:

1. Domestic and international gene technology policy relevant to primary industries;
2. Research and development relevant to the use of gene technology in primary industries;
3. The potential market advantages and disadvantages of allowing or not allowing the use of gene technology in Tasmanian primary industries, including food and non-food sectors; and
4. Any other relevant matters raised during the review.

The Department released a comprehensive Issues Paper to help inform public submissions. Following a six week advertised consultation period, 160 submissions were received. In addition the Project Team for the review conducted its own investigations, including engaging two consultancies to undertake market research into the perceptions of GMOs, in two key international markets for Tasmanian produce, and in the domestic Australian market.

Importantly, the Department's role was not to write or decide the State's future policy on GMOs. That is for the Government of the day to determine.

Summary of submissions: overall themes

There were divergent views on many of the issues associated with the moratorium on GMOs. Similar issues were also often raised under different terms of reference. However a number of consistent themes emerged across the four terms of reference.

Markets, marketing and branding

Many submissions focussed on the importance of being GMO-free to Tasmania's image, stating that the "clean and green" attribute is critical to the State's brand, without which both markets and individual businesses would be damaged and future opportunities lost. Point of difference was a recurring theme: that is, removing the moratorium and allowing GMOs would mean Tasmania loses a significant point of difference in current and potential future markets for our produce.

Other submissions took the alternative view that GMO-free market benefits are not proven and that some sectors are unfairly wearing the costs of the moratorium, from lost opportunity, and these costs outweigh any potential GMO-free marketing benefits.

Some agricultural sectors strongly support the option of GM technology to maintain industry competitiveness, because new GM crops and pastures are in the pipeline. Some other Tasmanian industries – like beef, fruit, honey, organics and food tourism – argue that they rely on Tasmania's GMO-free status as a key component of their marketing and branding and for market access generally.

There is also a perception that the State has not taken full advantage from the moratorium in terms of GMO-free market development, including comments that the Tasmanian Government has not put enough resources into marketing strategies.

Research and development

Some submissions stated that the moratorium creates uncertainty for research and development (R&D) which is limiting biotechnology advancement in Tasmanian agriculture. The absence of a clear path to market for GM-related research is said to create uncertainty and to have reduced private and public sector capital investment in R&D in Tasmania. Other submissions noted that there should be more investment in non-GM R&D.

The moratorium

Many submissions stated that allowing GMOs is irreversible, costly, and would have negative consequences for Tasmania's brand, marketing and markets, as well as for the environment or consumer health.

Some advocated keeping the moratorium for long enough to allow GMO-free markets to develop and realise the benefits of being GMO-free. Others argued to retain it for as long as required to allow GM R&D to develop in other jurisdictions and at other people's risk, so that Tasmania can observe and weigh up any opportunities.

Others argued that the moratorium should be lifted immediately to provide a positive statement and social licence for industry to have the option of using gene technology.

Co-existence

Co-existence was a significant theme, with many submissions stating that it is simply not possible for GMOs to be present in the State without negative consequences for non-GMO (including organic) producers. Other submissions asserted that co-existence of GMO and non-GMO crops and supply chains is possible, is already occurring in mainland States and can be managed safely.

Some submissions asserted that GMOs are a proven and safe technology, are essential to "feed the world", have benefits for on-farm crop production and reduce environmental impacts (for example, through reduced chemical usage). These same submissions emphasised that the production of GMOs in other jurisdictions has had no negative effect on their supply chains or trade, and that Tasmanian growers are disadvantaged by the moratorium through losing market share.

Conversely, other submissions were sceptical about the yield benefits and environmental claims associated with GMO crops and expressed concern about intellectual property rights over seeds and corporate control over food chains.

Summary of the findings

The issues associated with the use of gene technology in primary industries are varied and complex. This review necessarily focussed on major questions associated with the advantages and disadvantages of the moratorium to the State's markets, marketing and brand. This is because under the national scheme for regulating dealings with GMOs, States can only regulate dealings with GMOs for marketing purposes.

It is not possible for this Review to quantify the market (or marketing) advantages or disadvantages to the State of the moratorium. As observed with previous reviews on GMOs in Tasmania, beyond possibly small discrete markets it is not possible to provide a definitive answer either way. Future policy responses need to take this uncertainty into account.

In relation to co-existence, a fundamental and practical issue at this time is whether Tasmania could continue to market itself as GMO-free under the banner of a moratorium, while also potentially allowing dealings with selected non-food GMO crops in a manner that does not cause economic harm to the Tasmanian brand or markets for our products.

Accordingly, findings are made on six key issues that are most relevant to determining the future policy position on the GMO moratorium at this time:

1) Market advantages and disadvantages

There is no collective viewpoint across industry sectors as to whether there is an imperative to change the current policy position on the GMO moratorium from a marketing perspective. If the aim is to quantify the benefits and costs of the moratorium, the answer is inconclusive. It depends on the view of each discrete market or product offering as to whether there is a benefit or cost.

Some industry sectors such as beef, honey, fruit, organics, food tourism and wine all perceive negative market impacts or challenges if the current policy were to be altered. On the other hand, dairy and poppy growers perceive negative impacts if the current policy does not change. Only a small proportion of the State's food and agricultural output is currently marketed as Tasmanian and within that only a small number of producers are using the specific attribute of GMO-free as part of their branding and marketing.

The Tasmanian place-based brand is built upon a range of attributes including premium quality, clean and green, cool climate and biosecurity. The ability to grow food and other agricultural products in a GMO-free environment is not a core attribute to the brand, but supports the overall food brand position.

Freedom from GMOs is one of a range of second-tier attributes consumers consider when purchasing, but they rank it behind better known ethical attributes such as Australian grown and organic. The market research conducted specifically for this Review points out that Tasmania's markets for food and beverage products are on the whole ambivalent about the State's GMO-free status. Within the two Asian markets considered, there is not a high level of recognition or understanding by consumers about GM foods. The underlying perception of GM foods in these markets is that they are not good for human health, but consumers are not prepared to pay a price premium for GMO-free.

GMO-freedom may, however, serve as a hedge against potential future shifts in consumer sentiment and buying behaviour. The heightened interest and marketing effort around food provenance indicates there is a level of opportunity cost in removing the Tasmanian GMO-free status.

To develop GMO-free markets (and potential price premiums) in future, Tasmania will need to continue to build a better understanding of consumer preferences and behaviour in relation to GM foods generally. In addition, any strategy to promote the moratorium would require a far greater understanding of the supply chain dynamics, and support from the gate keepers (retail and wholesale markets), to ensure that optimal brand advantage is captured.

2) Monitoring future developments in gene technology

Irrespective of the policy position taken on the moratorium, a formal mechanism is required for monitoring future developments in gene technology that involves Government, industry and other stakeholders. With the likely increase in either field trials or the commercialisation of GM crops which could be grown in Tasmania, it is important to continually assess the potential benefits and/or the implications of the technology.

Of the current commercially approved GM crops in Australia, only GM canola is suited to Tasmanian conditions. GM pharmaceutical poppies, GM wheat and GM pasture cultivars are the most likely gene technology applications that the State Government may need to consider for commercial release in 2015-2020. Other crops, such as GM canola with high omega-3 oil for use in animal feeds, could also potentially be available for use before 2018. Any potential release of GM crops is first dependent on the outcome of research results and Commonwealth regulatory approval processes.

3) The Tasmanian GMO regulatory framework

States can regulate GMOs for marketing purposes. The *Genetically Modified Organisms Control Act 2004* ("the Tasmanian Act") that provides for the moratorium in Tasmania operates concurrently with the Commonwealth *Gene Technology Act 2000* and *Gene Technology (Tasmania) Act 2012*.

The Tasmanian Government, in considering the future policy on GMOs, may want to reinforce its support for agricultural R&D and address concerns that the moratorium is costing Tasmania through discouraging biotechnology research, by clarifying the position on tightly controlled GM trials and contained research.

4) Legal definitions and emerging technologies

Gene technology is evolving rapidly. An issue raised in submissions was whether the definitions of GMO and gene technology generally, were properly understood. This prompted a further question of whether the legal definition of what constitutes a GMO can keep pace with emerging technologies. Upon review, it is considered that the national regulatory regime for gene technology contains adequate definitions and mechanisms to incorporate new organisms and technologies. This is also a matter for the Office of the Gene Technology Regulator (OGTR) to monitor.

5) The form of the moratorium

Unless the Act is amended, the current moratorium on GMOs in Tasmania will automatically expire on 16 November 2014. Therefore, the first decision-point is whether to lift or maintain the moratorium.

Lifting the moratorium (or otherwise letting the moratorium lapse) would effectively create "open co-existence" under the national regulatory regime, with a "market choice" model of industry self-regulation.

If a decision is made to extend the moratorium the three options the form of the moratorium could take include:

1. Maintaining the status quo where the whole of Tasmania is declared GMO-free with the potential to permit GMOs on a case-by-case basis;
2. A blanket moratorium on GMOs which winds-back the ability to apply for a permit to deal with GMOs in Tasmania. Under this option, issues to consider would include the approach taken to R&D

into GMOs, and the need to recognise pre-existing permits and management arrangements of historical canola trial sites; or

3. Amending the current approach to one of "co-existence by regulation", with clearer exemptions for specific non-food crops and Government controls on how such crops are grown and managed via mandatory standards and protocols.

Irrespective of what form a moratorium takes, any policy other than a blanket moratorium means that at some point Tasmania will likely confront a "watershed" event with the first commercial release of a GMO crop, either a food or non-food crop. This could mean that Tasmania can no longer market itself as GMO-free. If this occurs, it also then becomes a question of managing for the co-existence of GM and non-GM crops.

6) Managing co-existence of GM and non-GM crops

Government would need to engage intensively with industry and other stakeholders, prior to any decisions being made on the commercial release of any GM crop, to develop an appropriate co-existence framework.

Management of co-existence between GM and non-GM crops raises issues at two levels. The first is practical: the segregation of GM from non-GM crops to manage the risk of contamination. The other is market based: whether GM and non-GM products can co-exist in the marketplace without causing harm to particular products, markets or the Tasmanian brand as a whole.

Co-existence already occurs across non-GM production systems in Tasmania, including between organic and conventional producers, but it would be complicated by the introduction of a GM crop. Managing co-existence would seem more straightforward should an absolute position be taken on the moratorium – that is, either to have a blanket ban on GMOs or to lift the moratorium. However, pharmaceutical poppies are already highly regulated and, as a non-food crop, GM poppy varieties are possibly more suited to managing for co-existence than other likely examples of GMOs relevant to Tasmania. But the risk of contamination cannot be eliminated entirely. Options for managing for co-existence include either regulatory standards or industry certification schemes.

If a specific GM crop was permitted for commercial release, a co-existence framework would also need to include marketing strategies to maintain the values (non-GM markets, future opportunities and Tasmanian brand position) that the moratorium is currently designed to protect. An issue that will also require further consideration is who pays the additional costs associated with managing for co-existence.

Regardless of the policy on the moratorium, it will become increasingly difficult for Tasmania to sustain a zero tolerance position on thresholds for adventitious (unintended) presence and low level presence of GMOs, as more GMOs are commercialised and produced interstate. This issue of acceptable thresholds therefore also warrants further consideration by Government with industry and stakeholders.

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ACKNOWLEDGEMENT

DPIPWE acknowledges the assistance of the Department of Economic Development, Tourism and the Arts (DEDTA) in preparing this Final Report.

Introduction

BACKGROUND

Genetically Modified Organisms (GMOs) are organisms that have been modified by using gene technology to produce certain desirable characteristics. Gene technology involves the modification of organisms by the direct incorporation (or deletion) of one or more genes to introduce or alter characteristics of organisms (Australian Government, 2001).[1]

Due to concerns over the potential impacts on markets from the introduction of GMOs into the Tasmanian environment, the Tasmanian Government has adopted a cautious approach towards GMOs. A moratorium on the commercial release of GMOs into the Tasmanian environment has been in place since the year 2001. Importantly, under Commonwealth laws, States and Territories can only regulate dealings with GMOs for marketing purposes. The national scheme for regulating dealings with GMOs, in which Tasmania participates, is responsible for assessing the environmental and human health risks, and regulating the use of gene technology in Australia.[2]

Prior to the release of this Report, GMOs in Tasmania have been the subject of public consultation in 2000, two departmental reviews (in 2000 and 2003), two Tasmanian Parliamentary Joint Select Committees (in 2001 and 2007) and two regulatory impact analyses on the legislation that underpins the moratorium, the *Genetically Modified Organism Control Act 2004* (Tas) (the Act). These measures are in addition to numerous Australian Government consultations and reviews.

The current *Policy Statement: Gene Technology and Tasmanian Primary Industries 2009-2014* committed the Government to commencing a review by November 2013 by a process determined by the Government of the day. The Act, and hence the moratorium, automatically expires on 16 November 2014. On 25 June 2013 the Minister for Primary Industries and Water directed the Department of Primary Industries, Parks, Water and Environment (the Department) to undertake a review of the moratorium on GMOs in Tasmania and to provide him with a report on that review by the end of 2013.

This Report contains the results of the Review and presents six findings. The findings of the review will help inform future Government policy on the moratorium.

TERMS OF REFERENCE

The Minister for Primary Industries and Water requested the Department to report against the following terms of reference (ToR):

1. Domestic and international gene technology policy relevant to primary industries;
2. Research and development relevant to the use of gene technology in primary industries;
3. The potential market advantages and disadvantages of allowing or not allowing the use of gene technology in Tasmanian primary industries, including food and non-food sectors; and

[1] For further information on definitions and terminology associate with biotechnology and gene technology refer to the background section in the Issues Paper for this Review at Appendix 2.
[2] The Issues Paper for this review also provides a comprehensive outline of the Commonwealth and State regulatory framework for GMOs.

4. Any other relevant matters raised during the review.

REVIEW GOVERNANCE ARRANGEMENTS

Reporting directly to the Secretary of the Department a Steering Committee provided oversight of the review. The Steering Committee comprised:

- Deputy Secretary, Agriculture, Corporate and Heritage, DPIPWE;
- General Manager, Biosecurity and Product Integrity, DPIPWE;
- Director Policy, DPIPWE;
- General Manager, Sector and Trade Development, DEDTA; and the
- Assistant General Manager, Food and Agribusiness Sectors, Sector and Trade Development, DEDTA.

The review was undertaken by a Project Team that reported to the Steering Committee. The Project Team comprised senior officers from the DPIPWE Policy Division and Biosecurity and Product Integrity Division, and from the DEDTA Food and Agribusiness Sectors, Sector and Trade Development Division.

PUBLIC SUBMISSION PROCESS

The Department produced a comprehensive Issues Paper and an online form to assist in the preparation of submissions. The Issues Paper for this Review is appended to this Report (Appendix 2). At the time of publishing the Issues Paper, on 31 August 2013, the Department called for public submissions in advertisements placed in the three Tasmanian daily newspapers. On Friday 6 September the Department also advertised the call for public submissions in *Tasmanian Country*. Further information, including questions and answers and background information on the Review, was also placed on the website: http://www.dpipwe.tas.gov.au. Two weeks prior to the closing date for public submissions there were further advertisements placed in the Tasmanian daily newspapers and *Tasmanian Country*. Submissions closed at 5pm, Friday 11 October 2013 following a six-week consultation period.

The Issues Paper, on-line form and the website all alerted those providing submissions that their submissions would be treated as public documents unless they indicated otherwise. Submissions could be provided in writing, via the on-line form, or by e-mail to the following purpose-built address for the review: gmo.review@dpipwe.tas.gov.au.

In total 160 submissions were received. Of these submissions, five were identically-worded letters and two were the same submission but received separately from the Federal and State organisations of the same political party. One other submission was on behalf of 169 signatories.

All submissions are published on-line via the Department's website www.dpipwe.tas.gov.au except for those submissions where a request in writing was received to keep them confidential, either in whole or in part. A list of submissions is provided in Appendix 1.

Outside the formal submissions process, four petitions supporting the moratorium were received by the Government, including from Senator the Hon Lin Thorp on behalf of the "supporters of an ongoing GMO moratorium", the Tasmanian Industries for GMO-free, Gene Ethics on behalf of "local electors", and from "the residents of Tasmania".

The Department and the Project Team would like to sincerely thank and acknowledge all those who took the time to provide submissions to this review.

Summary of Submissions

OBSERVATIONS

The following section sets out the context in which the summary of submissions should be considered.

The Review provided the opportunity for many members of the public and organisations to provide their views. This in itself is an important outcome.

The Issues Paper included a series of questions, under each Term of Reference, on which the Project Team were particularly seeking new evidence. Unless submitters used the on-line response form, in most cases the submissions did not address the specific questions in the Issues Paper, or if they did, not all of the questions.

The majority of submissions provided perceptions or were based on assertions. Very few verifiable facts (or objective evidence) were provided to support statements in submissions.

The following table provides a summary of the spread of submissions across stakeholder groups. While some submitters may fall into more than one stakeholder group, they have been assigned as best fits. The stakeholder groupings in no way infer a particular position on the moratorium.

Stakeholder Group	No. submissions
Member of the public (and small business)	85
Conventional and organic farmers, producers and suppliers (incl. wineries, and commercial beekeeping businesses)	31
Food tourism, including restaurateurs	7
Agri-business, including companies and environmental consultants	9
Industry representative bodies	13
Government / regulators	1
Non-government organisations (NGOs) and community groups	8
Political	3
Research organisations	3
Total	160

On the question of whether having a moratorium is appropriate for Tasmania, 145 submissions supported a continued moratorium, 11 were against and four were neutral towards the moratorium.

There was a wide diversity of views on the question of an appropriate length of the moratorium ranging from that it should be lifted completely or allowed to expire in November 2014, through to that it should be retained permanently. Seventy-three submissions responded to the question: if a decision was made to extend the moratorium what would be an appropriate length of time for the new moratorium? The distribution of the responses is as follows:

Length of time	No.
Indefinite	21
20 plus years	5
10 to 20 years	9
10 years	12
5 to 10 years	10
5 years	12
Less than 5 years	4

It is not possible to represent all the comments made in submissions in this summary Report. In the following section the Department's intent is to present a fair representation of "what the submissions said". A comment or response is only provided where necessary to address a particular issue raised or to correct any substantial factual misconceptions.

TOR 1) DOMESTIC AND INTERNATIONAL GENE TECHNOLOGY POLICY RELEVANT TO PRIMARY INDUSTRIES

Fewer than half of all submissions received responded directly to TOR 1. Of those that did, some submissions simply listed countries with bans on GMOs while others referred to specific countries or regions as examples of innovative gene technology policy.

Most countries with bans on GMOs listed were from the European Union (Submission 10 being a typical example). Some also referred to regions within different countries declared to be GMO-free. Paul Watson provided a number of examples such as some states in the USA banning different types of GMOs as well as parts of Austria pushing for GMO-free zones.[3]

A number of submissions referred to Tasmania's moratorium on GMOs in primary industries as the best policy on GMOs while some also listed South Australia's moratorium and legislation as innovative gene technology policy.

Bhutan as a nation has committed to 100 per cent organic farming and was referred to by a few submissions as good gene technology policy. Nathan Sidney[4] stated: "Bhutan demonstrates that traditional food production methods are still a legitimate way to produce food, care for soils and preserve bio-diversity."

A few submissions referred to GMO policy in Ireland and drew similarities to Tasmania in terms of market access. Organic farmer Joshua Morris[5] asserted that like Tasmania, Ireland's market access relies on niche products rather than broad acre crops and that being a GMO-free island has gained Ireland a market advantage. Conversely, David Armstrong[6] suggested that Ireland, having previously planted experimental GM crops, is a good example of innovative policy based on reviewing GMO status on a case-by-case basis when

[3] Submission 010
[4] Submission 053
[5] Submission 058
[6] Submission 022

gene technology opportunities arise. Mr Armstrong inferred that Ireland's use of GMOs on such a basis would not interfere with the marketing of other GMO-free products.

In favour of deregulating GMOs, a few submissions noted Victoria as an example of innovative gene technology policy. GM canola is grown throughout Victoria.

A number of submissions referred to the use of safeguard clauses within legislation utilised by some countries to prohibit GMOs if it can be shown that there is a risk to human health and the environment. The submissions[7] indicate six member countries of the European Union (EU) have invoked such clauses.

Anita Wild[8], an environmental consultant, suggested that Tasmania should base gene technology policy on a triple bottom line to cover not only market aspects but also health and environmental concerns. However, the Project Team notes that such an approach could be inconsistent with the national scheme of gene technology regulation where responsibility for considering human health and environmental risks lies with the Office of the Gene Technology Regulator (OGTR).

Aside from those submissions that provided examples of various countries or regions, some submissions made some general comments about the content of gene technology policy while some submissions asserted there to be no evidence of innovative policy for gene technology.

Support for use of the precautionary principle in developing gene technology policy was voiced in a few submissions. The Organic Coalition of Tasmania Inc (OCT) [9] stated: "There is ample evidence in scientific media and from consumer/ community documentation, to support the view that GMO policy should be based on the principle of caution …" The Environment Association Inc[10] expressed similar sentiments about taking a precautionary approach to GMOs until the long-term effect on organic certification and opportunities is determined.

Conversely, Dairy Tasmania (DairyTas)[11] and the Australian Dairy Industry Council Incorporated (ADIC)[12] argued that there is no need for Tasmania to maintain policy and regulation on GMOs over and above that already regulated by the OGTR. Both went on to say: "market and trade aspects of crops have been managed by the agriculture sector for years. This raises the question as to why should GM crops – which are now 17 years old and grown extensively around the world – be treated differently to other crops and agriculture products?"

Poppy Growers Tasmania Inc.[13] (PGT) called "for open minds, a fresh approach and an evidence-based, factual analysis to the current policy settings." PGT suggested that GM poppies could be managed and grown to co-exist with other non-GM crops under an already established strict regulatory regime. GlaxoSmithKline Australia (GSK)[14] also stated similar sentiments regarding a rigorous science-based approach and called for maximum flexibility in scientific options for improved poppy productivity.

[7] Submission 076, 107, 112 and 133
[8] Submission 076
[9] Submission 039
[10] Submission 106
[11] Submission 085
[12] Submission 111
[13] Submission 082
[14] Submission 158

Dairy Futures Cooperative Research Centre (CRC)[15] stated in their submission that the current moratorium on GMOs in Tasmania is inconsistent with a vision to improve the State's agricultural productivity. The submission suggested that GMO policy should be founded on management of low level presence of GMOs in seed and grains commodities.

Tolerance levels were advocated by a number of submissions in response to TOR 1. The Tasmanian Institute of Agriculture (TIA)[16] stated that a zero tolerance approach to GMO presence imposes an unnecessary level of stringency. However, the Tasmanian Farmers and Graziers Association (TFGA)[17], while supporting a continued moratorium on GMOs for a short time, supports the adoption of a 0.9 per cent threshold standard for GMO presence. In contrast, many submissions supported Tasmania's current policy of zero tolerance to support organic certification and ease of GMO-freedom.

Linked to tolerance levels, the matter of co-existence was mentioned by some submissions under TOR 1. These issues are explored further under TOR 3 and the findings of this Report.

AusBiotech Ltd[18] insisted Tasmania's current policy and moratorium should be removed immediately as it is inconsistent with the national scheme for gene technology regulation. However, as outlined in the Issues Paper for this Review, States can regulate GMOs for marketing purposes.

Two other issues that were raised under TOR 1 were questions of legal liability and labelling requirements for food products. Generally, there was opinion that legal liability issues are a real threat and remain largely untested. Further detail on legal liability and GMO labelling requirements is provided under TOR 4 and the findings sections of this Report.

With regard to food labelling, there were comments that the current requirements are not strict enough. Michelle Dyer[19], an organic supplier, suggested Food Standards Australia New Zealand (FSANZ) does not conduct adequate research and testing on GMO presence and relies upon results of GMO producing companies. FSANZ, in its own submission[20], stated that the statutory body regularly reviews scientific literature on GMO presence in foods and places evaluations on its website. Further, FSANZ stated that the current mandatory labelling requirements for GM content in foods were determined to be appropriate after review in 2011.

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[15] Submission 045
[16] Submission 038
[17] Submission 109
[18] Submission 095
[19] Submission 075
[20] Submission 118

TOR 2) RESEARCH AND DEVELOPMENT RELEVANT TO THE USE OF GENE TECHNOLOGY IN PRIMARY INDUSTRIES

Approximately half of all submissions received responded to TOR 2. Most responses focussed primarily on the question of emerging R&D opportunities in gene technology.

Research and development opportunities in gene technology

A number of submissions asserted that there are no opportunities or no benefits to be gained in gene technology R&D for primary industries. Gene Ethics[21] stated gene technology to be a dead end and argued that public resources should not be spent on such research and development. Another submission[22] stated that gene technology opportunities in R&D would put the State's GMO-freedom at risk.

Conversely, many submissions suggested that there are, and could be further opportunities available in gene technology R&D. Some submissions made general comments on opportunities such as using gene technology to develop adaptations to climate change[23], functional foods[24] and benefits to the canola industry[25]. The TFGA[26] commented that "whilst there is currently only a small number of GM products available, research is developing rapidly and the State needs to be able to respond quickly should new opportunities in gene technology arise."

TIA[27] stated in their submission that there are many opportunities, particularly in agricultural commodity production. TIA also suggested that the organics industry could benefit from increased demand should more gene technology be utilised.

Some submissions were more specific in giving examples of opportunities in gene technology. Dairy Futures CRC[28], DairyTas[29] and PGG Wrightson Seeds Limited[30] all referred to developments in GM ryegrass and white clover with a high nutritive value and improved productivity, potentially ready for 2015–2020 commercialisations. Dairy Futures CRC stated that Tasmania could benefit from these GM crops directly as highly productive livestock feed as well as through being a major supplier of pasture seed.

Those involved in Tasmania's poppy industry referred to historical developments in gene technology for the pharmaceutical plant, and indicated that "some trials that did exist were interstate, in areas where poppy growing itself has not been supported politically"[31]. Tasmanian Alkaloids Pty Ltd[32] stated in their submission: "Our view is that the biggest opportunity that GM technology offers to the poppy industry is an increase in the alkaloid content of poppy straw and the alkaloid yield per hectare."

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[21] Submission 124
[22] Submission 028
[23] Submission 043
[24] Submission 014
[25] Submission 054
[26] Submission 109
[27] Submission 038
[28] Submission 045
[29] Submission 085
[30] Submission 094
[31] Submission 082
[32] Submission 096

Tasmanian Alkaloids previously undertook controlled trials of GM poppies in collaboration with CSIRO in Tasmania. All permits to conduct that research were surrendered in 2009. GSK[33] also referred to potential developments in disease and herbicide resistance in poppies.

Another opportunity in gene technology under development was highlighted by Skretting Australia in their submission[34]. They referred to canola plants genetically modified to synthesise long-chain omega-3 fatty acids: EPA (eicosapentaenoic acid) and DHA (docosahexaenoic acid). These acids are important for human health as well as the health of farmed fish species and are currently sourced from fish oil. Skretting Australia stated that the GM canola, potentially available for commercial use by 2018, "will create another sustainable source of these important EPA and DHA nutrients for the use in fish feed, animal feed and food."

Wine Tasmania[35] referred to potential future developments in gene technology for powdery mildew resistance as well as using the technology to mark desired traits to then breed by conventional means. Forestry Tasmania[36] also suggested that there could be opportunities for wood yield improvements in plantation species, as well as for utilising previously unsuitable land for plantation forest. However, Forestry Tasmania stated no current intention of utilising GM plants in contravention of the Australian Forestry Standard and the principles of the Forest Stewardship Council.

Finally, a number of submissions were cautious of new R&D opportunities in gene technology. For example, the Environment Association Inc[37] commented: "we advocate that there be no expansion of research and development relevant to the use of gene technology in primary industries until unreserved benefits and no harmful consequences are established to a without doubt standard." Terrence Rattray[38], an organic supplier, expressed similar sentiments. OCT[39] suggested that all R&D using gene technology should be restricted to "in vitro situation" and treated as hazardous material. It was also suggested that to permit use of gene technology in R&D would be predominantly for the benefit of two major industries, poppies and dairy, and to do so would be "putting too many eggs into one basket"[40].

Research and development opportunities in non-GM biotechnology

Most submissions who responded to this question were supportive of R&D in non-GM biotechnology for primary industries. Many submissions stated a preference for non-GM conventional breeding techniques. Callum McEachern[41] gave a typical response: "Conventional selective breeding has proven itself as a robust foundation for our primary industries."

Gene Ethics[42] also stated similar sentiments: "other areas of biotechnology, such as gene-marker-assisted conventional plant breeding, appear to offer much more promise than genetic manipulation." Additionally, a number of submissions saw opportunities in organics as well as being a source of heirloom or heritage seeds.

[33] Submission 158
[34] Submission 065
[35] Submission 080
[36] Submission 057
[37] Submission 106
[38] Submission 008
[39] Submission 039
[40] For example, submission 086
[41] Submission 102
[42] Submission 124

George Vorillas[43] stated as much in his submission: "Tasmania has a valuable potential and ongoing role in being one of the locations for the safeguarding of genetic variation in food species." A few submissions also supported opportunities in permaculture but no further detail was given.

On the other hand, GSK[44] stated the following in their submission: "whilst traditional breeding techniques have been very successful in increasing poppy alkaloid concentration, the generation of hybrids with increased disease and herbicide resistance is a much slower and "hit and miss" process."

Very few specific examples of opportunities in non-GM biotechnology were given in submissions. Forestry Tasmania[45] indicated that they have used conventional breeding techniques in plantation species for decades while Fruit Growers Tasmania (FGT)[46] referred to use of non-GM biotechnology in the berry industry. The Safe Food Foundation[47] also mentioned the development of non-GM drought tolerant canola in Victoria.

While very few specific examples were supplied, it can be assumed that a number of agricultural industries have used non-GM biotechnology methods in R&D.

Impact of the moratorium on research and development of new products or markets

A number of submissions asserted there to have been no impact on R&D of new products and markets due to the moratorium but provided no evidence to support that assertion. However, Essential Oils of Tasmania Pty Ltd stated in their submission: "Essential Oils of Tasmania (EOT) has not experienced any restrictions with regard to R&D of new products or markets as a result of the GMO moratorium."

Dairy Futures CRC[48] and DairyTas[49] observed that "the moratorium has had no impact on early stages of research and development, but clearly reduces the efficiency and cost-effectiveness of the latter stages of research and development as well as commercial release."

In their submission, the ADIC[50] went a little further to say "a ban on a product (i.e. GMOs) that has been proven safe – and grown globally for 17 years – does not create an environment of innovation, when a potential 'developer' is unable to commercialise their end product."

The lack of "pathway to market" was a recurring theme across a number of submissions. Tasmanian Alkaloids[51] commented that "without a path to market, it was difficult to justify investment in a research program". Ausbiotech[52] and Croplife[53] also made very similar comments.

TIA[54] also referred to the moratorium as hindering R&D as "attempts to do research on GM plants at the University of Tasmania (UTAS) has been made difficult due to the regulatory processes imposed by both the

[43] Submission 130
[44] Submission 158
[45] Submission 057
[46] Submission 122
[47] Submission 115
[48] Submission 045
[49] Submission 085
[50] Submission 111
[51] Submission 096
[52] Submission 095
[53] Submission 089
[54] Submission 038

Commonwealth and particularly State Agencies. While there are processes that theoretically allow such work to be done, the associated transaction costs have prohibited any serious research associated with GM technologies."

TIA[55] went further: "researchers with an interest in gene technology and other forms of strongly regulated biotechnology have largely given up on this line of research, or moved elsewhere. As momentum has grown elsewhere in the world for utilising biotechnology to address substantial global problems, Tasmanian research organisations have fallen well behind this growth sector, and have likely missed the opportunity to be substantial players in this R&D area to a large extent." TIA also stated that the lack of R&D has implications for the educational opportunities UTAS can offer in biotechnology. The Project Team sought and received further information from TIA about the claims made in their submission. Further comment on the regulatory environment for GM R&D is provided in the findings section of this Report.

A few submissions[56] stated that there was a gap in understanding as to how the moratorium has affected R&D in Tasmania for new products and markets. Hence this question demanded an independent study be undertaken to further quantify the impacts on R&D.

Other risks to R&D opportunities in primary industries

A number of submissions made some observations regarding other risks to R&D in Tasmania, particularly using gene technology. TIA[57] referred to "researchers in other parts of Australia having to deal with legal challenges to research trials as well as personal harassment and destruction of trial sites."

PGT[58] referred to "a need for social licence to conduct R&D". In the case of GMOs, they stated that "the moratorium does not support a movement towards social licence." GSK[59] made similar observations, stating that "though they understand the benefits of gene technology, they also have a deep commitment to corporate, social and ethical responsibility."

Finally, some submissions referred to R&D in gene technology as being entirely profit-driven by large multinational companies.

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[55] ibid
[56] Submissions 107, 112, 133
[57] Submission 038
[58] Submission 082
[59] Submission 158

TOR 3) MARKET ADVANTAGES AND DISADVANTAGES

The potential market advantages and disadvantages of allowing or not allowing the use of gene technology in Tasmanian primary industries, including food and non-food sectors.

GMO-free as a point of difference or market advantage

Many submissions reflected the view that GMO-free is part of Tasmania's clean and green image and/or branding. Many submissions then argued that if Tasmania can guarantee a clean and green environment it will mean that Tasmanian products will become increasingly more valuable in the market, with an increasing demand for our products and premium prices.

Mark Burling[60], a farmer, noted that there was a need to "keep our image clean and green and GM-free and chase the high premium international markets. These opportunities will only increase over time and we may never be able to access the GM-free opportunities (as) once allowed, GM cannot be removed." R & N Hyland[61], organic producers, noted that "market opportunities have not been lost as a result of the moratorium, but removing the moratorium would impact on any potential new markets on non-GM. We are at no competitive disadvantage whatsoever because of our GM-free status." Eatem Organic Foods[62] was typical of many other submissions from the organic industry who said that their "business is heavily reliant on the Tasmanian clean and green image and that the Tasmanian brand would be damaged if GMOs were permitted in the State."

Some submissions explored the concept of Tasmania's clean and green branding in more detail, with many noting how being GMO-free is a key brand attribute. R & N Nyland[63] provided a typical response: "the Tasmanian brand or "clean and green" image would be diluted should the moratorium expire or if non-food GM crops were to be permitted to be grown commercially."

The main messages from the Brand Tasmania Council[64], representing a range of local businesses, was that the moratorium provides a valuable point of differentiation, a unique marketing advantage, or a competitive advantage, and that allowing GM crops in Tasmania would variously compromise, damage or undermine the Tasmanian brand.

Wine Tasmania[65] stated that "once GMOs are introduced there is no returning to the pre-GMO situation from a biosecurity and brand perception view. It will impact on the image of the Tasmanian brand with consumers, particularly for high value luxury goods such as wine." Wine Tasmania[66] also commented on the perception of GMOs among consumers noting that although consumers are generally ignorant or indifferent towards GMOs, high value Tasmanian branded products "come with a 'clean and green' image that is not consistent with GMOs in the public view at this point in time."

[60] Submission 004
[61] Submission 009
[62] Submission 063
[63] Submission 009
[64] Submission 067
[65] Submission 080
[66] ibid

The submission from FGT[67] conceded that the impact of the moratorium is difficult to assess as the GMO-free status is blended under Brand Tasmania, rather than being a direct marketing point on its own: "it is Brand Tasmania which is promoted at Asian trade shows, such as the recent Asia Fruit Logistica where there was strong interest in Tasmanian fruit, especially cherries."

With biosecurity being a variation on the concept of clean and green, FGT[68] also noted that "the number one priority for fruit growers will always be for Tasmania to remain an area of regional bio-security differentiation. Considerable effort has gone into developing (new Asian) markets over many years giving Tasmania access to international markets unable to be accessed by mainland States due to regional bio-security issues – lifting the moratorium could damage these markets."

Demonstrating the different views across agricultural industry sectors, some submissions countered the clean and green branding concept. For example PGT[69] observed that "a realistic appraisal of the Tasmanian situation is that we are not unique in making claims about 'clean and green' and the brand of a place can exist regardless of the presence of GM in local markets", citing Prince Edward Island, Canada as an example.

Submissions from industry groups and agribusiness, like PGG Wrightsons Seeds[70], referred to the issues raised in the Macquarie Franklin Report (2012a) and noted that of 28 stakeholders, GMO-freedom was not used as a point of difference in marketing. Ausbiotech[71] noted that "the moratorium significantly restricts market share to Tasmanian growers ... and that there is no evidence that GM-free provides the State any market advantage." The ADIC[72] went even further: "the moratorium is anathema because it effectively represents Government interference in the legitimate marketing activities of lawful business. Further it detracts from the ability of companies to differentiate and meet the needs and requirements of different market segments – a prerogative and essential element of sustainable businesses and artificially blocks market signals that enable both companies and dairy farmers responding to market signals which are essential for their on-going viability."

Another take on clean and green was provided by Toehold Farm[73] suggesting that "being clean and green is no longer a point of difference for Tasmania, but the Tasmanian brand could be enhanced due to the moratorium as an additional value". The same submission[74] concluded that "removal of the moratorium would damage the Tasmanian brand as it shows a willingness to compromise the clean and green status of the State."

This view was backed up by Slow Food Hobart[75] who said that "many countries now promote their primary products as 'clean & green'. The phrase has lost the meaning it once had. To have any substance it now needs to be backed up by hard evidence such as non-GM status and greater marketing efforts to support GM status, including tourism."

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[67] Submission 122
[68] ibid
[69] Submission 082
[70] Submission 094
[71] Submission 094
[72] Submission 111
[73] Submission 105
[74] ibid
[75] Submission 093

Moving beyond clean and green branding to the notion of "quality products" being the preferred marketing distinction, Dr Tony McCall[76] noted that "the GMO moratorium supports differentiation of Tasmanian products which can be supported with branding backed by quality certification." Dr McCall[77] was one of only a few submissions that linked branding and marketing to consumer perceptions: "when food is concerned consumers are risk averse and their values put GMOs at odds with quality. This is a values debate, not a rational science based argument." Tasmania cannot "re-establish the 'quality' competitive advantage once the moratorium is withdrawn and Tasmania cannot expect to establish a competitive advantage if we are required to compete in an old 20th century production contest."

