CropLife AUSTRALIA

*Representing **the best** of the plant science industry*

CropLife submission to the Independent Review of the South Australian GM Food Crop Moratorium

26 October 2018

EXECUTIVE SUMMARY

CropLife welcomes the independent *Review of the South Australian GM Food Crop Moratorium* to investigate the benefits and costs of the moratorium to the state of South Australia and to the state's agricultural and food production industries. Fourteen years of economic analyses have unequivocally shown there have been no demonstrable marketing premiums for South Australian agricultural produce versus like-for-like non-GM produce from states that permit the commercial cultivation of GMOs.

As at 26 October 2018, the South Australian GM food crop moratorium will have been in place for 5293 days. That's 14 years, 5 months and 27 days that South Australian farmers have been denied the opportunity to choose the latest plant science innovations with the potential to deliver economic, agronomic and environment benefits to their farming operations.

There is no evidence that South Australia will benefit from continuing to impose this severe restriction on their farmers or have benefited in any way since the introduction of the moratorium. The moratorium restricts farmer choice, is a costly disincentive for private investment in South Australian agriculture, is unnecessary for preserving the identity of GM and non-GM crops and provides zero trade or marketing benefit to South Australian primary producers.

The benefits and costs of South Australia maintaining a moratorium

Evidence from neighbouring states that permit the commercial cultivation of GM crops clearly demonstrates that both GM and non-GM crops can be grown and marketed side-by-side without impacting on prices or market access for primary producers.

Independent market analysis by Mecardo in 2016 and 2017 showed there is little evidence to determine that South Australia has achieved a premium for its non-GM canola crop due to the moratorium. In 2018 Mecardo released an independent report jointly commissioned by Grain Producers South Australia and the Agricultural Biotechnology Council of Australia (ABCA). The report analysed the price premiums under the South Australian GM moratorium with the results demonstrating overwhelmingly that most farmers in South Australia do not receive a premium because of the moratorium. In fact, further analysis released in 2018 by Biden et al. shows that Australian canola farmers have collectively missed out on AU$485.6 million in canola production as a direct result of the various state moratoria.

There have been no demonstrable marketing premiums for South Australian agricultural produce versus like-for-like non-GM produce from states that permit the commercial cultivation of GMOs.

The safety of GM crops

Since 1996 over 1 billion acres of GM crops have been cultivated and over 1 trillion meals containing GM food ingredients have been consumed globally. GM crops are the most tested and regulated food product in history. There are no substantiated scientific reports of any food safety issues related to the consumption of genetically modified crops, nor any unexpected effects on ecosystems. The development, planting and consumption of an approved GM crop is safe. All GMOs approved by Australia's Gene Technology Regulator for commercial release are as safe for human health and the environment as their conventional (non-GM) counterparts.

The consumer attitudes on GM crops and ingredients

Local and international consumer surveys have found consumers around the world are happy to continue to eat food containing GM ingredients. In a recent survey conducted by FSANZ, 1,200 Australians were asked, “Which types of foods do you have concerns about?” Less than three per cent nominated food containing GM ingredients. They also listed 16 other elements before GM when asked, “What information do you usually look for” on a food label when purchasing a product for the first time.

Research has shown that voiced negative consumer attitudes to GM foods expressed in surveys is not a reliable guide for what consumers purchase at the supermarket when pricing of products becomes a competitive factor in decision-making.

The contribution of GM crops

According to recent meta-analysis by Klumper and Qaim (2014), globally GM crops have increased crop yield by 22 per cent and boosted farmer profits by 68 per cent. Globally, GM technology directly increased farm income by US$18.2 billion in 2016, with just over half the gains going to farmers in developing countries.

Since 1996 GM crops have contributed to global food security, environmental sustainability and assisted farmers to adapt to and mitigate climate change by:

- Increasing the value of crop production by US$186 billion;
- Reducing pesticide usage (kg active ingredient) by 671 million kg, enhancing the sustainable use of crop protection products;
- Saving 183 million hectares of land from clearing because of higher productivity of the land used to grow GM crops;
- Reducing CO_2 emissions in 2016 alone by 27.1 billion kgs (equivalent to taking 16.7 million cars off the road for one year);
- Increasing the incomes of more than 18 million small farmers and their families – some of the poorest people in the world – and thereby helping to alleviate poverty in developing counties; and
- Providing nutritional benefits through the development of nutrient dense varieties of staple crops.

2 INTRODUCTION

CropLife Australia is the national peak industry organisation representing the agricultural plant science sector in Australia. CropLife represents the innovators, developers, manufacturers and formulators of crop protection and agricultural biotechnology products. CropLife's membership is made up of both patent holding and generic, Australian and international, and small and large companies. Accordingly, CropLife only advocates for policy positions that deliver whole of sector benefit.

The plant science industry provides products to protect crops against pests, weeds and diseases, as well as developing crop biotechnologies that are key to the nation's agricultural productivity, sustainability and food security. The plant science industry is worth more than $20 billion a year to the Australian economy and directly employs thousands of people across the country. CropLife Australia is a part of the CropLife International Federation of 91 national associations globally. However, our focus is specifically on an Australian agricultural sector that is internationally competitive through globally leading productivity and sustainability achieved through access to the technological innovation of the plant science sector.

The independent *Review of the South Australian GM Food Crop Moratorium* is timely to investigate the benefits and costs of the moratorium to the state of South Australia and to the state's agricultural and food production industries. CropLife welcomes this Review as 14 years of economic analyses have unequivocally shown there have been no demonstrable marketing premiums for South Australian agricultural produce versus like-for-like non-GM produce from states that permit the commercial cultivation of GMOs.

As at 26 October 2018, the South Australian GM food crop moratorium will have been in place for 5293 days. That's 14 years, 5 months and 27 days that South Australian farmers have been denied the opportunity to choose the latest plant science innovations with the potential to deliver economic, agronomic and environment benefits to their farming operations.

The world's population is predicted to increase to 9.7 billion by 2050, requiring an increase in global food production of over 70 per cent. Providing enough food in the context of production constraints, volatile consumption patterns and a changing climate will be an unprecedented scientific, economic and public policy challenge. The situation provides an opportunity for South Australian farmers to both assist in the global food security effort and to profit from increased demand for their agricultural products. By adopting innovative farming practices, such as the sustainable and efficient use of genetically modified (GM) crops, the South Australian farming sector will be able to produce more with less, strengthening both the sector and the regional communities that rely thereon.

The development, planting and consumption of an approved GM crop is safe. It is important to recognise that all GMOs approved by the Gene Technology Regulator for commercial release in Australia are as safe for human health and the environment as their conventional (non-GM) counterparts.

Globally, over 1 billion acres of GM crops have been cultivated since 1996 and over 1 trillion meals containing GM food ingredients have been consumed. There have been no unexpected effects on ecosystems or a single documented adverse effect on human or animal health.

Independent research demonstrated that the first 20 years of commercial GM crop cultivation in Australia (1996-2015) was a success. Australian cotton and canola farmers gained $1.37 billion worth of extra income and canola farmers produced an additional 226,000 tonnes of canola that would otherwise have not been produced if conventional technology alone had been used.

GM technology has enabled Australian cotton and canola farmers to reduce their use of insecticides and herbicides by 22 million kilograms of active ingredient over 20 years, enhancing the sustainable use of chemical crop protection products. That's equal to a 26 per cent improvement in the environmental impact associated with pesticide use on these two crops alone. This more sustainable use of pesticides has resulted in a saving of nearly 27 million litres of fuel use and 71.5 million kilograms less carbon dioxide being released into the atmosphere.

The London-based economic analysts Brookes and Barfoot (2017) estimate the average net increase in gross margins for GM canola in Australia in 2015 was US$38/ha (eq. to AU$48.50/ha based on exchange rate of 0.78).

While the global acreage of GM crops has increased at a significant rate, commercial organic acreage has also grown. There is no evidence that the global increase in GM crops has had any negative impact on the organic or conventional farming sectors. All evidence points to the organic and conventional farming sectors growing over the same period. A majority of Australian farmers embrace the concept of coexistence, whereby various agricultural production practices can be employed in parallel to each other without one harming the other.

In its current form, the GM crop moratorium serves as a significant barrier to the adoption of innovation and modern farming technologies that would serve SA growers well now, and in the future. SA farmers do not have access to the same crops as their national (Vic, Qld, NSW and WA) and global competitors, primarily in Canada, the United States and Latin America. It is like competing in the final of the 100m freestyle with one hand tied behind your back.

In addition to existing varieties, new GM crops are being developed that are more nutritious, higher yielding and resistant to pests and environmental stress. Developing technologies specifically designed for Australian conditions in the future could be severely inhibited due to the unnecessary moratorium legislation. Exemptions to or repeal of the moratorium provides a significant opportunity to ensure SA's farmers maintain access to the world's best crop innovations.

3 TERM OF REFERENCE (1)

Evidence of Market Benefits of South Australia's GM Moratorium

2.1 Lack of a nationally consistent regulatory scheme for gene technology

The *Gene Technology Act 2000* (Cth) was intended to establish a national system of regulating GMOs. Despite this intention, most states implemented legislation to address 'marketing concerns' that are neither consistent nor transparent nor necessary. This unclear path to market was well demonstrated in 2003 when the Gene Technology Regulator approved GM canola for commercial release and all the canola growing states immediately implemented politically motivated moratoria on commercial cultivation of this crop. This led to years of delays, which reduced the management options for Australian farmers and created real uncertainty about the future of GM crops in Australia. These delays have resulted in significant lost opportunity costs for South Australian growers.

Figure 1 illustrates the fragmented nature of the National Regulatory Scheme for Gene Technology.

Figure 1: Current regulatory position of each State and Territory on GM crops

Source: Licensed from the Agricultural Biotechnology Council of Australia (ABCA) under a Creative Commons Attribution 3.0 Australia.

GM crops are intensively studied and rigorously regulated in Australia. All regulation should be commensurate with the associated risk, cost and benefit to the community. CropLife supports the continued use of science-based risk assessment as the basis for sensible regulatory decision making. It is a key principle of good governance that governments should only intervene in a market where there is demonstrated market failure. To date, there has been no evidence of any market failure in South Australia that has justified the continuation of a moratorium on the commercial cultivation of approved GM crops.

2.2 Opportunity cost of South Australia's GM Moratorium

In 2005, the Australian Bureau of Agricultural Resource Economics (ABARE) reported that Australia's canola growers were suffering an economic loss because of the state moratoria on the commercial cultivation of GM canola. The report concluded that if the moratoria were to continue, it could result in a loss of $3 billion, in net present value terms, in the period to 2015[1].

A more recent ABARE report in 2008 indicated that the estimated economic benefit to Western Australia from adopting GM canola from 2008-09 for the following ten years would be $180 million in 2006-07 dollars. Over the same period, the benefit to New South Wales farmers (excluding those in the Murray Catchment Area) was estimated to be $273 million and South Australian farmers would receive a benefit of $115 million.[2]

The most recent analysis by Biden et al. (2018) found that the environmental opportunity costs from delaying the adoption of GM canola in Australia include an additional 6.5 million kilograms of active ingredients applied to canola land; a 14.3% increase in environmental impact; an additional 8.7 million litres of diesel fuel burned; and an additional 24.2 million kilograms of greenhouse gas (GHG) and compound emissions released. The economic opportunity costs of the moratoria resulted in foregone output of 1.1 million metric tonnes of canola and a net economic loss to Australian canola farmers of AU$485.6 million. [3]

New South Wales, Victoria and Western Australia now allow the commercial production of GM canola; however, this occurred more than 5 years after federal regulatory approval. While ever moratoria exist, these bureaucratic delays can only be expected, and continue the disadvantage for Australian farmers. It is not clear if such a delay will be repeated if future GM crops are introduced in Australia.

South Australia introduced the *Genetically Modified Crops Management Act 2004* (SA) to ensure that the cultivation of GM crops was regulated in that state. On 8 February 2008, against the advice of its own scientific advisory committee, the South Australian Government decided to extend its moratorium on growing GM canola in South Australia for a further five years. In November 2013, without any consultation the former state government extended the moratorium until 2019. Then, in December 2017, the moratorium was again extended, this time until 2025, again without any consultation or

1 Apted S., McDonald D., Rodgers H., 2005, *'Transgenic Crops: Welfare implications for Australia'* Australian Commodities, vol. 12, no. 3

2 Acworth, W, Yainshet, A and Curtotti, R 2008, *Economic impacts of GM crops in Australia*. Prepared for the Australian Government Department of Agriculture, Fisheries and Forestry, Canberra, May.

3 Biden S, Smyth SJ and Hudson D (2018) '*The economic and environmental cost of delayed GM crop adoption: The case of Australia's GM canola moratorium*,' GM Crops & Food, 9:1, 13-20.

economic basis for doing so. These continued interventions by the former state government mean that there is no clear path to market for the developers of GM crops in South Australia, even when licence applicants have satisfied the requirements of the Commonwealth *Gene Technology Act 2000*.

In 2015, it was publicly reported that the then South Australian Agriculture Minister, the Hon Leon Bignell MP, admitted that the South Australian Labor Government did not have solid economic data to support its decision to maintain the South Australian GM moratorium[4].

Independent market analysis by Mecardo in 2016 and 2017 showed there is little evidence to determine that South Australia has achieved a premium for its non-GM canola crop due to the moratorium on GM technology. Comparing the difference between non-GM canola in Adelaide (SA) and Kwinana (WA) demonstrated a clear premium for non-GM in Kwinana throughout the entire season. There is even evidence of GM canola in Kwinana achieving a premium over Adelaide non-GM.[5]

In 2018, Mecardo released an independent report jointly commissioned by Grain Producers South Australia and the Agricultural Biotechnology Council of Australia (ABCA), that analysed the price premiums under the South Australian GM moratorium.[6] The results of this analysis demonstrated overwhelmingly that most farmers in South Australia do not receive a premium because of the moratorium.

The Mecardo expert analysis, supported by reproducible economic data, found that the moratorium in South Australia has not led to enhanced premiums over comparable markets for South Australian farmers producing the following commodities: canola, wheat, barley, wine grapes, wool, cattle, sheepmeat or lamb. The analysis did find a slight temporary premium for pork prices in South Australia, however common-sense dictates there is no causal relationship between pork prices and maintaining a moratorium on the commercial cultivation of GM crops.[7]

The failure to implement a consistent national regulatory scheme has created significant uncertainty in the agricultural biotechnology sector in Australia. This issue needs to be addressed if Australia is to continue to have a competitive and productive food industry with safe and affordable food choices available for all consumers.

The Review should recognise that evidence to date has demonstrated that GM crops do not pose any risks to human health and the environment, and the GM moratorium does not provide any trade and marketing benefits to the state. Consequently, the moratorium on cultivation and transport of these crops is anti-competitive and in no way commensurate with the risk.

The Final Report of the Productivity Commission's Inquiry into the Regulation of Australian Agriculture in November 2016 recommended that, "the New South Wales, South Australian, Tasmanian and ACT Governments should remove their moratoria on GM crops. All states and territories should also repeal

4 Adelaide Advertiser, '*GM-free boost deflated'* 24 July 2015.

5 Whitelaw A (2016) *'Is the GM ban in South Australia providing a premium?'.* Mercado Expert Market Analysis: 25 July 2016; and Whitelaw A (2017) *'Controversial canola'.* Mercado Expert Analysis: May 25 2017.

6 Whitelaw A, Dalgleish M and Agar O (2018) *'Analysis of price premiums under the South Australian GM moratorium'*. Report independently produced by Mecardo, under commission from Grain Producers South Australia (GPSA) and the Agricultural Biotechnology Council of Australia (ABCA), March.

7 *Ibid.*

the legislation that imposes or gives them powers to impose moratoria on GMOs by 2018".[8] The state moratoria on GM crops were also identified in the March 2015 Harper *Competition Policy Review* as a significant example of a regulatory restriction on competition[9].

2.3 The effect of the GM Moratorium on marketing South Australian products

The 2018 Mecardo report found that the South Australian GM moratorium has not led to marketing premiums for South Australian agricultural produce over and above the price gained for like-for-like non-GM produce in those states that also permit the commercial cultivation of GMOs. Box 1 below explains why the methodology used by the Greens South Australia[10] to claim a premium because of the moratorium is incorrect.

Box 1: Methodology – Greens South Australia

The Hon. M.C. Parnell, in his private members bill to the South Australian Parliament, provided evidence of a premium achieved by South Australian growers as a direct result of the moratorium. This is the only instance of evidence presented of a premium being provided to South Australian farming businesses.

It is therefore important to discuss the methodology used by the Hon. M.C. Parnell as it was highly inconsistent with commonly used analytical procedures. The evidence provided was a comparison of the spread between non-GM and GM canola in several states on the week commencing 9 October 2017.

There are two major flaws in this methodology:

- Comparing the discount between non-GM and GM in another state is not an analogous comparison to South Australian canola pricing.
- When comparing pricing, it is important to choose an appropriate time period, one week is not considered a long enough period for a robust analysis. This is especially important in agricultural commodities which can be volatile due to weather conditions causing supply constraints.

Source: Whitelaw A et al. (2018) Op. Cit.

8 Productivity Commission 2016, Regulation of Australian Agriculture, Report no. 79, Canberra.

9 Harper I, Anderson P, McCluskey S and O'Bryan M 2015, The Australian Government Competition Policy Review, pp116.

10 Genetically Modified Crops Management Regulations (Postponement of Expiry) Bill, SA Hansard, 18 October 2017.

Summary of Mecardo findings by commodity

Despite GM canola being the only GM crop currently grown in Australia that is likely to be adopted by SA farmers soon; the 2018 Mecardo analysis included additional agricultural commodities to test the presumption that the GM moratorium provides a marketing premium in South Australia to these other agricultural commodities.