Yet another take on clean and green provided in some submissions is best illustrated by the view of Croplife[78]: "there is little value in the 'clean and green' brand as is and by adopting GMOs Tasmania can maintain and improve its 'Clean and Green' status and benefit from GM crop technology" (through, for example, farmers being able to produce more using less natural resources, improved environmental outcomes with reduced herbicide use, less tractor work and increased soil carbon from reduced tillage reducing greenhouse emissions).

The Project Team notes that many submissions included information disputing the environmental benefits arising from the use of GMO crops, and this is referred to more under Terms of Reference 4.

Benefits and costs of the moratorium

Some submissions raised the question of who is benefiting from using the GMO-free status, at the expense of others who are bearing the opportunity cost of not being able to use GMO crops. David Armstrong[79] noted that "it is easier to say Tasmania is GMO-free than for specific sectors or products to promote their own status as GMO-free rather than relying on the general moratorium. This position comes at the potential expense of other industries that would benefit from the use of GMOs and does not seem a fair arrangement." The same submitter suggested that "industry sectors should develop their own protocols to promote their own status. The real stakeholders who bear the financial consequences are the farmers, processors and marketers. Their view should have priority in the decision that the Government makes."

The Tasmanian Agricultural Productivity Group (TAPG)[80] in raising the issue of costs concluded that while Tasmanian industries suffer from high freight costs (logistics issues), "the State's moratorium on GMO can be regarded as another of the input costs crippling our competitive edge."

In support of the moratorium a view expressed by others was that the loss of GMO-free status would immediately add business costs, as to differentiate their products they would have to market the GMO-free status themselves. For example, Fat Pig Kitchen[81] noted that "in the absence of the moratorium, the (Tasmanian) brand that we and others like us rely on would be devalued substantially. Individual farmers would have to promote their own particular brand of clean, green, organic, spray free, produce. This would be expensive and take us away from our actual jobs of producing the kind of delicious food consumers expect from Tasmania."

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[76] Submission 088
[77] ibid
[78] Submission 089
[79] Submission 022
[80] Submission 061
[81] Submission 097

Rowena McDougall[82] summarised a point made by various submitters: "why allow GM crops that may only benefit a few producers but jeopardise all GM-free Tasmanian products?"

Other submissions like the TFGA[83] believe that Government should be "delivering on its earlier commitments to invest in promotional campaigns that will assist in market development." The moratorium "must be supported by significant investment by State Government in promoting the state's GMO-free status and capturing tangible benefits for farmers."

The TFGA[84] also noted that "it expects Government to undertake as a matter of urgency a costs-benefit analysis that highlights the true costs and benefits in continuation of the GMO moratorium."

The Greens Party[85] was representative of a number of submissions from across various industry and interest groups stating "there was a lack of concerted marketing effort to support and further develop the Tasmanian brand."

Valuing GMO-free in the market

Many submissions expressed the view that Tasmania cannot compete in commodity markets, and niche and premium markets can be developed where being GMO-free is a competitive advantage.

The OCT[86] stated that "Tasmanian (non-GM) canola receives a $40 per tonne premium and honey receives a 40 per cent premium over similar GMO product or GMO-contaminated product." Similar figures were provided by other submitters; for example Gene Ethics[87] quoted that non-GM canola in Europe received a $60/tonne premium.

Many organic producers submitted that allowing the release of GM crops in Tasmania presents a significant risk that they would lose their organic certification, or lose the premium prices they receive for their products, and hence cause damage to their business.

The OCT[88] reported that "the organic sector is one of the fastest growing food sectors in Europe and the United Stated and it has been growing at 15 per cent annually in Australia."

A few submissions provided statements, mostly provided commercial in confidence, about their organic produce receiving premiums in gross terms over conventional products. For example some certified organic cattle are attracting a price premium of 30 per cent above the normal cattle price at the farm gate. Producers noted that they rely on their certified organic status, the loss of which would result in the loss of such markets.

The OCT[89] stated that "allowing GM canola into Tasmania again could threaten organic certification and contracts for organic farmers".

[82] Submission 026
[83] Submission 109
[84] ibid
[85] Submission 098
[86] Submission 039
[87] Submission 124
[88] Submission 039
[89] Submission 039

Bronzewing Botanicals[90] referred to the potential for contamination of organic produce from GM crops including loss of certification and markets, costs incurred in trying to prevent contamination occurring and the costs of testing for contamination. Similar concerns were expressed in other submissions.

The Project Team notes that some examples were provided on the price premiums received for non-GM and/or certified organic products. The Project Team does not dispute these claims; however, it notes that verifiable published research in support of these claims was difficult to obtain, and commercial in confidence considerations often applied preventing the publishing of the information from individual businesses. Based on the information received in submissions, it is also not possible to conclude if the premiums would apply consistently across the whole organic sector, or if the price premium still applies once the relative costs of production of organic and non-organic, or GM and non-GM production systems, were factored in, i.e. to produce a gross margin. This is explored in more detail in the findings section of this Report.

Tasmanian Feedlots[91] noted that while the market relies on Tasmanian production attributes such as no Hormone Growth Promotants (HGPs) or GM inputs, they cannot say what the price premium is for Tasmanian product. However they believe that if GM status changed "we would lose a competitive marketing advantage" and "our opportunities and pricing would be significantly diminished."

Greenham Tasmania Pty Ltd[92], owners of the Smithton abattoir, noted that "it is Tasmania's GMO and HGP free status that underpins our capacity to obtain a premium pricing for Tasmanian beef. These premiums flow back to nearly 1000 farmers, greatly improving their profitability." Conversely they noted that the removal of the GMO-free status would "risk seeing Tasmanian cattle prices returned to their former discount level."

The same submission[93] quoting its customers in Japan, the USA and in Sydney concluded that "Tasmania's GMO-free status is a major reason why our customers are so enthusiastic about our premium grass fed beef and why they are prepared to pay a premium for it."

Summarising the view of submissions from beef industry players, Brett Hall[94] noted that "the beef industry in Tasmania is one of the main contributors to the state's agricultural sector, has successfully developed some of the most recognised beef brands in Australia ... and one of the main benefits to the beef industry in regard to Tasmania's GMO ban has been in allowing access to markets that have restrictions on GMO content food products."

FGT[95] confirmed that "while there is very little GMO research internationally into fruit, lifting of the moratorium to allow other crops could potentially damage Tasmania's fruit export markets. Further markets have been developed in the past ten years with apples into Japan and China and cherries into China and Korea through a committed industry effort." They continued: "in the highly competitive national and international markets, Tasmanian horticulturalists have focussed on developing premium niche markets for fruit, based on the reputation of the State's bio-security positioning." FGT[96] concluded that "given that primary industry remains a key economic driver for Tasmania into the future, lifting the moratorium could significantly impact on the State's reputation as a producer of premium produce."

[90] Submission 040
[91] Submission 049
[92] Submission 105
[93] ibid
[94] Submission 103
[95] Submission 122
[96] ibid

Other submissions expressed the view that Tasmania is a commodity producer first, with some scope for niche products.

PGT[97] said that "the reality is that some 85 per cent of Tasmania's agricultural production, such as dairy, is of world-price, low value commodities with the Tasmanian cost of production the key determinant in industry survival." The Dairy Futures CRC[98] mirrored other submissions from the dairy industry: "there will always be potential to create niche markets, but for major industries (like dairy), the question relates more to the widespread use of products in the supply chain. The market impact of each GM technology should be considered on its merits, as well as the ability for producers with different attitudes to the use of GM technology to co-exist. It is unlikely that there will be any brand differentiation for technology that is in widespread use in Australia and where supply chains operate on a national basis."

Submissions, particularly in support of major Tasmanian industry sectors poppies and dairy were adamant that their industries needed access to gene technology, including positive statements of Government support for the potential use of the technology, so that they can maintain their competitive position.

Croplife[99] noted that "over the last 10 years Tasmania has lost $40 million due to its moratorium." The $40 million loss figure was raised in a number of submissions and refers to the work undertaken by Macquarie Franklin (2012a) looking into the Tasmanian canola market.

Croplife[100] also went on to say "there is no evidence of appreciable gains as a result of being GMO-free with the oft quoted Japanese canola premiums being small and sporadic. Tasmania's international export markets are minimal so there are no international market benefits to the State of a moratorium." TAPG[101] commented that "the Japanese markets that require the GM-free products are relatively small and inconsistent in its demand."

PGT,[102] in highlighting the ongoing expansion of the world market for opioids, noted that "there is no such thing as free trade in narcotics and the notion of Tasmanian farmers themselves seeking out high value markets in pharmaceuticals from poppies GM or not will never become a reality. The profitability of poppy farmers is tied completely to the cost of production, as the ability of farmers to grow poppies outside a processor contract is restricted."

Looking at the potential benefits, Tasmanian Alkaloids[103] submitted that "the main market advantage that GM technology would provide the poppy industry is more competitive pricing to our customers, brought about by increased alkaloid yield per hectare. We expect that the cost advantages would be significant. For instance, we estimate that a 40 per cent higher alkaloid content in poppy crops could be produced using GM technology, which would result in a benefit of $56 million annually across the whole Tasmanian poppy crop." Tasmanian Alkaloids[104] concluded: "even after allowing for the additional costs involved in managing GM crops, this would make our industry much more competitive on the global market, and would assist Tasmania to maintain or increase its share of the world market."

[97] Submission 082
[98] Submission 045
[99] Submission 089
[100] ibid
[101] Submission 061
[102] Submission 082
[103] Submission 096
[104] ibid

GSK[105] provided a similar, but somewhat qualified view: "the likely near-term opportunities for the use of GM poppy lie in improving disease resistance. If deployed this will aid in continuing the industry's productivity growth, however any deployment must be made within a regulatory environment that serves to build trust with the agricultural, industrial and community stakeholders in Tasmania."

DairyTas[106] affirmed that "the Tasmanian dairy industry including farm and processing is a $1 billion industry and Tasmania's largest agricultural and food sector. The industry has a growth target for 40 per cent more milk in the next five years to meet the processing capacity of the State" and is "heavily reliant on pasture based dairy". DairyTas[107] continued: "to date the Tasmanian dairy industry has not been affected by the moratorium on GM crops. (However) the main issue for dairy in regard to the moratorium is the GM pastures that are being researched and the likelihood of these becoming a commercial reality. Tasmanian farmers do not want a situation whereby they are denied access to new varieties that their dairy counterparts in other pasture-based systems, such as Victoria, can access. Tasmania's dairy farmers need to be able to maintain a competitive advantage and implement new pasture varieties. "

Only a few submissions directly commented on the issue of labelling in a marketing-sense. As also noted under TOR 1 and 4, some submissions saw current product labelling for GMO content as being insufficient to address food safety concerns, however the national food-safety regulator, FSANZ[108] noted that the existing requirements for GM labelling were appropriate. Others highlighted consumer's need to know what is in their food suggesting Tasmania could take advantage of this in labelling more local products as GMO-free, creating a further point of difference in the market. Greenham Tasmania[109] provided some of the few examples of how GMO-free is prominent on its product labelling and critical to its beef product brands.

Food tourism

At least seven submissions represented the restaurant, food and food tourism sector. They all noted how dependent they are on the clean, green and GMO-free image being maintained.

Fat Pig Kitchen[110] was typical noting that "GMO-free is a key part of the Tasmanian proposition for supplying premium and niche products matched to fresh and clean food. In the absence of the moratorium, the (Tasmanian) brand that we and others like us rely on would be devalued substantially. Our task over the next ten years is to build our niche products and figure out ways to connect them to consumers who want them but who live far away from our farmgates. Consumers who want organic, who want pure, who want unadulterated, who want simplicity, who want to be able to trust a single brand: Tasmanian."

The Brand Tasmanian Council[111] noted links between the GM moratorium with tourism as well as the food and beverage and hospitality industries as people are now travelling to eat and "want natural, fresh and local", and being GMO-free supports this.

Conversely, PGT[112] remarked that "the promotion of the GMO ban by its supporters depends so heavily on the 'intangible' yet in the real world the issue of 'are there GM crops in Tasmania' is unlikely to be

[105] Submission 158
[106] Submission 085
[107] ibid
[108] Submission 118
[109] Submission 105
[110] Submission 097
[111] Submission 067

considered by any person connected with the tourism, manufacturing or education markets that Tasmania plays host to."

Co-existence of GM and non-GM

Numerous submissions stated that it is not possible for GM and non-GM crops to co-exist. The issue of contamination of non-GM producers, products or crops from GMO canola, poppies and ryegrasses was also raised by numerous submissions. Helen Hutchinson[113] summed up the view of many who did not think co-existence is possible simply as "you can't keep bees from pollinating".

The SafeFood Foundation[114] said that "arguments that Tasmania's GM moratorium should be reviewed on a case-by-case basis are disingenuous. The introduction of any GM crop be it ryegrass, poppies or canola risks contaminating other crops and jeopardising markets." Whereas some submissions stated that co-existence is very possible with GM and non-GM and should not be a barrier to GMO adoption.

Croplife[115] and Ausbiotech[116] both noted that there were examples around the world of successful co-existence; for example, the Australian grains industry developed the "market choice" framework to enable co-existence to occur between GM and non-GM canola. Furthermore they noted that co-existence frameworks are easily audited with sampling and testing regimes and would provide the necessary certainty and confidence to supply chain participants, consumers and Government.

The practical, policy, and regulatory issues associated with co-existence are explored in detail in the findings section of this Report.

Other submissions explored the concept of co-existence in terms of impacts on markets and marketing.

Fat Pig Kitchen[117] does not think co-existence is possible as "it would impact on marketing – we do not have to explain how or why our particular corner of Tasmania is GMO-free, or spend time and marketing energy re-iterating Tasmania's green credentials."

Whereas PGT[118] clearly consider co-existence is possible: "there is no meaningful link between the relevant markets for food products of any description with that of narcotic raw materials (poppies)."

DairyTas[119] stated that "the moratorium contradicts modern day agriculture which supports co-existence across many platforms and prevents the market from working by denying farmers, customers and consumers the GM option. In terms of co-existence issues with food and non-food crops is unlikely that there will be any brand differentiation for technology that is in widespread use in Australia and where supply chains operate on a national basis."

[112] Submission 082
[113] Submission 30
[114] Submission 115
[115] Submission 089
[116] Submission 095
[117] Submission 097
[118] Submission 082
[119] Submission 085

Anticipating the concerns of particular sectors David Armstrong[120] stated in his submission that "there is the ability for co-existence and that protocols should be developed to ensure the integrity of non-GMO produce. The protocols should be developed by an independent and trusted Government organisation (DPIPWE or TIA). It should be possible that particular products are GMO-free (leatherwood honey due to the area where it is sourced) and beef to Japan (produced with appropriate protocols and certification) rather than rely on a State ban."

The question of whether there should be exemptions from the moratorium for specific GM crops such as non-food crops drew a mixed response.

Many submissions were against there being any exemptions at all. Intro Tas Pty Ltd[121], a business that supports Tasmanians export to China, was typical in not supporting the growing of non-food GM crops due to cross contamination problems: "As soon as crops are grown, GM-free status cannot be guaranteed as there are no physical barriers to contamination."

The response from Gene Ethics[122] was similar to other submissions noting that "sectional interests should not be allowed to dominate any proposed exemption decision as the commercial release of any GM organisms will have negative effects on the marketing of all Tasmanian produce."

Black Ridge Farm[123] noted that "any exemptions would cloud the way in which Tasmanian agriculture is perceived by our markets. Perceptions of consumers are more important to the future of our agricultural markets than scientific fact."

Picking up on the issue of consumer perceptions, Tasmanian Feedlot[124] reinforced that "for Japanese customers perception of food production systems is more important than technical or scientific assessment of food production systems." Further, "essentially if GM product was to be permitted in the State then the whole agricultural industry could be affected and no one industry sector can be isolated. Our Japanese meat buyers as representatives of our customers have indicated they would have a lot of difficulty selling our beef in Japan if we are unable to continue to guarantee that the inputs to that beef are free from any GM material. The worst case scenario would be that our business would not even be able to operate in Tasmania with the consequential loss of direct jobs, indirect employment and export dollars into the Tasmanian economy."

Penelope Clark[125] was indicative of a small number of respondents who while supportive of maintaining the moratorium were "comfortable with an exemption for pharmaceutical GMOs provided no compromise to non-GM food crops or native species."

The TFGA's[126] view was that "the current exemptions under the *Genetically Modified Organisms Control Act 2004* should remain in place particularly for poppies, other crops for pharmaceutical purposes and research provisions for non-food plants." The TAPG[127] submitted that "pharmaceutical crops should be exempt from any future moratorium." Further, "a clear cut and public exemption from any future moratorium would allow

[120] Submission 022
[121] Submission 025
[122] Submission 124
[123] Submission 043
[124] Submission 049
[125] Submission 014
[126] Submission 109
[127] Submission 061

this critical crop (i.e. poppies) in Tasmania to both maintain and improve its position as a world leading cultivation. A further benefit to be derived from such an exemption would be to better cement Tasmania's place as the preferred poppy growing location within Australia and New Zealand given that all possible variants of this crop could be planted as required by the industry."

PGT[128] called for the lifting of all restrictions on the use of GM technology in research, breeding and commercial cultivations of all plants within the *Papaver* (poppy) genus.

The Project Team notes that a number of submissions referred to existing exemptions from the moratorium in legislation. However, there are no automatic "exemptions" as such from the Tasmanian regulation of GM-free area in any relevant legislation.

The *Genetically Modified Organisms Control Act (2004)* ("the Act") provides for the moratorium. Specifically Section 5 of the Act states that "the Minister, by order, may declare the whole or part of Tasmania to be an area that is free of GMOs if he or she considers that to do so would aid in preserving the identity of non-genetically modified crops and animals for marketing purposes". The Genetically Modified Organisms Control (GMO-free Area) Order 2005 declared all of Tasmania to be GMO-free. This still remains the case at the time of writing this report.

Under the Act, a person may however apply to the Secretary of DPIPWE for a permit to deal with (use, grow, make, sow, plant, etc.) a GMO in a GMO-free area. In assessing the application, the Secretary must consider a number of matters which are defined in the Act. In doing so the Secretary also considers the relevant policy, or policies, of the Government of the day. The current *Policy Statement on Gene Technology and Tasmanian Primary Industries 2009-2014*, states that uses (of GMOs) that may be authorised subject to assessment and conditions are:

- GM pharmaceutical plants (poppies) grown in the field, either for experimental or commercial purposes, and
- GM microbes used in animal vaccines, biological control of pests, and oil spill clean ups, etc.

Further information on how GMOs are regulated in Tasmania is provided in the Issues Paper released for this Review or on the Department's website www.dpipwe.tas.gov.au. The issue of exemptions is also discussed further in the Findings section of this Report.

Only a few submissions addressed the question of should Tasmania's policy allow for exemptions from the moratorium how could any exemptions be determined and by whom. The Gene Ethics[129] response was similar to other submissions believing that "participatory, open, public hearing and submission processes, conducted by parliamentary committees representing all parties, have served Tasmania well in previous reviews of the GM moratorium. These democratic, evidence-based processes should be used again."

[128] Submission 082
[129] Submission 124

Co-existence and commercial beekeepers

In terms of co-existence, many submissions also noted concerns about GM having a negative market impact for the honey industry which relies on clean and green marketing of its branded products.

The Tasmanian Beekeepers Association[130] stated that "allowing GMOs to be grown in Tasmania will create significant market disadvantages for honey producers, particularly those exporting to the European Union". Submissions from the commercial beekeepers also expressed the position that they may be unwilling to offer pollination services to areas where there are GMO crops, or the costs of pollination services may rise if the industry is locked out of high price EU markets.

The Tasmanian Beekeepers Association[131] provided information that honeybees are responsible for $120-$180 million of agricultural production in Tasmania, principally through pollination. They note that there is "every probability" that pollen from GM crops would end up in honey making "the honey not eligible to be sent to the EU". "If the moratorium was to lapse 40 per cent of our State's honey sales to EU would be stopped."

In an extensive analysis of the honey trade PGT[132] concluded that "the high-value leatherwood market in the UK and Germany cannot be affected by GM poppies under the current law".

The same submission[133] referred to a 2004 study by the Australian Government that found the percentage of dry weight canola pollen in 32 Australian canola honey samples ranged from 0.15 per cent to 0.443 per cent. They noted that in September 2011 the European Court of Justice ruled that pollen from GM maize was an ingredient in honey and as such it had to be labelled as contains GM pollen if above 0.9 per cent and that more than 1 per cent GM component requires labelling of honey in Australia. Moreover, the leatherwood variety sourced largely from Tasmania's wilderness areas "hundreds of kilometres away from the main poppy growing areas" accounts for "around 65 per cent of Tasmania's honey."

The issues around beekeepers, honey and pollination services are explored in more detail in the findings section of this Report.

[130] Submission 041
[131] ibid
[132] Submission 082
[133] ibid

TOR 4) ANY OTHER RELEVANT MATTERS

In addition to the first three terms of reference, TOR 4 gave people the chance to raise any other matters they considered relevant to the moratorium in their submissions. Some issues raised in submissions were relevant to more than one term of reference however, for completeness; the Project Team has covered all matters raised under TOR 4 below.

Impacts on health and the environment

Many submissions raised concerns regarding health and environmental impacts from use of GMOs. Some submissions wrote of unknown effects on human (and animal) health from consumption of foods containing GMOs. Helen Hutchinson[134] gave a typical response: "I do not believe that the future effects on our generation's health are known or the effects on future generations."

The Tasmanian Public and Environmental Health Network[135] also voiced similar doubts: "GM technology incorporated into food has still not been proven safe for human ingestion. Intergenerational problems cannot as yet be identified in humans as GM science is not that old, but problems are being identified both acutely and chronically in animal studies. Ingestion of meat from animals fed GM containing food also cannot be assumed to be safe."

On the other hand, some submissions referred to foods containing GMOs as being entirely safe to eat. AusBiotech[136] stated in their submission: "GM crops have been grown and consumed for more than 17 years and people around the world have eaten over two trillion meals containing biotechnology derived foods or ingredients. There are no peer reviewed nor credible scientific reports of any food safety issues related to the consumption of GM foods."

Also relevant to GMO presence in food, some submissions advocated for improved labelling of GMO content on products. The submission of Sandra Murray[137] was a typical example: "The labelling system should be improved so that consumers can easily identify foods containing all ingredients originating from GM organisms, and from animals fed GM feed." FSANZ[138] however, indicated that all new food products produced by gene technology must receive pre-approval from FSANZ and that there are mandatory labelling requirements in Australia and New Zealand and that at last review; they were determined to be current and appropriate.

Environmental impacts mentioned included cross-contamination problems resulting in both agricultural and native plant species containing GM material. Wine Tasmania[139] commented extensively on environmental impacts in their submission and stated: "Genetic transfer has been shown to occur between GM crops and related endemic species. Once these genes are in the environment they may affect the management options for primary producers and landscape managers (i.e. Parks and Wildlife) by reducing the efficacy of current agrochemical tools."

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[134] Submission 030
[135] Submission 037
[136] Submission 095
[137] Submission 123
[138] Submission 118
[139] Submission 080

Other submissions referred to an increase in chemical use[140] as a result of planting GM crops however, some submissions stated the opposite: that GM crops result in less chemical use. For example, CropLife[141] referred to decreased insecticide and herbicide use in GM canola in mainland States. AusBiotech[142] also alluded to a reduced environmental impact in the cotton industry with the introduction of GM varieties.

Linked to chemical use, some submissions were also concerned about an increasing prevalence of herbicide/pesticide resistant weeds, pests and diseases. Bronwyn Winfield[143], an organic farmer, cited increasing herbicide use resulting in herbicide resistant weeds in her submission. Anita Wild[144], of Wild Ecology Pty Ltd, also referred to insecticide resistance in some pests on transgenic Bt (a naturally occurring bacterial insecticide) crops.

Finally, many submissions made references to impacts of GMOs on bees, the honey industry and pollination services. While most submissions focussed on lost market access to the EU as a result of GMOs being permitted in Tasmania, a number also referred to lost pollination services from bees. The submission from the Tasmanian Beekeepers Association[145] contained detail on both of these concerns. A few submissions also suggested that prevalence of GM crops can have adverse effects on the health of bees and bee colonies[146]. Implications of GM crops on bee associated businesses are discussed further in the findings section of this Report.

The Project Team notes that human and animal health risks as well as environmental risks are assessed for proposed new GMOs by the OGTR under the national regulatory regime for gene technology.

Corporate control of gene technologies

Another issue raised by many submissions was ownership and intellectual property rights of large multi-national companies over gene technologies and products. Of those submissions, many simply stated that these multi-national companies are primarily profit-driven with little regard for anything else.[147]

Other submissions referred to companies using terminator technology to force farmers to buy new seed every year, imposing additional costs. Anthony Schindler[148] gave a typical statement with regard to company control over gene technology: "The shift of power into the hands of large companies who own the technology and rights to seeds is clearly wrong."

Questions of legal liability

Many submissions made references to legal liability issues under a number of terms of reference, including TOR 4. Some submissions made general observations as to how current legal systems would cope with

[140] Submissions 006, 116, 092, 099
[141] Submission 089
[142] Submission 095
[143] Submission 052
[144] Submission 076
[145] Submission 041
[146] Submissions 037, 055
[147] Submissions 011, 017, 031, 071
[148] Submission 032

liability cases arising. Robin Thomas[149] gave a typical response: " ... existing legal systems are not established to deal with complex and unforeseen agricultural and health legal challenges (and arguably never will be)."

Most questions of legal liability however, concerned protection for non-GM farmers who suffer from crop contamination from nearby GM crops. Legal liability matters associated with co-existence are discussed further under the findings section of this report.

Claims of increased yields

While some submissions stated higher yields in GM crop, there were also a number of submissions that questioned whether GM crops do produce higher yields. For example, CropLife[150] suggested improved yields using GM crops and Tasmanian Alkaloids[151] also see opportunities in increased alkaloid yields per hectare with GM poppies.

On the other hand, Gene Ethics[152] suggested GM crops do not provide yields better than conventionally bred crops. Likewise, farmer Mark Burling[153] is of the opinion that claims of increased yields in GM crops are false.

The Trans-Pacific Partnership Agreement

A joint submission from the Tasmanian and Australian Greens[154] reveal concerns regarding potential avenues for multi-national companies who have intellectual property rights in gene technology to sue the Australian Government for restricting ability to sell GM crops in Australia under the Trans-Pacific Partnership Agreement (TPPA).

The Project Team noted that the TPPA and Investor-State Dispute Settlement negotiations are primarily the responsibility of the Australian Government. However, consultation with States and Territories does occur on such matters.

[149] Submission 073
[150] Submission 089
[151] Submission 096
[152] Submission 124
[153] Submission 004
[154] Submissions 98 and 114

Findings: Key Issues

Emerging from this Review are six key issues that are most relevant to determining the future policy position on the GMO moratorium at this time. Each issue is summarised into a review "finding", followed by more detailed analysis. The analysis draws on the submissions received, plus the Project Team's own research, the issues identified in previous reviews, and the specific market research engaged for this Review.

It is important to emphasise that the findings are not policy recommendations. The future policy position on GMOs, including the moratorium, is a matter for the Government of the day to determine.

1) MARKET ADVANTAGES AND DISADVANTAGES

FINDING

There is no collective viewpoint across industry sectors as to whether there is an imperative to change the current policy position on the GMO moratorium from a marketing perspective. The perceptions across industry sectors and their contribution to Tasmania's food production are summarised in the table below.

Tasmania - Industry Sector and/or commodity	Packed and processed value or Gross Production/Food value 2010-11*	Industry perception - Moratorium remaining	Industry perception - Moratorium removed
Canola	$ 1 million	Positive for some markets	Negative for some markets
Beef	$ 262 million	Positive for some markets	Negative for some markets
Honey	$ 6 million	Positive	Negative
Poppy	$ 70-90 million (farm gate)	Negative	Positive
Dairy	$ 416 million	Negative for commodity, positive for speciality	Positive for commodity, negative for specialty
Organics	$ 4.7 million	Positive	Negative
Seafood	$ 692 million	Neutral	Neutral
Wine	$ 40 million	Positive	Negative
Apples and other horticulture	$ 100 million	Positive	Negative
Onions	$ 47 million	Positive	Negative

*Source: *Abridged by DPIPWE from Tasmanian Government (2012a), Bez et al (2012), Tasmanian Government (2012b) and Australian Bureau of Statistics 2010*

Some industry sectors in Tasmania – such as beef, honey and fruit – perceive significant negative market impacts to their overseas markets if the current policy were to be altered. Collectively, a number of other sectors including organics, food tourism and wine all wish the current policy to remain, as they see only market challenges if the moratorium was removed. Conversely, other vital industries such as dairy and poppy growers perceive negative impacts if the current policy does not change. This suggests that industry attitudes towards the GM moratorium are mostly driven by industry specific interest and whether they see a visible medium-term opportunity through GM product attributes.

It is not possible to quantify the market benefits and costs arising from the moratorium. However, it is clear that only a small proportion of the State's food and agricultural output is currently marketed as Tasmanian and within that, only a small number of producers are using the specific attribute of GMO-free as part of the branding and marketing.

The Tasmanian place based brand is built upon a range of attributes including premium quality, clean and green, cool climate and biosecurity. The ability to grow food and other agricultural products in a GMO-free environment is not a core attribute to the brand, but supports the overall food brand position.

From a consumer perspective, GMO-freedom is one of a range of second tier attributes they consider when purchasing, but they rank it behind better known ethical attributes such as Australian grown and organic.

Within the national food supply chain, awareness of the State's GMO-free status is highest amongst brand managers within the retail sector, where a stronger position on food provenance features is being held in response to increased concerns by consumers as to where their food comes from and how it is produced. With this comes sensitivity among retailers to potential adverse impacts on brand and retail sales. As a result, if some products are claiming to be GM-free then by default it implies that other products are not GM-free and this type of promotion would not be welcomed by retailers.

Within the two Asian markets considered as part of this Report, there is not a high level of recognition or understanding by consumers about GM foods. The underlying perception of GM foods is that they are not good for human health but consumers are not prepared to pay a price premium for GMO-free. Retailers largely base their purchasing policy on identifying reliable and safe suppliers of products, of which Australia is considered to be one.

However, a salient observation is that in the domestic market "GM freedom may serve as a hedge against potential future shifts in consumer sentiment and buying behaviour concerning the (GMO-free) attribute" (Freshlogic 2013). Based on consumers' heightened interest in food provenance, and increased level of marketing investment in provenance issues, there is a level of opportunity cost in removing the Tasmanian GMO-free status.

The market research conducted specifically for this Review points out that Tasmania's markets for food and beverage products are on the whole ambivalent about the State's GMO-free status. To develop GMO-free markets (and potential price premiums) in future, Tasmania will need to continue to build a better understanding of consumer preferences for and behaviour toward GM foods and related issues. In addition, any strategy to promote the moratorium would require a far greater understanding of the supply chain dynamics, and support from the gate keepers (retail and wholesale markets), to ensure that optimal brand advantage is captured.

Macquarie Franklin (2012a) captured a further difficulty: "any GM free promotion of Tasmania will need to clearly define Tasmania's point of difference and defined markets where GMO-free products are an advantage". This is possible for crop based enterprises but becomes more problematic for intensive animal industries. Tasmania's GMO-free status does not restrict the use of GM animal feed[155]. In Australia GM animal feed (such as soybean and cotton) that does not contain viable seed, is not required to be labelled. Therefore "the ability of Tasmanian animal industries to avoid GM animal feed is not a unique point of difference".

DISCUSSION

This section reviews the benefits achieved and costs incurred by maintaining the moratorium, the implications for the brand, and consumer perceptions in the domestic Australian market and key international markets.

It is based on the submissions provided, previous research conducted by Macquarie Franklin (2012a), and additional market research commissioned for this Review.

Cost benefit considerations

From a broad product perspective, evidence from the submissions was inconclusive as to whether a premium was received for many Tasmanian products because of the current policy on GMOs. However, there was a view that lifting the moratorium would be detrimental to some industry sectors such as beef, honey, fruit, food tourism and those that rely on organic certification. Other sectors, such as dairy and poppies, were of the view that if the current policy did not change, they would be at a competitive disadvantage to other regions in the future.

a) Livestock:

Dairy Industry

Several submissions from the dairy industry and agricultural peak industry bodies noted the future opportunities of GM pasture cultivars, such as GM ryegrass and GM clover. Both ryegrass and clover are suited to a range of grazing enterprises, with white clover a good companion legume for perennial ryegrass. This combination forms the basis of many high rainfall pastures in Tasmania (Tasmanian Government, 2012c).

Value of Industry

The Tasmanian livestock industry (wool, dairy and red meat sectors) is largely reliant on pasture production for their feed base. PGG Wrightson Seeds[156] estimate that the pasture value in Tasmania for the livestock industry is $402.7 million. The Department views the contribution of pastures slightly differently. Research into Tasmanian pastures reveals that our suboptimal pasture composition limits animal production (Friend et al, 1997: Smith and Corkrey 2013). Based on this Tasmanian pasture research, the Project Team note that about 40 per cent of the annual farmgate value of Tasmanian agriculture is derived from pasture based

[155] Imports of GMOs into Tasmania are regulated through import requirements contained in the *Plant Quarantine Manual Tasmania*. Only animal feed that contains material from non-viable GM plants, or processed non-viable seed, is permitted in Tasmania. Refer to the Issues Paper for this Review for further information (page 28).
[156] Submission 094

enterprises of red meat, dairy and wool. At a farm gate level for 2010-11[157] this would equate to Tasmanian pastures contributing at least $251 million for these sectors.

The value of red meat produced from Tasmanian herds was approximately $212 million at the farm gate in 2010-11, representing 23 per cent of the total value of agricultural (excluding non-food products) production for the year (Tasmanian Government, 2012a). Beef production dominates the red meat sector at approximately 75 per cent of total production (Tasmanian Government, 2012a).

Dairy is now Tasmania's single biggest agricultural industry, with an estimated packed and processed value of approximately $416 million, representing more than seven per cent of the nation's milk output (Tasmanian Government, 2012a). The most significant share of milk production is devoted to interstate exports at $308 million (Tasmanian Government, 2012a).

Impact

It should be noted that there are non-GM pasture cultivar opportunities in Tasmania. The TIA has bred a range of new perennial grasses, annual legumes and perennial legumes through its Herbage Development Program [HDP] (TIA, 2012). Markets for Tasmanian pasture seed selections are emerging with TasGlobal Seeds recently establishing a trade agreement with Matsuda to import and distribute Tasmanian temperate pasture seed cultivars (Grant, 2013). The quantum of this growth opportunity is unknown. Joshua Morris[158]commented that Tasmania is ideally placed to become a reliable source of uncontaminated seed for other GMO-free countries/areas that have problems with GM contamination.

The Department notes as an example, that the current annual demand for seed of new non-GM cocksfoot pasture plants is currently about 1,000 tonnes with a farm gate value of about $3.5 million per annum. TIA modelling and analysis suggests if the area available to improved pastures in the Northern and Southern Midlands was upgraded at a rate of five per cent per year with pastures containing a botanical composition optimised for site characteristics (for example non-GM cultivars developed as part of the HDP), animal production could be annually increased by 180 000 dry sheep equivalents (DSE). This represents an annual increase of $3.2 million in the farm gate profitability of sheep enterprises in this region. The cumulative benefit after five years would be $49 million (additional 950 000 DSE), and after 10 years $180 million (additional 1.8 million DSE). Over five years the area of botanically optimised pasture for both the Northern and Southern Midlands would be increased from around 30 per cent to approximately 55 per cent, still leaving an unexploited area for improvement of 45 per cent.

A small pasture seed growing and cleaning sector is already established in Tasmania but this could be significantly increased through the opportunities offered by the HDP.

DairyTas[159] in its submission noted that Tasmania has the infrastructure to be the largest supplier for GM ryegrass varieties of seed for the Australian market and that any extension of the moratorium would compromise this opportunity. DairyTas[160] indicated that Tasmania provides approximately 10-15 per cent of national demand for improved ryegrass cultivars, but more importantly provides 30-50 per cent of the supply for national consumption.

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[157] This figure is approximated from data sourced from Tasmanian Government (2012a) and ABS (2012)
[158] Submission 058
[159] Submission 085
[160] ibid

Historically within Australia, approximately 60 per cent of sales for pasture seeds were for perennial ryegrass (RIRDC, 2013a). From a Tasmanian perspective, the Department estimates that in 2013 the current gross cleaned seed amount for the whole of the State would be at least 123,500 tonnes for ryegrass and 120,600 tonnes for clover. The Department is not able to comment on the veracity of the proportion of Tasmania's contribution to national supply levels quoted by DairyTas[161].

DairyTas[162] and the DairyFutures CRC[163] indicated that recent research suggests that GM ryegrass has an increase in nutritional value estimated to increase the productivity of dairy land by approximately $200 per hectare and that commercial release could occur between 2015 and 2020. The Project Team note that the timeframe is largely dependent on the outcome of ongoing research and also regulatory approval processes. According to Australian Bureau of Statistics estimates, in 2009-10, Tasmanian dairy businesses reported 161,342 hectares of grazing land (Australian Government, 2013a). Based on historical technological adoption rates in the sector, the Department estimates that the productivity gain (farm gate gross value) of adoption of GM ryegrass over time could be in the vicinity of $10 million (Australian Government, 2009).

The TAPG[164] noted that GM could benefit the dairy industry whose final products are rarely marketed as Tasmanian (no market differentiation). The OCT[165] felt strongly that the dairy industry in particular has not considered the market impact both within the dairy sector and other agricultural sectors of the introduction of GMOs into pasture.

The Project Team notes that no submission discussed in particular how Tasmanian production of GM pasture seeds would impact the existing sales level of non-GM ryegrass or lead to a loss of markets.

Beef Industry

Value of the Industry

The *Tasmania Food and Beverage Scorecard 2010-11* (Tasmanian Government 2012a) indicates that the packed and processed value of the beef industry was $262 million, and accounted for nine per cent of the total processed value of food and beverages.

GMO-free is part of a bundle of attributes used in their marketing, including HGP free, clean and green, bone meal free and antibiotic free. According to the Macquarie Franklin Report (2012a), hormone growth promotant (HGP) free is the most important attribute to the safety conscious Japanese customers.

The Tasmanian Feedlot submission[166] noted the importance of the Premier's certification and the quality assurance systems that underpin the Tasmanian image of clean and green in their marketing to Japanese customers.

Due to confidentiality of information, a comment cannot be made on the actual premium received for Tasmanian Feedlots beef; however, Tasmanian Feedlots[167]noted that red meat exports to Japan in the three

[161] ibid
[162] ibid
[163] Submission 045
[164] Submission 061
[165] Submission 039
[166] Submission 049
[167] ibid

years to 2012-13 totalled in excess of $220 million (mostly beef). If the GM status for Tasmania changed, Tasmanian Feedlots [168] believe their price premium would be significantly diminished.

Impacts

Tasmanian Feedlots[169] revealed that the discussions with their parent company (AEON) and meat buyers in Japan indicate that their business may be severely jeopardised by any amendments to the ban on the use of GM crops in Tasmania.

Summary

If GM pastures were introduced, it appears that the impact on the livestock sector would be mixed. The dairy industry perceives that GM pastures would help to maintain a competitive advantage. However, the beef industry perceives that specific markets, marketing and branding efforts could be impacted in a negative way if GM pastures were introduced into the feed base.

b) Poppies

Value of Industry

In 2010-11, Tasmania produced 325,224 kg of alkaloids (contained in concentrated poppy straw) which was 48 per cent of the legal global manufacture of these alkaloids (INCB, 2011). The farm gate value of Tasmania's poppy industry has been estimated at around $70-90 million or around eight per cent of the value of overall State agricultural production (Macquarie Franklin, 2012b). Industry reports that in 2012 payments made to Tasmanian poppy growers are forecast to exceed $100 million for the first time and that production growth over the next seven years is expected to be similar to the last 10 years (Tasmanian Government, 2012d).

In an increasingly competitive international market, it is vital that Tasmania continues to strengthen and expand the industry to achieve its full potential (Tasmanian Government, 2012b). PGT[170] is concerned that "the competitive threat to Tasmanian pharmaceuticals is more real when recent EU developments of GM crops (in countries such as Spain) are considered". The Tasmanian poppy processors are already managing their production by investigating alternative sources of supply in areas such as Victoria. However, Victoria does not yet have regulations in place around poppy production (Tasmanian Government, 2012b).

Impact

Submissions from the poppy industry indicated that GM varieties may have a role to play in reducing the use of chemicals used for weed control, and have the potential to increase yield and/or alkaloid content or to help in the management of disease such as downy mildew.

[168] ibid
[169] ibid
[170] Submission 082

The poppy industry's view of the market impact is varied and differs from other submissions. PGT[171] perceives that "there is no meaningful link between the relevant markets for food products of any description with that of narcotic raw materials". GSK[172] on the other hand, noted that "GSK exports poppy seed to international culinary markets … hence the concerns about GM food may apply to the poppy crop". However, they did feel that "there is a trend towards acceptance of GMO poppy in relation to the supply of medicinal alkaloids". GSK[173] did not "anticipate any major negative reaction to customer attitude towards Tasmanian sourced, non-GMO poppy products".

The benefit of using GM technology was discussed by all three poppy submissions. PGT[174] noted the "market for opioids is growing relentlessly". Only one submission provided actual quantitative data on the likely benefit to Tasmania of GM poppy production. Based on their 2012-13 export sales turnover, Tasmanian Alkaloids[175] advised that a "40 per cent higher alkaloid content in poppy crops could be produced using GM technology which would result in a benefit of $56 million annually across the whole Tasmanian poppy crop."

Summary

The sector is an important contributor to Tasmanian agricultural industry. The industry perceives that there would be a positive commercial benefit to the Tasmanian poppy sector if commercial production of GM poppy crops commenced. It is currently unclear what the impact would be on local poppy production and processing capacity if the industry in Tasmania could not access gene technology.

c) Honey/Bees

Value of Industry

In 2007, the Tasmanian Beekeepers Association (TBA) noted that there were around 12,000 registered hives in Tasmania, or four per cent of the Australian industry, with two thirds of registered hives managed by six per cent of the registered beekeepers (Tasmanian Beekeepers Association, 2007; RIRDC, 2013b). In 2007, the industry reported the gross industry annual value of honey and beeswax in excess of $6.5 million with leatherwood honey representing 77 per cent or $5,040,000 of this (TBA, 2007).

From industry based information, the Department estimates that the 2012 gross food product revenue (honey and beeswax) has increased to approximately $8.9 million with approximately $1.6 million overseas processed exports. At this level, and based on the Tasmania Food and Beverage Scorecard, the honey production represents approximately 0.3 per cent of Tasmania's packed and processed food value for 2010-11(Tasmanian Government, 2012a). Tasmanian beekeepers receive the highest price for their honey in Australia, representing a premium over their average mainland counterparts of 67 per cent in 2006-07 (RIRDC, 2008).

Almost 60 per cent of all Tasmanian leatherwood occurs within public reserves, 34 per cent is on State forest and the remainder is on other public land or private property (Tasmanian Government, 2007). There

[171] ibid
[172] Submission 158
[173] ibid
[174] Submission 082
[175] Submission 096

is a high level of uncertainty in terms of bee foraging behaviour (EP, 2013). Honey bees are recognised as the most efficient insect to pollinate plants typically farmed in temperate agriculture (Tasmanian Government, 2007). The Tasmanian Beekeepers Association (TBA)[176]reported in their submission that honeybees are responsible for between $120-$180 million of agricultural production in Tasmania, principally through pollination. The same submission said that "many commercial beekeepers have stated that if GMO crops are introduced to Tasmania they would not pollinate crops anymore" (because of contamination concerns).

FGT[177] raised their concerns about the impact on beekeepers if GM crops were introduced and emphasised their close relationship with the horticulture sector through their pollination services.

Impact

Many submissions raised the issue of negative impacts on the honey industry if GMO crops were introduced including cross-pollination (or contamination) and the negative effects on honey markets. TBA[178] noted that there was every probability that pollen from GM crops would end up in honey making. The TBA[179] asserted that their members would lose 40 per cent of their market as the EU would no longer accept Tasmanian honey. This is as a result from the policy debate in the EU regarding GM pollen in honey (following a 2011 European Court of Justice decision).

Based on the 2012 Tasmanian honey export figures, if the industry lost all of the EU market because of the introduction of GM crops, the Department estimates that the gross loss to the industry would be in excess of $600,000 per annum.

Summary

Honey production represents a small contribution to the food packed and processed value for Tasmania; however, if GM crops were introduced into Tasmania, the impact to this sector in certain markets would be significant. The value of pollination services is much more significant. The horticultural industry highlighted that if these services were impacted by GM crops being released to the environment, potential losses in fruit export markets could result.

d) Organics

There were many submissions to the Review that highlighted the serious impact on the organic industry that they foresaw with the introduction of GM crops. The majority of Tasmania's organic production is understood to be distributed to the domestic market.

Value of Industry

From the submissions received, it has been difficult to quantify the value of the organic sector in Tasmania. Anchor Organics[180] noted that they invoice $2 million a year to niche markets and this is increasing by 20-25

[176] Submission 041
[177] Submission 122
[178] Submission 041
[179] ibid
[180] Submission 008

per cent a year. This figure from one organic horticultural producer appears at odds with the publicly reported value of Tasmania's organic industry value (as a whole) at approximately $4.7 million or approximately one per cent of the Australian organic market (Bez et al, 2012). At that level, Tasmania's organic production represents 0.1 per cent of the State's food packed and processed value for 2010-11 (Tasmanian Government, 2012a).

Tasmania, however, does have the highest annual volume of organic vegetable, herb and nursery production and the highest annual volume of organic fruit production in Australia (Mitchell et al, 2010). OCT[181] indicated that the sector was growing at 15 per cent annually.

Globally, organic seeds are sold at a premium above the price of conventional seeds, with the organic seed premium relative to the price of conventional seed averaging 20 per cent (Benbrook, 2009). The Project Team is unable to report on the price of organic seeds.

Impact

The economics of organic production are complex when compared with conventional production (Ashley et al, 2007). Previous research conducted in Tasmania highlights the fact that organic produce does not in itself provide a guarantee that price premiums will be achieved and that the level of price premiums required is directly relative to the production costs (Ashley et al, 2007). At a national level, it is known that the price premium for organic beef and chicken meat reflects the increased costs of production, including segregation costs involved in producing organic stock feed and livestock products (Australian Government, 2011a).

In Australia, the various organic standards have zero tolerances for GM material, including unintended GM presence (Foster, 2010). Many submissions to the Review argued that the impacts to the organic sector would be negative, both in markets and certification. However, TIA[182] countered the common assumption of many submissions that organic cropping and markets will be negatively impacted by the introduction of GM crops by indicating that "rates of organic industries in the USA doubled when GM crops became significant in the market place and half of the world's organic production now takes place in countries where GMOs have been released."

In their Royal Commission on Genetic Modification, the New Zealand Government noted that "it is unlikely that organic exports would attract a sufficient premium in the near or medium future to offset to any degree the contraction effect of not allowing any genetic modification in the country" (RCGM, 2001).

Although the commercialisation of GM canola has been anticipated to have very little direct impact on organic farming, the Australian Government has noted that this view does not extend to the potential impact of commercialising other GM crops (Australian Government, 2011b). Research in Australia has highlighted the need to consider GM contamination testing of relevant crops or other plants on an organic site if GM cropping sites are located within a region (Ashley *et al*, 2007).

Summary

The State's GM-free status provides a platform for organic and biodynamic production systems. The compliance costs for the organic sector would increase if GM crops were commercially produced in Tasmania, because of the zero tolerance to GM material required by Australian organic certifiers. The

[181] Submission 039
[182] Submission 038

industry sector is small, although growing, and the potential loss of certification would impact on individual organic producers through loss of markets.

e) Seeds and Grain:

Wheat and barley

GM crops such as wheat and barley have been identified as medium term opportunities with trials under way in some States[183]. The Project Team note that commercialisation of GM wheat may occur before 2020 and this is largely dependent on the outcome of research results and regulatory approval processes.

Tasmania is viewed as an ideal place to produce non-GM seed due to Tasmania's unique climate and fertile soils, and its out of season seed production in relation to the northern hemisphere (Serve-Ag, 2011). For large seed suppliers, utilising the opportunity of both a northern and a southern hemisphere production base enables them to produce two seed crops in one year.

Seed companies, such as South Pacific Seeds Australia, grow in regions like the east coast, the Coal River Valley and the northern central area as they essentially offer dry summer conditions (South Pacific Seeds, 2013).

Globally, the evidence is that certified non-GM grains (excluding organic grains) occupy only niche markets, mainly with soybeans and corn that would be used for human food in some markets (Foster, 2010). Research overseas indicates that to date price differentials for GM-free crops have been weak in international agricultural markets. However, this might change if availability of GM-free products declines as a result of worldwide adoption of GM crops (Demont & Devos 2008).

Marketing systems have been initiated by private firms in the grain and oilseed industry to extract premiums from a marketplace that has expressed a willingness to pay for an identifiable and marketable product trait or feature (Smyth and Phillips, 2002). Many of the submissions to the Review discussed canola as an example where Tasmania has been receiving a premium.

Wheat remains the predominant grain grown in the State over this period with approximately $6.8 million or less than 0.1 per cent of Australia's gross value produced (ABS, 2012). The major driver for wheat production in future for Tasmania will be expansion of the dairy industry (Freshlogic, 2012).

Each year in Tasmania, around 200 farms produce more than 30,000 tonnes of barley with a farm gate value of around $8 million, representing approximately five per cent of Australia's gross value produced (Macquarie Franklin, 2012c; ABS, 2012). The volume of feed barley imported into Tasmania fluctuates relative to the volume of State production. The need for feed barley is set to grow with the anticipated expansion of the dairy industry in Tasmania (Macquarie Franklin, 2012c; Field, 2013).

[183] Refer to the Issues Paper for this Review p. 32-36

Value of Industry

The overall estimated volume of grain used in Tasmania is summarised as follows (Field, 2013):

Purpose	Dominant Grain Type(s) if known	Estimate total volume (tonnes) used	Total value ($million) @ $200/t	Estimate of local grain (tonnes) used	Farm gate value ($million) @ $200/t
Beer Brewing	Barley	11,000	2.2m	11,000	2.2m
Poultry Feed	Wheat/Barley/Pulses	15,600	3.12m	15,600	3.12m
Livestock feed	Wheat/Barley	36,000	7.2m	12,000	2.4m
Other feed	Pulses/Grains	10,000	2.0m	a	
Dairy	Wheat/Barley	140,000	28.0m	b	
TOTAL		212,600	42.52m	38,600	7.72m
	A industry sources indicate limited local grain is used B Unknown				

Canola

The area of canola grown in Tasmania for 2009-10 was 1,252 hectares, producing approximately 2,000 tonnes (Macquarie Franklin, 2012). The gross value, estimated at $1 million, represents approximately 0.1 per cent of the gross value of canola (both GM and non-GM) produced in Australia (Macquarie Franklin, 2012a; ABS, 2012). It is estimated that around 150-200 hectares is grown for seed companies requiring conventional non-GM seed (Macquarie Franklin, 2012a). There would be very little, if any, organic canola grown in Tasmania (Australian Government, 2011b).

From the submissions, there was a mixed view on the opportunities for canola and how this impacts markets and premiums. Historically, analysts have concluded that there are few price premiums available in conventional markets for non-GM crops proven to be free of co-mingling with GM product (ACIL, 2005: AOF, 2009). Croplife[184] noted in their submission that "deliver prices at port currently range between $475-$505 per tonne with non-GM canola from South Australia receiving the lowest receival price of any mainland State."

The Project Team has explored the price for canola in more detail as this is a crop where GM and non-GM information is publicly available. Information supplied by Croplife[185] was compared with information from the Australian Wheat Board (AWB). When comparing the current AWB daily contract price spreads for canola varieties in Western Australia (no moratorium) and South Australia (moratorium on GM crops) for 2013-14 season (see table below), the Project Team observe that the non-GM variety has been receiving a premium of up to $20 per tonne. However, the South Australian canola (on average) receives the same price as commodity canola from WA (AWB, 2013).

184 Submission 089
185 ibid

Price/tonne canola varieties Western Australia and South Australia

Variety	Price/tonne
CSO1-A* Western Australia	Average $498/t
CSO1** Western Australia	Average $480/t
CSO1-A South Australia	Average $480/t
CSO1 South Australia	GM canola varieties not grown in SA because of the moratorium

CSO1-A = non GM canola   CSO1 = commodity canola (AOF, 2009)

The Victorian prices for Canola varieties for 2013-14 are indicated as follows:

Victorian (Riverina and North East) canola prices 2013-14 (AWB, 2013)

Variety	Price/tonne
CSO1-A* Victoria	Average $477/t
CSO1** Victoria	Average $470/t
CSO1-A Certified	Average $481/t

CSO1-A = non GM canola   CSO1 = commodity canola (AOF, 2009)

In the Victorian example above, it is clear that certified non-GM canola receives a premium of $11/tonne (on average) compared to commodity canola. Some areas such as Elmore received a price premium for certified non-GM canola of $25/tonne compared to the "commodity" price average (AWB, 2013).

One additional point worth noting is that there is very little organic canola grown in Australia (Australian Government, 2011b). Therefore it is unknown whether there is a differential in price for the certified non-GM canola and organic canola. OCT[186] noted within their submission that Tasmanian canola receives a $40 per tonne premium. However, Tasmanian figures for organic canola are unavailable as it is not grown on a commercial scale in the State.

In noting the figures from Croplife[187] and those in the tables above, the Project Team has also observed that in the last twelve months it has been reported that AWB has been providing the opportunity for farmers to fix the varietal spread between "commodity" canola and non-GM canola, so that GM canola is no more than $10 a metric tonne discount to that of non-GM canola. It has been reported that this price decision appears to have been motivated by the reluctance of some countries in the EU to purchase GM crops (Bita, 2012).

As noted in some of the submissions and the research conducted by the Department, a key market for Tasmanian canola is Japan. Import prices for Australian canola to Japan have received a premium (compared to Canadian canola), however, one explanation for the emerging gap for canola prices in Japan is the improvement in oil content of Australian canola relative to Canadian canola (Foster, 2010).

[186] Submission 039
[187] Submission 089

In 2011, Tasmanian Agricultural Producers reported that the price for GMO-free canola for Japan was between $500-520 a tonne (Grant, 2011). Although Tasmanian Agricultural Producers did not put forward a formal submission to the Review, follow up discussions by DEDTA reveal that Tasmanian non-GM canola retains a premium in certain markets such as Japan. Tasmanian Agricultural Producers indicate that specific prices are commercially sensitive. However, they receive upwards of $30-$115 premium per tonne (varies from year to year) based on global canola price rate, plus an additional amount based on the oil content of seed. Tasmanian Agricultural Producers also suggest that any premium must be offset against the yield discount (compared to GM canola) and the need to take account of increased costs such as freight.

Tasmanian Agricultural Producers have also verbally indicated that the non-GM canola market to Japan could increase over time from 600 tonnes to be upwards of 2,000 tonnes. However, the potential of the market depends on identifying and developing non-GM varieties that do well in Tasmania. This situation would be similar for any GM products which would compete in commodity markets against larger, more efficient regions.

Summary

There is a mixed view across seeds and grain sectors as to the impacts on their specific markets from the introduction of GMOs in Tasmania. From a canola perspective, the introduction of GM canola into the State would impact in a small, discrete non-GM market.

Branding and consumer attitudes

The Issues Paper for this Review noted that "branding aims to establish a significant and differentiated presence in the market that attracts and retains loyal customers". Markets are diverse and companies which possess competitive advantage, such as brand recognition, obtain advantages in the retail environment. From the submissions it is apparent that views differ about specific markets, impacts and the degree to which GMO-free status provides a competitive advantage.

It appears GM technology is particularly well suited to commodity products providing on farm productivity gains at scale, but GMOs are not considered in the minds of consumers to be compatible with premium niche products. Further to this, it is argued in Dr Tony McCall's submission[188] that seeking productivity gains with a view to accessing commodity markets does not support Tasmania's positioning as a small volume, high quality producer and in the longer term is not sustainable against regions with larger production capacities.

The Tasmanian brand is built upon a range of attributes. It has a strong profile within the domestic market and has some recognition in particular overseas markets, with the key drivers of brand value being the food and tourism industries. Key Tasmanian brand attributes that are promoted include premium quality, clean and green, cool climate and biosecurity; the State's GMO-free status is not a top level attribute. The ability to grow food and other agricultural products in a GMO-free environment is just one attribute of the Tasmanian brand, sitting alongside others such as HGP and antibiotics free, to support the overall food brand position.

[188] Submission 088

According to the Brand Tasmania Council's submission[189] the GMO moratorium provides a valuable point of difference and is a key part of the bundle of attributes that make up the brand. The linkages between tourism, food and hospitality are well established and people are now travelling to eat fresh natural food that is locally produced.

To gain a broader perspective of the Tasmanian brand and attitudes towards GMOs in domestic and interstate markets, additional market research was conducted specifically for this Review. This research comprised three components and was managed by DEDTA:

1. *Tasmanian food companies*: building on the Macquarie Franklin Report (2012a), follow-up interviews were conducted with 18 Tasmanian based food and agricultural producers. The interview responses are confidential.

2. *Domestic markets*: an attitudinal assessment was conducted by the consulting firm Freshlogic of domestic market gatekeepers to gauge perception and attitudes towards Tasmania, GM crops and food crops grown in areas that allow the cultivation of GM food and non-food crops. The results of this research are referred to in this Report and the consultant's report is available on the Department's website.

3. *International markets*: an attitudinal assessment in relation to GMOs was conducted through Austrade, in Japan and Hong Kong: two of Tasmania's key export trading partners. The reports produced by Austrade are wholly commercial in confidence. Accordingly a summary of the results is provided in this Report.

Tasmanian food companies

During September and October 2013 DEDTA contacted 18 Tasmanian based food and agricultural producers, many of which had been interviewed as part of the separate research project conducted by Macquarie Franklin (2012a). The aim of these interviews was to assess the current impacts (benefits and costs) from the moratorium and potential impacts which might result from any changes to the status.

Of those interviewed, most requested that their responses remained confidential. However on the basis of their responses:

- Products produced in relatively large volumes such as processed vegetables, potatoes, milk powder and bulk cheeses are generally not branded as Tasmanian.

- The majority of products in the beverage (beer and wine), red meat, aquaculture, honey, fresh fruit (particularly export) and gourmet restaurant sectors are Tasmanian branded.

- Specialty cheeses are typically Tasmanian branded, as are some fresh vegetables (such as export onions) and some limited product lines in dairy.

- Businesses/industries that make specific reference to Tasmania's GMO-free status in their marketing or product information include Tasmanian Feedlot (supplying AEON Group) and Greenham Tasmania in the red meat sector, canola exporter Tasmanian Agricultural Producers and vegetable exporter Field Fresh.

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[189] Submission 067

The information gained from the interviews supports the proposition that, depending on the food product, there are only a small number of Tasmanian based organisations (of those interviewed) that specifically utilise "GMO-free" to support their brand image and product marketing. More companies do brand product as Tasmanian but usually with no reference to being GMO-free.

From the businesses interviewed, the red meat, fresh fruit and honey exporters were identified with making specific reference to GMO-free. Very few were able to provide direct and verifiable price premiums or greater share as a result of marketing as GMO-free product. However, to illustrate the potential value from specific branding that includes GMO-free references, these sectors as a whole contribute over $135 million per annum to Tasmania's international exports. The table below values Tasmania's international exports by food product for agriculture for 2012-2013.

International exports: food product	A$(million) 2012-2013
Dairy Product Total ($23.64 is speciality cheese)	120.70
Fruit products	19.80
Vegetable products	32.52
Live animals	9.15
Beef products	113.64
Sheep products	22.57
Other meat	2.79
Beverages (including wine)	4.32
Chocolate	45.64
Honey	1.59
Other (including poppy seed $4.4)	15.83
Seafood	131.99
TOTAL	**520.54**

Source: Tasmanian Government, 2013

PGT[190] noted within their submission that "clean and green" and the brand of a place can exist regardless of the presence of GM in local agriculture; however, Tony McCall[191] also noted that "provenance branding place based strategies must be more than just place, it must be backed by quality."

Domestic markets

Globally, commodity prices for many of Tasmania's quality products like milk powders, onions and red meat remain relatively low (Tasmanian Government, 2012a). This, together with the high value of the Australian

[190] Submission 082
[191] Submission 088

dollar and a number of input cost factors, has resulted in an increasing proportion (50 per cent) of Tasmania's food production being sold in the domestic markets. This valuable interstate trade is 2.5 times our overseas exports at $1,552 million (Tasmanian Government, 2012a).

As many of the submissions to the Review discussed negative impacts to the domestic food, food tourism and organics sector if the moratorium was lifted, an important piece of work was to test the perceptions of GMOs in the domestic market. The following section discusses the research findings by Freshlogic (2013), which conducted domestic market research specifically for this Review.

Prevailing consumer views

According to consumer panel research conducted by Freshlogic, the primary considerations for consumers in the domestic retail market are price, value, waste and convenience. "Ethical" attributes such as GM-free are, in general, secondary purchasing considerations. GM-free ranked behind better known ethical attributes such as Australian grown, pesticide-free, certified organic and fair trade but above lower tiered priorities such as use of recycled products and CO^2 footprint labelling. GM-free food is a higher priority for singles and couple households compared with families and empty nesters.

While consumer attitudes show a high inclination to buy ethical attributes, the willingness to actually pay more for these attributes is uncertain. This is similar to overseas examples where the level of demand for GM-free products is ultimately dependent on the willingness or otherwise to pay higher consumer prices (Moses & Brookes, 2013).

Primary Producers and Peak Industry Bodies

Producers see Tasmania's reputation for "clean and green" food as an edge in the export market although this is viewed as secondary by export market buyers to the broader "clean and green" reputation of Australian exports in general.

On the domestic market, Freshlogic noted that "in the majority of cases Tasmanian food is not labelled as Tasmanian or otherwise differentiated from other Australian food. As a result there is a low visibility of the Tasmanian 'brand' and therefore little benefit to producers from the State's reputation". There is doubt amongst peak industry bodies that consumers are generally aware of Tasmania's GMO-free status or make a connection between this and the State's "clean and green" image.

Both producers and the peak bodies that represent them have views which vary by industry and depend upon the opportunities that GM attributes present to them in the medium term.

Retail channel

The influences on food retailers are centred on the brands the retailers own and manage and the range of products they offer. Freshlogic noted that in recent times, retailers have reflected commitments in their brand values and positioning such as:

- Hormone Growth Promotant (HGP) free meat;
- Permeate-free milk; and
- Commitments to move fresh egg supplies to free range production systems.

These changes reflect retailers' increased sensitivity towards consumers' concerns about where their food comes from and how it is produced. Most if not all major Australian retailers have a policy that their retail (in-house) branded products will be produced from non-GM ingredients and additives and are to remain GM-free as much as possible. However, Freshlogic noted that "retailers do not have policies regarding preferential purchasing from regions that are GM-free".

Freshlogic noted that retailers have positive perceptions about the quality of food on offer from Tasmania with the brand image anchored in "pure", "natural" and "clean" attributes. However, when tested against a supply scenario of comparable products sourced from the mainland, product with Tasmanian origin is not enough to earn exclusivity with retailers. There is also a high awareness that if some products are claimed to be GM-free, this action by default implies that all other products are not GM-free and retailers do not see this as a welcome situation and are concerned how this may impact on retail sales.

Retail managers who are responsible for managing retail brands are more aware about GMO issues due to their involvement in checking food ingredients to meet policy requirements. Significantly, however, those who are purchasing the bulk of retail merchandise, and not involved in the private label programs, are not all aware that the Tasmanian GM moratorium is in place. Freshlogic also noted that "potential retailer responses must be considered within the current context, in which the Tasmanian GM moratorium has little impact on retail purchasing decisions". Freshlogic concluded: "as there is minimal trade with local retailers based on the moratorium being in place, there are minimal commercial consequences for the local retailers if the moratorium is lifted".

Food wholesalers and distributors

The wholesale and distribution channel is made up of traders and vertically integrated growers. As "middle men" they generally have lower level of investment in consumer attitudes.

Tasmanian product often has low visibility in this sector because of higher volumes of product from other States. At present, GM attributes are not a significant factor in their commercial decisions.

The wholesalers and distributors responded to Freshlogic that a lapse in the moratorium is unlikely to initiate any significant response given the low awareness of the current moratorium status and the attitudes of their supply chain.

Beverage producers and distributors

Freshlogic noted from their research that this sector has a higher exposure to consumer attitudes and that there is the perception in this sector of a low awareness of both the moratorium and GM issues in general; in their marketing, there was little perceived commercial benefit in marketing a GM-free trait. Freshlogic's research indicated that removal of the moratorium would have minimal impact in this sector.

Food service suppliers and operators

The foodservice channel distributes the food that consumers do not prepare themselves. In the majority of cases food ingredients are combined with other products into an end product that is then made available to consumers. This makes food ingredients and their attributes somewhat anonymous. There are exceptions such as "organic", "free range", "responsibly sourced", or "locally grown" and this did not appear to extend out to widespread GM-related claims at the meal ingredient level.

In this market segment, purchasing behaviour is completely dominated by a requirement to achieve the lowest possible cost. However the small number of specialty businesses that have positioned their offer on Tasmanian food quality would have concern if the moratorium was lifted and this would be framed by the media profile any change attracts.

Private sector certification organisations

Freshlogic also spoke to some of Australia's regulators and certifiers. Private sector certifiers see the moratorium as a potential advantage for the Tasmanian agricultural sector, with the key advantage of a marketing edge in the global trade area. The certifiers note the disadvantage of an increase in regulatory and certification costs to primary producers if GM varieties were introduced in Tasmania.

Freshlogic also noted that the actions of some non-government organisations counteract efforts to establish a marketing advantage based on Tasmania's GMO-free status, specifically when they put the credibility of this status in doubt. Freshlogic highlight an example of the True Food Guide (established by Greenpeace) where they have "seen products manufactured in Tasmania labelled with a "red warning", despite the State's GM-free status."

Domestic market summary

In summary the awareness and value associated with GMO-free indicates it is more of a supporting product attribute for marketing purposes rather than a leading or sole product attribute.

The Australian marketplace awareness of Tasmania's GMO-free status is higher amongst those investing in consumer brands than those trading in food products. All indications are that this is led by heightened consumer interest in food provenance issues, and reflected in new levels of marketing investments from food market brand managers, including the major retailers. Based on this heightened interest and increased level of marketing investment in provenance issues, there is a level of opportunity cost in removing the Tasmanian GMO-free status.

International market research

From Tasmania's international trade figures, food products exported into North Asia in 2012-13 totalled $265 million, or 51 per cent of Tasmania's total food product exports[192] (Tasmanian Government, 2013). As a way to ascertain perceptions of Tasmania and GMOs in overseas markets, Austrade was commissioned to conduct market research in two of Tasmania's key export trading partners, Japan and Hong Kong. The following is a summary of the main points from the research.

Hong Kong

Austrade interviewed five companies in Hong Kong representing supermarkets, food importers and/or distributors. Two currently buy Tasmanian products and all purchase Australian products. These buyers considered Australian foods to be clean, green, natural and have good quality with a high food safety standard. The majority of companies included Tasmanian food in this perception with only one indicating that they perceived Tasmania products to be cleaner and more natural compared with those of other States in Australia.

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[192] The values for exports to North Asian markets are updated from what was included in the Issues Paper for this Review.

Since July 2006, the Hong Kong Government has provided a set of guidelines on voluntary labelling of GM food. The guidelines set out the principles underlying the recommended labelling approaches for GM food, and provide assistance for the trade to make truthful and informative labels in a consumer-friendly manner. The guidelines are advisory in nature and do not have any legal effect. Adoption is entirely voluntary and is not binding.

In general there is a lack of understanding and education around GM food. Consumers do not possess adequate information about the relative advantages and disadvantages of GM food and are not able to differentiate the different types. Consumer perceptions towards GM food in this market are not positive, with GM foods generally thought to be unhealthy.

All interviewed companies advised that they do not purchase meat, vegetables, fruit and/or dairy products from countries/regions that grow GM products commercially. However, they were not certain if the food products that they import are GM-free or not. When asked to rank which factors (list of eight factors) most influence their food purchasing decisions, the companies in Hong Kong ranked "presence of GMOs" and "grown in a GMO-free environment" as the least important factors in their purchasing decisions. Other attributes such as "country of origin", "quality" and "reliability and reputation of producer" were considered most important. In addition, brand attributes such as HGP free, organic, and "clean and green" are considered to be relatively more important than GMO-free, possibly because there is a lower awareness of GM foods.

Most companies interviewed in the Hong Kong survey emphasised that GMO-free products may not be able to attract market advantages such as price premiums but if the price was the same, consumers prefer Non-GM products. On the hypothetical question of Tasmania allowing non-food GMOs to be produced in Tasmania most interviewed said they would continue to purchase food from Tasmania, with price, uniqueness and quality the factors driving purchasing decisions. Interestingly, many of those interviewed equated pharmaceuticals with food because they are ingested and they were therefore reluctant to accept GM pharmaceuticals.

Japan

Austrade interviewed five companies in Japan of varied size and customer base, including companies with retail chains, merchandising stores, supermarkets and food specialist stores. The companies source products from suppliers (locally and overseas), through Japanese importers, with only one selling Tasmanian food products. All of those interviewed recognised Australia as a region with high standards of food safety and a producer of quality seafood and agricultural products, principally flour, beef, salmon and prawns. Retailers had a limited concept of Tasmania but considered it to have a very clean environment.

All interviewees source products from countries producing GM food and see it as unavoidable. As a consequence, some retailers restrict the sourcing of beef, vegetables, fruit and dairy to only their known suppliers (e.g. beef only from Japanese farmers).

Since 2001 the Japanese government has regulated the cultivation and distribution of GMO products through the Japanese Food Sanitation Act and the Japanese Agricultural Standards law. This includes the labelling laws requiring GM ingredients that make up more than five per cent of food products to be labelled. Labelling is not required for animal fodder.

The interviewed retailers did not have a preference for sourcing from GM-free countries, mainly because they perceive that this would be extremely restrictive. The decision on sourcing of product categories was generally based around finding sources that are of significant scale and can provide a reliable and safe supply. When the retailers were asked to rank what influences their decision making, the top four considerations were "reliability and reputation of producers", "country of origin", "price" and "traceability of product". Use of additives, hormones and antibiotics were all considered relatively less important but the majority ranked them higher than GMO-free and grown in a GMO-free environment. This is partly due to the fact that these retailers rely on their manufacturers and importers to supply safe products.

Austrade reported that one food category that seems to spark some concerns for Japanese consumers is soya bean derivatives such as soy sauce, tofu and natto, which are consumed on a daily basis. For these products processors mark their products as GM or non-GM. Soya bean, the main ingredient, is mostly imported from GM crop-growing countries such as USA, Brazil and Canada. Some Japanese trading houses are paying 25-30 per cent more for Non-GM soya beans where they can source product. However, the retailer noted that it is increasingly difficult to source GM-free soya beans globally.

If the awareness about GM labelling and food safety were to increase, retailers would consider taking a more proactive role in promoting non-GMO produce. Currently, these retailers do not actively promote GMO-free products in store. Any additional changes to retail policy would be driven by a response to increased consumer concern about food safety issues.

As with the Hong Kong market, the Japanese retailers do not believe that consumers would pay a premium for GMO-free products but where two products are priced the same there is a preference for GMO-free.

According to the research the general awareness of GM food products is fairly low and consumers do not appear to actively seek out information on the use of GM technology in food production. The general consumer perception is that GMO food does not have a positive impact on human health and the environment.

There was very low awareness of Tasmania's GMO-free status due in part to these retailers having a fairly low involvement in direct importation (fewer than five per cent of in store products).

None could see any major issues, in the short term at least, with a potential change in State Government policy to allow the production of non-food GM products. Some retailers commented that they would want to check with their Tasmanian suppliers that this policy change would not impact on their ability to supply GMO-free. However, some felt it may also prompt them to question if the government policy was likely to extend to food as well.

Summary

It is clear from the Austrade research that in the Japanese and Hong Kong markets general consumer awareness of GM technology in food is fairly low and that the purchasing policy for retailers is generally based on accessing reliable and safe supply of product. The Project Team notes however, that in some areas consumer awareness of GMOs is higher. For example, the Green Co-op[193], a consumer co-operative from western Japan with 376,000 members, has a "food for life" campaign that opposes GM.

Most companies in these two countries pointed out that other brand/product attributes such as "organic", "hormone free" and "clean and green" are more important than "GMO-free". In addition the retailers'

[193] Submission 087

awareness of the State's GMO-free status was also fairly low but there was some recognition of Tasmania being a clean and green environment.

Macquarie Franklin (2012a) noted in their Report that the current market advantage that can be gained from specific promotion of Tasmania's GMO-free status is currently quite limited. Their finding appears to be supported by the research in the export markets of Hong Kong and Japan.

Although Tasmania's products do not have a significant differentiated presence in the Japanese and Hong Kong markets, the retailers considered that Tasmania has a very clean environment.

Research (Anderson & Jackson, 2005) has found that overseas countries adopting GM have initially lost market share to GM-free suppliers. The feedback from Japan and Hong Kong suggests that at this point in time if the GMO moratorium was removed, overall there would be very little impact on Tasmanian products *as a whole* in these overseas markets. However, there could be an impact in a small number of specific market segments such as canola, cherries and beef to Japan.

2) MONITORING FUTURE DEVELOPMENTS IN GENE TECHNOLOGY

FINDING

In coming years there will most likely be an increasing number of GM crops commercialised with claims of direct benefit to a wider range of stakeholders. These advanced modifications will apply to crops that are of relevance and able to be produced in Tasmania. The most prominent examples are pharmaceutical poppies and pasture cultivars.

Keeping track of developments in gene technology will help lead to a balanced debate and sound decision making. Formal mechanisms for monitoring these technological developments by Government, industry and other stakeholders will be important, either to assess the benefits and implications of the technology in the absence of a moratorium, or to inform future GMO policy in the presence of a moratorium.

DISCUSSION

"GM crops can be categorised as having either first, second or third generation traits: first generation traits provide benefits on the farm; second generation traits provide benefits to the producer and consumer; and third generation traits allow the plant to be used as a 'factory' to produce pharmaceuticals or industrial products" (Glover *et. al.*, 2005).

Of the commercially available GM crops, the only one of relevance to Tasmania at present is canola and it is representative of having first generation traits. These are primarily resistance to different herbicides. These traits are designed to simplify weed management in the crop and enhance production of the crop on farm.

Future developments

In Tasmania the focus has been primarily on GM canola as the most relevant of GM crops to the State. Though currently the GM trait relates to herbicide resistance, as one submission highlighted[194], canola plants genetically modified to synthesise long-chain omega-3 fatty acids could potentially be available for use before 2018, which could replace fish oil as an alternative source of these acids for use in stock feeds. This crop is an example of second generation traits and could potentially be produced in Tasmania. This example is illustrative of the importance of looking ahead and being aware of technology developments.

There are a range of other agricultural crops that are currently, or potentially, at the research and development stage in Australia and internationally, representing both second and first generation traits. These include GM pasture grasses (disease resistance, nutrition), GM poppy species (alkaloid yield and types), GM wheat (nutrient utilisation efficiency, enhanced yield) and GM forestry (growth rates, yield).