A summary of the findings follows:[11]

Wheat

- Adelaide trades at an average 3% discount to Geelong (Vic)
- Adelaide trades at an average 5% discount to Kwinana (WA)
- *The moratorium delivers no premium for South Australian wheat; the discount for South Australian wheat compared to WA and Vic has steadily increased since 2012.*

Barley

- Adelaide trades at an average 5% discount to Geelong (Vic)
- Adelaide trades at an average 7% discount to Kwinana (WA)
- *The moratorium delivers no premium for South Australian barley; the discount for South Australian barley compared to WA and Vic has steadily increased since 2012.*

Canola

- Adelaide trades at an average 2% discount to Geelong (Vic)
- Adelaide trades at an average 3% discount to Kwinana (WA)
- *The moratorium delivers no premium for South Australian canola; the discount for South Australian canola compared to WA and Vic has steadily increased since 2012.*

Wool

- No data on pricing at a state-by-state level.
- Statements from wool market analysts and brokers suggest there is no differentiation for wool based on its [proximity to the cultivation of GM crops
- *The moratorium delivers no premium for South Australian wool.*

Cattle

- South Australian Trade Steers trade at an average 8.3% discount to Victorian Trade Steers
- *The moratorium delivers no premium for South Australian Trade Steers; the discount to Victorian Trade Steers has widened more rapidly since 2008.*

Sheepmeat

- South Australian Trade Lambs trade at an average 3% discount to Victorian Trade Lambs
- South Australian Mutton trades at an average 9% discount to Victorian Mutton
- *The moratorium delivers no premium for South Australian sheepmeat producers; the discount for South Australian sheepmeat producers has steadily increased since 2000.*

Pork

- South Australian pork trades at an average premium of between 0.46-1.08% to Victorian pork.
- *This points to the pork market in SA and Vic trading at very similar levels since 2012. Common-sense dictates there is no causal relationship between pork prices and maintaining a moratorium on the commercial cultivation of GM crops.*

Wine Grapes

- South Australian grapes trade at a discount to Tasmania, Victoria and Western Australia; and at a premium to NSW and the Murray Darling-Swan Hill District.
- "It is the view of the industry analysts at Wine Australia that a region or state's status as 'GM-free' would be unlikely to have an effect on grape price and therefore would not be expected to play a role in premiums or discounts to any states".[12]

11 Whitelaw A et a. (2018) *Op. Cit.*
12 Wine Australia, quoted in Whitelaw A et al. (2018) *Op. Cit.*

4 TERM OF REFERENCE (2)

Awareness of South Australia's moratorium by key trading partners and food production businesses

CropLife is not aware of any peer-reviewed or empirical studies that have looked to either qualitatively or quantitatively assess the degree of awareness of the South Australian moratorium by trading partners and food production businesses.

However, we do have credible information relating to the global trade (grain flow) of GM commodities and consumer preferences that is useful for informing the Review.

3.1 Consideration of global demands and consumer attitudes for GM crops

World trade in commodities (such as soybeans, corn, cottonseed and canola) is dominated by countries which have widely adopted genetically modified varieties. This indicates that, while some consumers are concerned about food containing genetically modified ingredients, these concerns are not reflected in buyer behaviour at the supermarket; nor do they result in widespread trade barriers or price premiums for non-genetically modified products.

Even in the European Union, which has some of the strictest regulations regarding genetically modified imports and labelling, more than 50 genetically modified crops are approved for use as food and feed. These include maize, soybean, rapeseed, sugar beet and cotton.[13]

The barriers that have been erected in some countries in response to perceptions of consumer concerns about GM crops have increased the importance of supply chain management to keep genetically modified, organic and conventional grains separate (within agreed thresholds), from planting seeds through to end use.

3.1.1 Consumer attitudes

A series of local and international consumer surveys has found that consumers around the world are happy to continue to eat food containing GM ingredients. One of the most recent Australian surveys, conducted in 2017 on behalf of the Office of the Gene Technology Regulator, found that support for gene technology has remained constant over the past few years.

Segmenting the audience into four groups based on their support for GM foods, almost half the respondents were open to the production of GM food provided regulations were in place to make

[13] http://ec.europa.eu/food/dyna/gm_register/index_en.cfm

sure it was safe. About a quarter were against the production of food this way until the science could prove it was safe.[14]

In another survey, conducted by FSANZ, 1,200 Australians were asked, "which types of foods do you have concerns about?", fewer than three per cent nominated food containing GM ingredients. They also listed 16 other elements before genetic modification when asked, "what information do you usually look for" on a food label when purchasing a product for the first time.[15]

A 2010 Eurobarometer survey of 16,000 Europeans found that just eight per cent spontaneously nominated food containing GM ingredients when asked about "possible problems or risks associated with food and eating".[16]

Furthermore, several studies have shown that voiced negative consumer attitudes to GM foods expressed in surveys is not a reliable guide for what consumers purchase at the supermarket when pricing of products becomes a competitive factor in decision-making.[17] "What consumers say they will choose in a survey and what they actually choose in a real-purchase situation may differ substantially when their decision is framed by a socially charged issue such as genetic modification".[18]

3.1.2 Grain flows of GM commodities

The 2018 Mecardo expert independent analysis examined the flows of Australian canola exports over the past three years. The data available did not differentiate between GM and non-GM canola. Interestingly, Mecardo found that there are no export destinations with whom South Australia trades canola, that its neighbouring states (WA, Vic and NSW) that permit the cultivation of GM canola have not also traded.[19]

In addition, Mecardo note that South Australia have not traded any canola into France or Germany, which are countries that currently prohibit commercial GM cultivation; yet canola from NSW, Vic and WA has gone into France; and canola from NSW and WA has gone into Germany. This data strongly indicates that the cultivation of GM canola does not impact on canola export markets or destinations.

The trade of canola from WA, which produces the largest amount of GM canola of any Australia state, into the same export destinations as South Australia points to evidence of the capacity of bulk handlers to effectively segregate between conventional (non-GM) and GM varieties (Table 1).

14 Cormick C and Mercer R (2017) *'Community attitudes to gene technology'*. Prepared for the Office of the Gene Technology Regulator,Canberra.

15 FSANZ (2008). *'Consumer attitudes survey 2007: A benchmark survey of consumers' attitudes to food issues'*. Food Standards Australia New Zealand, Canberra.

16 European Commission (2010). *'Special Eurobarometer 354—Food-related risks'*. Retrieved from http://ec.europa.eu/public_opinion/archives/ebs/ebs_354_en.pdf

17 Sleenhoff S & Osseweijer P (2013) *'Consumer choice'*. GM Crops & Food, 4:3, 166-171; Knight, J. G., Mather, D. W., Holdsworth, D. K., & Ermen, D. F. (2007). *'Acceptance of GM food—an experiment in six countries'*. Nature biotechnology, 25(5), 507;

18 Mather, D. W., Knight, J. G., Insch, A., Holdsworth, D. K., Ermen, D. F., & Breitbarth, T. (2012). *'Social stigma and consumer benefits: trade-offs in adoption of genetically modified foods'*. Science communication, 34(4), 487-519; as quoted in Lucht, J. M. (2015). *'Public acceptance of plant biotechnology and GM crops'*. Viruses, 7(8), 4254-4281.

19 Whitelaw A et al. (2018) *Op. Cit.*

Table 1: Canola Flows

Destination	NSW	SA	VIC	WA
Netherlands	60000	216754	30000	881992
Belgium	60000	181465	180000	679445
Argentina		81816	90000	331582
South Africa	167550	61834	155482	228265
United Arab Emirates		57470		75727
Japan		53865	5249	279121
China		49850		296476
France	80000		100862	614613
Germany	99839			550491
Hong Kong				50000
Indonesia				5000
Oman				16000
Pakistan			30377	122061
Portugal				54999
Singapore			66714	
South Korea				25000
Spain	65000		113000	411530
Sri Lanka	60000			
Taiwan				50000
United States			10000	120169
Source: Reuters Eikon				

Source: Whitelaw A et al. (2018) Op. Cit.

Brookes and Barfoot (2018) detail the share of global crop trade accounted for by GM production in 2016/17 (Table 2).[20]

Table 2: Share of global crop trade accounted for by GM production 2016/17 (million metric tonnes).

	Soybeans	Maize	Cotton	Canola
Global production	351.3	1,075.0	23.25	74.0
Global trade (exports)	147.4	141.7	8.1	15.9
Share of global trade from GM producers	143.5 (97%)	103.7 (73%)	6.1 (75%)	14.2 (89%)
Estimated size of market requiring certified conventional (in countries that have import requirements)	3.0-3.5	7.0	Negligible	0.1
Estimated share of global trade that may contain GM (ie, not required to be segregated)	140.0-143.5	96.7-103.7	6.1	14.1-14.2
Share of global trade that may be GM	95% to 97%	68%-73%	75%	88.7% to 89%

Source: Brookes and Barfoot (2018)[21]

20 Brookes G and Barfoot P (2018) *'GM crops: global socio-economic and environmental impacts 1996-2016'*. PG Economics, Dorchester, UK (June).