Similarly to canola, genetically modified forestry species may also be agronomically suited to production in Tasmania. Forestry Tasmania[195] "envisaged that in forestry, GMO's will improve wood yields from plantations under conventional production systems, reducing the pressure to produce wood from native forests and or using less land for plantations." However it is noted that Forestry Tasmania[196] stated that it "has not, and does not, use GMO's in its field operations or in its genetic improvement programs". As noted previously in this Report: "Forestry Tasmania has no intention to use GMO's in its field or tree breeding

[194] Submission 065
[195] Submission 057
[196] ibid

operations as doing so would be in contravention of the current Australian Forestry Standard and Forest Stewardship Council principles, to which Forestry Tasmania subscribes."

Several submissions stated that the relevant industries in Tasmania would need the option to access gene technology to remain competitive and at the leading edge of their industries in the future. The two most prominent future applications of direct relevance to Tasmania, raised in several submissions, are dairy and poppy production.

Pasture

A mixture of first and second generation traits are currently the subject of R&D work in Australia and overseas. This includes virus resistance in white clover species and nutritional characteristics of ryegrass pasture grasses. Both are identified to directly benefit productivity, particularly in dairy cattle.

Timeframe for commercial release is estimated to be over the next five to 10 years: submissions from the dairy industry indicated a timeframe for commercialisation in the 2015-2020[197] period. Others, like Gene Ethics,[198] suggest the research is only "proof of concept" and state that "the possibility of other commercial (GM) products becoming available for Tasmania in the five to ten year timeframe of a new GM-moratorium is extremely remote."

Pharmaceutical Poppies

Submissions received from the poppy industry suggested that in future GM poppies may provide a range of benefits for Tasmanian poppy producers and that such benefits may be the difference between being competitive with other poppy producers in the world or not. Traits generally relate to changes in types of alkaloid being produced and the efficiency of alkaloid production, and are good examples of third generation traits. Timeframe for commercial release is not known and current work is at the R&D stage. Field research and development in Tasmania would be expected to occur ahead of commercialisation.

Others

There is extensive R&D on a range of other species investigating a range of first, second and third generation traits. The timing of commercial release for crops ranges from "imminent" for some canola crops producing modified oils, through to a decade or more for some of the "nutriceutical" crops presenting third generation traits. In addition there is a large range of factors that influence whether a GM crop plant is taken through to commercialisation including the outcome of the R&D work itself, commercial viability of the modified crop, marketing considerations and regulation. The mere fact that R&D is being conducted does not mean a commercial product will result.

A mechanism for monitoring future developments

"Knowing what GM crops are under development is needed to ensure a balanced debate and informed decision making on their adoption. Advanced notice is beneficial for crops that require monitoring or industry stewardship. It is also important to assess GM crops under development internationally because of their potential impacts on Australia's trade and competition, as well as the issues surrounding the unplanned presence of GM material in non-GM crop imports" (Glover *et. al.*, 2005).

[197] Submissions 045, 085
[198] Submission 124

At least three submissions[199] suggested a mechanism was needed to monitor future developments of GM technology for relevance to Tasmania. Whether a moratorium is in place or not, the Government could consider establishing a mechanism to monitor GM technology developments, including the newer second and third generation trait developments. Such a mechanism would need to consider a range of issues related to the technology including the technical development itself, as well as assessing the potential economic and market implications that the new gene technology development would have for Tasmania.

Such monitoring would assist in any subsequent reviews of the moratorium. If a moratorium is not in place a monitoring mechanism would still be able to assess the technology for application in the State and be able to assess benefits or otherwise.

It should be noted that the existing administrative system used by the Department in relation to the GMO policy in Tasmania incorporates internal monitoring processes via a "Communities of Practice" of staff specialising in, and sharing knowledge related to, gene technology developments. It also includes an Interdepartmental Committee (IDC) for gene technology. The IDC membership includes representatives from DPIPWE, DEDTA, Department of Health and Human Services (DHHS), and Department of Premier and Cabinet (DPAC) and meets as required. Both these mechanisms are primarily government-based memberships, whereas what has been proposed in submissions suggests broader stakeholder involvement.

[199] Submissions 038, 061 and 109

3) THE TASMANIAN GMO REGULATORY FRAMEWORK

FINDING

The *Genetically Modified Organisms Control Act 2004* ("the Tasmanian Act") operates concurrently with the Commonwealth and Tasmanian *Gene Technology Acts*. A matter for future policy could be to provide further guidance on the "likely impact on markets test" (for when determining whether to grant or refuse a permit for dealing with GMOs in Tasmania). The South Australian approach that provides for an exemption to a GMO-free area to be granted after taking into account market requirements offers an alternative test.

There is a view that the moratorium and associated regulation is stifling biotechnology research at the University of Tasmania, with negative economic consequences for the education economy. The future policy on GMOs may benefit from reinforcing the Government's support for agricultural R&D, and in doing so clarify the position on tightly controlled GM trials and contained trials.

DISCUSSION

Issues raised in the submissions

The legal validity of the dual Commonwealth-State regulatory regime for gene technology in Tasmania was raised in two submissions. The operation of the regulatory regime and its effect on R&D was also an associated matter raised by TIA[200].

On the issue of legal validity, PGT[201] stated that the legal basis for the moratorium, in particular the test for refusing a GMO permit under section 9(2) of the *Genetically Modified Organisms Control Act 2004*, was open to successful legal challenge: "the wafer thin legal basis for the state ban on GM, already narrowed due to the obvious constitutional issues, could be about to get thinner."

Ausbiotech submitted that: "the current Tasmanian moratorium on GM is inconsistent with the policy intent for a national, coordinated national approach to the research, development and commercialisation of agricultural biotechnology as agreed by the COAG and has created a two-tier regulatory process." [202]

The point that was made by TIA[203] in relation to the dual regulatory process and its effect on R&D was that: "Attempts to do research on genetically modified plants at UTAS have been made difficult by the regulatory processes imposed by Commonwealth and particularly State agencies … the associated transaction costs have prohibited any serious research associated with GM technologies."

The Project Team sought further information from TIA on this assertion, and they stated: "numerous science opportunities have been missed because the regulatory environment is at odds with the fast paced environment of transgenic research … the above comments do not imply that the Tasmanian and Commonwealth … processes are overly slow, onerous or bureaucratic in themselves, but that they are relatively time consuming in an international context of fast-paced, high level research development" (H Meinke, pers.comm., 15 Nov 2013).

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[200] Submission 038
[201] Submission 082
[202] Submission 095
[203] Submission 038

A response to these issues raised in submissions is provided below. In so doing, this Report is not intended to constitute legal advice or opinion and should not be relied on as such.

Power to regulate

The *Gene Technology Agreement 2001* (Cth) sets out the policy intent of the national regulatory regime. Tasmania supports a national regime for the scientific assessment of risks to the environment and human health and safety posed by GMOs, provided that the sovereignty of the State to determine its appropriate level of protection in marketing matters is not impeded.

The Commonwealth legislature has powers to make laws on certain matters listed in the *Commonwealth of Australia Constitution Act 1900* (the Constitution). GMOs are obviously not among these matters; therefore the *Gene Technology Act 2000* (Cth) was enacted using a collection of constitutional powers (see section 13 of that Act). The *Gene Technology (Tasmania) Act 2012* expressly provides that the Commonwealth Act applies in Tasmania to its fullest extent, but is modified to prohibit a GMO licence if the dealing is in contravention of an order declaring a GMO-free area (section 7 of that Act).

The purpose of the *Gene Technology Act 2000* (Cth) is set out in section 3 of that Act: "… 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 GMOs." It is important to note that this object is limited to environment and human health and safety. "Marketing purposes" is not an object of the Commonwealth Act, therefore that Act applies in Tasmania, concurrently with the *Gene Technology (Tasmania) Act 2012* to "cover the field" and regulate dealings with GMOs for the environment and human health and safety, but not for marketing purposes.

The Australian Government has also made the Gene Technology (Recognition of Designated Areas) Principle 2003 for the Gene Technology Regulator to recognise State-based controls for marketing purposes. Thus the *Genetically Modified Organisms Control Act 2004* (Tas) operates concurrently with the Commonwealth Act.

PGT also submitted that the test, in section 9(2) of the *Genetically Modified Organisms Control Act 2004* (Tas – "the Tasmanian Act") is legally flawed and bad law.[204]

Section 9 of the Tasmanian Act provides:

> *(1) On receipt of an application under section 8, the Secretary may –*
> - *a. grant a permit to the applicant; or*
> - *b. refuse to grant a permit to the applicant.*
>
> *(2) In determining whether or not to grant a permit, the Secretary is to consider –*
> - *a. the location and purpose of the dealing with the GMO as proposed in the application; and*
> - *b. the **likely impact on market access** for non-genetically modified crops and animals of the dealing with the GMO as proposed in the application; and*
> - *c. the management regime for the GMO as proposed in the application; and*
> - *d. any other matter the Secretary considers relevant.*

[204] Submission 82, page 26.

In making a decision the Secretary (DPIPWE) could have regard to the *Policy statement: gene technology in Tasmanian primary industries (2009-2014)*. The Policy Statement contains some information that could be relevant to a decision. For example, clause 6.6 reads:

> Release of plants, seeds or other propagules genetically modified for pharmaceutical purposes and not intended for use as food or feed, to the Tasmanian environment for open-air trials or commercial purposes may be authorised under the *Genetically Modified Organisms Control Act* 2004. However, authorisation will be subject to:
>
> - prior approval by the national Office of the Gene Technology Regulator as required; and
> - assessment by the Department … of the likelihood of GMO entry to the broader environment, other plants, or human or animal food supplies; and
> - conditions as required.

A point of comparison may be drawn with South Australia where the Minister may grant an exemption to a GMO-free area if, among other considerations, the Minister is satisfied that it is reasonable that an exemption be granted after taking into account market requirements: s.6(2)(b) of the Genetically Modified Crops Management Act 2004 (SA). This is a slightly different test that does not require a consideration of "likely" impacts on markets and may offer an alternative approach.

A matter for future GMO policy could be to provide further guidance on the likely impact on markets test (for when determining whether to grant or refuse a permit for dealing with GMOs in Tasmania).

Regulation and R&D

On the question of whether the Australian national regulatory regime for gene technology and the State-based controls hinder GMO R&D, the Project Team notes that this requires consideration of the national regulatory regime as well as the State-based measures.

Under current regulatory controls, any "dealing" with a GMO in Tasmania requires a licence from the OGTR to first be issued (unless under the *Gene Technology Act 2000* (Cth) a licence is not required), then the licensee must apply to the Secretary (DPIPWE) for a permit. It is recognised that this is a two-stage process that does not apply in any other State in Australia other than South Australia. It is also recognised that this issue was raised in only one submission and none of the research institutions that have previously been granted GMO permits in Tasmania[205] have expressed these concerns.

The regulatory burden of the national regulatory regime was addressed in the 2011 review of the *Gene Technology Act 2000* (Cth), where it was recognised that almost all regulations impact on productivity, yet this and compliance costs were justified due to the risks identified and the benefits achieved by the legislation (Allen Consulting Group, 2011). It was also recognised in that review that State moratoria result in additional compliance costs, including forgone opportunities.

Addressing this issue is a matter for the Australian Government in its administration of the national regulatory regime. However, it is recognised that controlled R&D on GMOs in Tasmania is not precluded by the existing legislation and is supported in the current Policy Statement. Nonetheless, it may be beneficial for the future policy on GMOs to reinforce the Government's support for agricultural R&D, and in doing so clarify the position on tightly controlled GM trials and contained research.

[205] See page 14 of the Issues Paper for this Review.

4) LEGAL DEFINITIONS AND EMERGING TECHNOLOGIES

FINDING

The national regulatory regime for gene technology contains adequate definitions and mechanisms to incorporate new organisms and technologies. A previous Commonwealth Government review identified that any limitations in the regime that lead to uncertainty for researchers and users of new undefined technology, are a matter for the Office of the Gene Technology Regulator to address.

Confusion and lack of understanding of the complex scientific process for using gene technology to create new organisms is not a new issue. While the Gene Technology Regulator has statutory responsibility to address this, and provides information to the public, the Tasmanian Government may need to take additional steps to increase public awareness and understanding in the event that an application to deal with a GMO in Tasmania is received that meets the requirements for a permit to be issued (should the current legislative approach be retained).

DISCUSSION

Two submissions from stakeholders raised concerns about the definitions of GMO and whether gene technology is properly understood by those engaging in the debate. The potential for such confusion was mentioned in the Issues Paper for this Review, along with the preferred terminology for conventional breeding, biotechnology, gene technology and GMO.

The TFGA raised concern about the general understanding of gene technology and what organisms are covered by the term GMO: "One key issue is the fact that there is little real understanding of what is actually meant by the terms "genetic modification" or "genetic engineering". It is clear that there is widespread confusion about what actually constitutes a GM process and what might be a natural breeding program ... Before any meaningful conversation can be had about the moratorium, there needs to be a consistent and agreed position on a definition."[206]

TIA submitted: " … it should be highlighted that simplistic definitions of GMOs and conventional breeding do not represent the current diversity of approaches to breeding. Trans-genic organisms (in which genetic material from different species are combined) might be considered quite differently from intra-genic organisms. In the latter only DNA from within the host organism itself is used to transform the organism – hence it is not transgenic (no foreign DNA) but intra-genic even though the means of developing these organisms follows typical GMO processes. These processes can have similar or even identical outcomes to mutagenesis approaches which speed up the rate of genetic recombination in a random way, and are not considered to be genetic modification under Tasmanian law."[207]

An ancillary question is the ability of legislation to adapt to emerging technologies.

As Australia has a national regulatory regime for "dealings" with GMOs, of necessity the relevant legislation must contain definitions of gene technology and the organisms produced by it. These definitions are crucial to the operation of the national regulatory regime and organisms that do not fall within the relevant definitions are not subject to the legislation.

[206] Submission 109
[207] Submission 38

The term "GMO" is defined in section 3 of the *Gene Technology Act 2000* (Cth) as: *"An organism that has been modified by gene technology, or an organism that has inherited particular traits from an organism (the initial organism), being traits that occurred in the initial organism because of gene technology"*. Gene technology is defined in the Cth Act as: *"any technique for the modification of genes or other genetic material, but does not include sexual reproduction or homologous recombination."*

While the definitions of gene technology and GMO in the *Gene Technology Act 2000* (Cth) can be extended in the *Gene Technology Regulations 2001* (Cth) to account for emerging technologies, no such regulations have been made to date. However, schedules 1A and 1 of the Regulations operate to remove certain techniques and organisms from the definitions of gene technology and GMOs in the Commonwealth Act. The Project Team is of the view that the complexities in defining technologies and the organisms produced using these technologies can be adequately dealt with under the national regulatory regime.

The definitions in the *Gene Technology Act 2000* (Cth) are incorporated by reference in the corresponding *Gene Technology Act (Tasmania) 2012* and the *Genetically Modified Organisms Control Act 2004 (Tasmania)* and the definitions as set out in the *Gene Technology Act 2000* (Cth) are thus the official definitions of gene technology and GMO therefore apply in Tasmania.

The *Gene Technology Act 2000* (Cth) requires the Gene Technology Regulator to provide information and advice to the public about the regulation of GMOs (s.27(f)). The Allen Consulting Group (2011) noted that, while the OGTR website contains up-to-date information and advice and the OGTR regularly communicates via media, event participation and the like, there remains some confusion about GMOs and GM crops in the community. In response, Australian jurisdictions[208] agreed, in principle, that the Gene Technology Regulator should increase communications to the public and address misinformation about gene technology in the public arena (Australian Government, n.d.).

In its submission, the TFGA[209] also committed to working with Government and stakeholders to ensure a widespread understanding of terminology, in particular to avoid confusion with conventional or traditional selective breeding and enhancement methods.

Further, in the 2011 review of the *Gene Technology Act 2000* (Cth) the Allen Consulting Group found that the Act already contemplates emerging technologies, as the Minister has the power to narrow or broaden the scope of the definition of GMO in the *Gene Technology Regulations 2001* (Cth). However, significant problems with this approach were noted: it could take up to 18 months for a new regulation to be made, thus leading to uncertainty for researchers and users of new, undefined, technology. In responding to the 2011 report, all Australian jurisdictions agreed that the OGTR should investigate ways of streamlining the process for regulatory amendments so emerging technologies can be covered (Australian Government, n.d.).

As mentioned above, the Tasmanian legislation that regulates GMOs and gene technology incorporates the Commonwealth *Gene Technology Act 2000* (Cth) definitions by reference, so any amendments made to the definitions by virtue of the *Gene Technology Regulations 2001* would automatically apply in Tasmania.

[208] Other than the Queensland Government
[209] TFGA ob cit.

5) THE FORM OF THE MORATORIUM

FINDING

Unless the *Genetically Modified Organisms Control Act 2004* (Tas) is amended to remove or extend the operation of section 36, the current moratorium on GM crops and animals in Tasmania will automatically expire on 16 November 2014. Therefore the first decision-point is whether to lift or maintain the moratorium.

If a decision was made to lift the moratorium, this would effectively create an open co-existence regime, or "market choice" model of industry self-regulation. It should be noted, though, that no submissions advocated removing all regulatory controls including the Gene Technology Act 2001 (Cth). This would make Tasmania's regulation of GMOs similar to that of Queensland and the Northern Territory, which have no moratorium legislation; whereas the other States all have moratorium legislation, but with differing approaches for commercial release of GM canola and GM cotton.[210]

In the current circumstances, if a decision is made to maintain a moratorium there are effectively three options as to what form it could take:

1. The "***status quo***" where dealings with GMOs are assessed for environment and human health and safety risks by the Gene Technology Regulator (GTR) under the national regulatory regime, and prohibited in Tasmania for marketing purposes unless approved on a case-by-case basis via a permit. To maintain this option requires legislation to remove or extend the sunset clause in the *Genetically Modified Organisms (Control) Act 2004*;

2. A "***blanket moratorium***" which winds-back the ability to apply for a permit to deal with GMOs in Tasmania. Again, legislation would be required to implement this option. Under a blanket ban option issues to consider would include the approach taken to R&D into GMOs, and the need to recognise pre-existing permits and management arrangements of historical canola trial sites; or

3. A "***co-existence by regulation regime***", with specific legislative provisions to exempt certain crops from the moratorium, for example non-food crops, with Government controls on how the crop is grown and managed throughout the supply chain via mandatory standards and protocols.

For the option of a co-existence by regulation regime, the current legislation could be amended to allow for GM-designated areas where only certain GM crops could be grown, and/or to allow for exemptions to be granted on specific GM crops.

Some submissions[211] raised the need for participatory and transparent decision-making. [212] The current Tasmanian legislation does not require public or stakeholder input when the Minister is considering declaring GMO-free areas[213] and when the Secretary is assessing an application for a permit to deal with a GMO.[214]

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[210] For further information on the regulatory position of other States, refer to the issues Paper for this Review.

[211] For example, submission 124

[212] This is a separate question to the consultation processes employed by the OGTR. The OGTR invites submissions when assessing applications for licences under the Commonwealth legislation, which regulates risks to the environment and human health and safety. The Tasmanian legislation regulates for marketing purposes only.

[213] Under the South Australian *Genetically Modified Crops Management Act 2004* the Minister is required to undertake a public consultation process prior to recommending that the Governor make a regulation declaring GM or non-GM crop areas.

To date this has not been a major issue, with numerous reviews before a decision has been made on whether the moratorium should be extended and limited applications of GMOs being relevant to Tasmania. However, any future decisions, either approving or rejecting dealings with GMOs, will generate considerable public interest.

Investigation of any option other than a blanket moratorium will raise a fundamental question: "what is the 'watershed' event that tips the balance from GM-free to GM for marketing purposes?" Some suggest that this has already happened in Tasmania with the GM canola trials in the late 1990s and early 2000s[215], while the Project Team observes that this could be when the first commercial GM crop, either a food or non-food crop, is planted in Tasmania.

In that event, consideration must then turn to how co-existence between GM and non-GM crops can be managed. The issues associated with co-existence are discussed in detail in the next Finding in this Report.

DISCUSSION

As outlined in the Background to this Report, the majority of submissions supported the continuation of a GM moratorium in Tasmania, 11 were against maintaining the moratorium and four expressed no particular position either way.

Views as to an appropriate length of the moratorium, not unexpectedly, ranged from zero to indefinite, yet the majority of respondents to the question of how long should a moratorium remain indicated that it should be for 10 or more years. Some stated that this would be long enough for GMO-free markets to develop while others suggested that as soon as research and development of benefit to Tasmania emerge, the moratorium should be lifted either wholly or on a case-by-case basis.

Open co-existence

An open co-existence regime, where there is no moratorium, can be considered as one where the national regulatory regime is the primary system for managing risks to the environment and human health and safety from the release of GMOs, and market impacts are left to industry self-regulation.

Of the submissions against any continuation of the moratorium, Ausbiotech and the ADIC[216] advocated a "Market Choice" framework. Using GM canola as an example, this framework effectively recognises industry's ability to manage marketing aspects of co-existence under the national regulatory regime. The following table, from Australian Oilseeds,[217] was provided by ADIC to illustrate the GM canola Market Choice model:

[214] Contrast with section 6 of the South Australian *Genetically Modified Crops Management Act 2004* where the Minister must consult the Advisory Committee.

[215] See for example submission 112.

[216] Submissions 95 and 111

[217] Adapted from Australian Oilseeds, n.d, *Delivering Market Choice with GM canola*, http://australianoilseeds.com.

Step	Action
1	Australian regulatory approval gained for GM varieties
2	Market requirements identified • Need for segregation to meet the various requirements of domestic and international consumers
3	Threshold levels established • Australian AP thresholds established for the presence of GM traits in canola at 0.5% for seed (Australian Seed Federation) and 0.9% for grain (NACMA CSO1 Canola standard) • AP thresholds established in key trading partners, such as Japan (5%) and Europe (0.9%), for contractual or labelling purposes
4	Importing market approvals in place • GM varieties have approvals in key importing countries
5	Supply chain processes to meet market requirements • Protocols available to segregate throughout the supply chain

Expiry of the *Genetically Modified Organisms Control Act 2004* (Tas) would pave the way for the GM canola Market Choice (or similar) model to be implemented in Tasmania by participating industries.

The "status quo"

As the moratorium is achieved through a legislative mechanism, any extension of it must be made by the Tasmanian Parliament as an amendment to the *Genetically Modified Organisms Control Act 2004* (Tas), ("the Tasmanian Act").

Legislative options for extending the moratorium in its current form could include:

1. Repealing section 36 of the Tasmanian Act , that is, to remove any reference to an expiry date in legislation; or
2. Amending section 36 by inserting a new expiry date.

The Tasmanian Act currently provides for, among other things:

1. The Minister to declare the whole or any part of Tasmania to be an area that is free of GMOs if he or she considers that to do so would aid in preserving the identity of non-GM crops and animals for marketing purposes (section 5);
2. A prohibition on dealing with GMOs in a GMO-free area (part 2);
3. Exceptions from the prohibition for those who have obtained a GMO licence from the Gene Technology Regulator (when required under the *Gene Technology Act 2000* (Cth)) and a permit under the Act; and
4. Power for the Secretary (DPIPWE) to grant permission to a person to deal with a GMO in a GMO-free area.

It is important to note that the Tasmanian Act does not give the Minister power to declare GM areas, or areas on a crop-by-crop basis. Rather, if the Minister was to declare some areas of the State to be GM-free areas, the remaining areas would be GM permitted areas, by default.

It should also be noted that there is no statutory requirement for the Minister to consult with any person, group or industry prior to declaring GMO-free areas.

A "blanket" moratorium

Many submissions argued for stronger controls so that no GMO plants or animals can be permitted in Tasmania. As the current legislation allows for permits and limited exemptions (for inadvertent dealings) any decision to retract those aspects of the moratorium may require removal of relevant provisions from the legislation.

There are two issues that would need further consideration if there was to be a blanket moratorium. The first relates to how the ban would apply to R&D into GMOs. For example, a blanket moratorium could apply to all dealings with GMOs, including R&D trials and contained research. Alternatively the blanket moratorium could apply to the release to the environment of GMOs for commercial purposes only, leaving open the possibility for R&D into GMOs. The second issue relates to how the historical GM canola trial sites in Tasmania would be recognised to avoid a potential situation where volunteer GM canola plants could put the landholder in breach of the moratorium.[218] In this case the legislation may require specific provisions to recognise the pre-existing permits and management arrangements for the trial sites, which aim to eradicate any GM volunteer plants.

Co-existence by regulation

Some submissions advocated for automatic exemptions for non-food crops, such as GM poppies, other GM pharmaceutical plants and GM pastures for dairy and grazing. The TFGA and TAPG also raised the idea of "triggers" for all or part of the moratorium to be lifted.

Contrary to the assertions made in some submissions, the Tasmanian Act does not currently contain specific provisions that exempt certain crops or products from the moratorium. The legislation contains limited exemptions in section 19 for people who unintentionally deal with a GMO in a GMO-free area, but it appears that this exemption provision is directed towards inadvertent dealings. This is likely not the type of exemption that some submissions advocated for.

A person wishing to deal with GM crops in a GMO-free area can currently be granted a permit to do so, but that permit is on a case-by-case basis and applies only to the applicant and other people named in the site management plan. The permit does not attach to the particular GMO crop per se.[219]. In order for a permit to be issued, the Secretary is to consider the items set out in section 9(2) of the Act.[220] Clearly any person wishing to "deal" with a GMO can apply to the Secretary (DPIPWE) for a permit to do so, once a valid

[218] For further information on the management of the historical GM canola trial sites in Tasmania see the Issues Paper for this Review, or the DPIPWE website.
[219] The Issues Paper for this review provides further information on the permits issues in Tasmania for dealing with GMOs (page 14).
[220] For a detailed discussion of these elements, refer to Finding 3 of this Report.

licence from the GTR has been obtained (if required). [221] A permit, if approved, would be issued to a particular person and is not blanket coverage for anyone to grow a particular GM crop.

Exempting certain crops from the moratorium would likely require moving to a "co-existence by regulation regime". In this scenario the Government would need to consider mechanisms to tightly control the GM crop, so that the risks associated with it co-existing with other non-GM crops or enterprises are managed. It is likely that legislative changes would be required.

First, the Tasmanian Act does not allow the Minister to declare GMO areas or restrict those areas to certain GM crops. Here a comparison can be drawn between the Tasmanian Act and the South Australian *Genetically Modified Crops Management Act 2004*, under which the Governor may designate GM-food crop free areas or GM areas where only certain GM food crops may be cultivated (section 5). Once an area has been designated the Minister may declare that specified GM crops are able to be cultivated in the area, provided that appropriate and effective co-existence systems are in place and are reasonably expected to be complied with (section 5(5)). The South Australian legislation may provide for a more flexible moratorium arrangement that can allow for certain GM crops to be cultivated in areas across the State.

Alternatively, the current legislation could be amended to grant exemptions for specific GM crops. The growing of any exempt GM crop and how it is managed throughout the supply chain, could conceivably then be controlled through notification and reporting requirements, as well as standards and protocols, that are mandated in legislation (or in supporting regulation).

The TFGA and TAPG also both indicated qualified support for a short continuation of a moratorium as there are no new GM crops in the immediate pipeline, and advocated for "triggers" to be established so that any moratorium in place could be reviewed. It was not entirely clear from these submissions what those "triggers" could be; however, technological change, increased availability of GMO products and shifts in consumer market trends (presumably towards greater acceptance of GMOs) were mentioned in this context.[222]

The discussion in Finding 2 on establishing a formal mechanism for Government and stakeholders to monitor future developments is relevant in this context. It was noted that second and third generation trait developments, technical development and potential economic and market implications would need to be monitored over time. Such information could then be used to inform policy decision making at a future point in time.

Aside from the sunset clause in section 36, the Tasmanian Act does not currently provide triggers as such for winding back the moratorium in whole or in part, although at any time Parliament can conceivably decide to repeal or amend the legislation. However, the development and passage of legislation through Parliament is typically a lengthy and involved process.

In terms of stakeholder engagement, the Act currently does not contain any statutory requirement for the Secretary to consult any person prior to granting or refusing a permit to deal with a GMO in a GMO-free area. The Secretary has the power to require the applicant to provide further information (s.8(3)), and consider any other matter the Secretary considers relevant (s.9(2)(d)). It is considered that these powers could be used by the Secretary to obtain further details relevant to market access and other relevant

[221] Note that there are rights of administrative and judicial review under the *Genetically Modified Organisms Control Act 2004* (Tas) so any such decision, is subject to review by those with standing to appeal.
[222] Submissions 109 and 61 respectively.

considerations, and to consider the terms of any Policy Statements[223] as relevant direction from the Government of the day, but do not necessarily equate to a public consultation process. Moving to exempt certain crops would necessitate giving further consideration to stakeholder consultation processes.

What is the "watershed" event?

Notwithstanding the mechanics of how to manage any future moratorium as described in the above options, the "watershed" event is a fundamental policy question to be satisfied before any measure other than a blanket moratorium is imposed.

The decision to release a GM crop has been described in New Zealand as the "watershed" decision because at that point "we would no longer be a genetic modification-free nation in terms of crops" (Royal Commission on Genetic Modification, "RCGM", 2001, p338). The Project Team concurs with this finding of the RCGM, and considers that, in the Tasmanian context the first commercial release of a GM crop into the Tasmanian environment could be considered our "watershed" event. At that point our State could no longer market itself as "GMO-free".

This position is in contrast to the submission of Mark Poll, who cited the persistence of GM canola from the field trials in Tasmania in the late 1990s and early 2000s as evidence that the GM-free balance had already tipped.[224] In this case, the Project Team considers that because the GM canola in question was not permitted for commercial release, is relatively small-scale and is being actively managed and audited for eradication, it does not materially impact on the State's ability to market itself as GMO-free.

Depending on the market segment, submissions differed on whether commercial release of a non-food GM crop would allow the State, and individual businesses, to continue to market as "GMO-free". The first test when contemplating the future policy on the moratorium is therefore whether permitting the commercial release of any GM crop would put at risk the benefits arising from the moratorium for marketing purposes. If it does not, then it becomes a question of how to manage for co-existence between GM and non-GM crops.

Managing co-existence is explored in detail in Finding 6 in this Report.

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[223] For example the current *Policy Statement: gene technology and Tasmanian primary industries 2009-2014*.
[224] Submission 112.

6) MANAGING CO-EXISTENCE OF GM AND NON-GM CROPS

FINDING

Co-existence is a complex policy area. An appropriate co-existence framework would be required if any GM crop were permitted to be grown in Tasmania. Given the range of issues involved, developing such a framework would require input from industry and other stakeholders. The framework would need to include protocols, standards and thresholds, as well as new marketing strategies to reassure non-GM markets. The roles of each party, Government and industry, would also need to be clearly defined and the question of who pays to manage for co-existence resolved.

Co-existence across non-GM production systems and crops is already occurring in Tasmania. However co-existence would become much more complicated following the introduction of a GM crop in Tasmania. As soon as the commercial release of a GMO to the environment, either a food or non-food crop, is contemplated it raises a number of inter-related issues including segregation, risk of contamination to non-GM crops (including organics), thresholds (adventitious presence and low level presence of GM) and legal liability.

There are different approaches that Tasmania could consider for establishing a co-existence framework to manage the introduction of a GM crop. To segregate GM from non-GM materials on-farm and in supply chains the options include regulatory standards and protocols and/or industry certification systems.

Segregating and managing the risk of contamination between non-GM and GM crops is likely more feasible for some crops than others: e.g. pharmaceutical poppies are already a highly regulated crop. However, regardless of any co-existence framework introduced, there will always be some risk of contamination. It is noted that contamination may occur to non-GM crops from GM crops, and also vice versa.

However, co-existence occurs at two levels. Beyond physical segregation, there is the additional complexity of whether Tasmanian products, either GM or non-GM, can co-exist in the marketplace without causing economic harm to particular products, markets or the Tasmanian brand as a whole.

The Government's role in managing co-existence would seem more straightforward if the State's policy position was absolute: either to have a blanket ban on dealings with GMOs, or to allow the moratorium to lapse so that GMOs would be entirely regulated through the existing national system. In the former case, the issue of co-existence generally becomes one of managing the quarantine barrier for imports of GM materials through appropriate thresholds, testing and audits. The latter becomes a "case-by-case" approach with a clearer onus on the industry to develop appropriate co-existence protocols to segregate GM from non-GM in the supply chain, with disputes managed through the courts and industry self-regulation of the marketing aspects. The marketing position is also clearer in either case, i.e. Tasmania is either entirely GMO-free or it is no longer GMO- free.

Co-existence is more complex to manage if the policy is to maintain a moratorium to protect non-GM market opportunities, but potentially provide for the commercial release of specific GM crops, e.g. non-food crops. In this case the co-existence framework has to manage the risk of contamination both between GM and non-GM crops (in the field and in the supply chain) and between different production systems, e.g. organic and conventional. It also needs to protect the integrity of the moratorium itself and manage the market perceptions to maintain the very values (markets, future opportunities and Tasmanian brand position) for those other sectors relying on non-GM. Marketing is also more complex as Tasmania's GMO status becomes more complex to explain to markets and consumers.

An issue that will also require further consideration is who pays the additional costs associated with managing for co-existence. For example, the costs include monitoring, reporting, compliance, auditing, physical segregation of materials in the field and at point of harvest, logistics in the supply chain, plus the marketing strategies to manage Tasmania's non-GM markets and brand positioning.

Regardless of the policy position on the moratorium, it will become increasingly difficult for Tasmania to sustain a zero-tolerance position on GMO materials. As time progresses and the presence of GM plants increases in Australia it is likely the only way to mitigate risk at a "zero tolerance" level would be to increase regulation – e.g. testing of all seed and grain entering Tasmania for GMOs, not just canola. This would be costly and impractical and could lead to Tasmania being unable to access some product or having to ban at-risk commodities. For feed grain that would not be feasible as Tasmania is a net importer of feed grain and we would have a range of issues, including animal welfare, arising for feed grain dependent industries. If any GM crops, food or non-food, are permitted in Tasmania the issue of thresholds will become even more pressing.

Therefore the issue of thresholds also warrants further consideration by Government, in consultation with industry and other stakeholders, in preparation for a time when additional GM crop types are commercially grown interstate in the future, and as part of determining the longer term policy on GMOs.

Associated with the issue of co-existence is the question of legal liability and the concerns of non-GM and organic farmers who may suffer contamination and economic loss in the event that GM crops are approved for release in Tasmania. All Australian jurisdictions have agreed that compensation for GM contamination should be sought through the courts rather than enacting specific civil liability laws. This is consistent with other jurisdictions, other than New Zealand, although it can be seen that the New Zealand strict liability scheme is not absolute and compliance with regulatory requirements for environmental release of a GMO is likely to affect the success of any action for compensation.

The ability of common law to address GM contamination and subsequent economic loss remains unclear in Australia, making it difficult for GM and non-GM farmers and producers alike to accurately assess their legal risks from GM crops. Questions remain about the ability of the liability system in Australia to deal with GM contamination under a co-existence framework. It is recognised however, that the potential exists for non-GM and organic farmers to inadvertently infringe Federal gene technology, intellectual property and consumer laws in the event of GM contamination.

DISCUSSION

Co-existence: managing segregation

As noted previously in this Report, numerous submissions stated that it is not possible for GM and non-GM crops to co-exist, whereas some submissions stated that co-existence between GM and non-GM is entirely possible and should not be a barrier to GMO adoption. Others highlighted the well regulated non-food crop of poppies as a highly suitable crop for Tasmania to manage in terms of co-existence because of its established risk management systems.

In Tasmania, our agricultural supply chains have been managing the co-existence of different production systems for many years. Industrial hemp and poppies are two examples of regulated non-food crops that currently co-exist with other food crops. Tasmanian producers already choose between wholly certified organic/biodynamic or conventional production systems.

Tasmania can look to other jurisdictions for examples of how to establish co-existence frameworks to segregate GM and non-GM crops.

For the introduction of GM canola in Western Australia from 2009 a two stage process was adopted to first assess and then manage co-existence. During the first year there were only limited plantings and analysis of the capacity of the grains industry to manage segregation, with the second year comprising permitted plantings with further assessments of the effectiveness of segregation (McCauley et al, 2012).

In January 2011, a broad range of industry representatives met in Western Australia to consider management of the co-existence of GM, conventional (non-GM) and the organic production systems (McCauley et al, 2012). The main finding was that:

> Growers from all three farming systems should conduct their risk assessments and implement risk mitigation strategies before planting. Communication between neighbours is the key to co-existence of different farming systems. Due to the uncontrolled forces of nature, it is not possible to completely eliminate the risk of accidental GM presence on neighbouring properties and therefore communication between neighbours and relevant parties such as local government, contractors and service utilities … is required.

New Zealand has adopted a "preserving opportunities" approach. This requires each GM crop or field use to be treated on a case-by-case basis. It establishes an intermediate step ("conditional release") between field testing and open release with a range of mitigation measures proposed to achieve crop capability and to protect environmental and cultural values (RCGM, 2001). However, as noted in the Issues Paper for this Review, New Zealand is yet to "reality test" its stepped approach because as yet, and despite it being possible to do so, no GM crops are grown commercially in that country.

Even with an effective assessment process to approve co-existence of GM crops, challenges can still emerge after commercial release. As the existing zero tolerance position of the organic industry remains, any staged approach for the commercial release of GM crops could create a challenge in the organic sector (Australian Government, 2011b). Any risk would depend on the nature of the GM crop, its location and the management of the GM crop along its specific supply chain.

In GM growing regions, two typical co-existence regulation measures include isolation distances and pollen barriers. These measures have been adopted widely for the commercial production of GM canola and GM cotton in Australia. Mandatory isolation distances do not affect all farmers equally, so growing GM crops in "clusters" can be easier with levels of adventitious presence below a target threshold achieved "simply by cleaning shared equipment" (EC, 2006).

Some of the submissions noted that specific areas could be established for GM production. However if these were to be considered, overseas experience highlights that they need to be proportional and time-based around various crop rotations, to manage co-existence effectively (Demont and Demos, 2008). As noted previously in this Report, under current legislation, the Minister can only declare GMO-free areas, which by default could create areas where GMO production is permitted.

Experience in the EU shows co-existence problems emerge in seed and honey production in particular (EC, 2012). The OCT[225] and the Tasmanian Beekeepers Association[226] suggested that contamination of non-GM crops by GM crops is a proven risk with resulting impacts on certification and additional costs incurred in trying to prevent contamination.

A further challenge that Tasmania would need to consider is managing co-existence of GM and non-GM across supply chains. Beyond the farm gate, co-existence is not easily addressed as there are different components and management systems along supply chains and there can also be different strategies for handling co-existence between food and feed sectors (Co-Extra, 2013).

The Issues Paper for this Review discussed assurance systems. Estelle Ross[227] suggested the "Non-GMO Project" as a verification system that Tasmania could adopt for verification of non-GM. However, the ADIC[228] presented the existing "Market Choice" system as an effective process for managing co-existence. Croplife[229] noted that co-existence frameworks are easily audited with sampling and testing regimes. Overseas experience highlights that "suitable technical and organisational measures during cultivation, harvest, transport and storage may be necessary to ensure coexistence" and to maintain the levels of adventitious presence of GM material below labelling thresholds (EC, 2006).

Co-existence: managing market impacts

Even less certain than segregating GM from non-GM products on-farm or in supply chains, is whether managing co-existence in the marketplace is possible. That is, can Tasmania promote and sell product as "clean and green" in some markets, at the same time as producing specific GM-derived products for another market. This is the critical question at this point in time and particularly relates to the question of whether non-food GM crops should be permitted.

As referred to previously in this Report, the Review received strong representations in some submissions that allowing any GMOs would negatively impact on Tasmania's brand as a whole, and on the ability of some sectors to market their produce and to achieve premium prices. Some submissions implied that this "brand-damage" would apply even if their product was completely unrelated to a particular GMO-product. However, other submissions generally discounted the value of the clean, green and GMO-free brand proposition in delivering market advantages or price premiums anyway. PGT[230] was adamant that there is "no meaningful link between relevant markets for food products and the markets they target for narcotic raw materials, and pharmaceuticals generally".

The international and domestic market research conducted for this Review[231] would indicate that consumers and retailer perceptions of Tasmanian products would likely not differentiate between GM food and non-food products. "Any extension of GMOs into non-food products may raise consumer concerns, however, this is likely impacted by the media exposure generated by any change" (FreshLogic 2013).

[225] Submission 039
[226] Submission 041
[227] Submission 011
[228] Submission 111
[229] Submission 089
[230] Submission 082
[231] Refer to finding number 1 for further information.

The answer is not straightforward. However, what is clear is that to address the question of co-existence in the marketplace, the Government would need to engage closely with those sectors trading on Tasmania's GMO-free status to reinforce brand credentials, allay any concerns and retain market confidence. Based on submissions it is highly likely that there would be claims on Government to provide the resources for specific marketing strategies. The issues associated with developing GMO-free markets were explored further under Finding 1 of this Report.

Thresholds: Zero Tolerance

Thresholds or tolerance levels are the maximum allowable level of adventitious (unintended) presence of GM material set by regulators and/or markets (ACIL, 2005; Victorian Government, 2012). Overseas experience highlights that some industries may request high thresholds (Demont and Devos, 2008), whereas many of the Review submissions were clear that they sought low or zero limits.

In 2005, the Primary Industries Ministerial Council (PIMC) agreed to "adopt threshold levels for canola grain and seed approved by the OGTR of 0.9 per cent GM seed for canola crop and 0.5 per cent GM seed for commercial seed for sowing" (Emslie et al, 2007). These levels are consistent with other areas such as the European Union.

Tasmania's current policy position is different to that of other States, in that our threshold for GM material is zero tolerance[232]. Some of the submissions, such as TIA's,[233] urged regulators to "rethink the approach to zero tolerance levels" where as others such as Toehold Farm[234] note that GMO-freedom "cannot be guaranteed for the State (due to former trial sites)".

David Armstrong[235] noted that "Tasmania could not claim to be GMO-free as some of the livestock feeds we import probably contain GMO materials". In 2006-07, an estimated 487,200 tonnes of GM material was used in Australia in animal feed, representing approximately five per cent of "total grain and grain products used in animal feed that year" (Australian Government, 2011a). Tasmania is a net importer of stock feed (Field, 2013). However, as mentioned in the Issues Paper for this Review,[236] imports of GMOs in Tasmania are tightly regulated through import requirements and this includes canola and other seed and grain.

Annual wheat imports into Tasmania have averaged between 80,000-90,000 tonnes over the last two years and it is anticipated that an extra 67,000 tonnes will be required by the dairy industry alone in the next five years (Field, 2013). It should be noted at present there are no GM wheat crops grown commercially in the world.

Maintaining the zero tolerance level for contamination by GM crops in future could result in increased analysis requirements on imports of grain and seeds, which would increase costs for importers/exporters of the product. This would be especially so if and as more genetically modified seed and grain crops are grown commercially interstate. To maintain a zero tolerance of such contamination in Tasmania, the State would

[232] Tested canola grain and seed is deemed to meet this threshold standard if tests are undertaken such that a level of contamination by GM material of 0.01% would be detected with a probability of 95% and the test has returned a negative result for GM events known to have been inserted into canola.
[233] Submission 038
[234] Submission 104
[235] Submission 022
[236] Pages 16 and 17

need to maintain the same testing regime as at present (testing to the limits of detection), but across a wider range of seed and grain commodities.

Testing to the limit of detection is more expensive than testing to a threshold level of adventitious presence as, for the latter, fewer samples are involved and testing time is reduced. At present GMO testing only applies to canola grain and seed as it is the only commercial GMO crop being grown of relevance to Tasmania (Tasmanian Government, 2012e). The wider availability of GM seeds and grains could result in increased regulatory burden and costs on importers/exporters inasmuch as additional sensitive testing would be required. The alternative would see such commodities no longer being available to Tasmania due to the costs involved. Where feed grain is involved it should also be noted that even allowing and enforcing a threshold value of adventitious presence, for certain grades of feed grain, may still be uneconomic for exporters/importers of the feed grain.

As well as adventitious (unintended) presence, another issue of increasing importance globally is the low level presence (LLP) of GM material in non-GM crops[237]. LLP refers to: "the unintended presence, at low levels, of a GM event which has undergone a full science-based safety assessment and has been approved in accordance with the Codex Plant Guidelines for food (and domestic regulatory process for feed and environment) in at least one country but not in the country of import" (Tranberg, 2013). Overseas research has shown that the most sophisticated infrastructure cannot prevent different crops or crop varieties from potentially coming into contact with one another (Stein & Rodriquez-Cerezo, 2010; Tranberg, 2013).

For Tasmania, this issue arises because licensed GM crops are grown in other States and, through the everyday importing of seeds and grains, there is the increased risk that GM material may end up in Tasmania at low levels. This will likely become a greater challenge for the State to manage, particularly as the occurrence of LLP is also likely to increase interstate with the adoption of more GM crops.

To deal with this problem, the experience of the Organisation for Economic Cooperation and Development (OECD) indicates that Tasmania, like other States and overseas countries, may need to continue to manage the LLP problem by dealing with any environmental risks and returning the situation to compliance with relevant legislation (OECD, 2013).

In summary, given the growing need to import material such as seed and grains into Tasmania, for either stock feed or propagating crops, the Project Team observes that it will be increasingly difficult to maintain a zero tolerance position for GMOs as the means to manage for either adventitious presence or low level presence. Moreover if any GM crops, food or non-food, are permitted in Tasmania the issue of thresholds will become even more relevant.

Co-existence case-studies

Submissions to the Review highlighted that the most immediate issue for Tasmania to confront is how to manage co-existence for poppies, pastures, canola, animal feed, honey and organics. The following case-

[237] The Project Team notes that there are differing views on what the difference is between adventitious (unintended) presence (AP) and low level presence (LLP). For the purposes of this Review, AP is considered an event where GM material is unintentionally or accidentally introduced into the State. An example is the Grace canola unintentional release in Tasmania in 2003-04 (refer to the Issues Paper for this Review, pages 17-18, for further information). LLP is where GM material has received full regulatory approval and is commercially produced in other States and, even though it has not received approval for commercial release in this State, due to the levels of commercial production of the GM crop we can reasonably anticipate a LLP of GM material in some products imported into Tasmania.

studies look at the question of whether co-existence through effective segregation is possible for each of these sectors.

a) Poppies

As submissions from the poppy industry confirmed, it is a Government requirement that all stages of growing and production are carefully controlled, and there are strict regulatory requirements in place coordinated by the Poppy Advisory and Control Board (Macquarie Franklin, 2012b). The poppy industry considers that the existing regulatory environment makes the poppy industry highly suited for GM non-food production in Tasmania.

Poppy Growers Tasmania (PGT) [238] suggests that a "limited moratorium on herbicide resistant poppies could be feasible in order to enable scientific analysis of the benefits and any risks associated with such use". PGT[239] also suggest that a "focus on GM poppy breeding to 'poppy only' genes would be in keeping with trends overseas introducing genes from the plant family, not genes foreign to the species".

Is it possible to set appropriate tolerance levels?

As GM poppies are not currently grown in commercial quantities in any jurisdiction across the globe, there are no existing industry tolerance levels in place. None of the submissions from the poppy industry suggested tolerance levels of GM and non-GM poppy material. Thresholds for low level presence would need to be determined with stakeholders.

Managing contamination

PGT[240] argued in their submission that "history shows that Tasmanian poppy DNA stays intact within the poppy". However, GlaxoSmithKline Australia (GSK) [241] noted that "in Tasmania, growers are contracted by the processing companies to sow commercial poppy crops and as such may be growing for up to three companies on the same farm". GSK[242] considered "that it may be virtually impossible to prevent cross-pollination between GM and non-GM poppy crops".

If GM poppy crops were grown in Tasmania, clearly there would need to be extra segregation measures in place to prevent cross-pollination of poppy cultivars on-farm as well as across farming landscapes. GSK[243] raised the concern of lateral gene transfer of herbicide tolerance to wild weed populations. There will need to be management of the probability of contamination occurring in five species of wild poppies identified as weeds in commercial poppy crops in Tasmania, particularly *P. somniferum* spp. *Setigerum* L. (Bishop, 2001).

Industry would need to carefully consider what components of the poppy supply chain are excluded (such as seed for culinary uses). GSK[244] noted "challenges with seed being so small it is easily spread by wind, machinery, livestock, foot and vehicle traffic". Segregation for harvesting, transportation and processing would need to be managed by industry.

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[238] Submission 082
[239] ibid
[240] Submission 082
[241] Submission 158
[242] ibid
[243] ibid
[244] ibid

As GSK[245] also pointed out, "industry also needs to consider management and control of poppy regrowth within a paddock utilised for a different crop, or different poppy cultivar belonging to a competing company in the following season". GSK[246] noted "the possibility for legal issues to arise for both growers and the three competing poppy companies in terms of cultivar ownership and patent rights".

Regulatory burden

This industry is already highly regulated. However, the sector would need to manage increased regulation if GM poppy production was introduced.

Summary

The poppy industry is currently highly regulated. It is potentially suited to manage co-existence of a non-food GM crop. However the existing regulatory regime and production requirements would need to alter to accommodate GM varieties and the following may need to be considered:

Requirement (Conventional)	Changes to Existing production system
Accredited Production System	Systems already exist as the industry highly regulated. Would need to be adjusted to address the GM issues
Notification requirements	The existing system already has requirements in place for statutory authorities and neighbours. Would need to be adjusted to address the GM issues
Property and farm system requirements	The existing system requires systems for pesticides, herbicides, fertilisers. Would need to be adjusted to address the GM issues.
Market thresholds in produce	The threshold in produce for GM material is unknown.
Consequence of exceeding market thresholds	Unknown
Regulatory burden to industry	Already highly regulated but may be additional regulation due to GM crops
Indicated impact to industry with GM	Indicated to be positive

[245] ibid
[246] ibid

b) Pastures

Is it possible to set appropriate tolerance levels?

No GM pastures are produced commercially in Australia. No submission from the dairy industry indicated what a suitable tolerance level for GM pasture seeds would be. The ADIC[247] highlighted that industry has relevant thresholds to manage tolerance of GM contamination. Other jurisdictions like Victoria have agreed to "allow the market to determine whether segregation in GM and non-GM canola in the supply chain is required" (Victorian Government, 2013).

It is assumed that existing thresholds (as agreed by PIMC) that are used for GM crops such as canola and cotton could be adopted for other GM crops, though this may be influenced by the agronomic characteristics of the crop in question.

Managing contamination

The ADIC[248] noted that the "Market Choice" system demonstrates the industry's ability to manage co-existence through market requirements, identified thresholds and supply chain processes. However, it might not be that simple for pastures as compared with annual crops. According to a recent report from a New Zealand organisation, "Government officials describe grass pollen as 'notoriously difficult to contain' and warn of GM grasses becoming 'irreversibly established in the environment' and 'permanent components of New Zealand's pasture and dairy production systems'." (Sustainability Council of New Zealand, SCNZ, 2011)

This issue is perhaps best summarised by the submission from Fat Pig Kitchen[249]: "while in its infancy and research phase, the reality is that ryegrass can cross-pollinate with other ryegrass in the vicinity, and infest neighbouring paddocks." Other submissions noted that ryegrass is in extremely widespread use in Tasmania and questioned how it would be possible to differentiate the non-GM ryegrass pasture from a GM one.

Regulatory burden

Although no submission commented on the cost to manage co-existence and segregation, the regulatory burden on industry is anticipated to be significant. A New Zealand report investigating the introduction of GM grasses estimates "… the loss of premiums, separation distances and testing costs to assure customers of the GM-free status of production systems at between $3.1 to $12 million per annum" (SCNZ, 2011).

Summary

GM pasture production would be problematic to manage for co-existence in Tasmania. If the existing production system requirements were to alter, the following may need to be considered:

247 Submission 111
248 ibid
249 Submission 097

Requirement (Conventional)	Changes to existing production system
Accredited Production System	Would need to be adjusted for GM material
Notification requirements	Would need to be adjusted for GM material
Property and farm system requirements	Would need to be adjusted for GM material
Market thresholds in produce	No specific thresholds in place for pasture as no GM pasture crop currently grown commercially. Would need to meet specific industry thresholds once set.
Consequence of exceeding market thresholds	Indicated to be significant
Regulatory burden to industry	Would be sizeable
Indicated impact to industry with GM	Indicated to be positive for livestock productivity but could have loss to beef markets in export markets such as Japan.

c) Canola

As the only GM food crop approved in Australia that could potentially be grown in Tasmania, managing co-existence for canola provides insights into the likely issues if GM seeds and grains were introduced. The management of the former Tasmanian GM canola trial sites is discussed in the Issues Paper for this Review.

Is it possible to set appropriate tolerance levels?

Sources of adventitious presence for seeds can include machinery, transport and storage processes and cross-pollination. Joy Phillips from Heritage Seeds[250] stressed the concerns regarding cross-pollination and transport between areas and did not think co-existence could occur. Joy Phillips considered that Tasmania's future is in niche markets such as specialty non-GM seed production.

In 2005, PIMC specified AP thresholds for GM canola approved by the Gene Technology Regulator of 0.9 per cent in non-GM canola grain and 0.5 per cent in non-GM canola seed for sowing. These thresholds are also agreed nationally by the Australian seed and grain industries (Mewett et al, 2008).

Seed purity is a crucial basic factor of co-existence "with any seed threshold largely lower than labelling to leave enough leeway to make coexistence possible at the field level" (Co-Extra, 2013). Results from overseas indicate that maintaining a threshold of 0.1 per cent, particularly for canola, is extremely demanding with additional production management measures meaning an increase in production costs of up to 40 per cent

[250] Submission 135

(GMO Compass, 2006a). PGG Wrightson Seeds[251] believes that the removal of bans on GM crops in New South Wales and Victoria is evidence that the grain industry can manage co-existence problems.

Ute Muller[252] highlighted the point made by many organic sector submissions, that organic certifiers in Australia have zero tolerance for GMO in organically certified produce.

Managing contamination

Seed production is organised in plots. The examples of GM canola and GM cotton in Australia indicate that production systems and associated supply chain system requirements can be adjusted to meet the needs of GM crop production. Arranging GM and non-GM seed plots would need to consider ensuring optimum orientation with respect to the dominant wind direction, growing varieties with different flowering times, isolation distances (depending on the seed, this can range from 100m to 600m) and contract arrangements between growers involved in the same seed production group and the seed company (EC, 2006).

Regulatory burden

Due to the nature of seeds and grains and the specific requirements along the supply chain, there would be an extra regulatory burden to industry for GM canola production.

Summary

GM canola production would be problematic to manage for co-existence in Tasmania. If the existing production requirements were required to alter, the following may need to be considered:

Requirement (Conventional)	Change to Existing production system
Accredited Production System	Depending on the crop, would need to be adjusted for GM
Notification requirements	Depending on the crop, would need to be adjusted for GM
Property and farm system requirements	Depending on the crop would need to be adjusted for GM
Market thresholds in produce	Existing thresholds for GM are 0.9% GM seed for canola crop and 0.5% GM seed for commercial seed for sowing
Consequence of exceeding market thresholds	Indicated to be significant
Regulatory burden to industry	Would be sizeable
Indicated impact to industry with GM	Indicated to be positive for productivity but could have loss to seed and grain markets in export countries that are seeking GM-free (such as some countries in Europe).

[251] Submission 089
[252] Submission 001

d) Honey/Bees

Is it possible to set appropriate tolerance levels?

GM pollen will normally be derived from commodity crops when hives are located near to experimental GM crops or locations where there are high levels of GM commodity crops (EP, 2013). It has been reported that "the maximum distance honey bees may forage is up to 13.5km from the hive" (EP, 2013). An international workshop on GMOs and honey proposed "… a range in size of isolation zones from flowering GMO crops … varying between 1-10km; but typically about 5km" (EP, 2013).

Good production practices would keep beekeepers informed if they were within a certain perimeter of GM crops. Co-existence measures for crops such as maize in areas like the EU "have isolation distances that range between 25-600m for conventional maize and 50m-600m for organic maize which are insufficient to protect against GMO transmission to honey" (EP, 2013).

Current organic standards specify that bees may only forage on organic crops or natural flora and that "hives must be placed more than five kilometres from either conventional or GM crops" (Australian Government, 2011b). PGT[253] noted "that it is inconceivable that poppy pollen, let alone GM poppy pollen could contaminate leatherwood honey as the source of honey is hundreds of kilometres from the major growing regions of poppy". Nevertheless, some Tasmanian honey producers are certified organic and they would risk the loss of their certification if GM pollen was evident in their honey; this is a reasonable possibility if hives are located within a bee's flight distance from a GM crop.

The marketing of non-authorised GMOs and ingredients derived from them "is not permitted in the EU" (EP, 2013). Accurate detection of GM pollen DNA is problematic and, as at the end of May 2013, "there was no GM pollen standards available … and potentially would be difficult to produce" (EP, 2013). The Tasmanian Beekeepers Association[254] noted that if pollen in the EU is defined as a "natural constituent" then testing and labelling would not be required as traces of GM pollen would account for less than 0.9 per cent of the final product (the threshold trigger). The Project Team notes that the EU is still to finalise its position on pollen.

Managing contamination

In addition to managing the location of hives, attention would need to be given to the risk of volunteers (i.e. inadvertently germinated GM plants from previous plantings) releasing GM pollen in subsequent years if GM crops were introduced into Tasmania. Some possible strategies to minimise accidental inclusion of GM material in bee products include (MAF, 2002):

1. Separating GM and non-GM crops via planting distances or flowering times;
2. Screening the crop to exclude bees;
3. Using bee management techniques that maximise foraging on a particular crop;
4. Using biotechnological solutions; and
5. Using post-harvest honey treatments to remove pollen.

The Tasmanian Beekeepers Association[255] indicated that commercial beekeepers may be unwilling to offer pollination services to areas where there are GMO crops or the cost of pollination services may rise if the

[253] ibid
[254] Submission 041
[255] ibid

industry is locked out of high price EU markets (which effectively cross subsidises pollination services). In Australia, apple pollination prices over $65 per hive are common (CPA, 2011). Any of the management strategies mentioned above would incur an additional cost to beekeepers.

No submission provided specific examples of other States (such as Western Australia, New South Wales and Victoria) and the direct impact to the honey industry or pollination services as a result of the introduction of GM crops. The EU has approved residue monitoring plans in place for honey with Australia authorised under these plans to export honey to the EU with traces of GM cotton and canola (EP, 2013).

As identified by RIRDC (2009), crops likely to be impacted by a possible change in pollination services as a result of an introduction of a GM crop in Tasmania would be pome and stone fruits, broadacre crops such as canola, and seed production for plants such as broccoli, beans, canola, carrot, lucerne, mustard and onions.

Regulatory burden

For producers who are at risk from their bees foraging on GM plants, testing would be required (EP, 2013). In addition, for those who wish to be certified as organic, appropriate documentation and evidence to meet the Australian certifier requirements would be necessary.

The regulatory burden would rise for industry, particularly to retain their market share in European markets and organic certification. As an indication of regulatory burden, in the EU, the potential costs of label changes and testing for the identification of the presence of GM pollen could be in the vicinity of an ongoing €6,578 per annum (EP, 2013).

Summary

The production of GM crops in Tasmania would be problematic for the honey industry. Co-existence would need strict requirements particularly for pollination:

Requirement (Conventional)	Change Existing production system
Accredited Production System	Would need to change if GM crops were introduced.
Notification requirements	Would need to change if GM crops were introduced.
Property and farm system requirements	For organic honey current standards specify that bees may only forage on organic crops or natural flora and that hives must be placed more than five kilometres from either conventional or GM crops
Market thresholds in produce	If more than 1% GM component, the product requires labelling of honey in Australia
Consequence of exceeding market thresholds	Indicated to be significant
Regulatory burden to industry	Would be sizeable
Indicated impact to industry with GM	Indicated to be negative for industry, particularly for markets such as EU and organics

e) Organics

There were many submissions to the Review expressing concerns about the serious impact on the organic industry of the introduction of GM crops.

Zero tolerance

Many submissions to the Review expressed the view that co-existence between GM crops and organics was not possible due to the GM zero tolerance requirements for organics under Australian certifier standards. Overseas research indicates that "… analytical testing to a strictly zero-presence level is not possible as detection will always be limited by the sensitivity of the test methods used, by the number of samples taken and the number of seeds analysed per sample" (Mewett et al, 2008).

The EU provides some useful examples.

The policy criterion in the EU for organics, states that organic foods can be labelled "GM-free" even if they contain up to 0.9 per cent GM content (Foster, 2010). The argument for the 0.9 per cent approach was that "… the lowest level at which GM organisms could be scientifically detected would place standards which would make organic produce too expensive for farmers and that the higher ceiling was sufficient for accidental presence of approved GMOs" (Meikle, 2007). As an observation, it should be noted that some certification bodies in the EU still do not allow any GM content (Meikle, 2007; Moses & Brookes, 2013).

Under the Australian organic certification standards, organic production is to be isolated from the production of non-organic products (Australian Government, 2011a). There is a zero tolerance of GMO material in organic products (Western Australian Government, 2010).

Managing contamination

Some countries, such as the Netherlands, have developed guidelines for appropriate distances for separating GM and non-GM crops (such as maize) to keep the possibility of cross-pollination at a minimum (GMO Compass, 2006b):

Organic	Conventional
Sugar Beets - 3 Metres	Sugar Beets – 1.5 Metres
Potatoes – 10 Metres	Potatoes – 3 Metres
Maize – 250 Metres	Maize – 25 Metres

Overseas research indicates that even achieving a threshold goal above zero (0.1) for organic agriculture for GM crops such as canola "could mean an increase in production costs of between 20-40 per cent, depending on the distribution of GM crops" (GMO Compass, 2006b).

Regulatory burden

The regulatory burden on the organic industry would be significant, with extra testing costs to maintain certification.

Summary

The commercial release of a GM crop in Tasmania would be highly problematic to the organic sector and co-existence would need to be carefully considered and managed. If the existing production requirements were required to alter, the following may need to be considered:

Requirement (Organic)	Change Existing production system
Accredited Production System	Standards and certification requirements are existing.
Notification requirements	Yes for pesticide, fertiliser and GM material
Property and farm system requirements	Only permitted substances. GM material not permitted
Market thresholds in produce	Zero tolerance
Consequence of exceeding market thresholds	Loss of market and possible certification suspension of affected land until risk is minimised.
Regulatory burden to industry	Would be sizeable
Indicated impact to industry with GM	Indicated to be negative for industry,

f) Animal feed

The Issues Paper for this review provided an overview of animal feed derived from GM plants[256].

Is it possible to set appropriate tolerance levels?

The Murray Goulburn Dairy Cooperative allows up to five per cent GM in the diet of suppliers' milking herds, while others such as National Foods recommend against the use of GM stock feed (Hunt, 2011). The Australian pig meat industry and some chicken meat processors have tried to avoid using GM material in stock feed due to concerns about market acceptance; however, the Australian Government noted that "virtually all imported pig meat consumed in Australia is likely to be produced using at least some GM stockfeed" (Australian Government, 2011a).

[256] Pages 28 and 29.

Managing contamination

Segregation of GM material already occurs on a "client-need" basis (Australian Government, 2011a) with the ADIC[257] highlighting the "Market Choice" system that demonstrates industries' ability to manage co-existence and contamination.

Regulatory burden

Based on research in Australia, an increase in the use of GM ingredients in stock feed imported from mainland Australia is unlikely to require additional administration costs in Tasmania (Australian Government, 2011a). However, If GM crops were produced in Tasmania for use as stock feed, this position would change (refer to the previous discussion in this Report on pastures and canola). As also noted previously in this Report, maintaining the zero tolerance level could result in increased analysis requirements of imported grains and seed, which could increase costs for importers.

If the existing requirements were required to alter, the following may need to be considered:

Requirement (conventional)	Existing production system
Accredited Production System	Standards and certification requirements, particularly for importation of stock feed
Notification requirements	As per existing importation requirements.
Property and farm system requirements	The growing of the crop used in stock feed would require additional compliance in relation to GM
Market thresholds in produce	Importation of stock feed is zero tolerance for viable seed/grain
Consequence of exceeding market thresholds	Destruction of material and the need to replace material imported into Tasmania.
Regulatory burden to industry	Unlikely to increase costs
Indicated impact to industry with GM	Indicated to be negative for industry,

Co-existence: questions of liability

A number of submissions raised legal liability issues and the related concerns of non-GM and organic farmers who may suffer contamination and economic loss in the event that GM crops are approved for environmental release in Tasmania.

[257] Submission 111

The legal liability issues for non-GM farmers as raised in the submissions can be categorised into the following areas of concern:

1. The ability of regulators and courts to protect non-GM and organic farmers from GM contamination, particularly in the absence of a statutory strict liability scheme;
2. The availability of compensation at common law for farmers who suffer damage and loss from GM contamination;
3. Potential for prosecution of non-GM farmers for "dealing" with a GMO in a contamination event;
4. Enforcement of intellectual property rights against non-GM farmers in a contamination event; and
5. Potential for action under consumer protection laws when GM-free claims cannot be substantiated.

The following discussion outlines the key issues for each of these concerns raised.

Absence of statutory liability for GM contamination

Several submissions questioned the ability of regulators and courts to protect non-GM and organic farmers from GM contamination that affects the ability of these farmers to market their products, raising the idea that a statutory liability scheme should be put in place in Australia.

For example, the Safe Food Foundation[258] submitted that: "to resolve the liability issues posed by potential GM contamination, the Act should be amended to ensure that the GM crop companies are held liable for any damage caused by their products and to ensure there is no liability for non-GM farmers."

In Australia the *Gene Technology Act 2000* (Cth) contains licence conditions to control and minimise the entry, spread and persistence of GMOs in the environment, and offence provisions and powers to force remediation of environmental damage by those that deal with GMOs without a licence or in contravention of licence conditions, yet potential victims of GM contamination are not provided for (Rogers, 2002).

During drafting of the *Gene Technology Act 2000* (Cth), the option of including civil liability provisions was considered but rejected on the basis that risks and damage or loss could be resolved at common law (Dalton et al, 2003). This position was reviewed by the (then) Gene Technology Ministerial Council in the 2006 Statutory Review of the *Gene Technology Act 2000* and the *Gene Technology Agreement 2001* (Commonwealth of Australia, 2006a), which concluded that specific provisions for strict civil liability, compensation funds and mandatory insurance were not required (Commonwealth of Australia, 2006b). This conclusion was upheld in the subsequent 2011 review of the *Gene Technology Act 2000* (Allen Consulting Group, 2011).

Dalton et al (2003) noted that the United Kingdom, Canada and the USA also do not have specific civil liability schemes for damage or loss caused by dealings with GMOs, similarly relying on existing statutes and common law to provide redress.

Lawson (2005) argued that a strict liability scheme for third parties suffering economic, health or environmental loss or damage caused by a person dealing with a GMO is consistent with the purpose of the *Gene Technology Act 2000*. However Dalton et al (2003) contend that in the absence of a cooperative national approach such a regime would need to be imposed under State and Territory laws. No State or Territory statutes currently contain civil liability provisions for those who cause GM contamination, leaving such

[258] Submission 115

matters to be dealt with by the common law (potential common law actions for GM contamination are discussed further below).

An example of a statutory civil liability scheme can be found in New Zealand. The New Zealand *Hazardous Substances and New Organisms Act 1996*, which is used to regulate GMOs, contains strict liability provisions (s.124G); but this liability is not absolute as it is limited by the provision of defences in s.124H (Lunney & Burrell, 2006). These defences mean that liability may not be attributed to a person who follows all controls set by the authorising authority (McGuinness and Mokena-Lodge, 2013).

Common law liability

In Australia, and in the most likely scenario of GMO contamination from seed or pollen drift, the main causes of action available at common law for farmers who suffer damage and loss include trespass, negligence or nuisance (Dalton et al, 2003).

To date there have been no decided cases in Australia specifically in relation to GMO contamination. At the time of writing this Report a case is ongoing in the West Australian Supreme Court for private nuisance and economic loss to an organic farmer who has lost his ability to sell produce under the label "certified organic" due to GM contamination allegedly from a neighbouring farm (*Marsh* v *Baxter* [2013] WASC 209). This case was cited in many submissions as evidence of the practical and legal obstacles in terms of non-GM and organic farmers being compensated for economic loss arising from GM contamination. These obstacles include the costs and duration of litigation.[259]

In hearing an application by the Plaintiff in *Marsh v Baxter* to prevent further planting of GM canola until the original case is decided, Martin J stated:

> I evaluate the strength of the Plaintiff's case viewed at this time on a basis the plaintiff has, in principle, an arguable case, not necessarily a strong or overwhelming case, to take to trial. That, of course, is only my provisional evaluation as of now, on the material before me. A trial has not yet begun. ((Martin J in Marsh v *Baxter* [2013] WASC 209, p31*)*

The trial in this matter is likely to commence in early 2014. The decision of the West Australian Supreme Court in this matter will be persuasive in any future cases for loss of organic certification from GM contamination. However, it should be noted that each case turns on its facts, and in this case the Plaintiff's claim is in nuisance, not negligence or trespass, and the claim is that the contamination was caused by the harvesting method used by the Defendant (swathing) and wind, not from pollen drift.

Until a final judgement is delivered in the *Marsh v Baxter* case, liability and compensation for GM contamination in private nuisance remains unclear in Australia. Further, a recent review of potential legal actions in private law for GM contamination concluded that the chances of success in an action for negligence or nuisance are small (Lunney & Burrell, 2006). While only briefly considering trespass as a potential action, Lunney & Burrell (2006) again concluded that the chance of such an action being successful is remote.

[259] In particular see submissions 115, 124 and 125.

Potential for prosecution of non-GM farmers

Concerns raised in submissions about the legal risks to non-GM farmers from GM presence on their farms included the risk of prosecution for dealing with GMOs without a licence, an offence under the *Gene Technology Act 2000* and corresponding State laws.

Dalton et al (2003) concluded that the current regulatory regime in Australia had potential for victims of GM contamination to be prosecuted for "dealing with a GMO without a licence". However, the OGTR has discretion not to proceed to prosecution depending on the particular facts and circumstances of the matter.

In provisions designed to provide some protection for growers of non-GM crops from inadvertent and unauthorised cultivation of GMOs in South Australia (South Australia, House of Assembly, 2004), the *Genetically Modified Crops Management Act 2004* (SA) provides special protection from liability for the spread of GM plant material such that no court action can be taken against an owner or occupier of land for the presence of GM material (s.27(2)). This protection is not absolute and action may be taken if the owner or occupier deliberately dealt with the GM material for commercial benefit and it is in the interests of justice that another person's rights with respect to the GM material should be protected or recognised (s.27(3)).

Intellectual property infringement

Ownership of intellectual property in GMOs and the potential for infringement by those "contaminated" with GM material was a recurring theme in many submissions, citing the high-profile Canadian case of *Monsanto Canada Inc. & Monsanto Co.* v *Percy Schmeiser & Percy Schmeiser Enterprises Ltd* (2001) (FCT 256, Federal Court of Canada, Trial Division) where the court found that Schmeiser had infringed Monsanto's intellectual property rights by harvesting and selling crops that he ought to have known contained GM material (Dalton et al, 2003).

While that Canadian case is only of persuasive application in Australia, the Australian Centre for Intellectual Property in Agriculture (ACIPA) has recognised patent infringement as a possible liability for non-GM farmers, noting that the Supreme Court in Canada indicated that courts should be slow to impose liability when non-GM farmers were unaware of the GM presence (ACIPA, n.d.).

Infringement of consumer protection laws

A small number of submissions referred to the operation of consumer protection laws that prohibit misleading and/or deceptive conduct in the context of "GM-free" claims. The Australian Competition and Consumer Commission (ACCC), the Australian Government agency responsible for ensuring compliance with the Competition and Consumer Act 2010, has warned food producers that "that within the strong wording of our misleading conduct laws, 'free' has to mean 'free'" and products under such a label cannot contain any GM inputs, including animal feed (Sylvan, 2004).

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Appendix 1: List of submissions

Submission No.	Name
001	Bio-Dynamic Education and Consultancy Tasmania
002	Wild Artisan
003	Lesley Keegan
004	Mark Burling
005	Julie Clearihan
006	Wayne Thompson
007	Kerri Cross
008	Anchor Organics
009	R W & K N Hyland
010	Paul Watson
011	Estelle Ross
012	Rick Calitz
013	Malcolm Mars
014	Penelope Clark
015	Greg Bradfield, Musselroe Beef
016	G & B Lindsay
017	Karl Stevens
018	Timothy Gunn
019	Jens Volkmann
020	Seaview Farm
021	Mandy Gunn
022	David Armstrong

023	Jodie Epper
024	TSJ Barrett
025	Intro Tas Pty Ltd
026	Rowena McDougall
027	Carlos Andrade
028	David & Lyndy Pinner
029	Our Mates' Farm Pty Ltd
030	Helen Hutchinson
031	Wilhelmine Engel
032	Anthony Schindler
033	Ray Meredith
034	Joyce Johnston
035	Confidential
036	Luke Nicholson
037	Alison Bleaney
038	Tasmanian Institute of Agriculture
039	Organic Coalition of Tasmania Inc
040	Bronzewing Botanicals
041	Tasmanian Beekeepers Association
042	York Town Organics
043	Black Ridge Farm
044	Bagdad Hills Vineyard
045	Dairy Futures CRC
046	P&B Rubenach

047	Ilona Powell
048	Warren Hastings
049	Tasmania Feedlot
050	Heather Thorpe
051	Tom Kingston
052	Merri Bee Organic Farm
053	Nathan Sidney
054	Adriene Cobcroft
055	Jeanette Cooper
056	Anne Layton-Bennett
057	Forestry Tasmania
058	Joshua Morris
059	Leon Quilliam
060	E Pugh
061	Tasmanian Agricultural Productivity Group
062	CSIRO
063	Eatem Organic Foods
064	P Wadsley
065	Skretting Australia
066	Garagistes
067	Brand Tasmania Council
068	Michelle Hudspeth
069	Ben Clark
070	Kev Rothery

071	Malcolm Ryan
072	Paul Thomas
073	Robin Thomas
074	Kelty Farm
075	Harvest Feast
076	Wild Ecology
077	Susan & Geoffrey Probert
078	Quill Australia
079	Confidential
080	Wine Tasmania
081	Hon Lin Thorp – Labor Senator
082	Poppy Growers Tasmania
083	Lissa Villaneuve et al (169 signatures)
084	Environment Tasmania
085	DairyTas
086	Hannah Rubenach
087	Green Co-op Union
088	Dr Tony McCall - UTAS
089	CropLife
090	Anonymous
091	Simon Tassell
092	Eternal Source Pty Ltd
093	Slow Food Hobart
094	PGG Wrightson Seeds

095	AusBiotech
096	Tasmania Alkaloids
097	Fat Pig Kitchen
098	Greens Party – Milne, Whish Wilson & Booth (same as submission no. 114)
099	Kaylyn Geeves
100	Margot White
101	Marcia Watkins
102	Callum Eachern
103	Brett Hall
104	Toehold Farm
105	Greenham Tas
106	The Environment Association
107	Toni Radcliffe
108	Essential Oils of Tasmania
109	Tasmanian Farmers and Graziers Association
110	Joseph Hartley
111	Aust Dairy Industry Council
112	Mark Poll
113	Curringa Farm
114	Australian and Tasmanian Greens Party (same as submission no. 98)
115	Safe Food Foundation
116	Confidential
117	Sustainable Living Tasmania
118	Food Standards Australia New Zealand

119	Frogmore Creek
120	Ethos Eat Drink
121	Fork & Hoe Collective
122	Fruit Growers Tasmania
123	Sandra Murray - UTAS
124	Gene Ethics
125	Provenance Growers
126	ANTU Trading
127	Jamie Brooks
128	Zachary Morris
129	The Agrarian Kitchen Pty Ltd
130	George Vorillas
131	Confidential
132	Grace
133	Sapphire
134	Island Cards
135	BB Heritage Seeds/Heirlooms of Tasmania
136	Confidential
137	Good Life Permaculture
138	Jonathon Carter
139	Julie Vaughan
140	Tara Hoy
141	Patricia Kahler
142	Edwin Morris

143	Rosemary Ann Ogilvie
144	Seraphim Blueprint Tm
145	Joanna McRae
146	Diggers Club
147	Veena Tilly
148	Mike Smith
149	Geraldine de Burgh-day
150	Mark & Janet Buckerfield
151	Forest Hill Farm Organic Produce
152	Lynette Taylor
153	Sarah Buckerfield
154	John Heck
155	Anna Clements
156	Robyn Wood
157	Evan Scherrett
158	GSK Australia
159	Tasmanian Active Honey Group Pty Ltd
160	Harvest Launceston

Appendix 2: Issues paper and invitation to comment

Review of the moratorium on genetically modified organisms (GMOs) in Tasmania

Issues paper and invitation to comment

30 August 2013

Department of Primary Industries, Parks, Water and Environment

Further information about the Review

Please refer to the Department's website: www.dpipwe.tas.gov.au

Contact:

Policy Division
Tasmanian Department of Primary Industries, Parks, Water and Environment
GPO Box 44
HOBART TAS 7001
Phone: 1300 368 550
email: gmo.review@dpipwe.tas.gov.au

Invitation to comment

The Tasmanian Government's vision is to substantially increase the State's food and agricultural production and become a major supplier of premium products. The smart use of innovative research and technology is essential if we are to achieve this goal – as will be the development of markets, big or small, that leverage Tasmania's reputation for producing clean, safe and reliable products.