21 *Ibid.*

Focussing on canola, which is the immediate focus of GM crop adoption in South Australia, this data shows that 21 per cent (15.9mmt) of global canola production in 2016-17 was exported, with Canada being the main global trading country. The share of global trade accounted for by the three main GM canola producing countries (Canada, the US and Australia) was 89 per cent. Brookes and Barfoot (2018) conclude that, "as there has been only a very small development of a market for certified conventional canola globally, non-segregated GM exports probably account for 89% of global trade."[22]

22 *Ibid.*

5 TERM OF REFERENCE (3)

Can market benefits, if any, be retained through segregation protocols in the supply chain

4.1 Co-existence between GM and non-GM (conventional) crops – a familiar agricultural practice

All agricultural production systems should have an equal opportunity to contribute to the agri-food production system. Preference for one production system over another should not be the result of artificial, discriminatory and impractical public policy decisions made on a false premise by governments at any level.

Coexistence is the practice of growing crops with different quality characteristics or intended for different markets in the same vicinity without becoming commingled and thereby possibly compromising the economic value of both. Coexistence is based on the premise that famers should be free to cultivate the crops of their choice using the production system they prefer, be it conventional, organic or GM.

Coexistence of various production methods is not a new concept to the agricultural community. Farmers have practiced coexistence for generations to meet demands for different types of products. Historical experience shows that coexistence of a wide range of production methods is not a problem, provided the basic rules of good farming practices are followed and cooperation between neighbouring farmers is encouraged.

Coexistence is not about environmental or health risks, it refers only to the growing of crops that have been authorised as safe for the environment and for human health by the regulatory authorities in the country in which they are being grown, and which are therefore available commercially to farmers in the area.

In Australia, different types of wheat, barley and rice are grown in close proximity and channeled to different uses (e.g. bread wheat versus noodle wheat; malt barley versus feed barley and short-grain versus long-grain rice). Farmers follow simple but effective procedures to achieve agreed standards of quality and purity in their harvested products. It is important to note that agricultural crops are never 100 per cent pure: coexistence means meeting agreed, low level thresholds of admixture.

In Australia, GM and non-GM canola has been grown side-by-side successfully, productively and profitably without creating marketing issues. With Australia having more than eight years' experience of growing GM canola, there has not been one incident across more than 6.5 million tonnes of canola delivered domestically, or more than 19 million tonnes delivered internationally, where an end user (seed crusher / oil or meal buyer, or food / feed manufacturer) has not received what they had ordered in terms of the GM status.[23] Australia has continued trading all other agricultural commodities, including certified non-GM canola without incident since the commercialisation of GM canola.

Accessing ready-export markets such as China has been a boon for Australian farming since the Asian nation re-opened its borders to importation of canola in 2013. Since then, two million tonnes of

[23] Data provided courtesy of the Australian Oilseeds Federation

Australian canola (GM and conventionally farmed) has been sold to China for a value of nearly A$1.2 billion. China is a large importer of GM grain, as evidenced by the three to four million tonnes of canola imported from Canada (95 per cent GM) and 80 million tonnes of mostly GM soybeans imported from North and South America per annum. Similarly, Japan is a large user of GM grain, importing around two to three million tonnes each of Canadian canola and US/South American soybeans per year.[24]

Coexistence is the foundation of all Australia's farming. There are systems in place to ensure farmers can keep commodities sufficiently separate so that all customers can get what they paid for. The same systems apply to GM crops, because approved GM plants are no harder to control, and pose no greater risk than conventionally bred plants. It is essential to continue to work together with all farming systems to ensure that no farmer is exposed to unnecessary economic risk because of unreasonable commodity standards.

Australian farmers must be allowed to remain competitive. A farmer's inability to grow approved, safe crops on their land purely because of a neighbour's ideological opposition to those crops will severely impact Australia's capacity to remain globally competitive as an agricultural exporter.

South Australia successfully exports canola to several markets, as shown in Table 1. Some of these markets demand certified non-GM canola (CSO-1A), whilst others accept commodity grade canola (CSO-1), which can be a combination of non-GM and GM canola. The ability to service many different markets provides evidence of the capacity of bulk handlers to effectively segregate between grades of canola within the permitted tolerance levels.

Australia is a globally competitive, innovative provider of safe and nutritious food, and high-quality feed and fibre. All of GM, conventional and organic agriculture are part of this. The sustainability of diversity in our production systems ensures this for the long-term.

4.2 Co-existence between GM and organic crops – the problem with an implied zero tolerance in organic marketing standards

A considerable number of Australian states host high levels of certified organic farms, co-existing with the presence of GM cultivation. Presently, Queensland, New South Wales and Victoria all have over double the number of certified organic farms than South Australia, and all permit the commercial cultivation of GM crops. Whitelaw et al (2018) extrapolate that on this basis, it is perfectly reasonable to conclude that cultivation of GM crops in South Australia could operate effectively alongside the organic food production industry, as is the case in other states.[25]

The current implied zero tolerance by some Australian organic certifiers for the unintended presence of approved GMOs in organic and biodynamic production systems is scientifically and technically unenforceable. This is because even with a state of the art analytical laboratory, it is impossible to prove with a 100 per cent statistical confidence that a product contains 0.0 per cent GM without destroying the product (i.e. destroying every kernel of grain in a shipment). Even if every kernel of grain were to be destroyed, the current sensitivity of DNA analytical techniques cannot go as low as 0.00 per cent.

24 *Ibid.*
25 Whitelaw A et al (2018) *Op. Cit.*

Nowhere in the current Australian Organic Standards is zero tolerance to GMOs explicitly stated. GMOs are listed as a 'prohibited input' and some Australian certifiers have incorrectly interpreted this to mean zero tolerance. This flawed interpretation was questioned in the Western Australian case of *Marsh v Baxter* [2013] WASC 187 in the judgment of Justice Martin.

The perceived zero tolerance for the unintended presence of approved GMOs erroneously applied by some certifiers in the Australian National Standards undermines the capacity for different, approved cropping systems to coexist within the same farming region in the Australian grains value chain.

There is considerable concern amongst the Australian agricultural industry and international experts that setting thresholds at zero introduces difficulties that at this time are technically complicated to overcome and operationally difficult to implement and monitor for compliance. The long-term outcome of maintaining a perceived zero tolerance will be a significant cost burden to the organic industry and ultimately increase the cost of both GM and organic planting seed for all Australian farmers.

The current perceived zero tolerance approach limits the amount of available organic sowing seed in Australia and compromises the integrity of both the approved GM and conventional planting seed required by growers across Australia.

Perceived zero tolerance makes the production and testing of organic sowing seed significantly more expensive as separate production areas are needed, with high-quality seed needing to be produced on a "production system" basis.

This has led to a significant increase in the costs of certified organic planting seed for organic farmers in all Australian jurisdictions. Seed companies may need to review the desirability of marketing organic seed given the high cost and low return on investment.

Perceived zero tolerance introduces avoidable complications for Australian organic producers that undermine the capacity for different, federally approved cropping systems to coexist in the Australian seed and grain supply chain. Perceived zero tolerance adds complications and costs for compliance activities of organic certifiers, as well as the potential to prohibit production on organic farm land areas. This is not a desirable outcome for organic farmers nor the broader organic industry in terms of growing the industry over time.

It is normal practice in agriculture for growers to engage in 'identity preservation' of crops, or even different quality traits within a crop where premiums are paid. For example, malting barley versus feed barley and durum wheat versus common wheat. Higher value or 'niche' varieties of certain crops are also identity preserved to ensure they meet certain purity and quality standards. These premiums compensate for the extra cost of identity preservation. An example of a high value crop variety is the canola variety Monola.[26] It is important to note that any premiums from organic production go to the organic grower. It is therefore entirely appropriate that any extra costs incurred in the organic production system to meet contractual standards should be borne by the growers who get the premiums and not the GM or conventional growers.

[26] In 2018, *Monola* growers will receive a $80/mt premium payment at harvest. For further information, see http://www.nuseed.com/au/products/canola/monola/

4.3 Managing GM and non-GM canola in the Australian supply chain

The setting of thresholds for the unintended presence of approved GMOs is not a new concept in Australian food and agricultural standards.

In 2005, the then Primary Industries Ministerial Council agreed to a nationally consistent definition of threshold levels in canola seed and grain for the adventitious presence[27] of GMOs approved for commercial release by the Gene Technology Regulator. The Council agreed to two thresholds:

- A 0.9 per cent threshold for approved GM canola in non-GM canola grain (supported by the Australian Oilseeds Federation)
- A 0.5 per cent threshold for approved GM canola in non-GM canola seed for sowing (supported by the Australian Seed Federation).

At the time, these thresholds were supported by the Australian grains industry for three main reasons:

- They achieved end-user requirements
- They were economically achievable
- They were achievable for farmers and others in the supply chain to implement.