With the aim of distinguishing Tasmania in the global market place, the State Government has maintained a moratorium since 2001 on the commercial release of genetically modified organisms (GMOs) to the environment.

Previous reviews of Tasmania's policy on gene technology in primary industries have confirmed just how complex the use of GMOs is. Gene technology is also constantly evolving, which in itself presents challenges to public policy makers as they keep pace with new developments. With this in mind, in 2009, the Government extended the moratorium for a further five years, recommending it be reviewed again before it expires in November 2014.

On 25 June 2013 the Minister for Primary Industries and Water directed my Department to undertake a review of the moratorium and to provide a report by the end of the year. The findings from this review will be considered by the Government to help decide the future policy on GMOs.

Major questions for this review are the advantages and disadvantages of the moratorium to the State's markets, marketing, and brand. Under Commonwealth laws, States and Territories can only regulate dealings with GMOs for marketing purposes. A national scheme, in which Tasmania participates, is responsible for assessing the environmental and human health risks, and regulating the use of gene technology in Australia.

This comprehensive Issues Paper has been prepared to help you to provide your comments. The paper provides a snapshot of some of the issues associated with each of the terms of reference. It also poses a series of questions, on which we're particularly interested in your feedback.

Some people will agree with the current stance to declare all of Tasmania as GMO-free so as to preserve the identity of non-genetically modified products; others will argue that, as a consequence of the moratorium, Tasmanian agribusiness is missing out on the opportunities that could come from using gene technology.

While your views are important, we also need facts, figures and information backed up by evidence. For example, we need your experiences or case-studies that highlight the impacts, positive or negative, the moratorium is having across the supply chain – that is, the impacts on-farm and beyond the farm gate, and for producers, suppliers, processors, wholesalers, marketers, retailers and exporters.

We want to hear from businesses that use the GMO moratorium in their product marketing and also those businesses that see opportunities with or without gene technology to develop their products or to exploit markets. Of course these examples only scratch the surface of this very important issue.

I look forward to your contribution to the Review.

Kim Evans
Secretary

TERMS OF REFERENCE

The Minister for Primary Industries and Water has requested the Department report against the following terms of reference (ToR):

1. Domestic and international gene technology policy relevant to primary industries.
2. Research and development relevant to the use of gene technology in primary industries.
3. The potential market advantages and disadvantages of allowing or not allowing the use of gene technology in Tasmanian primary industries, including food and non-food sectors.
4. Any other relevant matters raised during the review.

HOW TO HAVE YOUR SAY

All submissions must be made in writing and are to be received by **5pm, Friday 11 October 2013**.

All submissions should address the Terms of Reference.

Send your submission by post to:

The Project Team - Review of the moratorium on GMOs in Tasmania (2013)
Department of Primary Industries, Parks, Water and Environment
GPO Box 44
HOBART TAS 7001

Or by email to: gmo.review@dpipwe.tas.gov.au

Or via the on-line form: www.dpipwe.tas.gov.au

All submissions will be treated as public documents and made available on the Department's website. If you wish for your submission to be treated as confidential, either whole or in part, please note this in writing at the time of making your submission.

No personal information other than the name of individual submitters will be disclosed.

The Right to Information Act 2009 and confidentiality

By law, information provided to the Government may be provided to an applicant under the provisions of the *Right to Information Act 2009 (RTI)*. When making your submission, please detail any reasons why you consider the information that you have provided is confidential or should not be publicly released. Your reasons will be taken into account in determining whether or not to release the information in the event of an RTI application for assessed disclosure.

ACKNOWLEDGEMENT

DPIPWE acknowledges the assistance of the Department of Economic Development, Tourism and the Arts in preparing this Issues Paper.

Contents

Background to this review

PREVIOUS REVIEWS INTO GMOs IN TASMANIA

In July 2000 the Tasmanian Government commenced a public consultation process on the environmental, economic, ethical and social and health issues raised by the application of gene technology in Tasmania's primary industries. At the same time a group of experts was convened to report to the Minister on gene technology and Tasmania's primary industry and food products – the Experts Group on Gene Technology. Also running concurrently was a Joint Select Committee on Gene Technology in Agriculture. All three contributed to the first *Gene Technology Policy: Gene Technology and Primary Industries July 2001* (Tasmanian Government, 2001). This Policy advocated a cautious approach to gene technology in Tasmanian agriculture and imposed a two-year moratorium on commercial genetically modified (GM) food crops, stating that:

> "*Although gene technology offers some benefits now, and has the potential to offer greater benefits in the future, risks are also posed by the technology, particularly with regard to the environment and market image.*"

In 2003 the Tasmanian Government released a position paper outlining the results of a Departmental review of the 2001 policy. This position paper, titled *Gene Technology Policy Review Position Paper – A Balanced Approach,* recommended, among other things, that the moratorium on commercial release of agricultural GMOs be continued for five years to underpin Tasmania's reputation for 'clean, green and quality' products (Tasmanian Government, 2003).

The *Genetically Modified Organisms Control Act 2004* was enacted to provide a specific legislative basis for the moratorium. The relevant provisions of this Act are discussed further below (see 'How are GMOs regulated in Tasmania'). Section 36 of the *Genetically Modified Organisms Control Act 2004* provided for the Act to expire five years after enactment (15 November 2009).

In July 2007 a second review was undertaken by a Joint Select Committee on Gene Technology in Primary Industries. The Committee made 32 recommendations, including *'that the prohibition on the release of GMO food crops to the Tasmanian environment for commercial purposes should be extended and reviewed after five (5) years'* (Parliament of Tasmania Joint Select Committee, 2008).

In response to the Committee's report, the Government released the *Policy Statement: Gene Technology and Tasmanian Primary Industries 2009-2014* and introduced legislation to extend the moratorium for another five years.

UNDERSTANDING GENE TECHNOLOGY AND GMOs

The terminology used to describe GMOs can be confusing, particularly for non-scientists or the lay person. There are no universally agreed definitions other than those in legislation, regulation or policy. A useful approach can be to first understand what is meant by conventional or traditional breeding as compared to biotechnology and then gene technology. For the purposes of this paper, the following terms have been adopted:

Conventional (or traditional) breeding "*involves changing the genes of a plant so that a new and better variety is developed. To conventionally breed a new plant variety, two closely related plants are 'sexually crossed'. The* *aim is to combine the favourable traits from both parent plants and exclude their unwanted traits in a singular new and better plant variety. However, the progeny of this first cross inherit a mix of genes from both parent plants and so both positive and negative traits may be inherited."* (CSIRO, 2011)

"Breeders have to look at all the progeny and select the ones with the most positive traits and least negative traits. They then cross this selected progeny back to one of the original parent plants to try and transfer more of its positive traits into the following generation. This process, called 'back-crossing', takes place over a number of generations, which usually means a number of years, until the progeny have all the desirable traits and none of the negative ones of the original two parent plants. Conventional plant breeding may also use 'wider crosses' that involve crossing species or even genera that are quite unrelated. These crosses cannot occur without help – so sophisticated techniques are employed." (CSIRO, 2011)

Conventional or traditional breeding is not considered gene technology.

Biotechnology *"is a broad term that covers the practical use of biological systems to produce goods and services. It encompasses the transformation of materials by micro-organisms (e.g. fermentation), methods of propagation, such as plant cloning or grafting, and may involve genetic alteration through methods such as selective breeding."* (Australian Government, 2001)

One kind of biotechnology is gene technology, sometimes referred to as genetic engineering or genetic modification.

Gene Technology is defined in the Commonwealth *Gene Technology Act 2000* as *any technique for the modification of genes or other genetic material, but does not include sexual reproduction or homologous recombination*." This Act also defines ***Genetically Modified Organism (GMO)*** as "*an organism that has been modified by gene technology, or an organism that has inherited particular traits from an organism (the initial organism), being traits that occurred in the initial organism because of gene technology*." Additionally the Commonwealth *Gene Technology Regulations 2001* specifies other techniques that do not constitute gene technology, and can declare those things that are a GMO.

The Tasmanian *Genetically Modified Organisms Control Act 2004* defines GMO as having the same meaning as in the Commonwealth *Gene Technology Act 2000.*

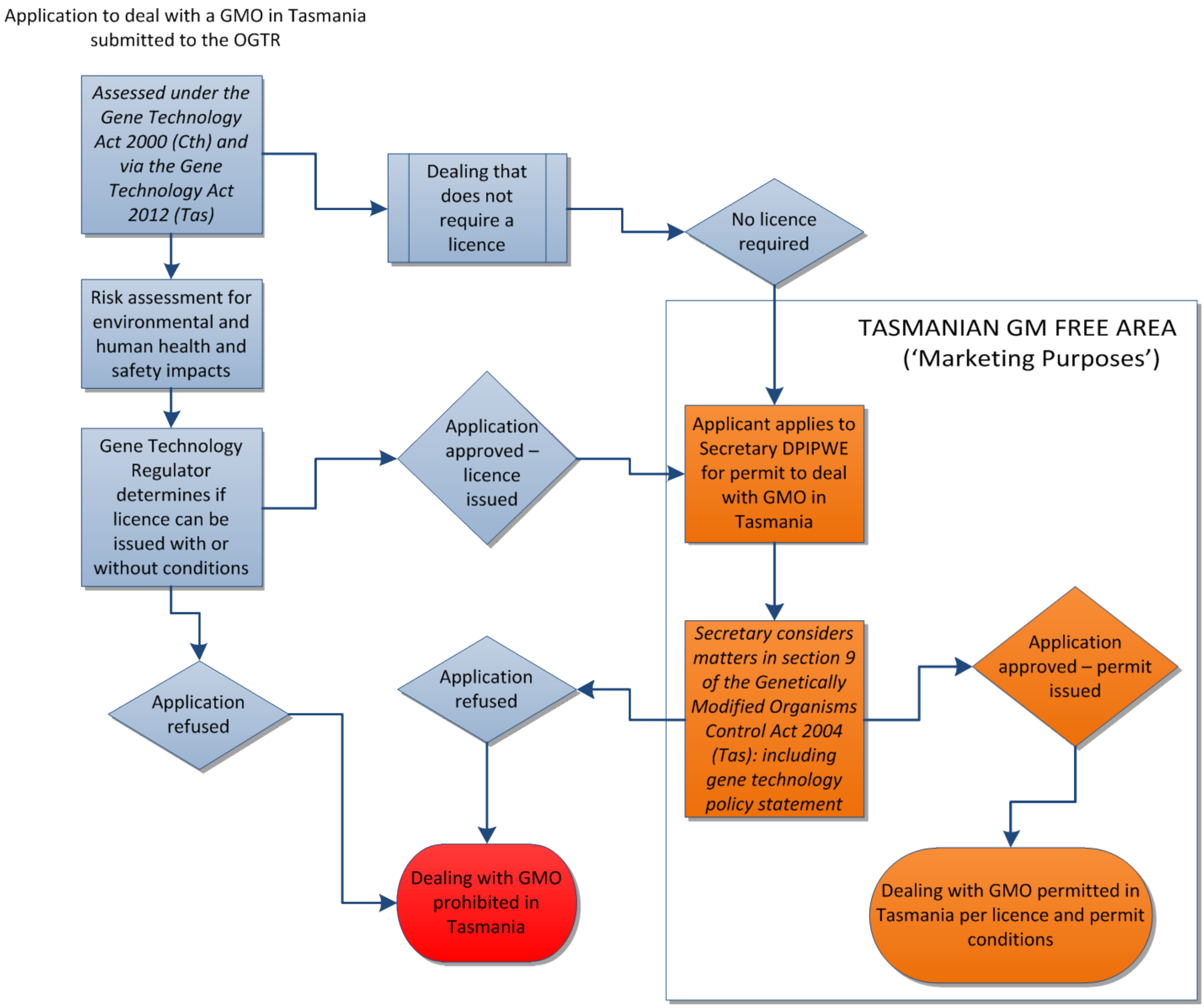
A more scientific definition of Gene Technology is "*the modification of organisms by the direct incorporation (or deletion), of one or more genes to introduce or alter a specific characteristic or characteristics. Organisms created using gene technology techniques are commonly referred to as* ***genetically modified organisms (GMOs).***" (Australian Government, 2001)

Sometimes the term transgenic is used to describe an organism that has been modified by gene technology (Tasmanian Government, 2001). However, for this Paper, the terms GMO or genetically modified (GM) are preferred.

HOW ARE GMOs REGULATED IN TASMANIA?

The import, use and development of GMOs in Tasmania, along with any other dealings, are regulated by numerous laws at both Commonwealth and State levels, depending on the particular application of gene technology and the end products.

To illustrate how the regulatory system works, the diagram below tracks how an application submitted to the Office of Gene Technology Regulator (OGTR) to 'deal' with a GMO in Tasmania would be assessed. The following sections outline the specific Commonwealth and Tasmanian regulations and Tasmania's Gene Technology Policy.



COMMONWEALTH REGULATION

The following table outlines the main regulatory agencies at the Commonwealth level regulating GMOs.

REGULATORY AGENCIES IN AUSTRALIA WITH A ROLE IN REGULATION OF GENE TECHNOLOGY (Source: Australian Government 2008a)

Agency	What they regulated	Scope	Relevant Legislation (Commonwealth)
OGTR Office of the Gene Technology Regulator (supporting the Gene Technology Regulator)	Dealings with GMOs	The Gene Technology Regulator administers a national scheme for the regulation of GMOs in Australia, in order 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 GMOs.	*Gene Technology Act 2000*
TGA Therapeutic Goods Administration	Medicines, medical devices, blood and tissues	The TGA administers legislation that provides a national framework for the regulation of medicines, medical devices, blood and tissues in Australia, including GM and GM-derived therapeutic products, and ensures their quality, safety & efficacy.	*Therapeutic Goods Act 1989*
FSANZ Food Standards Australia New Zealand	Food	FSANZ is responsible for setting standards for the safety, content and labelling of food. FSANZ conducts mandatory pre-market safety assessments for food produced using gene technology.	*Food Standards Australia New Zealand Act 1991*
APVMA Australian Pesticides and Veterinary Medicines Authority	Agricultural and Veterinary Chemicals	The APVMA operates the national system that regulates all agricultural chemicals (including those produced in or used on GM crops) and veterinary therapeutic products. Assessments consider human and environmental safety, product efficacy (including insecticide and herbicide resistance management), and trade issues relating to residues.	*Agricultural and Veterinary Chemicals (Code) Act 1994;* *Agricultural and Veterinary Chemicals Administration Act 1994*
NICNAS National Industrial Chemicals Notification and Assessment Scheme	Industrial Chemicals	The NICNAS provides a national notification and assessment scheme to protect the health of the public, workers and the environment from the harmful effects of industrial chemicals.	*Industrial Chemicals (Notification and Assessment) Act 1989*
AQIS Australian Quarantine and Inspection Service	Quarantine	The AQIS regulates the importation into Australia of all animal, plant and biological products that may pose a quarantine pest and/or disease risk. Import permit applications must indicate the presence of GMOs or GM material and the relevant authorisation under the *Gene Technology Act 2000*.	*Quarantine Act 1908;* *Imported Food Control Act 1992*

What are 'dealings'?

The table below describes the classes of 'dealings' with GMOs as defined in the *Gene Technology Act 2000 (Cth)*.

Dealing	Explanation
Exempt Dealings	Are a category of dealings with GMOs that have been assessed over time as posing a very low risk (i.e. contained research involving very well understood organisms and processes for creating and studying GMOs). The only legislative requirement for exempt dealings is that they must not involve an intentional release of a GMO into the environment.
Notifiable Low Risk Dealings (NLRDs)	Are dealings with GMOs that have been assessed as posing low risk to the health and safety of people and the environment provided risk management conditions are met.
Dealings NOT involving an intentional release into the environment (DNIR)	Are dealings with GMOs in contained facilities which do not meet the criteria for classification as Exempt Dealings or NLRDs. DNIRs must be licensed by the Gene Technology Regulator (the Regulator).
Dealings involving an intentional release (DIR)	Are dealings with GMOs outside contained facilities. These can range from small scale field trials (limited and controlled releases) of GMOs to general/commercial release of GMOs.
Inadvertent Dealings	If the Regulator is satisfied that a person has come into possession of a GMO inadvertently the Regulator may, with the agreement of the person, treat the person as having made an inadvertent dealings application under section 40A of the Gene Technology Act 2000 (the Act). Refer www.ogtr.gov.au for further information.
Emergency Dealings	The emergency provisions in sections 72A - 72E of the Act give the responsible Minister the power to expedite an approval of dealings with a GMO in an emergency. This recognises that situations may arise in which a rapid approval of a dealing with a GMO may be required. Refer to www.ogtr.gov.au for further information.

Source: abridged from www.ogtr.gov.au

Regulating dealings with GMOs for environmental and human health and safety

The *Gene Technology Act 2000* (Cth), its subordinate legislation, the *Gene Technology Regulations 2001*, and the *Gene Technology (Licence Charges) Act 2000* (Cth) constitute part of the Commonwealth's framework for regulating the development and environmental release of GMOs.

The object of the *Gene Technology Act 2000* (Cth) 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 managing those risks by regulating certain dealings with GMOs.

Using a collection of constitutional powers, and agreements with the States on residual matters, the Commonwealth has 'covered the field' with respect to having power to regulate dealings with GMOs.

Due to the States' residual powers under the *Commonwealth of Australian Constitution Act 1900* there are some matters that the Commonwealth Government's powers do not cover, such as sole traders, State-regulated organisations and some higher education institutions. For this reason all States, Territories and the Commonwealth signed the *Gene Technology Agreement 2001* and thereby committed to a nationally-consistent scheme for the regulation of gene technology, including the introduction of corresponding or applied legislation to the *Gene Technology Act 2000* (Cth) into State and Territory parliaments.

The corresponding and applied State laws seek to ensure that the Gene Technology Regulator (the Regulator) has power to issue licences for all dealings with GMOs regulated under the *Gene Technology Act 2000* (Cth).

Tasmania has applied the Commonwealth laws in the State, first in 2001 with the *Gene Technology (Tasmania) Act 2001* and then in 2012, when the 2001 Act was repealed and replaced with the *Gene Technology (Tasmania) Act 2012* . This 2012 Act operates slightly differently from the previous Act by providing that the Commonwealth gene technology laws, as in force for the time being, apply as a law of the State of Tasmania (subsection 6(1)), effectively ensuring that any amendments to the *Gene Technology Act 2000* (Cth) automatically apply in Tasmania without the need for the Tasmanian Parliament to change the *Gene Technology (Tasmania) Act 2012*.

The *Gene Technology Act 2000* (Cth) is, however, modified in Tasmania by prohibiting the operation in Tasmania of any licence granted by the Regulator for a dealing with a GMO, if the dealing is in contravention of a GMO-free order (section 7 *Gene Technology (Tasmania) Act 2012).*

Regulating dealings with GMOs for 'marketing purposes'

There is no provision in the Commonwealth legislation for a State or Territory to 'opt-out' of the scheme on environmental or human health and safety grounds by prohibiting a licensed dealing in their jurisdiction. However, section 21 of the *Gene Technology Act 2000* (Cth) empowers the Gene Technology Ministerial Council (now known as the Legislative and Governance Forum on Gene Technology) established under the *Gene Technology Agreement 2001,* to issue a policy principle in relation to recognising areas, if any, designated under State law for the purpose of preserving the identity of GM crops and/or non-GM crops for marketing purposes. This provides an 'opt-out' of sorts. By virtue of section 57 of that Act, the Regulator must not issue a licence to deal with a GMO if the Regulator is satisfied that to do so would be inconsistent with a policy principle.

On 5 September 2003 the *Gene Technology (Recognition of Designated Areas) Principle 2003* (Cth) came into force. That Principle states: "*An area is recognised as an area that is designated for the purpose of preserving the identity of GM crops, non-GM crops or both GM and non-GM crops, for marketing purposes, if the area is so designated under a State law."*

Regulating dealings with GMOs – ethical matters

As biotechnology is often dealing with new ethical problems, it is important that guidance is provided when dealing with specific issues such as GMOs. Ethics is about answering the question *"What ought I do?" (*SJEC, 2013). The OGTR has an Ethics and Community Consultative Committee that provides advice to the Regulator on ethical issues relating to gene technology.

The Ministerial Council may also issue policy principles on ethical issues relating to dealings with GMOs. Again, by virtue of section 57 of that Act, the Regulator must not issue a licence to deal with a GMO if the Regulator is satisfied that to do so would be inconsistent with a policy principle.

For further information on the Australian Government's regulatory arrangements for GMOs and GM products refer to the OGTR website at www.ogtr.gov.au and the website for the Department of Agriculture, Fisheries and Forestry at www.daff.gov.au

TASMANIAN REGULATION OF GM-FREE AREAS

The *Genetically Modified Organisms Control Act 2004* (Tas) came into force on 16 November 2004. The object of that Act is to provide for the whole or any part of Tasmania to be declared a GMO-free area for the purpose of preserving the identity of non-genetically modified crops and animals for marketing purposes and to provide for persons to be allowed to deal with GMOs under permits.

The power for the Minister to declare GMO-free areas is provided in section five of the *Genetically Modified Organisms Control Act 2004* (Tas) and is only exercisable if the Minister considers that declaring a GMO-free area would aid in preserving the identity of non-genetically modified crops and animals for marketing purposes. This power is clearly linked to the *Gene Technology (Recognition of Designated Areas) Principle 2003* (Cth).

The Minister declared the whole of Tasmania a GMO-free area by the *Genetically Modified Organisms Control (GMO-free Area) Order 2005* (Tas) on 31 October 2005.

Part two of the *Genetically Modified Organisms Control Act 2004* (Tas) prohibits a person from knowingly dealing with a GMO in a GMO-free area unless that person has a permit (granted under section nine of the Act by the Secretary, DPIPWE) and a licence from the Regulator, or just a permit when dealing with a GMO that does not require a licence. Penalties apply for breaching part two of the Act.

By the operation of section 36 of the *Genetically Modified Organisms Control Act 2004* (Tas), the Act expires on 15 November 2014. All subordinate legislation made under that Act, including the *Genetically Modified Organisms Control (GMO-free Area) Order 2005* (Tas) will also expire on that date.

If the *Genetically Modified Organisms Control Act 2004* (Tas) is not re-enacted, or similar legislation enacted, not only will the declaration of Tasmania as a GMO-free area lapse, but section seven of the *Gene Technology (Tasmania) Act 2012* becomes obsolete and the *Gene Technology Act 2000* (Cth) becomes the primary legislation for regulating dealings with GMOs in Tasmania.

TASMANIAN GOVERNMENT GENE TECHNOLOGY POLICY

The *Policy Statement: Gene Technology and Tasmanian Primary Industries 2009-2014* outlines the Government's intention to maintain a GMO moratorium and how that moratorium will be achieved. The Policy Statement does not have the force of law in the same way that legislation does, yet it would be taken into account as a guide for when decisions are made under the relevant laws.

The stated objective for maintaining a moratorium on commercial release of GMOs in primary industries is:

> *"... to position Tasmania in the global market place as a producer of food that is genuinely GMO-free by striving to ensure that no GMOs are released to or persist in the Tasmanian environment, and by encouraging investment in GMO-free business through brand development and pursuit of GMO-free opportunities in primary industries."* (Tasmanian Government, 2009)

Permits issued in Tasmania for dealing with GMOs

Section eight of the Tasmanian *Genetically Modified Organisms Control Act 2004* (the Act) allows a person to apply for a permit to deal with a GMO in Tasmania. In determining whether to grant an application for a permit, the Secretary of DPIPWE will consider:

- The location and purpose of the dealing with the GMO;

- The likely impact the dealing with the GMO might have on market access for non-genetically modified crops and animals;

- The proposed management regime for the GMO; and

- Any other matters considered relevant to the dealing with the GMO.

An approved permit will specify the location at which the dealings with the GMO are to take place and also specify any other necessary conditions, such as safe destruction and storage of the GMO and any accreditation or certification required.

Since commencement of the Act, ten permits have been issued for various dealings with GMOs. Four permits are still valid until 14 November 2014. All permitted dealings (except one) have involved scientific research using a GMO in contained facilities, registered with the OGTR as Notifiable Low Risk Dealings (NLRDs). In 2007, a permit was granted in Tasmania for use of a live attenuated GM vaccine for Equine Influenza by the Chief Veterinary Officer. The permit reflected an Emergency Dealing Determination under the Commonwealth *Gene Technology Act 2000* enabling urgent use of the vaccine to control an outbreak.

Apart from use of the Equine Influenza vaccine, dealings conducted under permit in the past have included contained research in areas such as GM seed modified for particular growth and tolerance characteristics, as well as using GMOs in development of early prototype vaccines for animals. Some dealings may promote improvements in food production in the future. A permit under the Act is not required for medical research for human health purposes.

There are currently no dealings involving an intentional release of a GMO (DIRs) or dealings not involving an intentional release of a GMO (DNIRs) licensed in Tasmania by the OGTR or permitted under the Act by the DPIPWE.

For more information on licensed dealings, refer to the OGTR website: www.ogtr.gov.au

The Policy Statement provides further detail on what the moratorium entails for food and non-food plants, commercial release and contained research, GMO animal feed and human food. The risk analysis for determining whether dealings with GMOs in a GMO-free area are authorised in Tasmania is described in item four of the Policy Statement:

> *"Authorisation of any such dealing under the Act will not proceed unless risk analysis demonstrates a likelihood of GMO release or escape to the broader environment that is low enough to provide for very low risk to the Brand."* (Tasmanian Government, 2009)

Each regulatory aspect of the Policy Statement is presented in the following table.

GMO dealing	Policy Statement	Measure
Food Plants	6.3	Release into the Tasmanian environment is prohibited.
	6.4	Dealings in contained facilities may be authorised subject to OGTR approval as required, assessment of the likelihood of entry to the environment, other plants, or human or animal food supplies and other conditions as required.
	6.12, 6.13, 6.15	Sites in Tasmania previously used to trial GM canola will continue to be regulated to eradicate residual GM seed and prevent spread of GM material off-site.
	6.14	Zero tolerance for viable GMO contamination in imported canola seed and whole grains will continue to apply. Zero tolerance also applies to other imported seed and whole grains if they are likely to be contaminated with GM material.
Microbes	6.23, 6.24	Release of viable GM microbes to the Tasmanian environment is prohibited. Vaccines, bioremediation agents or biological controls may be authorised subject to OGTR approval as required, assessment of the likelihood of containment and entry into human or animal food supplies and other conditions as required.
	6.25, 6.26	Use of GM microbes in food manufacturing (food processing or additives) is prohibited if the GMO remains alive and viable in the final food product.
	6.27	Research in contained facilities may be authorised subject to OGTR approval as required, assessment of the likelihood of entry to the environment and other conditions as required.
Non-food plants	6.5	Release into the Tasmanian environment is prohibited.
	6.6	Open-air trials or commercial release of GM non-food plants developed for pharmaceutical purposes not intended for food or feed may be authorised subject to OGTR approval as required, assessment of the likelihood of entry to the environment, other plants, or human or animal food supplies and other conditions as required.
	6.7	Dealings in contained facilities for research purposes may be authorised subject to OGTR approval as required, assessment of the likelihood of entry to the environment

		and other conditions as required.
	6.14	Zero tolerance for imported seed if they are likely to be contaminated with GM material.
Animals	6.20	Release of viable GM livestock, fish, invertebrates or other animals to the Tasmanian environment is prohibited.
	6.21	Dealings relevant to release of live GM animals for bioremediation or biological control may be authorised subject to OGTR approval as required, assessment of the likelihood of containment and entry into human or animal food supplies and other conditions as required.
	6.22	Dealings in contained facilities for research purposes may be authorised subject to OGTR approval as required, assessment of the likelihood of entry to the environment and other conditions as required.
Animal feed	6.8	Dealings with animal feed that contains viable GM seed capable of producing a GM plant are prohibited.
	6.9	Dealings with viable GM seed for processing to a non-viable state in an approved facility may be authorised subject to OGTR approval as required, approval of the facility and other conditions as required.
	6.10	Dealings with animal feed that contains material from non-viable GM plants is permitted.

For further information on the *Policy Statement: Gene Technology and Tasmanian Primary Industries 2009-2014* refer to the DPIPWE website: www.dpipwe.tas.gov.au

ZERO TOLERANCE: IMPORTING GMO PRODUCTS TO TASMANIA

Imports of GMOs into Tasmania are regulated through import requirements contained in the *Plant Quarantine Manual Tasmania*, issued under section 68 of the *Plant Quarantine Act 1997* (Tas). Import Requirement 32: Canola Seed and Grain – Freedom from Genetically Modified (GM) Brassicaceae Seed requires all imported canola seed and grain to be accompanied by a certificate or statement of analysis demonstrating freedom from GM contamination. Import Requirement 36: Seed for Sowing is also relevant in that it prohibits importation of viable genetically modified seed unless authorised under the *Genetically Modified Organisms Control Act 2004* (Tas). Imported products that do not comply with these import requirements are held and dealt with by Quarantine Tasmania.

Quarantine Officers enforce a zero tolerance policy on GMOs at the State barrier for imported products. If imported products are suspected of posing a risk to Tasmania's GMO-free status, the importer will be asked to produce evidence the product contains no GMOs before being released by Quarantine Tasmania. The exception to the zero tolerance level is GMOs imported for use in scientific research under permit with risk mitigation conditions imposed.

For further information on the Plant Quarantine Manual Tasmania and import requirements, refer to the Biosecurity section of the DPIPWE website: www.dpipwe.tas.gov.au

Administration costs of the moratorium

DPIPWE incurs administrative costs of approximately $250,000 a year in maintaining the internal GMO-free Program. The audit program of former canola trial sites, which employs two staff on a full-time basis, makes up most of these costs. Barrier costs in enforcing the moratorium and monitoring imports of canola seed and grain are negligible and incurred during regular barrier operations. Other costs include the policy support required to liaise with the OGTR and support Tasmania's participation in the national arrangements for regulating GMOs.

Former Tasmanian GM Canola Trial sites

In the late 1990s and early 2000, GM canola was grown on 57 field trial sites around Tasmania under contract between land owners and Monsanto Australia or Aventis (now known as Bayer CropScience).

The Tasmanian Government's decision to pursue a GMO-free path for agriculture in 2001 meant that the 57 trial sites could no longer operate as such and required management to contain leftover GM canola seed in the soil. Site management plans were developed by the Department in consultation with land owners for each former trial site.

DPIPWE also established an auditing program whereby all former trial sites are audited three times a year. The auditing program enables the Department to check for compliance with site-management plans, assist in the removal of germinated volunteer plants, and informing progress of individual sites towards release from management under permit. Audits normally occur in January/February, May and October/November to coincide with periods when volunteer plants are likely to be found.

Former trial sites are deemed to be free of legacy GM canola seed when the Department is satisfied that the likelihood of GM canola seed remaining is negligible. This is determined by demonstrated absence of germinated GM canola plants between two soil disturbances on a site (six months apart) and no germination in the six month period following the second disturbance. To date, four former trial sites have been signed off and are subject to periodic checks by DPIPWE, with the permission of the landowner.

The next audit of former trial sites is scheduled for November 2013.

The audit reports for the former GM canola trial sites are available from the Biosecurity section of the DPIPWE website: www.dpipwe.tas.gov.au

Former GM Canola unintentional release sites

In 2003-04 a conventional type of canola called Grace canola was grown commercially at 33 sites by nine growers in Tasmania, mostly in the Northern Midlands. In 2005 the Grace canola was discovered to be contaminated with some GM canola. The GM canola was modified for herbicide resistance.

Site management plans were developed in consultation with the nine growers for future management of the contaminated sites.

All former unintentional release sites are audited by DPIPWE three to four times a year. Volunteer plants are found periodically at sites however no GM canola has been detected when testing has been done. The continued presence of volunteer plants (which could or could not be GM canola) prevents sites being released from management.

IN SUMMARY

Since 2000 there have been two Tasmanian Parliamentary committees and two Government reviews of gene technology policy in agriculture and primary industries. Throughout this time respective Tasmanian Governments have maintained a moratorium on GMOs in Tasmania for marketing purposes.

The regulation of GMOs at the State level is for ‘marketing purposes’. The Gene Technology Regulator administers a national scheme to manage the environmental and human health and safety risks of GMOs.

The current moratorium on GMOs in Tasmanian primary industries automatically expires in November 2014.

ToR 1) Domestic and international gene technology policy relevant to primary industries

INTERNATIONAL POLICY

A mix of policy approaches to manage GMOs has been adopted by countries across the globe. Some countries ban the growing of GM crops, others have attempted to use international trade agreements to prohibit the import of products that contain non-approved GMOs (such as the European Union), and other countries are embracing the technology (such as Canada, the USA and Australia) (EC. 2006a: Ludlow & Smyth, 2011).

Of particular relevance to the review are the policy and regulatory environments in Tasmania's major international trading partners. Twenty-five per cent of Tasmania's food product is sold to overseas exports (Tasmanian Government, 2013a). Ten countries import the majority of Tasmanian food products (Macquarie Franklin, 2012). As shown in the table below, Tasmania's 10 main trading partners (in no particular order) have differing policy and regulatory approaches to the commercial release and growing of GM crops.

Country	Policy Information
Japan	Japan has regulatory arrangements for GMOs for experimental and commercial release into the environment. Importation of GM products must be approved. All GM foods must undergo a safety assessment prior to being awarded certification for distribution to the domestic market. There are labelling requirements. **It is not apparent that Japan has commercially released GMO crops.**
Hong Kong	The Hong Kong Government does not currently have a specific biotechnology policy. **The Hong Kong Special Administrative Region does not have any commercial production of GM crops or livestock to date.** In 2013 Hong Kong announced its intention to regulate GM food by introducing a mandatory pre-market safety assessment scheme. Hong Kong does import food that contains GM products. Hong Kong has had voluntary labelling of GM products. At this stage it does not plan to mandate labelling of GM products.
United States of America (USA)	**The USA allows commercial production of broadacre GM crops**. The importation of GMOs into the USA is permitted with approvals across three Federal Agencies. The *Coordinated Framework for Regulation of Biotechnology* describes the Federal policy for regulating products developed using modern technology. If the FDA rules that a GMO is 'substantially equivalent' to its conventional counterpart labelling is not required.

Singapore	Singapore has guidelines on the release of agriculture-related GMOs. The Genetic Modification Committee scrutinises the application in accordance with the guidelines. Post market monitoring is conducted by relevant agencies. **It is not apparent that Singapore has commercially released GMO crops**.
New Zealand (NZ)	Genetic modification has been used in NZ. The importation and release of GMOs is regulated at a national level by the Environmental Protection Authority under the *Hazardous Substances and New Organisms Act 1996*. Approvals are considered by the Environmental Risk Management Authority on a case-by-case basis. NZ aligns with FSANZ on most food safety standards. **NZ is yet to approve a GM crop for commercial release.** No fresh produce is genetically modified but some processed foods may contain imported ingredients that are genetically modified.
The United Kingdom (UK)	The UK forms part of the European Union (EU) regulatory arrangements. There are two EU laws under which technology providers can file an application for the authorisation of GM products. There are also regulations for marketing approval. **No GM crops are being grown commercially in the UK.** The UK imports GM in commodities for animal feed and, to a lesser extent, in some food products. All food and feed products containing GMOs and/or produced from GMOs, including products that no longer contain detectable trace of GMOs, must be labelled. Business operators must transmit and retain information about products that contain or are produced from GMOs at each stage of placing on the market.
China	**China was the first country in the world to begin growing GM crops commercially** (in 1988). In 2001 China issued Regulations on the Safe Management of Agro-GMOs. These regulations incorporate safety, importation and labelling. In 2009 the Committee for Biological Safety in the Chinese Ministry for Agriculture permitted the cultivation of GM rice and maize. However as at March 2013, China has not yet begun commercial production. All products containing GM must be labelled GM products.
Korea	The Korean Ministry for Food Agriculture, Forestry and Fisheries regulates labelling of unprocessed GM products and is responsible for conducting risk assessments of GM crops. **No GM crops have been commercialised in Korea**. Korea does import both GM crops and processed products derived from GM crops. Korea has labelling laws around GM crops and foods.
Indonesia	In 2011 the Indonesian Government made changes to the Environmental Law that allows cultivation of GMOs. Since 2005 the Government has had a regulation that states that any biotechnology product that will be used widely has to be tested, and that a risk assessment and risk management process needs to be conducted. **Indonesia was the first country in Southeast Asia to venture into commercial production of GM crops with BtCotton.** Decisions about food safety and/or feed safety of biotechnology involves a number of departments.
Taiwan	In 2001 the Department of Health implemented legislation to require mandatory registration of GM

	soybeans and corn. **No GM crops have been commercialised in Taiwan**. All foods or beverages made of GM soybeans and corn must be labelled. Taiwan imports GM corn and soybeans.

Source: abridged from Australian Government (2011b), GMO Compass (2013), Centre for Food Safety (2006), Deswina & Prasetya (2006), GMAC (2013), Kao (2006), Tao & Shudong (2003), NZ Ministry for Primary Industries (2012), DEFRA (2013), Bhumiratana (2002).

United States of America

The United States of America (USA) has recently introduced regulations to streamline the deregulation of GM organisms through the Code of Federal Regulations, Title seven Part 340.6: www.aphis.usda.gov/biotechnology/downloads/7_cfr_340.pdf These new regulations allow for applicants to conduct their own safety assessments of GM organisms and submit the results to the United States Department of Agriculture's (USDA) Animal and Plant Health Inspection Service (APHIS) for consideration and final approval for deregulation. Previously it was APHIS that would conduct the safety assessments.

European Union

In 2004 the European Union (EU) passed unified legislation permitting the cultivation of GM crops within its member States. Countries currently producing GM crops include the Czech Republic, Poland, Portugal, Romania, Slovakia and Spain (Macquarie Franklin, 2012).

Since 2010 EU member States have been able to preclude GM crop cultivation within their regions by imposing isolation distances between GM crops and conventional crops. In addition, a number of member States have invoked a so-called 'safeguard clause' under which a member State may "*provisionally restrict or prohibit the use and/or sale of the GM product on its territory provided they have justifiable reasons to consider that the GMO in question poses a risk to human health or the environment*". Six member States currently apply safeguard clauses on GMO events: Austria, France, Greece, Hungary, Germany and Luxembourg (European Commission, 2013).

Within the current EU and UK regulatory framework, Scotland and Wales have adopted policy positions that restrict GM crop cultivation within their regions; in Scotland's case citing possible negative impact on the environment and the country's reputation as a high quality natural food and beverage producer (Scottish Government, 2013). According to Friends of the Earth (2013) approximately 10 per cent of German farmland is declared GMO-free. GMO-free areas are created through voluntary contractual commitments by neighbouring farmers within a particular region.

New Zealand

Following a 2001 Royal Commission on Genetic Modification, New Zealand's (NZ) GM moratorium expired in 2003. A major theme of the Royal Commission was 'preserving opportunities', and the Commission found that cautious adoption of GMOs was compatible with existing non-GM land uses:

> "*Our major conclusion is that New Zealand should keep its options open. It would be unwise to turn our back on the potential advantages on offer, but we should proceed carefully, minimising and managing risks. At the same time, continuation of the development of conventional farming, organics and integrated pest management should be facilitated."* (New Zealand Royal Commission on Genetic Modification, 2001)

The NZ Government in 2003 adopted a position of co-existence of GM and non-GM crops on the basis of proceeding carefully and using a comprehensive regulatory framework (NZ Ministry for Primary Industries, 2013). In theory, GM crops that satisfy regulatory requirements can be commercially grown and NZ media websites report field trials of brassicas, onions and pine trees. (Gorman, 2013)

Nonetheless, "*no genetically modified crops are grown commercially in New Zealand. No fresh fruit, vegetables or meat sold in New Zealand is genetically modified*". (NZ Ministry for the Environment, 2013) There are many reasons cited for this: currently available GM crops may not be suited to NZ conditions; significant delays in developing GM grasses; consumer or international market concerns; excessive or uncertain regulation; and, public opposition to outdoor trials and cultivation of GMOs.

DOMESTIC POLICY

AUSTRALIAN GOVERNMENT

The Australian Government supports the application of gene technology and takes a risk-based approach to the assessment, approval and monitoring of dealings with GMOs in cooperation with the States and Territories of Australia (see Part 1 of this Paper).

GM crops are not permitted unless they have been assessed as safe for human health and the environment; GM foods are not approved for sale unless they have been assessed as safe; and foods that are approved must be labelled in accordance with the requirements of the Australia New Zealand Food Standards Code to enable consumers to make informed choices (FSANZ, 2005).

The Australian Government is a signatory to a Joint Statement on Innovative Agricultural Production Technologies, particularly plant biotechnologies, along with Brazil, Canada, Republic of Argentina, Republic of Paraguay, and the USA (Australian Goverment, 2013a). This Statement demonstrates the Australian Government's commitment to biotechnology and the "*promotion of science-based, transparent and predictable regulatory approaches that foster innovation and ensure a safe and reliable global food supply, including the cultivation and use of agricultural products derived from innovative technologies*" (Australian Goverment, 2013a).

National food policy

Food policy in Australia is coordinated nationally through the Council of Australian Governments along with informal mechanisms (Australian Government, 2011c). The food policy framework for Australia is set by the Legislative Governance Forum of Food Regulations, which consists of health and agricultural ministers from the States, Territories and NZ Governments. This policy framework is also informed by international food standards, guidelines and codes of practice developed by the Codex Alimentarius Commission. Food standards are developed to reflect this policy framework (Codex, 2013; FAO, 2013b).

The Australian Government developed Australia's first National Food Plan ('the Plan') in 2013 (Australian Government, 2013b). The aim of the Plan is to integrate food policy by looking at the whole food supply chain, to protect Australia's food security and to develop a strategy to maximise food production opportunities (Australian Government, 2011b).

New technology, such as biotechnology, will continue to be created and used in the food sector, as in other industry sectors. Under the Plan the Australian Government announced that it has a goal to develop a national strategy for biotechnology in agriculture (Australian Government, 2013b&c). The aim of the Strategy is to move towards national consistency on biotechnology. The Australian Government intends to hold targeted consultations during 2013-2014 and work with industry and State and Territory Governments (Australian Government, 2013b).

GM Food safety

The Australian Government maintains that the risk-analysis approach to managing the production of safe food and regulating food safety is in line with international agreements and best practice (Australian Government, 2005).

Food standards are developed by FSANZ in consultation with all Australian Jurisdictions and implemented and enforced by the States and Territories. State authorities monitor food production to ensure that the food supply continues to be safe. In Tasmania, the safety and quality of food is regulated and monitored by the Public and Environmental Health Service in conjunction with local councils (Tasmanian Government, 2013b).

GM foods are regulated under Standard 1.5.2 – Food Produced Using Gene Technology, contained in the Australia New Zealand Food Standards Code (FSANZ, 2012a). The Standard, which is an enforceable regulation, has two provisions:

1. Mandatory pre-market approval (including a food safety assessment).
2. Mandatory labeling requirements.

Standard 1.5.2 ensures that only assessed and approved GM foods enter the food supply (FSANZ, 2012a).

FSANZ maintain an up-to-date list of current applications and approvals on GM food. Currently food and food ingredients produced using gene technology and approved for sale by FSANZ come from seven main crops being, soybean, canola, maize (corn), potato, sugar beet, lucerne and cotton. A number of GM food processing enzymes have also been approved (Australian Government, 2013db, FSANZ, 2012b).

GM Food Labelling

At the moment there are no internationally agreed recommendations on food labelling of GM foods, therefore Governments across the globe are applying their own regulations (Codex, 2013: FSANZ, 2012c). In Australia, labelling is required when genetic modification results in an altered characteristic in a food – for instance, soy beans with changed nutritional characteristics, such as an increase in their oleic acid content (FSANZ, 2012d).

GM foods, ingredients, additives or processing aids that contain novel DNA or protein must be labelled with the words 'genetically modified'. GM foods that do not contain any novel DNA or altered characteristics do not require labelling. A decision not to label these foods was made because the composition and characteristics of these foods are exactly the same as non GM food – typically they are highly refined foods (such as sugar and oils) (FSANZ, 2012c).

Labelling with 'GM-free' and 'Non-GM' claims are made voluntarily by food manufacturers and are subject to relevant trade practices and fair trading laws in Australia and Zealand, which prohibit representation about foods that are likely to be misleading or deceptive.

For further information on the safety assessments of GM foods, refer to the FSANZ website www.foodstandards.gov.au

THE POSITION OF OTHER STATES

All States and Territories of Australia are part of the national regulatory regime for gene technology.

All States and Territories except Queensland and the Northern Territory originally enacted GM crop moratorium legislation. New South Wales and Victoria subsequently allowed the commercial production of GM canola licensed by the OGTR. Also, in 2008, the NSW Government amended its moratorium to provide for the case-by-case basis of commercial cultivation of GM food crops. Western Australia lifted its moratorium on the commercial production of GM cotton in the Ord irrigation area in November 2008 and, more recently, granted an exemption for the cultivation of GM canola varieties. The South Australian Government continues to have a moratorium on GM crops (Australian Government, 2010).

The table below is a summary of each jurisdiction's moratorium legislation.

State and Territory Moratorium Legislation and GM crops			
Jurisdiction	**Legislation**	**Current Orders**	**Expiry of Act**
New South Wales	Gene Technology (GM Crop Moratorium) Act 2002	Blanket prohibition of all GM food crops except commercial cultivation of canola	July 2021
Victoria	Control of Genetically Modified Crops Act 2004	GM crops are allowed to be grown unless a prohibition order is made by the Minister. A prohibition on GM canola was allowed to lapse in February 2008	No expiry date
South Australia	Genetically Modified Crops Management Act 2004	No GM food crops permitted in SA other than those (effectively field trials) being grown under exemption orders	No expiry date
Western Australia	Genetically Modified Crops Free Areas Act 2004	Cultivation of GM crops is prohibited but the Minister can issue exemption orders and has done so for GM canola and cotton.	No expiry date
Australian Capital Territory	Gene Technology (GM Crop Moratorium) Act 2004	GM canola cultivation prohibited	Expiration date of the Act is set by the Minister
Queensland	No moratorium Legislation	GM planting permitted	N/A

Northern Territory	No moratorium Legislation	GM planting permitted	N/A

Source: Adapted from Mewett et al, 2008.

ABARES RESEARCH

The Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) is currently undertaking a project for the Grains Research and Development Corporation (GRDC) analysing examples of when a State's moratorium on the commercial release of a GM crop is in the best interest of industry. The Project is titled *GM Crops: A Framework for Analysing the decision to approve commercial release* (Gray, E. ABARES, 2013, pers. comm., 8 August 2013, Australian Government, 2013i).

Industry may be better or worse off under a moratorium. On the one hand a moratorium may be beneficial, given uncertainty about the risks to market access and the magnitude of on-farm management costs, and because commercial release is irreversible. However a moratorium may be costly because farmers miss out on the benefits of GM crops and risk falling behind competitors in export markets that have already adopted them. The challenge for the States lies in determining how large the benefits of GM crops must be to justify commercial release, given the associated risks and costs (Gray, E. ABARES, 2013, pers. comm., 8 August 2013).

The ABARES research aims to progress the debate over the States' moratoria on GM crops by analysing the decision to approve commercial release using a framework that compares the net benefits and costs of immediate release with those from a postponed decision. This framework (real options analysis) includes an estimate of the value of waiting for more information when evaluating the release decision (Gray, E. ABARES, 2013, pers. comm., 8 August 2013).

It is anticipated that the ABARES research will be available towards the end of 2013.

CO-EXISTENCE AND SUPPLY CHAIN MANAGEMENT

Co-existence means consumers and farmers can have the choice between conventional, organic and GM crop production. The aim of co-existence is to establish the best agricultural management practices to achieve sufficient segregation and flexibility between GM and non-GM production (EC, 2006a).

In 2001 the then Tasmanian Experts Group on Gene Technology noted that "*the production of some transgenic food crops may expose producers to some future market risks. Others may not wish to share in such risks and all efforts must be made to safeguard the interests of surrounding producers, as well as preserving the identity of the transgenic crop itself.*" To maximise any future benefits from differentiated products the issues of vertical co-ordination between the stages of agricultural product handling, identity preservation, and the potential contamination of non-transgenic crops with transgenic material, were all issues that would need to be managed (Experts Group on Gene Technology, 2001). Observations on how these issues are being addressed internationally and in Australia are summarised below.

INTERNATIONAL

In the USA, Canada and the EU, the major focus for segregation and traceability has been management of the equivalent GM or non-discriminatory and organic supply chains. In general, governments of major GM crop producing countries – such as the USA, Canada, Brazil and Argentina – let respective industry supply chains manage and resolve issues related to the market, only intervening where industry has failed or to act on specific issues (Australian Government, 2007a). An example of supply chain management for co-existence is the European Coexistence Bureau; it exists to exchange technical-scientific information on best agricultural management practises for co-existence and to develop consensus on crop-specific guidelines for co-existence measures (EC, 2006b).

Although there are frameworks for managing co-existence, countries can differ in implementation and there is no global monitoring system (FAO, 2010a). Failure to maintain GM crop segregation (commercial release or limited release trials) has caused disruption in many countries, including Canada, NZ and the USA (Heinemann & Wickson, 2011). A recent example of this challenge is the discovery of GM Glyphosate-tolerant Wheat in the USA where no GM wheat varieties are approved for sale or commercial production (Australian Government, 2013e).

Greenpeace International maintains a 'GM Contamination Register' website to publicly monitor incidences of contamination arising from the intentional or accidental release of GMOs (Greenpeace, 2013). The Food and Agricultural Organisation (FAO) note that low-level presence of GMOs in internationally traded crops is of growing concern to national authorities. In light of the increase in trade-related problems due to unintentional mixing, the FAO commenced a study in early 2013 to better understand this issue (FAO, 2013a).

AUSTRALIA

In Australia the major focus has been on the management of the equivalent GM and non-GM supply chains through the adoption of co-existence principles by stakeholders in the supply chain (Australian Government, 2007a). In Australia, the Regulator has an important role in assessing and managing risks (Australian Government, 2007a, Australian Government, 2013j). In recognition of the need to actively manage issues surrounding the introduction of GM crops, the grains industry developed *A Strategic Framework for maintaining coexistence of supply chains* as a guide to assist industry in 2001 (GTGC, 2002).

Occasionally, grains such as soybean, canola and maize are imported in bulk into Australia for processing and stockfeed use (Australian Government, 2008b). The Regulator and the Department of Agriculture, Fisheries and Forestry (DAFF) have strict regulations on the import of some commodities for quarantine reasons. If a bulk shipment contains GM grains not approved for commercial release in Australia, then authorisation is required from the Regulator. Tasmania's zero tolerance approach to importing GMO products was outlined on page of 16 this paper.

Success of segregation efforts relies on co-ordinated operating procedures and marketing policies for all players in the supply chain (Endres, 2008). It is for this reason the industry approach to the introduction of GM canola in Australia was endorsed by 29 organisations representing the entire supply chain (ABCA, 2012).

Quality assurance and quality management systems used in Australia generally include the key elements of identification and traceability. Tasmanian Quality Assured (2004) noted that the challenge of providing supply chain assurances with regard to product identity and segregation is increased in the case of genetically modified products. To achieve identity preservation and segregation, management systems must address the critical elements of risk assessments, external auditing, business commitment, training, customer specifications, trace-back and corrective actions (TQA, 2004).

The need for research and development into the potential productions and supply-chain risks of adopting GM crops is a common theme raised publicly. For example, the Australian Farm Institute (2011) noted that two issues identified in Australia that require careful management in the future include management of herbicide tolerant crops, which create the potential for herbicide tolerant weeds and the real risk that the sector will come to be dominated by a small number of major players. A strategy for diversified herbicide use and non-chemical weed control systems, as well as very close scrutiny of pricing and market behaviour, will be required to ensure that Australian crop producers are not disadvantaged (Kingswell, 2011).

LEGAL ISSUES

Legal issues relevant to growing GM crops arise in both private and public law. In the private law spectrum, GM farmers and producers may be potentially liable under trespass, negligence or nuisance laws for loss or harm arising from unintended contamination to non-GM crops or products (Lunney & Burrell, 2006). In addition, breach of contract could be argued, along with infringement of intellectual property rights. In public law a number of statutory causes of action could arise, depending on the nature of the alleged breach and the particular statute involved (Dalton et al, 2003).

Potential legal issues associated with unintended presence of GMOs are summarised in the table below.

Potential defendant	Potential cause of action against defendant
GM seed manufacturers/suppliers	• Breach of contract • Nuisance • Negligence • Breach of fair trading/trade practices legislation
GM farmers	• Breach of contract • Breach of statutory duty (GM regulation) • Trespass (civil) • Nuisance • Negligence
Non-GM, organic and GM-free farmers	• Infringement of intellectual property rights • Breach of statute (GM regulations and/or fair trading or trade practices legislation. • Breach of contract.
Transporters and harvesters	• Breach of contact • Trespass (civil) • Negligence
Bulk handlers	• Breach of contract • Breach of fair trading/trade practices legislation • Negligence
Manufacturers/retailers	• Breach of food standards • Breach of fair trading/trade practices legislation.

Source: adapted from Dalton et al, 2003 Liability Issues Associated with GM Crops in Australia, Commonwealth of Australia, Canberra, viewed 18 August 2013 http://www.daff.gov.au. (note this is provided for general information only, does not constitute legal advice or opinion).

The potential legal issues arising from GM co-existence are varied and complex, and as such a more detailed discussions is beyond the ambit of this Paper. In general, however, common law legal liability relevant to co-existence requires a duty of care to be established on the part of the person alleged to have caused the GM contamination, and a breach of that duty resulting in damage to the plaintiff (Lunney and Burrell, 2006).

While there have been no decided cases concerning agricultural GMOs in Australia (Ludlow and Smyth, 2011) there are court proceedings on foot in Western Australia relating to alleged negligence and nuisance regarding GM canola (ABC, 2012). Notwithstanding, Lunney and Burrell (2006) have concluded that given the current regulatory environment under which GM crops are grown in Australia, causes of action in negligence or nuisance may not be successful, particularly as detailed risk assessments are required by the Gene Technology Regulator prior to commercial release.

ANIMAL FEED FROM GM PLANTS

A key issue in the last review of gene technology (Parliament of Tasmania Joint Select Committee, 2008) was the use of stock feed from GM plants. The analysis at that time largely revolved around quarantine controls and segregation on the basis that Tasmanian livestock producers use grain imports to supplement locally produced stocks.

The issue was also raised in the first gene technology policy. The Tasmanian Government (2001) noted that "*livestock reared on GM feed posed risks to the Tasmanian market image, with several of Tasmania's trading partners indicating they did not wish to import livestock that had been fed GM feed*". Similar sentiments were also expressed in the 2008 review (Parliament of Tasmania Joint Select Committee, 2008).

Ansell and McGinn (2009) noted that the use of stockfeed that includes GM ingredients has been "*increasing with the rapid adoption of GM cotton varieties by Australian farmers and GM soybeans and canola internationally. The consumption of foods produced using stockfeed containing GM material is substantial. The ability of stockfeed manufacture and livestock industries to adapt to the increased availability of GM crop ingredients for stock feed presents both opportunities and challenges, and will be important for future investment decisions*" (Ansell and McGinn 2009).

As referred to earlier in this paper, the Tasmania's Government's policy response has been to maintain a zero tolerance approach. Imports of GMOs into Tasmania are regulated through import requirements contained in the *Plant Quarantine Manual Tasmania*. Only animal feed that contains material from non-viable GM plants, or processed non viable seed, is permitted in Tasmania.

> "*Australian Government regulators continue to monitor the scientific and other literature for any new information in relation to GM crops and GM foods (and food safety), and assess this information for its potential to impact on regulatory approvals*" (Australian Government, 2013f).

A recent well-publicised issue related to a toxicology study on pigs fed a combined genetically modified (GM) soy and GM maize diet in the USA (Carman et al 2013). "*The study authors claim that pigs fed a GM diet had a higher rate of severe stomach inflammation and higher uterine weights compared to pigs fed the control (non-GM* *diet), and thus raise concerns about the use of GM food and feed. No differences were noted for the majority of parameters measured, including feed intake, weight gain, mortality, various blood measurements, number or nature of illnesses and a range of visual indicators of pathology*." The OGTR reviewed this study and advised that there were many problems with the study, and that it did "*not provide any grounds for reconsidering existing GM crop or GM food approvals or assessment processes in Australia*" (Australian Government, 2013f).

Institutions such as the European Food Safety Authority have also analysed several scientific studies on GM feeds in animal products. Their findings demonstrate that neither fragments of the transgenic DNA nor the proteins derived from GM plants are detectable in tissues, fluids or edible products of farm animals such as broiler poultry, cattle or pigs (EFSA, 2007).

IN SUMMARY

The Australian Government and the majority of States and Territories have adopted risk–assessment frameworks for biotechnology, including gene technology. Different policy and regulatory approaches have been adopted internationally for GM crops, food and feed.

The use of gene technology in Tasmania would raise important questions regarding co-existence of GM and non-GM crops. In most cases managing GMOs in the supply chain has been left to industry to self-regulate, and governments have been active in assisting industry to do so.

Legal liability for GM contamination remains unclear in Australia in the absence of precedent and statutory compensation provisions.

Question

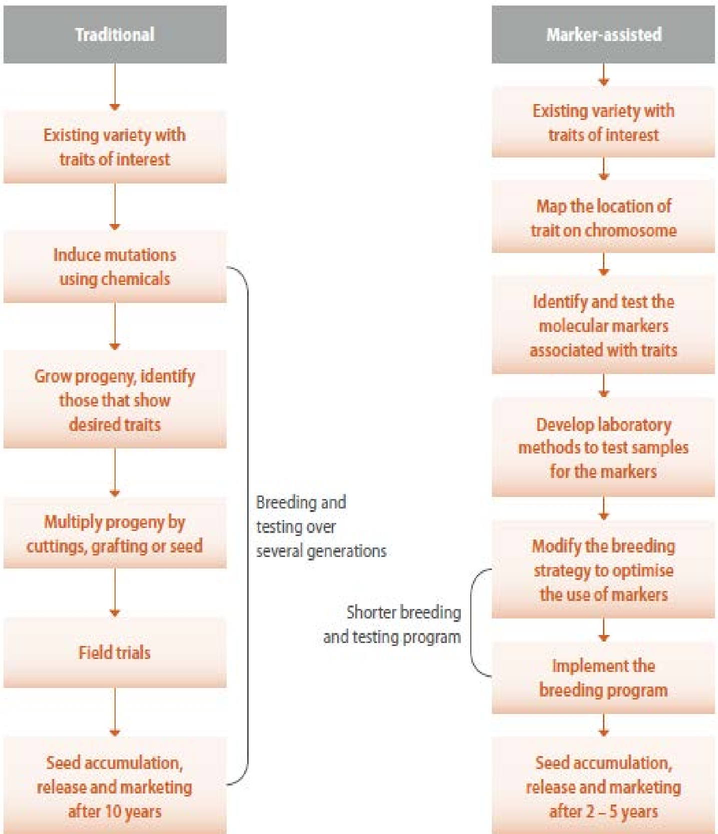
1.1 Are there any other examples of innovative GMO policy and regulation from other States or countries that Tasmania can learn from?

ToR 2) Research and development relevant to the use of gene technology in primary industries

The following sections provide an overview of some of the current developments in biotechnology, including the use of non-GM and GM technologies. This does not capture all the developments, nor is it a comparative analysis of the merits of GM versus non-GM research.

TRENDS IN BIOTECHNOLOGY

As noted earlier in this Paper, biotechnology is a broad term covering not only gene technology but other forms of transforming materials. "*Non-GM biotechnology is used extensively in Australia for growing and husbandry, which includes plant and animal breeding and disease management*" (Innovation Dynamics, 2007). Non-GM biotechnology can increase the speed and accuracy of plant breeding programs. The main use of these has been in the cereals industry (Innovation Dynamics, 2007). The diagram below demonstrates a difference in plant breeding between traditional and non-GM biotechnology techniques.



Source: Innovation Dynamics (2007) derived from Barr and Langridge (2007).

Biotechnologies to improve productivity gains and animal welfare standards in livestock industries include gene marker testing, as well as research into improvement in feed efficiency and methane emission reduction (Beef CRC, 2012). The Australian Winter Cereals Molecular Marker Program has used markers in the breeding programs to increase quality and yield, and to improve disease resistance and stress tolerance to maximise their value to the Australian farming systems (GRDC, 2009).

From a non-food perspective, the poppy industry is a particularly good example of collaborative effort in the agricultural biotechnology sector producing economic benefits to Tasmania (Tasmanian Government, 2007). Tasmania is already the world's largest legal producer of non-GM opium alkaloids for the pharmaceutical market. It should be noted that all licenses for research into GM poppies (limited and controlled release of *papaver somniferum)* have been surrendered (Australian Government, 2013g).

Tasmania also supplies non-GM pyrethrum to 40 per cent of the world market. High yielding varieties and efficient production methods allow industries and industry sectors such as poppies to compete successfully in the international marketplace (Tasmanian Government, 2007).

Biotechnology has been used in aquaculture in areas such as macro algae and selective breeding programs for the Tasmanian Atlantic Salmon industry (Tasmanian Government, 2007).

The Tasmanian Institute of Agriculture (TIA) conducts biotechnology-based research; for instance, a microbial biotechnology research stream has recently been established within TIA's Food Safety Centre. An example of a project includes fermentation based research (TIA, 2013).

FUNCTIONAL FOODS

In 2004 Invest Australia defined functional foods as:

> *"… any food or food component that may provide demonstrated physiological benefits or reduce the risk of chronic diseases, above and beyond basic nutritional functions"* (Australian Government, 2004).

Research carried out in the 1990s led to the first 'functional products' including an 'anti-cholesterol' oil derived from maize, a rice deprived of its most allergenic properties and a grapevine synthesising more resveratrol, an anti-oxidant well known for its impact on cardio-vascular disease (UNUIAS, 2012).

Examples of functional foods (also called "nutraceuticals") include probiotic foods (usually yogurt or other fermented dairy products) and margarine with plant sterols (phytosterols) that help lower cholesterol levels (GMO Compass, 2013). Biofortified crops can be developed by traditional breeding methods as well as through biotechnology. Leaders in biofortification such as HarvestPlus have been using conventional plant breeding to develop its biofortified crops such as beans, cassava, maize, pearl millet, rice, sweet potatoes, and wheat (CSIS, 2011).

Nutrient deficiencies pertain mainly to proteins and micronutrients like vitamin A, iron, and iodine. Conventional strategies to combat nutrient deficiencies include dietary supplements and food fortification programs (ISAAA, 2012b). Through plant breeding, the level of minerals and vitamins in staples can be increased without reducing the crop's agricultural production levels (CSIS, 2011). In principle it is possible to genetically modify plants to produce substances beneficial to human health, with recent examples (not yet commercially released) including "Golden Rice" (Golden Rice, 2013. GMO Compass, 2013).

FOREST BIOTECHNOLOGY

Forest biotechnology is associated with a broad spectrum of modern methods applicable to agricultural and forest science. In forestry, the definition of biotechnology covers all aspects of tree breeding and plant cloning, DNA genotyping and gene manipulation, and gene transfer (FAO, 2010b).

Of all the methods used in forest biotechnology, genetic modification has received the most attention from the public and regulators. Since the first successful genetic transformation of a tree was reported in 1987 (Fillatti et al., 1987), more than 700 field trials of GM trees have been undertaken worldwide with no adverse effects on the environment or human health (Walter et al., 2010). However, very few countries, including China (FAO, 2010b) and the US (Gonsalves et al., 2007), have reported the commercial release of GM trees.

There have been no approvals for the environmental release of GM eucalypts in Australia either by the Gene Technology Regulator (Australian Government 2013e: Record of GMO and GM Product Dealings[1]) or under the former voluntary system administered by the Genetic Manipulation Advisory Committee (GMAC, 1999).

Forestry Tasmania has conducted a genetic improvement program (through conventional breeding techniques) in *Eucalyptus nitens* for more than 30 years (Hamilton et al., 2008) and is now beginning to employ DNA markers (a non-GM biotechnology) to improve the efficiency of the breeding program (Southerton et al., 2010). Under the FSC International Standard (Forest Stewardship Council, 1996) Forestry Tasmania would not be permitted to use GM organisms on their estate.

INTERNATIONAL TRENDS IN GM CROPS

Although 28 countries (including Australia) collectively planted 170 million hectares of GM crops in 2012, most crops were grown in just five countries: the USA, Brazil, Argentina, Canada and India (Nature Publishing, 2013. ISAAA, 2012a).

Growth for many of the largest GM adopters has slowed but Brazil is continuing to see large annual leaps (Nature Publishing, 2013). However, current estimates are that GM crops are still growing by more than eight per cent per annum. This means that the rate of adoption of GM crops by farmers is the fastest of any new technology introduced over recent decades (AFI, 2011).

Four main crops are grown (soybean, cotton, maize and canola) that feature two main traits: herbicide tolerance and insect resistance (Nature Publishing, 2013). The scale of the adoption of GM crops globally confirms that the technology will be a permanent part of the global agricultural landscape (AFI, 2011).

OTHER GM CROPS

GM Crops under research and development around the world.

Crop	Trait (aims of research and development)	Information
Apples	Fungal and bacterial resistance, delayed maturity, modified rooting and flower	Field trials conducted in EU and USA. A commercial use of GM apples is possible in the

[1] The Record of GMO & GM Product Dealings includes information about all applications and authorisations for the environmental release of GMOs under the *Gene Technology Act 2000.*

	formation.	mid-term.
Apricot	Virus resistance.	No field trials or approvals. The commercial use of GM apricots cannot be anticipated in the long term.
Barley	Fungal resistance, herbicide tolerance.	Field trials conducted in USA, Canada, Iceland, EU and Australia. To-date no approvals received for commercial cultivation.
Bean	Herbicide tolerance, resistance to fungi and viruses.	Field trials conducted in USA, Brazil, Ghana, Nigeria and Burkina Faso. No commercial cultivation approvals. A commercial use of GM beans is possible in the mid-term.
Blueberry	Includes herbicide tolerance.	Only three field trials in USA. No commercial cultivation. The commercial utilisation of GM blueberry cannot be anticipated in the long term.
Cabbage (cauliflower, broccoli etc)	Herbicide resistance, insect resistance.	Field trials conducted in the EU and USA, Canada, New Zealand, Japan, China and India. No approvals to cultivate. No commercial use of GM cabbage sorts is expected.
Canola **(also known as Rapeseed)**	All GM Canola grown throughout the world is herbicide resistant. Traits also include fungal resistance, insect resistance and drought resistance.	Although there is broad acceptance of GM canola, for the time being there is no GM canola grown in Europe. Despite many approvals, there is currently no cultivation of GM rapeseed in Japan.
Carrot	Fungal and nematode resistance, herbicide tolerance and increased calcium content.	Field trials conducted in EU and USA. No approvals to cultivate. No commercial utilisation of GM carrots is envisioned.
Cherry	Modified root system and modified fruit quality.	Field trials conducted in EU and Canada. No approval to cultivate. No approval is expected for a long while.
Chick Peas	Insect resistance as well as resistance to drought, salt and cold.	Limited trials in USA and India. No approval for cultivation. The commercial utilisation of chick peas cannot be expected in the near future.
Linseed **(also known as flaxseed)**	Herbicide tolerance, fungal and insect resistance and oil composition.	Field trials conducted in EU and Canada. Approvals to cultivate in USA and Canada. Despite approval in Canada, GM flaxseed has not been cultivated to-date. No value-added linseed or flaxseed products are expected in the future despite approval in Canada and the USA.

Lucerne **(also known as alfalfa)**	Herbicide tolerance, fungal and virus resistance and stress tolerance. Australia has utilisation as a foodstuff/feed.	Field trials conducted in EU, USA, Argentina, and Japan. Approval to cultivate includes USA, Japan and Canada.
Maize **(also known as corn)**	Herbicide tolerance, drought and salt tolerance. Altered flowering time.	Cultivation in USA, France, Spain, Italy, Belgium, Hungary, Germany and other countries. Australia utilises GM Maize in foods/feed.
Mustard	Herbicide tolerance, salt and heavy metal tolerance.	Field trials conducted in EU, USA, India, Canada and Australia. No immediate commercial use of GM mustard is expected.
Oat	Viral resistance.	Only one field trial conducted in the USA. No approvals for cultivation. A commercial use of GM oats is not to be expected in the long term.
Onion	Herbicide tolerance, virus and insect tolerance, delayed maturity of flowering.	Field trials have been conducted in USA and New Zealand. No approvals for cultivation. No immediate commercial use of GM onions is expected.
Pea	Herbicide tolerance, insect, fungal and viral resistance.	Field trials conducted in EU and additional countries. No approval to cultivate. A commercial use of GM peas is to be expected in the medium term.
Poppies	Antibiotic resistance, variance in alkaloid production, marker genes to allow study of pollen transfer.	High interest in development of varieties, hybrids, synthetics and GMO in opium poppy. No commercial crops, but limited trials conducted.
Potatoes	Fungal, virus, drought and cold resistance, herbicide, salt tolerance, modified starch composition, increased protein and levels of amino acids.	Trials have been completed in some EU countries, United Kingdom, USA, Canada, Argentina, New Zealand, China, Australia, India, Indonesia and South Africa. GM Potatoes have been approved for cultivation in the USA and Canada. The USA and Canada suspended commercial cultivation in 2001. Introduction of phytophtora resistant potatoes for cultivation is expected in the EU by 2015. The first field trials are already underway. Australia utilises GM potatoes in foods/feed.
Rice	Herbicide tolerance, insect resistance, drought, salt tolerance, resistance to flooding, enrichment with Vitamin A, starch and protein content.	Commercial cultivation of GM rice is expected in the near future in China, India, Indonesia and the Philippines. Field trials conducted in Spain, Italy, France, USA, Japan, Argentina, China, India, Brazil, Australia, Mexico, Philippines, Indonesia and other Asian countries. USA is the only country with

		approval to cultivate GM rice.
Ryegrass (for dairy)	Cold, drought and salt tolerance, disease resistance and improvements to forage qualities.	Australia's Dairy Futures CRC is developing a plant breeders 'toolbox' to hasten the rates of genetic gain in pasture breeding programs. They are working on identifying elite lines of ryegrass that can consistently produce more dry matter and higher levels of metabolisable energy than currently-available varieties. Dairy Australia anecdotally suggests six years before readiness for approval for cultivation.
Soybeans	Herbicide tolerance, fungal and nematode resistance, tolerance to drought and salinity, modified protein and oleic acid.	Cultivation in USA, Argentina, Brazil, Mexico, Paraguay, Uruguay, Bolivia, Canada, South Africa. Increasing worldwide tendency for cultivation, widespread use of GM soya for foodstuffs and animal feed. Australia utilises GM soybeans in foods/feed.
Strawberry	Herbicide tolerance, fungal and insect resistance, modified blossom time and rooting.	Some trials in the EU, Canada, Japan and Argentina. Commercial use of GM strawberries is not expected in the long run.
Sugar Beet	Herbicide tolerance, virus resistance. Pectin content, increase in starch levels and concomitant reduction in the water content, adaptation to climatic and location factors.	Trials in many EU countries, USA, Canada, Argentina and Japan. Commercial cultivation has been very limited in USA and Canada (export for animal feed to EU). From 2010, additional plantings have not been allowed until the USDA submits further environmental impact statements.
Tomato	Insect and virus resistance.	Trials conducted in EU, USA, Canada, Australia and others. Cultivation has been limited. There has been none in EU. In 1998 the USA had 200,000ha under cultivation. This has been suspended since 2002. The first gene modified tomatoes FlavrSavr™ did not fulfill the producers expectations and are no longer cultivated today. No further commercialisation is anticipated at present. Commercial utilisation of GM tomatoes is expected in Indonesia in the medium term.
Triticale **(cross of Wheat and Rye).**	Herbicide tolerance and storage of proteins.	Field trials conducted in EU and USA. No approvals for commercial cultivation. A commercial application of GM triticale cannot be forseen in the long term.

White clover, Subterranean clover	Virus resistance.	Trials conducted in Australia but no commercial cultivation. CSIRO Plant Industry scientists explored disease resistance in white clover and improved protein in subterranean clover. No immediate plans for general release.
Wheat	Herbicide tolerance, fungal resistance, tolerance to drought and salt, increased content of glutenin and protein.	GM Wheat is not grown commercially anywhere in the world. Field trials in EU, USA, Australia and five other countries. It is possible that it may enter the market in the medium term.
Wine grapes	Fungal, virus and bacterial resistance, modified sugar content, colour and grape size, modified flower and fruit development.	Field trials conducted in EU, USA and three other countries (including Australia). No approval for cultivation. No immediate commercial use of GM grape vines is expected.

Note: Short term means 0-5 years; medium term 5-10 years; and long term >10 years.

Source: Abridged from GMO Compass (2013), Cogan (2013).

AUSTRALIAN TRENDS IN GM CROPS

COMMERCIAL CROPS

It is evident that the use of specific GM crops in Australia has grown since 2003. GM cotton and GM Canola have been grown in Australia for more than a decade, although ABARES recently noted that a slow-down in broadacre productivity growth (attributed to State Moratoriums) had slowed the adoption by farmers and possibly the development of new varieties (Australian Government, 2008c. Reading, 2013).

Canola is most relevant to Tasmania. GM canola was grown commercially in Australia for the first time in 2008 in New South Wales and Victoria. The area of GM canola has grown from 9,600 ha in 2008 to 133,300 ha in 2011. The breakdown of commercial GM canola production by State for the 2010-11 season is provided in the table below.

State	Growers accredited	Area planted (ha)	Tonnes delivered
NSW	132	24,043	32,879
Victoria	96	36,497	58,713

Western Australia	743	72,793	47,491
TOTAL	**971**	**133,333**	**139,083**

Source: ABCA (2012)

In 2012 the area increased again to approximately 176,000 ha, representing almost 10 per cent of the nation's canola crop (ABCA, 2012).

APPROVALS OF LIMITED AND CONTROLLED RELEASE OF GM CROPS

The Regulator has approved limited and controlled releases (field trials) into the environment of a variety of GM crops. These include GM maize (corn), GM narrowleaf lupin, GM perennial ryegrass and GM tall fescue, GM sugarcane, GM wheat, GM barley and GM white clover (Australian Government, 2013g).