Thresholds exist for a range of quality factors in grain bulk handling. For example, the Grain Trade Australia standard for Australian Prime Hard Wheat (APH1) allows up to one per cent of grain to be insect damaged and up to 10 small insects (i.e. aphids) to be present per half litre of grain. The international Codex Standard for Wheat and Durum Wheat includes tolerances for other cereals (three per cent), shrivelled grain (eight per cent), and even harmful or toxic seeds (0.5 per cent). Tolerances also exist for mycotoxins, which are produced when certain grains are infected with fungal spores.

These thresholds recognise the practicalities of food production and transport while still ensuring safety and quality standards. They recognise this even when the threshold relates to a genuinely harmful contaminant. GMOs that have been approved by the Gene Technology Regulator for release into the environment are at least as safe as their non-GM counterparts, so it does not make sense to not have a threshold for them in agricultural supply chains.

The best evidence of how GM grain can be properly managed in Australia was provided by CBH Group to a Public Hearing of the Western Australian Parliament's *Standing Committee on Environment and Public Affairs Inquiry into Mechanisms for Economic Loss to Farmers in Western Australia Caused by Contamination by Genetically Modified Material*. Box 2 is a direct excerpt of the Hansard transcript from that hearing.

There are two key take-home messages for the Review from this evidence in Box 2:

1. Over the last five harvests, only 0.04 per cent of non-GM canola loads have been found to contain the unintended presence of GM canola above the 0.9 per cent tolerance.
2. No shipment of non-GM canola from a CBH port has ever been rejected by an export market – whether domestic or international – due to the unintended presence of GM canola.

[27] Adventitious presence in the context of these thresholds is now termed low level presence (LLP), as announced by the Australian Oilseeds Federation for the 2016/17 season https://www.graintrade.org.au/sites/default/files/AOF_Standards_All_Changes_Explanatory_Note_%2016_17.pdf

This 'real world' evidence from South Australian farmer's direct competitors in Western Australia is proof that coexistence can and does work. It provides choice to WA farmers to use the production system that works best for them. This choice is currently denied to South Australian grain producers.

Box 2: Transcript of Evidence by CBH Group Taken at Perth Wednesday, 11 April 2018

Standing Committee on Environment and Public Affairs Inquiry into Mechanisms for Economic Loss to Farmers in Western Australia Caused by Contamination by Genetically Modified Material

Canola receival standards are typically based on trading standards set by the Grain Industry Association of WA—or GIWA. The current trading standard for the unintended low-level presence of GM canola in non-GM canola is less than 0.9 per cent, as approved by the Office of the Gene Technology Regulator. This trading standard has been adopted by CBH as our receival standard.

CBH takes a sample of every load of non-GM canola that is delivered to any of our receival sites. Each of those samples is issued with a unique load number, which is tracked in the CBH computer system and identifies details about the load, including where the load is stored. For testing, a composite sample is created which comprises a small subsample of every load sample of non-GM canola. When the composite site sample accounts for 1000 tonnes of non-GM canola received at a site, the sample is sent to CBH's Australian Grains Centre—AGC—in Forrestfield, a National Association of Testing Authorities accredited lab which tests for the unintended low-level presence of GM product in the composite site sample.

If an unintended low-level presence of GM canola is detected, then each of the load samples that comprised the composite site sample are then tested individually in order to identify the source and location of the unintended low-level presence of GM canola in the non-GM stock.

If at any of those stages testing confirms that a load of non-GM canola contains GM canola above the unintended low-level presence limit, CBH notifies the relevant grower to ensure they can investigate their relevant farm management practices.

The most important information to note is that loads that exceed the tolerance for GM canola are extremely rare. Over the last five harvests, an average of 0.04 per cent of non-GM canola loads have been found to contain unintended low-level presence of GM canola above the 0.9 per cent tolerance.

Further testing then occurs when the grain is transported and received at our ports. A sample is taken for every 500 tonnes received at the port and tested for the unintended presence of GM canola. If the test indicates the presence of GM canola, the grain is further tested to determine the quantitative levels of GM canola. If found to be above the tolerance for unintended low-level presence of GM canola, the grain is isolated and regraded, if that is required.

In CBH's view, the testing regime described is robust, sophisticated and has multiple safeguards to detect whether GM product exists in non-GM canola. As a testament to this, CBH can confirm that no shipment of non-GM canola from a CBH port has ever been rejected by an export market—whether domestic or international—due to the unintended presence of GM canola.

Source:
http://www.parliament.wa.gov.au/Parliament/commit.nsf/(Evidence+Lookup+by+Com+ID)/CEFBA0D98B112CE34825829E002192D0/$file/ev.ngm.180411.tro.001.CBH.pdf

6 TERM OF REFERENCE (4)

Other relevant evidence to inform the analysis

5.1 The South Australian 'transport ban'

Due to an inadvertent drafting error, the South Australian legislation imposed a total ban on the transport of genetically modified (GM) seed and grain through the state of South Australia. This total ban on the trade and commerce of GM seed and grain originally arose as an unintended outcome following the drafting of technical provisions in the *Genetically Modified Crops Management Act 2004* (SA) and subsequent definitional changes made to the Commonwealth *Gene Technology Act 2000* (Cth).

While definitional issues within the *Gene Technology Act 2000* (Cth) may have been a contributing factor to the South Australian GM seed and grain transport ban, it is in South Australia's own legislation where the conflict arises and where corrective action is required.

How the transport ban arose

- The *Genetically Modified Crops Management Act 2004* (SA) ('the Act') **s5 (1)(a)(ii)** permits the Governor of South Australia, by regulation to "designate an area of the State as an area in which no genetically modified food crops may be cultivated".
- **Section 4** of the Genetically Modified Crops Management Regulations 2008 (SA) states, "Pursuant to **s5(1)(a)(ii)** of the Act, the whole of the State is designated as an area in which no genetically modified food crops may be cultivated."
- **Section 3(1)** of the Act defines cultivate in relation to a genetically modified food crop to include at paragraph (b) "to spread, disseminate, deal with or dispose of any plant or plant material that has formed part of that crop."
- **Section 3(1)** of the Act further defines deal with, "in relation to a crop, GMO or other material, has a meaning that corresponds to deal with a GMO under the *Gene Technology Act 2000* (Cth)".
- **Section 10** of the *Gene Technology Act 2000* (Cth) defines deal with at paragraph (h) to include "transport the GMO".

Technical amendments arising from the *Gene Technology Amendment Act 2007* (Cth) resulted in "transport the GMO" becoming a specific dealing regulated under the *Gene Technology Act 2000* (Cth). Prior to these technical amendments, transport only "in the course of a dealing" was regulated under the Commonwealth Act.

An unintended consequence of these subsequent amendments is that the transport of GMOs is prohibited in South Australia by virtue of being listed as a dealing under the Commonwealth Act.

There is no indication in the Second Reading Speech of the Genetically Modified Crops Management Bill 2004 (SA) that the Parliament of the day intended for the Act to ban transport of GM seed and grain through the state.

There is further evidence from the Second Reading Speech that the Parliament of the day noted that the Act needed to be compliant with national competition principles and consistent with Commonwealth law (noting that s109 of the Constitution renders invalid and inoperative any state law to the extent that it is inconsistent with the Commonwealth Law).

There exists significant overlap between the definition of cultivate in the South Australian Act and the definition of deal with in the Commonwealth Gene Technology Act. Relatively minor amendments to the South Australian *Genetically Modified Crops Management Act 2004* could resolve this issue.

CropLife suggests that as an initial step, the Review recommends that the appropriate Minister immediately provides exemptions to the *Genetically Modified Crops Management Act 2004* (SA) that will allow for the unfettered transport of GM seed and grain through the state of South Australia. Following that, irrespective of any decisions relating to the future of commercial cultivation of GM crops, the legislation should be corrected to remove the unintended ban.

5.2 The 'Stepwise approach': a pragmatic and conservative solution

Recognising the need for the South Australian Government to manage the potential future cultivation of GM crops in South Australia in a responsible manner and in line with community expectations; CropLife proposes the below 'Stepwise approach' towards a possible repeal of the *Genetically Modified Crops Management Act 2004* (SA).

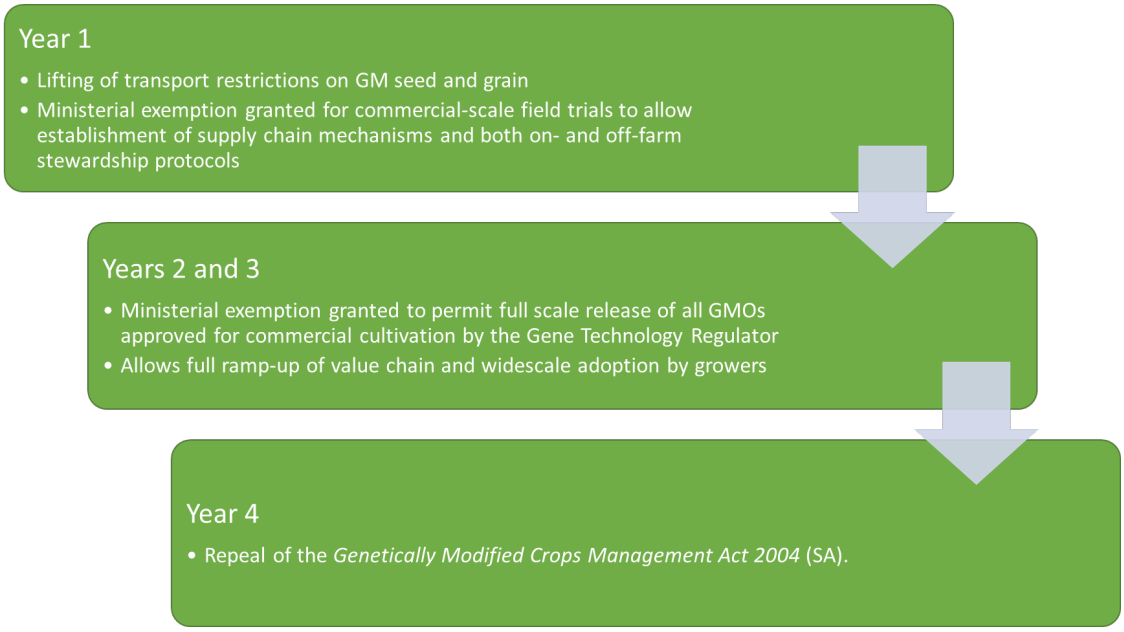

Figure 2: A proposed 'Stepwise approach' to a repeal of the Genetically Modified Crops Management Act 2004 *(SA)*

7 TERM OF REFERENCE (5)

Potential innovations for commercial adoption in South Australia

The Gene Technology Regulator maintains the GMO Record, a database of GM crops that have received approval for either commercial or limited and controlled (i.e. field trial) release in Australia. GM crops listed on the GMO record that could potentially be available to South Australian growers are listed in Appendices 1 and 2. The actual availability of these crops depends on both regulatory and commercial decisions made by the licence holders.

Potential future GM crops applicable to South Australian cropping systems include canola, safflower, wheat, barley, perennial ryegrass, sorghum, potato and Indian mustard (Appendices 1 and 2).

In addition to insect resistance and herbicide tolerance, future GM traits that could be available to the South Australian farming sector include: enhanced human nutrition (canola, Indian mustard, banana) and enhanced animal nutrition (canola, Indian mustard, perennial ryegrass, sorghum); plant-based industrial oils and lubricants (safflower); disease resistance (wheat and barley, potato, banana); yield (perennial ryegrass, sorghum, wheat and barley); and environmental stress tolerance (wheat and barley) (Appendices 1 and 2).

It is clear from Appendix 2 that there is a significant number of field trials of GM crops being undertaken by public sector institutions in Australia. Of the 24-current field trial licences issued, 18 (75 per cent) are held by public sector agencies, either Universities, RDCs or the CSIRO. This evidence strongly contradicts the claims made by opponents of GM technology that R&D in GM crops is dominated by multinational companies.

CropLife International maintains a Plant Biotechnology Product Pipeline [28] that highlights forthcoming developments from CropLife member companies. This clearly demonstrates that on a global basis, the clear majority of private sector investment in plant biotechnology is in the two crops of soybeans and corn, neither of which are cultivated on a large scale in Australia. Therefore, a clear path to market for products developed for Australia, by Australian public-sector agencies and agricultural research organisations is critically important. The South Australian GM moratorium is a inhibitor for developing many of these public-sector innovations beyond proof-of-concept stage in the field.

[28] https://croplife-r9qnrxt3qxgjra4.netdna-ssl.com/wp-content/uploads/2017/09/CropLifePlantBiotechPipeline2017_V5.pdf

8 TERM OF REFERENCE (6)

Quantify the economic costs and benefits of maintaining, modifying or removing the moratorium

There is no economic benefit from maintaining the moratorium, and significant opportunity costs have been borne since its implementation in 2004. This section explores the potential agronomic, economic, environmental and human health benefits that could be realised by South Australia should the moratorium be repealed, or exemptions granted.

6.1 The agronomic, economic, environmental and human health benefits of GM crops

Since being first commercially cultivated in 1996, GM crops have contributed to global food security, sustainability and helped farmers to adapt to and mitigate climate change by:

- Increasing the value of crop production by US$186 billion;[29]
- Reducing pesticide usage (kg active ingredient) by 671 million kg;[30]
- Saving 183 million hectares of land from clearing because of higher productivity of the land used to grow GM crops;[31]
- Reducing CO_2 emissions in 2016 alone by 27.1 billion kgs[32] (equivalent to taking 16.7 million cars off the road for one year[33], more than all the passenger vehicles registered in Australia; and 86% of all vehicles registered in Australia); and[34]
- Increasing the incomes of more than 18 million small farmers and their families – some of the poorest people in the world – and thereby helping to alleviate poverty in developing countries.[35]

GM crops have helped farmers financially. Globally, GM technology directly increased farm income by US$18.2 billion in 2016, with just over half the gains going to farmers in developing countries.[36] This is an additional $18.2 billion on what farmers would have earned had GM crops not been cultivated.

A 2012 study reported in the science journal *Nature*, found that in China over a period of 16 years, vast plantings of GM insect-resistant crops have helped to control several major insect pests and reduced the need for additional insecticide applications by promoting the bio-control services offered by

29 *Ibid.*
30 *Ibid.*
31 ISAAA (2017) *'Global Status of Commercialized Biotech/GM Crops* in 2017: Biotech Crop Adoption Surges as Economic Benefits Accumulate in 22 Years. ISAAA Brief No. 53. ISAAA: Ithaca, NY.
32 *Ibid.*
33 *Ibid*
34 Australian Bureau of Statistics (2018) *'Motor Vehicle Census'*. Data cube available from: http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/9309.031%20Jan%202018?OpenDocument
35 ISAAA (2017) *Op. Cit.*
36 Brookes and Barfoot (2018) *Op. Cit.*

beneficial predatory insects[37]. On conventional crops, these beneficial insects were killed by the broad-spectrum insecticides used to control the major target pests, for example, cotton bollworm. This study found a marked increase in the abundance of three arthropod predators (ladybirds, lacewings and spiders) and a decreased abundance of aphid pests associated with the widespread adoption of GM insect-resistant cotton and reduced insecticide sprays in this crop[38].

A 2014 study by the International Food Policy Research Institute (IFPRI) measures the impacts of agricultural innovation on farm productivity, prices, hunger and trade flows to 2050 and identifies practices that could significantly benefit developing nations. The study reinforces that no single agricultural technology or farming practice will provide sufficient food for the world in 2050.[39] This highlights the need for a combination of agricultural technologies and practices, such as heat-tolerant crops and no-till farming.

6.1.1 GM crops in Australia

In Australia, growing GM cotton varieties has seen environmental benefits resulting from decreased insecticide use and changes in the type of insecticides and herbicides used. First grown in 1996, almost 100 per cent of Australia's cotton crop is now grown with GM varieties[40]. Cultivation of GM insect resistant cotton varieties has enabled a reduction in the amount of insecticide active ingredient used by up to 85 per cent[41, 42]. This, in conjunction with industry stewardship practices, has greatly reduced the potential for chemical runoff into rivers in cotton growing regions of Australia[43].

The adoption of GM technology in cotton has coincided with a 40% increase in water productivity of the crop over the past decade. New cotton varieties released have contained new features such as improved fibre quality, disease resistance, maturity and regional adaptability – research is being undertaken to develop varieties that require less water and/or are drought tolerant[44].

The types of chemical being used have also changed. Because of the 'in-built' insecticide in GM insect resistant cotton, insect control can be more targeted and specific meaning there is less of an impact on non-target organisms thereby allowing beneficial insects (i.e. predatory insects) to remain in the crop. It is worth noting that the insecticidal 'Bt' protein expressed in GM insect resistant cotton is also an approved input in organic agriculture. In-crop fuel use is reduced because of fewer insecticide applications being required.

GM herbicide tolerant cotton has increased the adoption of minimum tillage practices and the replacement of some herbicides with less hazardous alternatives. By facilitating minimum tillage, GM herbicide tolerant cotton has reduced soil erosion, increased retention of soil moisture and

37 Lu Y, Wu K, Jiang Y, Guo Y and Desneux N 2012. 'Widespread adoption of Bt cotton and insecticide decrease promotes bio control services'. *Nature* doi: 10. 1038/nature11153 published online 13 June 2012.

38 *Ibid.*

39 Rosegrant Mark W. et al. 2014 'Food Security in a World of Natural Resource Scarcity: The Role of Agricultural Technologies' *International Food Policy Research Institute (IFPRI)*

40 Cotton Australia Cotton Fact File: Biotechnology http://cottonaustralia.com.au/cotton-library/fact-sheets/cotton-fact-file-biotechnology

41 Hattersley P, Johnson H, Glover J, Foster M, Wesley V and Mewett O 2009. 'Plant Gene Technology: Improving the Productivity of Australian Agriculture'. Australian Government Bureau of Rural Sciences, Canberra.