What GM crops can be grown commercially in Australia?

Currently, the only genetically modified plants approved for commercial release in Australia are GM canola, GM cotton and GM carnations.

Although GM canola could be suited to Tasmania, none of the GM crops listed are approved to be commercially grown in Tasmania because of the Moratorium on GMOs.

To date, no genetically modified animals have been approved for commercial release in Australia.

A variety of foods produced using gene technology (including ingredients, food additives and processing aids) are also approved for sale and use in Australia.

Source: Australian Government (2013g), Australian Government (2013h)

Advanced work is underway on three of these GM crops – wheat, barley and sugarcane (AFI, 2011). From a medium-term perspective (five to 10 years) wheat, ryegrass and white clover are pasture and field crops to watch from a research and development perspective as limited and controlled release trials are approved by the OGTR up to 2017 (Australian Government, 2013d) .

Drought resistant, high-energy GM ryegrass and disease resistant clovers (being developed by the Victorian Department of Environment and Primary Industries and partners) are claimed to have the potential to significantly raise productivity on dairy and red meat enterprises (Victorian Government, 2013).

In Australia, trials have commenced for GM omega 3 rich canola as there is a local market for fish feed to service the growing aquaculture sector (Australian Government, 2013k). There is also a growing body of research into GM potato varieties, although no licences have been approved by the OGTR as yet (GMO Compass, 2013).

GM CROP TRAITS

To date the main benefit of GM technology to agribusiness has been through increased yields or less pesticide use (Nature Publishing, 2013). Of some 30 traits that are currently engineered into plants for commercial use, the most popular are those that confer herbicide tolerance, insect resistance or both traits together (AFI, 2011). There is now a new generation of GM crops emerging that focuses on traits like enhanced nutrition and pharmaceuticals. GM crops are now classified into 'first, second and third' generation. This is described further in the table below.

Category	Specific Traits	Also called
First generation	Environmental stress tolerances	Input traits
	Improved pest and disease control	
	Improved nutrient use	
Second generation	Enhanced nutrition	Output traits
	Improved oil quality	
	Longer post-harvest life	
	Improved feed and pastures	
Third generation	Pharmaceutical crops	Non-food industrial products or processes
	Industrial crops	

Source: Australian Government (2001b)

The development of third generation GM plants in particular is being driven by the need to produce large volumes of vaccines for livestock disease (such as Avian Influenza) as well as delivering affordable drugs to large populations of people (Australian Government, 2007b).

The Crop Biofactories Initiative (a joint initiative by CSIRO and the GRDC) aims to develop technologies for novel industrial compounds from GM non-food grain crops (CSIRO, 2012a). An example of a third generation crop is a new safflower type which could provide Australian grain growers with an opportunity to supply renewable sustainable oils to replace petroleum-based feed stocks (CSIRO, 2012b).

An emerging trend has also been for 'stacking traits'. This is a process of combining two or more genes of interest into a single trait. These stacks are engineered to have better chances of overcoming problems in the field such as insect pests, diseases, weeds, and environmental stresses so that farmers can increase productivity (ISAAA, 2012a). Traditional plant breeding is the most common way to stack novel genes in GM crops (FSANZ, 2010). An example of a notable 'stacked trait' product is "Golden Rice" which is a biofortified rice that accumulates provitamin A in the grain (Golden Rice, 2013). It should be noted that "Golden Rice" is still under development and evaluation (IRRI, 2013).

GM ANIMALS

There are currently no GM animals in commercial production in Australia (Australian Government, 2013e).

A GM vaccine against cattle tick was released in Australia in 1994. This was the first vaccine to be used commercially against ticks anywhere in the world (Safe Meat, 2006). In 2007 a permit was granted in Tasmania for use of a live attenuated GM vaccine for Equine Influenza. (Refer to the box page on page 14 for further information.)

Genetic modification of animals is progressing at a slower rate than in crops. Apart from the production of pharmaceuticals, the targets of animal transgenics have mostly been in breeding for feed conversion efficiency, and disease or parasite resistance (CSIRO, 2003).

Research trials of transgenic sheep have, in the past, been conducted in countries such as NZ (FRST, 2008). NZ continues research to develop and apply genetic modification technology with the aim of using genetic molecular techniques to provide future options for animal industries to realise previously unattainable breeding goals (AgResearch, 2012). Despite research conducted in Australia and NZ over the past 20 years, there is currently no transgenic animal being grown for food or fibre production in these countries (Seymore et al., 2004. Australian Government, 2013g).

Currently little genetic modification is involved in dairy production or manufacture. During processing, some cheeses are produced with an enzyme (chrymosin) that is derived from GM bacteria or yeasts as an alternative to the chymosin derived from calf rennet. It is used as a processing aid and, as such, no GM organisms or genetic materials are present in the final product (Dairy Australia, 2009).

Research on GM fish overseas has primarily focused on producing fish with increased growth rates, increased temperature tolerance and improved disease resistance (BRS, 2002). There is an application currently outstanding by the United States Food and Drug Administration (USFDA) for approval of the 'AquAdvantage' genetically engineered salmon. Preliminary findings were that an approval of the application (under the specific conditions proposed in the application) would not have a significant impact on the environment. Earlier this year the USFDA extended the comment period for their draft environmental assessment (USFDA, 2013). No similar applications have been made to Australian regulators.

IN SUMMARY

Gene technology is one application of biotechnology that has been used in recent times to enhance the properties of crops, animals and food through the introduction of various production and functional traits.

In Australia the GM crops released commercially are canola, cotton and carnations. Field trials of GM crops have included corn (maize), lupin, soybean, ryegrass, fescue, sugarcane, wheat, barley, white clover and poppies.

No GM animals have been approved for commercial release in Australia.

Questions

2.1 Are there any new or emerging opportunities in gene technology that could benefit Tasmania's primary industries, now or in the future?

2.2 Are there any new or emerging opportunities in non-GM biotechnology that could benefit Tasmania's primary industries, now or in the future?

2.3 What impact has the moratorium had on the research and development of new products or markets?

ToR 3) Market advantages and disadvantages

The potential market advantages and disadvantages of allowing or not allowing the use of gene technology in Tasmanian primary industries, including food and non-food sectors.

DEFINITIONS – MARKETS, MARKETING AND BRANDING

Under current laws Tasmania can only regulate GMOs for marketing purposes. The term 'marketing purposes' is not legally defined or explained in the relevant legislation, nor are the risks that regulators are to take into account when making decisions (Ludlow, 2004). In the Regulatory Impact Statement for the Policy Principle[2], 'marketing purposes' was taken broadly to mean impacts on marketability of a specific product or its entrance into the marketplace, although States may interpret it in different ways (Ludlow, 2004).

Ludlow (2004) further noted that with respect to GMO releases, what socio-economic risks are considered is unclear and may depend on how broadly 'market' is interpreted. For example, it was not clear how issues like economic repercussions, farmers' freedom to farm as they choose upon release of a GMO, ethical issues, and the views of the public as possible consumers (and therefore relevant to marketing), would be assessed (Ludlow, 2004).

In considering the potential market advantages and disadvantages (of having a moratorium for marketing purposes), this paper explores the inter-related concepts of markets, marketing, and branding. Often all three terms are used interchangeably, but they actually mean different things. For this reason the following terms have been adopted for the purposes of this paper:

Market

> *"A collection of buyers" of a given product.* (Kotler, 2003)
>
> *"An actual or nominal place where forces of demand and supply operate, and where buyers and sellers interact (directly or through intermediaries) to trade goods, services, or contracts or instruments, for money or barter."* (The Business Dictionary, 2013)

In the context of this Paper, markets for Tasmanian food and other agricultural products can be divided into local (Tasmanian), domestic (Australia) and international.

[2] The *Gene Technology (Recognition of Designated Areas) Principle 2003* (Cth): refer to the background section of this paper for more information.

Marketing

"*The task of creating, promoting, and delivering goods and services to consumers and businesses" or "meeting needs profitably*". (Kotler, 2003)

"*The science and art of exploring, creating, and delivering value to satisfy the needs of a target market at a profit.*" (Kotler, 2013)

Brand

"*The intangible sum of a product's attributes: its name, packaging, and price, its history, its reputation, and the way it's advertised.*" (Drypen, 2008).

"*A brand is a name, term, sign, symbol, or design or a combination of them, intended to identify the goods and services of one seller or group of sellers and to differentiate them from those of the competitor.*" (Kotler, 2013).

In the context of this Paper brand refers to both the 'Tasmanian Brand' and the brands of individual businesses.

Branding

"*The process involved in creating a unique name and image for a product in the consumers' mind, mainly through advertising campaigns with a consistent theme. Branding aims to establish a significant and differentiated presence in the market that attracts and retains loyal customers.*" (The Business Dictionary, 2013).

THE QUESTION OF MARKET ADVANTAGE

Tasmania's brand positions the State as a distinctive, premium food producer. The brand has a strong profile within the Australian domestic market and is gaining increasing recognition overseas. In 2001 a Parliamentary Committee found, "*there was potential for use of gene technology to impact negatively upon Tasmania's ability to market locally produced food domestically and abroad under a clean, green banner … (and) that as a small island with a well-developed biosecurity system and a promising brand, Tasmania is one of a handful of places in the world potentially able to achieve, maintain and take advantage of a GMO-free status*" (Tasmanian Government, 2009). This has formed a basis for Tasmania's policy for a moratorium on GM crops ever since.

In support of this policy, the Tasmanian government has committed to a range of initiatives to develop and promote the Tasmanian food brand by highlighting product attributes such as premium quality, safety and sustainability. These include:

- Market development programs and activities operated out of The Department of Economic Development, Tourism and the Arts (DEDTA), including the Marketing Assistance Scheme (MAS), inward buyer and visiting journalists programs, *Savour Tasmania*, and international trade promotions; and

- *Taste Tasmania,* a Tasmanian food branding and market development initiative, launched in early 2012, to promote of high quality, locally grown food within the Tasmanian market place.

In 2012 DEDTA commissioned a report into the question of market advantages and also the benefits and costs of the moratorium on GMOs. Macquarie Franklin (2012) found that Tasmania's GMO-free status does create a point of difference that fits with and supports the Tasmanian Brand, but noted a range of views expressed (by industry stakeholders) in relation to market advantage and disadvantage.

Other key findings from the report include:

- A majority (possibly 75 per cent) of the State's agricultural output (food and non-food) is either sold as commodities or not branded as 'Tasmanian'. The report estimates that less than five per cent of Tasmania's food and agriculture sector specifically utilise 'GMO-free' to support brand image and product marketing, comprising:
  - all beef exports to North Asia;
  - all fresh vegetable exports to Europe and Asia;
  - all fruit exported to Asia;
  - the honey industry's export sales to Europe and Asia; and
  - the organics industry's annual sales.
- The ability to grow food and other agricultural products in a GMO-free environment is just one attribute of the Tasmanian brand, along with clean and green, cool climate, isolation and biosecurity.
- The potential market advantage of being able to grow food in a GMO-free environment is an intangible benefit – it is difficult to quantify what additional value being GMO-free creates or what the impact of removing it would be.
- The GMO moratorium has retarded the growth of the canola seed industry (the only GM crop currently authorised by the Australian government that is suitable for Tasmanian conditions) and resulted in lost GMO research opportunities. While noting that market advantages were inherently intangible and difficult to quantify, the report estimated a net market disadvantage of $4 million/annum at the farm gate from the inability to grow GM canola.

The "Macquarie Franklin Report" is available from the DEDTA website
http://www.development.tas.gov.au/__data/assets/pdf_file/0011/67736/MF_Tas_GMO-free_Marketing_Advantage_2.pdf

MARKETS FOR TASMANIAN PRODUCTS

The *Tasmanian Food and Beverage Industry ScoreCard for 2010-11* and the Macquarie Franklin Report both note that the Tasmanian food and beverage sector has grown significantly over the past decade, although the ratio of exports and domestic sales has fluctuated in line with droughts, changes to industry composition, global market conditions and currency movements.

The strength of the Australian dollar during the mining boom in particular has resulted in increased volumes of products, such as cheese and salmonoids, being redirected from export markets to the Australian domestic market. Currently approximately 25 per cent of Tasmania's packed and processed food (by value) is exported with the remainder sold within Australia (refer to the box: *Tasmanian food, agricultural and seafood production*).

A question of industry competitiveness

Dairy is a significant industry for Tasmania. In 2010-11 it was worth $312 million at the farm gate and $416 million after packing and processing (Tasmanian Government, 2013b).

As noted earlier in this Paper, drought resistant, high energy GM ryegrass and disease resistant clovers for the dairy and grazing industry are in development. Conceivably, over time, Tasmania's direct competitors, such as dairy producers in Victoria or NZ, may move to adopt this gene technology. Macquarie Franklin (2012) notes that by being GMO-free Tasmanian producers would certainly then have a point of difference with their competitors. However the question is whether the Tasmanian dairy industry (for example) could turn this into a market advantage (Macquarie Franklin, 2012).

Under this scenario, could Tasmania be confronted with a difficult choice between remaining GMO-free or allowing the use of gene technology so that key local industries can maintain their competitiveness (and keep pace with their competitors)?

Key local industries may also seek a more pro-active policy approach that provides them the opportunity to gain a commercial advantage over their competitors by becoming early adopters of a particular gene technology. In such circumstances clearly the industry would need to carefully consider consumer and customer support, among other issues.

DPIPWE would welcome evidence on this issue as part of the review.

Historical trends and the cyclical nature of global commodity markets indicate the proportion of exports may likely increase in the future in line with changed market conditions, economic performance of key trading partners (i.e. the rise of China) and exchange rates.

If seafood products are excluded, a significant majority of Tasmania's packed and processed food products are either sold as commodities, such as milk powder, or as branded products, such as processed vegetables and chocolate, but with no reference to Tasmania (Macquarie Franklin, 2012).

Products currently identified and sold as 'Tasmanian[3]' in domestic and export markets include:

- Fresh vegetables, principally onions exported to Europe and Asia;
- Beef exported to Asia (mostly Japan) or sold under brands such as *Cape Grim Beef* and *King Island Beef*;
- Fresh fruit (particularly cherries) exported to Asia;
- Honey exported to Europe and Asia;
- Premium wine and beer sold mostly into the domestic market;
- Premium dairy products (mostly cheese) sold mostly into the domestic market;
- Farmed (salmon) sold mostly into domestic markets; and
- Wild-caught seafood products (abalone, lobster) sold mostly into Asian markets.

[3] While identified as 'Tasmanian', these examples may or may not specifically refer to 'GMO-free' as part of their branding and product marketing.

Tasmanian food, agricultural and seafood production

The gross value of agricultural, seafood and food production sectors has increased, despite challenging climatic and trade conditions. In 2010-11 the gross value of Tasmanian agricultural and seafood production at the farm gate and beach was $1.76 billion, which was an increase of $105 million compared to 2009-10. The food component of that is $1.45 billion and, once packed and processed, is worth $2.85 billion.

Food Trade Revenue

- Tasmania produces a large net food and beverage surplus, with more than 75 per cent of Tasmanian production going to overseas and interstate customers. Only 25 per cent of the food and beverages are consumed within Tasmania.
- About half of Tasmanian food and beverages by value ($1.55 billion) were sold interstate.
- Overseas food exports were $527 million and account for approximately 25 per cent of production. Trade to North Asia accounts for 52 per cent of total exports. Japan remains the largest customer (23 per cent of total exports) and China and Hong Kong represent some 24 per cent of total exports.
- The ASEAN region countries account for 14 per cent, EU members 6.5 per cent and USA five per cent of exports.

Tasmanian Agriculture and Fisheries Production (2010-11)

Sector	$ million	Sector	$ million
Cereals	$18	Milk	$312
Other Field Crops – oilseeds*, legumes, hay, nursery	$96	Eggs	$13
Other field crops - poppies, pyrethrum & Essential Oils	$77	Rock Lobster	$60
Apples	$31	Giant Crab	$2
Other Fruit	$58	Abalone	$97
Wine Grapes	$18	Scallops	$0
Carrots	$21	Other Molluscs	$2
Potatoes	$89	Scalefish	$3
Other vegetables	$75	Salmonoids	$418
Beef	$180	Oysters	$23
Lamb & Mutton	$43	Mussels	$2
Other meats	$28	Abalone	$6
Wool	$97	**Total**	**$1,764**

*The production of **canola** was reported as 710 ha that yielded 1,065 tonnes and the gross value at the farm gate was $0.6 million.

Sources: Australian Bureau of Statistics, Value of Agricultural Commodities Produced, cat no 7503.0, ABS, Agricultural Commodities, cat no 7121.0, ABARES, Australian Fisheries Statistics

For further information, the Tasmanian Food and Beverage Industry ScoreCard for 2010-11 is available from the DPIPWE website: www.dpipwe.tas.gov.au

The shift in global economic power from North America and Europe ('The West') to the Asian region, along with rising incomes in developing countries, presents opportunities for Australian agricultural producers and processors. This is particularly so given our proximity to Asia and our reputation for producing safe, high quality food and other primary products from a clean, unspoilt environment.

The economic opportunities and impacts of this global transformation are identified in the *Tasmania's Place in the Asian Century White Paper*:

> "*Demand is likely to grow for high quality and niche products as well, with a growing proportion of fish, meat and dairy. The growing number of Asian high-income households will be an important focus for Tasmania's premium products, such as seafood, cherries and wine"* (Tasmanian Government, 2012).

When considering market opportunities, understanding the context in which Tasmania operates is also essential. In 2011 Australia accounted for 2.1 per cent of all global exports of agriculture fisheries and rubber (www.dfat.gov.au/trade/negotiations/trade_in_agriculture.html). Tasmania in turn accounts for approximately 2.5 per cent of Australian agricultural production (ABS, 2012).

Tasmania's food and agriculture sector is highly diversified with a mix of enterprises. Some of the State's production is geared to niche, premium products such as abalone, seeds, cherries, wine, soft cheese and grass-fed beef. However the State also relies on commodities like opiate alkaloids, potatoes and milk powder.

MARKET RESEARCH AND CONSUMER ATTITUDES

Attitudes towards GM foods vary globally and there have been numerous surveys attempting to understand and measure evolving public attitudes towards the technology.

A 2012 Australian National University (ANU) survey of 1,200 Australians on their attitudes to food security found that up to 44 per cent of those surveyed felt that GM foods are safe to eat and 36 per cent felt otherwise. The lead author believed that attitudes are shifting and that 10 years ago the same survey would have revealed 'widespread opposition' to GM food (Lochie and Pietsch, 2012).

Regular surveys of community attitudes towards biotechnology are commissioned by the Australian Department of Industry, Innovation, Science, Research and Tertiary Education. The most recent survey noted that generally the awareness of biotechnology, including GM food and attitudes towards GM food, had improved since 2010 (IPSOS, 2013). This survey revealed there was a high degree of uncertainty of the prevalence of GM foods and crops in Australia. Respondents generally felt that the benefits of GM and other biotechnologies outweighed the risks. The use of GM technology where plants were modified by introducing genes of a plant of the same species was more acceptable than introducing animal or bacterium genes.

This survey revealed that GM food was valued more highly where the objective would be to make food healthier, followed by making food cheaper, longer-lasting and better tasting. Willingness to eat organic food was higher than food with some form of scientific intervention. Willingness to eat (GM food) was lowest for meat and other products that come from GM or cloned animals, or their offspring. This survey (IPSOS, 2013) also indicates that attitudes to GMOs would be influenced by the level of confidence in regulatory approvals, long term testing of the risks to the environment or human health, and community participation in decisions on biotechnology.

What is the value of niche (premium) versus commodity markets?

As noted earlier in this Paper, Macquarie Franklin (2012) estimated that 75 per cent of the State's agricultural output (*food and non-food*) is either sold as commodities or not branded as 'Tasmanian'. This is a good starting point for considering the value of our food and beverage production that is sold as commodities with that sold in niche (or premium) markets. For the purposes of this Paper, DPIPWE sought to further analyse this question. The current sector and industry data, and how it is reported, means it is not easy to differentiate between the two. DPIPWE took a different approach and considered if it is possible to estimate and compare the potential value of niche versus commodity under a hypothetical 'ideal scenario'.

Using the latest Tasmanian Food and Beverage Industry ScoreCard for 2010-11 (Tasmanian Government 2013a), and a general knowledge of current businesses, production and markets, the categories of food and beverage that tend to be sold, or could lend themselves to be sold, as niche, premium or Tasmanian-branded were identified. A percentage that could likely be sold as branded versus unbranded was then applied to each category identified.

Based on this initial analysis, it is conceivable that 55 per cent of the current processed value of foods and beverages are or could be differentiated and sold as Tasmanian branded product. Based on the 2010-11 ScoreCard data, the packed and processed value of Tasmania's food and beverage industry was $2.847 billion annually. Hence the value of the branded proportion has the potential to grow to approximately $1.6 billion annually (based on 2010-11).

The (estimated) remaining 45 per cent would likely be unbranded or supplied as part of bulk commodity markets.

The actual level of differentiation and branding will vary from product to product and market to market, and would of course be determined by a range of factors, including individual company objectives and the level of customer demand for differentiated foods. It should also be noted that DPIPWE included seafood, beer and confectionary in its analysis, whereas Macquarie Franklin (2012) did not include salmon or abalone, focusing on agricultural products.

DPIPWE would welcome any evidence on this issue as part of the review.

Macquarie Franklin (2012) examined the research into consumer attitudes to GMOs and noted that the low priority that Australian consumers place on GMOs, relative to other food concerns, is reflected in the GMO policies of the major supermarket chains.

Given cultural similarities, research in the UK offers some useful insights into consumer attitudes to GMOs. A 2013 YouGov survey of 2,301 consumers revealed that, if given the choice, 67 per cent of UK respondents would prefer to buy conventional (non-GM) food. This contrasted starkly with another survey conducted at the same time which found that '"*61 per cent of farmers in the UK would grow GM crops if it were legal to do so*", highlighting the significant differences in levels of acceptance between food producers and consumers (FoodBev, 2013).

A 2013 report on GM labelling commissioned by the UK Food Standards Agency used both qualitative and quantitative research methodologies. It found that when buying food for the first time the main information respondents spontaneously look for were "*price (37%), nutritional information such as the amount of fat (25%) and sugar (19%). In contrast, only 2% of respondents spontaneously mentioned they looked for GM information on labels"* (UK Food Standards Agency, 2013).

Consumer attitudes and behaviour are inherently complex, driven by a range of influences. Price, product characteristics, media coverage, advertising, campaigns by Non-Government Organisations (NGOs), and economic conditions all inform consumer values and purchasing decisions across different market segments and product categories.

When considering the results of surveys, like those referred to above, it is important to recognise that preferences stated through interviews, online surveys or telephone polls will not necessarily reflect actual purchasing behaviour (or 'revealed preferences') (Macquarie Franklin, 2012. Knight, 2011). Accordingly, greater weight should be given to research that draws on actual consumer behaviour or accurately simulates purchasing scenarios.

IN SUMMARY

At present approximately half of Tasmania's food and beverage production is sold interstate, with approximately 25 per cent exported overseas and 25 percent consumed locally within Tasmania. Rapid economic growth in the Asian region and rising incomes in developing countries presents opportunities for Tasmanian producers and processors.

Tasmania's food production sector is diverse and supplies both commodity and niche markets.

Consultants Macquarie Franklin noted that approximately 75 per cent of Tasmania's agricultural output by value (food and non-food) is sold as commodities or not branded as 'Tasmanian'. They also estimated that less than five per cent of Tasmania's food and agriculture sector currently utilise GMO-free status to support brand image and product marketing.

Consumer attitudes to GM foods vary. The presence of GMOs is one of many attributes that consumers may consider when making purchasing decisions. Factors such as price and nutritional information are often given greater priority by consumers.

Questions

3.1 The use of GMOs in Australia is controlled by a dual system of national and State regulation, where Tasmania can only regulate gene technology to "... preserve the identity of GM or non-GM crops, or both GM and non-GM crops, for marketing purposes". Is having a moratorium appropriate for Tasmania?

3.2 From a marketing perspective we particularly want to hear from actual producers, retailers, wholesalers and exporters:

a) What products do you sell in domestic or international markets as 'Tasmanian' and/or 'GMO-free'?

b) What market opportunities have you gained or lost over the past 10 years as a result of Tasmania's GM moratorium?

c) If Tasmania's GMO moratorium was to lapse, what would be the impact on your business?

d) If non-food GM crops were grown commercially in Tasmania, would this impact on your food markets?

e) Can you provide evidence of the financial benefits or costs to your business as a result of the current moratorium?

(Please clearly identify any confidential information).

3.3 Should Tasmania's policy allow for exemptions to a moratorium? *For example, to allow for specific GM crops (such as non-food crops), or to designate some areas of the State where GM crops can be grown, or for other circumstances.* If so:

a) How could any exemptions be determined and by whom?

b) What other issues could arise and how could they be managed?

3.4 Is it possible for GM and non-GM crops to co-exist and not affect the marketing of Tasmania's products?

3.5 The current moratorium automatically expires in November 2014. If a decision was made to extend the moratorium beyond 2014, what would be an appropriate length of time for the new moratorium?

DPIPWE would also welcome evidence on the following issues:

1. A question of industry competitiveness? (refer to box page 44)

2. What is the value of niche (premium) versus commodity markets? (refer to box page 47)

BRANDING

The Tasmanian brand is not about a single product, service or business – so it does not have one 'owner.' Brand Tasmania, an independent, industry-based and government-supported organisation, was established to develop and assume custodianship of a Tasmanian master brand identity, which can be used to help market products of Brand Tasmania 'partners.'

Brand Tasmania's website contains a brand model that defines the Tasmanian brand 'essence' as 'far from ordinary' and expands on this essence through a cascading hierarchy of personality, values, positioning and attributes. The Tasmanian brand is difficult to define concisely or summarise but it is clearly built around Tasmania as a place. 'Tasmania is the story' (Brand Tasmania, 2013).

As Macquarie Franklin (2012) notes,

> "*Brand values used to market Tasmanian food and agricultural products derive mostly from location – an isolated island in the Southern Ocean, clean, green, pristine water, clean air, cool climate, etc. These provenance features help create a story around food production that is very appealing to many export markets, particularly in Asia, as they evoke a sense of romance*" (Macquarie Franklin, 2012).

As Tasmania's brand is essentially based on 'place' it could be argued that individual attributes like Hormone Growth Promotant (HGP) and GMO-free are secondary elements that enhance or support (or are implicit in) the primary geographic attribute of place. Conversely, the physical isolation of being an island may also make a GM-free stance more credible in the eyes of consumers.

Like any other brand, the Tasmanian brand needs to be carefully managed to build the profile, value and reputation of the brand and therefore products and services sold under it (as well as to maintain consumer trust). Actions, omissions or neglect by custodians of a brand or events beyond their control (such as natural disasters, environmental pollution or protests by influential NGOs) can damage that brand, sometimes irreparably. Examples include the bovine spongiform encephalopathy (BSE) outbreak in the UK during the 1990s which reduced demand for British beef, and the recent contamination of whey (dairy) products from Fonterra in New Zealand.

GMO freedom is only one of a number of attributes that consumers may consider when making purchasing decisions. Brand owners understand this and pitch their products according to what their markets and customers value. This may mean focussing on or promoting individual attributes or elements of the Tasmanian brand – and indeed some businesses do so. For example, premium beef producers emphasise Tasmania's hormone-free status (such as Cape Grim) while wine producers stress Tasmania's cool-climate credentials.

It could be argued that greater effort marketing Tasmania's GM-free status could extract greater value from this attribute and help offset the costs of maintaining a GM moratorium. However, as noted by Macquarie Franklin (2012), it is important to recognise that while Tasmania maintains a moratorium on the commercial release (i.e. cultivation) of GMOs, the State is not, strictly speaking, GMO-free. *"A potential danger of promoting Tasmania as a producer of GMO-free products is that there are a number of instances where GMO inputs may be included in the supply chain, for example, animal feed"* (Macquarie Franklin, 2012). Similarly, food processing inputs can also be GMOs; for example, cheese production can use synthetic rennet sourced from GMOs.

Initiatives to more actively promote Tasmania as GM-free also need to have widespread backing from the business-sector within the State, as well as key distributors and external retailers (such as Coles and Woolworths) and other stakeholders. There may be commercial risks for food producers and retailers from promoting the GM status of one supplier or region over others.

Macquarie Franklin (2012) noted that anti-GMO non-government organisations (NGOs) can exert significant influence on purchasing behaviour and that communicating Tasmania's policy to these entities could complement the promotion of Tasmania's GMO-free image. However, despite the moratorium, two anti-GM NGOs have already publicly raised concerns about GMOs in Tasmania, including naming products produced in Tasmania that may contain GM (Macquarie Franklin, 2012).

BRANDING AND MARKETING IN COMPARABLE JURISDICTIONS

The experiences and approaches of comparable countries and other Australian jurisdictions are a useful lens through which to consider the GM question in Tasmania.

An initial objective of the Macquarie Franklin Report "*was to develop case studies on two regions that are GMO-free and have promoted their GMO-free status for at least two years. A review of regions within the Cairns group of agricultural exporting countries, the United States and Europe, failed to uncover such a region*" (Macquarie Franklin, 2012).

North America

Macquarie Franklin (2012) noted that Prince Edward Island in Canada (often likened to Tasmania) considered declaring GMO-free status but abandoned the idea after a review found no economic advantage would likely be gained. Perhaps unsurprisingly, there are no GMO-free States within the US although some subregions and counties have banned commercial GM crop cultivation apparently "*motivated by health and environmental concerns raised by local citizens; as opposed to any potential market advantage*" (Macquarie Franklin 2012). These concerns may also be behind moves in some US States (including Connecticut, Vermont and Maine) to introduce mandatory labelling of foods that contain GM ingredients (Boothroyd, 2013).

European Union

A number of large supermarket chains in the EU – including Carrefour, Tesco, Rewe, ITM, Metro Group and Aldi – have developed and maintained policies on the labelling and sale of GM foods, such as having no GMOs in their own-brand product lines (Greenpeace, 2005). Upmarket UK supermarket retailer Waitrose currently has policy of not stocking GM foods, requiring all food and ingredients to be sourced from conventional or organic crops; this includes fresh meat and poultry, salmon, eggs and milk, which must be produced from animals fed on a non-GM diet – although there are minor exceptions (Waitrose, 2013).

In May 2013 Tesco, Co-op and Marks and Spencer abandoned similar policies announcing that they no longer required poultry to be fed on GM-free feed, citing industry-wide difficulties sourcing guaranteed non-GM based feed. Morrisons, Asda and Sainsbury's had already adopted similar policy positions (Doward, 2013). In response to consumer preferences some multinational food and beverage companies, including Nestle and Danone, have adopted non-GM food policies for their European markets (Nestle, 2013. Danone, 2013)

New Zealand

NZ has many similarities to Tasmania including climate, similar brand attributes and markets, and a significant reliance on agriculture as a source of national income. As noted earlier in this Paper, the NZ Government adopted a position of co-existence of GM and non-GM crops.

A NZ Ministry for the Environment commissioned report (2012) found that:

> *"For genetically modified organisms there is considerable interaction between market factors, uncertainties around the regulatory system and how the regulatory process will impact on the public perception of the firm, and the potential new product. Uncertainty around market perception of the technology introduces uncertainty about the potential value of any product based on it to the firm, which in turn affects how much the firm is prepared to invest in the regulatory process to bring the product to market. Decisions on innovations with genetically modified organisms were particularly complex. While many expressed an interest in the potential benefits that genetically modified organisms could provide for their firm or sector no firm in the study was actively considering introducing one in New Zealand. A mix of economic, market, knowledge and/or regulatory factors influenced this decision."* (NZ Ministry for the Environment, 2012)

Research commissioned by the NZ Government in 2003 to analyse the economic impacts (including risks and opportunities) of releasing genetically modified organisms (GMOs) into NZ's environment confirmed the complexity and the difficulties in understanding the impacts of any decisions to allow the adoption of GMOs into agriculture and other sectors (NZ Ministry for the Environment, 2003).

The research incorporated data from consumer surveys and economic modelling of agricultural trade and whole of economy impacts and indicated that "*the impact of releasing a GMO in New Zealand or not using GMOs in production could result in both negative and positive overall economic outcomes*". Modelling suggested that while the impacts of supply and demand side influences are potentially significant, productivity gains from the introduction of GMOs are potentially cancelled out by "*the assumed negative demand reaction to the release of a GMO in New Zealand (as indicated by the consumer intentions from the surveys*)". The report also found that the impact of the release of GMOs on NZ's clean, green image would vary depending on the type of GMO released and the purpose of the release (NZ Ministry for the Environment, 2003).

A more recent report (Knight, 2011) that considered what impact the introduction of GM pastures would have on perceptions of NZ's food in overseas markets was more conclusive. Like Tasmania, pasture based industries dominate NZ's agricultural sector and the successful development of GM pasture species with increased energy content, drought tolerance or disease resistance could be expected to attract strong interest from the dairy and grazing industry – as long as there was consumer acceptance in key markets. Evidence was gathered from interviews with 'gatekeepers' in key markets, choice modelling studies of consumers and a survey of in-bound tourists.

Knight noted that the majority of animal-derived food products imported into the EU and other key markets are already produced using GM feed and concluded by saying, "*our extensive set of interviews with food distribution channel gatekeepers in Europe, in China and in India provide clear evidence that introducing specific GM technology into New Zealand will have no harmful effect on perception of New Zealand as a source of high quality food and beverage imports*" (Knight, 2011).

The GM issue remains divisive in NZ. A number of North Island councils have entered the debate in recent years by trying to insert powers for local government to restrict GMO plantings within planning schemes, a development that the Central government is moving to block through amendments to the Resource Management Act (Davison, 2013).

IN SUMMARY

The Tasmanian brand is difficult to define but is built around Tasmania as a place. A GMO-free environment is one of a number of elements that make up the Tasmanian brand.

More focused promotion of Tasmania's GMO-free status may leverage greater market advantage but comes with risks. The support from key stakeholders in the food supply chain, particularly retailers, would be required.

When looking for case studies, consultants Macquarie Franklin were unable to identify any regions in Australia or other major agricultural producing countries that are GMO-free and have promoted their GMO-free status for at least two years.

Internationally, restrictions on GMO crop production tend to be driven by concerns about risks to human health or the environment, not potential marketing advantage.

Major UK and EU food retailers have adopted GMO policies, ranging from outright bans to the requirement that their own-brand product lines contain no GMOs.

NZ, which is in many ways similar to Tasmania, allowed a moratorium on GMOs to expire in 2003. Although the country officially adopts a co-existence policy, no genetically modified crops are or have been grown commercially in NZ.

Questions

3.6 What would be the impact on the Tasmanian brand if the current GMO moratorium expired?

3.7 What would be the impact on Tasmania's brand if non-food GM crops were grown commercially in the State?

ToR 4) Any other relevant matters

The last review (Tasmanian Parliament Joint Select Committee 2008) demonstrated that gene technology is a broad, complex and often controversial topic. Important issues such as public health and safety, environmental benefits or concerns, on-farm production (e.g. crop yields, inputs), food labelling, imports, unintended presence, seed supplies, and ethics are often contested by advocates or opponents of gene technology. Information on many of these issues is provided in this Paper.

Due to Commonwealth laws and the national scheme for regulating GMOs, Tasmania can only restrict dealings with GMOs – i.e. impose a moratorium – for marketing purposes. This current review therefore focuses on questions relating to markets, marketing and branding, and also seeks to update our knowledge of developments in policy and research and development.

In this context DPIPWE welcomes submissions on any other relevant issues that would help inform our consideration of the moratorium.

Questions

4.1 What other relevant issues should be considered in this review? How would these matters relate to Tasmania's markets, marketing or branding for our products?

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Summary of questions

1.1 Are there any other examples of innovative GMO policy and regulation from other States or countries that Tasmania can learn from?

2.1 Are there any new or emerging opportunities in gene technology that could benefit Tasmania's primary industries, now or in the future?

2.2 Are there any new or emerging opportunities in non-GM biotechnology that could benefit Tasmania's primary industries, now or in the future?

2.3 What impact has the moratorium had on the research and development of new products or markets?

3.1 The use of GMOs in Australia is controlled by a dual system of national and State regulation, where Tasmania can only regulate gene technology to "... preserve the identity of GM or non-GM crops, or both GM and non-GM crops, for marketing purposes". Is having a moratorium appropriate for Tasmania?

3.2 *We particularly want to hear from actual producers, retailers, wholesalers and exporters:*

a) What products do you sell in domestic or international markets as 'Tasmanian' and/or 'GMO-free'?

b) What market opportunities have you gained or lost over the past 10 years as a result of Tasmania's GM moratorium?

c) If Tasmania's GMO moratorium was to lapse what would be the impact on your business?

d) If non-food GM crops were grown commercially in Tasmania would this impact on your food markets?

e) Can you provide evidence of the financial benefits or costs to your business as a result of the current moratorium?

(Please clearly identify any confidential information.)

3.3 Should Tasmania's policy allow for exemptions to a moratorium? *For example, to allow for specific GM crops (such as non-food crops), or to designate some areas of the State where GM crops can be grown, or for other circumstances*. If so:

a) How could any exemptions be determined and by whom?

b) What other issues could arise and how could they be managed?

3.4 Is it possible for GM and non-GM crops to co-exist and not affect the marketing of Tasmania's products?

3.5 The current moratorium automatically expires in November 2014. If a decision was made to extend the moratorium beyond 2014, what would be an appropriate length of time for the new moratorium?

3.6 What would be the impact on the Tasmanian brand if the current GMO moratorium expired?

3.7 What would be the impact on Tasmania's brand if non-food GM crops were grown commercially in the State?

4.1 What other relevant issues should be considered in this review? How would these matters relate to Tasmania's markets, marketing or branding for our products?

DPIPWE would also welcome evidence on the following issues:

1. **A question of industry competitiveness? (refer to box page 44)**

2. **What is the value of niche (premium) versus commodity markets? (refer to box page 47)**

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