42 Holtzapffel R, Mewett O, Wesley V and Hattersley P 2008. 'Genetically modified crops: tools for insect pest and weed control in cotton and canola'. Australian Government Bureau of Rural Sciences, Canberra.

43 *Ibid.*

44 Cotton Australia https://cottonaustralia.com.au/cotton-library/fact-sheets

increased soil carbon. Reducing the use of some residual herbicides, together with good industry stewardship, has decreased the potential for herbicide runoff into waterways[45].

Economic and social benefits have also been realised through the adoption of GM crops in Australia. For example, in GM cotton growing regions, the incidence of on-farm workplace incidents have decreased because of reduced insecticide spraying and the reduced need for hand weeding in cotton fields. Community perceptions of the Australian cotton industry have also markedly improved since GM cotton was first grown in 1996[46]. Cultivation of GM cotton varieties has allowed cotton farmers to spend less time on the tractor and more time with their families, an important social implication for rural Australia that should not be overlooked.

The adoption of GM herbicide tolerant canola varieties in Australia has also resulted in environmental benefits and increased environmental sustainability. For example, just as for those farmers growing GM herbicide tolerant cotton, cultivation of GM herbicide tolerant canola has allowed farmers in New South Wales, Victoria and Western Australia to use selective, targeted and lower hazard crop protection products.

Herbicide tolerant canola provides farmers with more effective weed control, particularly for those broad leaf weeds, such as wild radish, that are closely related to canola. Varieties of non-GM herbicide tolerant canola have been grown in Australia since 1993 (triazine tolerant) and 2000 (imidazolinone tolerant). The introduction of glyphosate tolerant GM canola merely adds another weed management option to farmers' weed control toolbox. Both non-GM and GM herbicide tolerant canola technologies have led the shift to no-till or conservation tillage systems with associated environmental benefits such as reduced soil erosion and increased soil water retention.

The agronomic benefits of GM (when compared to non-GM) herbicide tolerant canola include increasing the options for in-crop weed control, allowing herbicide rotations that address the risk of herbicide resistant weeds developing and increasing the yield in subsequent cereal crops, which could be adversely affected by herbicide carry over from the herbicides used in non-GM herbicide tolerant crops.

The technology has provided significant economic and environment benefits to Australian farmers and citizens. Australian cotton and canola farmers have gained AU$1.37 billion worth of extra incomes and canola farmers have produced an additional 226,000 tonnes of canola that would otherwise not have been produced if conventional technology had been used.[47] These calculations take into account the impact on yield and quality, and the cost of accessing the technology, such as payment for seed and other inputs.

The technology has enabled Australian cotton and canola farmers to reduce their use of insecticides and herbicides by 22 million kg of active ingredient, equal to a 26 per cent improvement in the environmental impact associated with pesticide use on these two crops. This improvement in the

[45] Hattersley *et al.*, Op. cit.
[46] Holtzapffel *et al.*, Op. cit.
[47] Brookes G (2016) *'Adoption and Impact of GM Crops in Australia: 20 years' experience'*. Report prepared for CropLife Australia Ltd, Canberra, May.

sustainable use of pesticides has also resulted in a saving of nearly 27 million litres of fuel use and 71.5 million kgs less CO_2 being released into the atmosphere.[48]

According to the recent meta-analysis (a 'study-of-studies') by Klumper and Qaim (2014), GM crops have:

- Reduced pesticide use by 37 per cent;
- Increased crop yield by 22 per cent; and
- Increased farmer profits by 68 per cent.[49]

6.2 Health, Safety and Nutritional Impact of Agricultural Biotechnology

GM crops currently grown around the world and the food they produce have been studied extensively and repeatedly declared safe by scientific bodies and regulators globally.

Commercial production of GM crops is only permitted when environmental and consumer safety has been thoroughly demonstrated. In Australia, the Gene Technology Regulator is responsible for licensing any dealings with live and viable genetically modified organisms (GMOs). Food Standards Australia New Zealand (FSANZ) is required to approve any GM food ingredient and APVMA regulates those GM crops with inbuilt pest protection. The GM canola and GM cotton crops that are grown in Australia have passed these regulatory assessments.

A significant number of peer-reviewed scientific research papers have been published that describe the results of biosafety research on biotech crops. The GENetic Engineering Risk Atlas (GENERA) is a long-term project to catalogue, examine and communicate the findings of all peer reviewed scientific publications that can be used to analyse the relative risks of genetically engineered plants. Currently listing 600 peer-reviewed papers, the overwhelming weight of scientific consensus in these papers confirms that approved genetically modified crops are as safe for human health and the environment as their conventional counterparts.

Biotech crops have been grown and consumed for more than 20 years and people around the world have eaten billions of meals containing biotech derived foods or ingredients. There are no substantiated scientific reports of any food safety issues related to the consumption of biotech crops.

6.2.1 Nutritional benefits of GM crops

Agricultural biotechnology is being used to develop nutrient dense varieties of staple crops that could be grown for a fraction of the recurrent estimated annual costs of supplementation programs in developing countries and could reach far more people. The nutritional quality of staple foods can be substantially improved using transgenic methods compared to what can be accomplished using traditional breeding.

48 *Ibid.*

49 Klümper, W. and Qaim, M., (2014). *'A meta-analysis of the impacts of genetically modified crops'*. PloS one, 9(11), p.e111629.

Example: Golden Rice

Golden Rice (with elevated levels of pro Vitamin A) is expected to soon be available in developing countries where 250 million children of preschool age are at risk of Vitamin A deficiency. Every year, about half a million children go blind because of Vitamin A deficiency, which is the single most important cause of childhood blindness in developing countries, and 70 per cent of those die within a year of losing their sight.

Golden rice could have been available and saving children's lives for many years were it not for the ongoing activism of anti-humanitarian organisations, who first claimed the elevated levels of pro Vitamin A in the modified rice were toxic. When this was shown to be patently untrue, these activist organisations changed tack and claimed the level of pro Vitamin A in the rice was in fact too low to have any meaningful biologic effect.

Biotechnology is also being used to produce vegetable oils with low saturated fats and properly balanced essential fatty acids which are associated with reducing the risk of heart disease and stroke, important for brain function and essential for growth and development of infants.

Example: Long-Chain Omega-3 Canola

Canola crops that have been modified to produce high levels of long-chain omega-3 oils, like those found in fish oil, have clear health benefits. They have been developed through a joint venture between the CSIRO, the Grains Research and Development Corporation and Nuseed, a CropLife Australia member. The health benefits of long-chain omega-3 oils are well documented with adequate intake having an overall positive impact on brain, eye and heart health, and inflammation management. Omega-3 oils also play an important role in child and infant development.

When commercialised, the long-chain omega-3 canola will relieve pressure on wild fish stocks and maintain adequate supply of this important nutrient via a proven land-based, sustainable source. One hectare of this canola has the potential to provide the omega-3 oil yield from 10,000 kilograms of fish.

6.3 Impact of the GM moratorium on research and development investment in South Australia

The lack of a clear path to market in South Australia for GM food crops as a direct result of the GM moratorium has applied a handbrake to industry investment in plant science research and development (R&D) in the state. South Australia's competitors in neighbouring states that permit the cultivation of GM crops are instead realizing the R&D and commercial benefits of such investment.

The GM food crop moratorium sends a clear signal to markets that the South Australian government does not have faith or trust in the state's primary production sector. Instead it has felt the need to intervene to protect farmers from what has been proven to be a non-existent market failure.

It is crucial that South Australian primary producers have access to the latest plant science innovations to be productive and competitive. The moratorium is impacting South Australia's

ability to attract investment from plant breeding companies to carry out research and release new varieties of crop plants.

Additionally, even though South Australia farmers have contributed to the development of new GM crops through the levies they have paid to GRDC, they are unable to benefit from these crops in their rotations due to the status of the moratorium.

In October 2016, the then Executive Director of ABARES commented that it was clear that reduced investment in R&D was partly to blame for the reduction in agricultural productivity growth since the mid-1990s.[50]

Mr Gooday used the South Australian moratorium on GM food crops as an example of the serious effect government policy could have on agricultural research and development, noting the moratorium discouraged financial incentive for any R&D into GM crops:

> "When people are thinking how to spend that research and development money, they're really thinking about how they can make a dollar out of it themselves. So there needs to be a path to market for that research."
>
> "We need to be fairly clear about what the rules and regulations might be going forward. So there's less uncertainty about what the rules might be in 10 years' time because R&D has a very long lead time between an initial investment and adoption on farm or somewhere else so you need to be thinking long term."[51]

Mr Gooday concluded that "things like GM crop moratoria are probably resulting in less research in that area than we would otherwise get."[52]

[50] See https://www.abc.net.au/news/rural/2016-10-06/lack-of-research-development-funding-threatens-ag-productivity/7907400
[51] *Ibid.*
[52] *Ibid.*

9 CONCLUSION

At the time of this submission, South Australian farmers have waited 5,293 days and counting to gain access to GM crop technologies that have the proven potential to deliver agronomic, economic and environmental benefits to their farming operations.

The decision to unnecessarily regulate GM crops at a state level completely undermines the National Regulatory Scheme for Gene Technology. The 'Gene Technology (Recognition of Designated Areas) Principle 2003' gave the states and territories the power to recognise areas (if any) designated under a state law for preserving the identity of GM crops, non-GM crops, or both GM and non-GM crops, for marketing purposes.

The South Australian GM moratorium is a costly disincentive for private investment in South Australian agriculture. It has been demonstrated to be unnecessary for preserving the identity of GM and non-GM crops, and it removes farmer choice. Above all, the GM moratorium hurts South Australian farmers. It denies them the opportunity to choose innovative technologies that will improve the environmental sustainability and economic growth of their farm businesses.

The evidence is clear and unambiguous; there is no trade or marketing benefit to South Australian primary producers being gained from keeping the moratorium in place. CropLife calls on this Review to consider the evidence before it and consider supporting the proposed 'Stepwise approach' to manage the potential future cultivation of GM crops in South Australia in a responsible manner and in line with community expectations.

The time for enabling all South Australian producers to have the freedom of choice to pick the farming system that best suits their own businesses and deliver greater productivity, environmental sustainability and productivity is long overdue.

APPENDIX 1

GM Crops Licenced for Commercial Release in Australia

Licence No	Parent Organism	Modified Trait	Organisation	Issue Date
DIR 158	Safflower	Composition – non-food (processing)	Go Resources Pty Ltd	27-Jun-18
DIR 157	Cotton	Insect resistance	Syngenta Australia Pty Ltd	14-Feb-18
DIR 155	Canola	Composition - food (human nutrition), Composition - animal nutrition	Nuseed Pty Ltd	13-Feb-18
DIR 145	Cotton	Insect resistance and herbicide tolerance	Monsanto Australia Limited	20-Dec-16
DIR 143	Cotton	Insect resistance and herbicide tolerance	BASF Agricultural Solutions Australia Pty Ltd	8-Dec-16
DIR 139	Canola	Herbicide tolerance	Pioneer Hi-Bred Australia Pty Ltd	29-Mar-16
DIR 138	Canola	Herbicide tolerance, Hybrid breeding system	BASF Agricultural Solutions Australia Pty Ltd	22-Mar-16
DIR 127	Canola	Herbicide tolerance	Monsanto Australia Ltd	21-Nov-14
DIR 124	Cotton	Herbicide tolerance, Insect resistance	Monsanto Australia Ltd	19-Jun-14
DIR 118	Cotton	Herbicide tolerance	Monsanto Australia Ltd	16-Aug-13
DIR 108	Canola	Herbicide tolerance/Hybrid breeding system	BASF Agricultural Solutions Australia Pty Ltd	2-Dec-11
DIR 091	Cotton	Insect resistance	Dow AgroSciences Australia Pty Ltd	25-Nov-09
DIR 066/2006	Cotton (Gossypium hirsutum L.)	Herbicide tolerance, Insect resistance	Monsanto Australia Ltd	26-Oct-06
DIR 062/2005	Cotton	Herbicide tolerance	BASF Agricultural Solutions Australia Pty Ltd	8-Aug-06
DIR 021/2002	Canola	Herbicide tolerance, Hybrid breeding system	BASF Agricultural Solutions Pty Ltd	25-Jul-03
DIR 020/2002	Canola	Herbicide tolerance	Monsanto Australia Ltd	19-Dec-03

Source: GMO Record http://www.ogtr.gov.au/internet/ogtr/publishing.nsf/Content/ir-1

APPENDIX 2

GM Crops Licenced for Limited and Controlled Release (field trials) in Australia

Licence No	Organisation	Title of Project	Parent Organism	Modified Trait	Issue Date
DIR 164	Monsanto Australia Limited	Limited and controlled release of canola genetically modified for herbicide tolerance	Canola	Herbicide tolerance	Under Evaluation
DIR 163	Nuseed Pty Ltd	Limited and controlled release of canola genetically modified for altered oil content and herbicide tolerance	Canola	Composition - food (human nutrition), Composition - animal nutrition, Herbicide tolerance	6-Sep-18
DIR 162	CSIRO	Limited and controlled release of bread wheat and durum wheat genetically modified for enhanced rust disease resistance	Bread wheat and durum wheat	Disease resistance	11-Jul-18
DIR 160	Department of Economic Development, Jobs, Transport and Resources	Limited and controlled release of perennial ryegrass genetically modified for fructan biosynthesis	Perennial ryegrass	Composition – animal nutrition, Yield,	6-Mar-18
DIR 156	Royal Melbourne Institute of Technology University	Limited and controlled release of buffalo grass genetically modified for herbicide tolerance and dwarf phenotype	Buffalo grass	Herbicide tolerance, Plant development-altered plant architecture	11-Apr-18
DIR 153	University of Queensland	Limited and controlled release of sorghum genetically modified for grain quality traits	Sorghum	Composition - animal nutrition, Yield	25-Jul-17
DIR 152	The University of Adelaide	Limited and controlled release of wheat and barley genetically modified for abiotic stress tolerance and yield improvement	Wheat and Barley	Abiotic stress tolerance; enhanced yield	17-Jul-17
DIR 151	CSIRO	Limited and controlled release of wheat genetically modified for disease resistance, drought tolerance, altered oil content and altered grain composition	Wheat	Disease resistance, drought tolerance, Composition - food (processing), Composition - food (human nutrition)	1-May-17
DIR 150	Queensland University of Technology	Limited and controlled release of potato genetically modified for disease resistance	Potato	Disease resistance	20-Feb-17
DIR 149	Nuseed Pty Ltd	Limited and controlled release of Indian mustard (Juncea	Indian mustard	Composition - food (human nutrition),	14-Feb-17

Licence No	Organisation	Title of Project	Parent Organism	Modified Trait	Issue Date
		canola) genetically modified for altered oil content		Composition - animal nutrition	
DIR 147	Monsanto Australia Limited	Limited and controlled release of cotton genetically modified for insect resistance and herbicide tolerance	Cotton	Insect resistance and herbicide tolerance	23-Jan-17
DIR 146	Queensland University of Technology	Limited and controlled release of banana genetically modified for disease resistance	Banana	Disease resistance,	13-Dec-16
DIR 142	Victorian Department of Economic Development, Jobs, Transport and Resources (DEDJTR)	Limited and controlled release of wheat genetically modified for enhanced nitrogen use efficiency and water use efficiency - Victorian Department of Economic Development, Jobs, Transport and Resources (DEDJTR)	Wheat	Yield and Abiotic stress tolerance	19-Apr-16
DIR 136	CSIRO	Limited and controlled release of cotton genetically modified for enhanced fibre quality	Cotton	Product quality – non-food	4-Sep-15
DIR 135	The University of Queensland	Limited and controlled release of sugarcane genetically modified for enhanced sugar content – The University of Queensland	Sugarcane	Yield	3-Aug-15
DIR 131	Go Resources Pty Ltd	Limited and controlled release of safflower genetically modified for high oleic acid composition	Safflower	Composition – non-food (processing)	17-Feb-15
DIR 130	Murdoch University	Limited and controlled release of wheat genetically modified for improved grain quality	Wheat	Composition – food (processing)	3-Mar-15
DIR 129	Sugar Research Australia Ltd	Limited and controlled release of sugarcane genetically modified for herbicide tolerance	Sugarcane	Herbicide tolerance	24-Oct-14
DIR 128	The University of Adelaide	Limited and controlled release of wheat and barley genetically modified for abiotic stress tolerance or micronutrient uptake	Wheat and barley	Abiotic stress tolerance, Yield, Composition – food (human nutrition)	4-Aug-14
DIR 123	Nuseed Pty Ltd	Limited and controlled release of canola genetically modified for altered oil content	Canola	Composition - food (human nutrition), Composition - animal nutrition,	13-Nov-13
DIR 115	CSIRO	Limited and controlled release of cotton genetically modified for enhanced fibre yield	Cotton	Yield	27-Jul-12

Licence No	Organisation	Title of Project	Parent Organism	Modified Trait	Issue Date
DIR 111	CSIRO	Limited and controlled release of wheat and barley genetically modified for altered grain composition, nutrient utilisation efficiency, disease resistance or stress tolerance	Wheat and barley	Composition - food (human nutrition), Yield, Disease resistance, Abiotic stress tolerance	17-Feb-12
DIR 109	Queensland University of Technology	Limited and controlled release of banana genetically modified for enhanced nutritrion	Banana	Composition - food (human nutrition)	3-Aug-11
DIR 085/2008	CSIRO	Limited and controlled release of cotton genetically modified for altered fatty acid composition of the cottonseed oil	Cotton	Composition - food (processing)	28-Oct-08

Source: GMO Record: http://www.ogtr.gov.au/internet/ogtr/publishing.nsf/Content/ir-1