Submission

Review of the New South Wales Moratorium on GM crops

Molecular Plant Breeding
Cooperative Research Centre

Contact

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Preamble

The Molecular Plant Breeding Cooperative Research Centre (MPBCRC) exists to ensure the competitiveness of Australian crop and pasture industries by developing the latest molecular technologies and delivering them through the crop and pasture breeding programs. MPBCRC is made up of participants from government research bodies, universities, R&D corporations and private industry.

GM crops have the potential to provide significant economic, environmental and social benefits to Australian farmers and the Australian public. GM crops offer farmers benefits such as:

- more efficient weed control
- ease of herbicide management in preventing weed resistance
- better yields and higher returns
- reduced costs and greater profits.

Australian farmers are able to remain competitive in global markets – even though their competitors are heavily subsidised – because they are at the forefront of scientific research. Restrictions on the development of new technologies are compromising the capacity of Australian farmers to remain competitive, and risk leaving Australian agricultural research to lag behind the rest of the world.

It is the view of the Molecular Plant Breeding CRC that the moratorium should be allowed to expire so that:

1. farmers are given access to cost saving and yield enhancing technologies
2. farmers are allowed to compete on an even footing with overseas competitors
3. research is provided with the certainty required to secure external investment

Economic implications of the moratorium

The moratorium was originally born of a ‘wait-and-see’ mentality. Essentially, it was proposed that a ban on the planting of GM crops would allow NSW the opportunity to wait until perceived risks to market and trade were resolved elsewhere.

Since that time, GM crops have continued to experience enormous growth internationally. The global area planted to GM crops continues to expand at a rate of around 13% per annum, reaching 102 million hectares in 2006 (James, 2006). Australia’s competitors have not hesitated to embrace GM crops raising the real possibility that Australia will be left behind the rest of the world.

Canada

Canadian farmers

Canada is Australia’s major competitor in export canola markets. Canada has embraced GM canola to the extent that the great bulk of Canadian canola is now either Roundup Ready® (48%) or Liberty Link® (34%), with 14% sown to the non-GM Clearfield variety (Holtzapffel, Johnson, & Mewett, 2007). Although there were over 30 registered canola varieties available for purchase by canola farmers in 2005, only 4% of canola acreage was sown to these varieties (Holtzapffel et al., 2007).

An independent study of the effect of GM canola in Canadian agriculture between 1997 and 2000 found that farmers who grew GM varieties were better off than those who continued to grow conventional canola (Canola Council of Canada, 2005). As can be seen in Table 1 below, growers enjoyed higher yields, used less fuel, used less herbicide and received an overall increase in revenue of CAN$5.80 per acre.

Table 1. Impacts of GM canola in Canada (1997-2000)

Benefit or Cost	Measurement Parameter
Improved weed management	80% of GM growers said weed management was more effective.
Improved yield	GM varieties resulted in 10% yield advantage over conventional varieties.
Reduced dockage (penalty for presence of non-grain contaminants)	Only 3.87% dockage in GM varieties compared to 5.14% in conventional varieties.
Reduced cultivation	'In crop' weed control permits GM growers to direct seed with pre-seeding tillage operations. This has soil conservation benefits.
Savings on fuel use and cost	GM growers used less fuel due to fewer field operations. Fuel saving varied from 9.5 million litres in 1997 to 31.2 million litres in 2000. This equates to Can$13.1 million saving based on a fuel price of Can$0.42 per litre.
Increased fertiliser cost	More fertiliser was required by GM growers. This was related to the type of cultivation system used which differed from that used by the majority of conventional growers.
Decrease in herbicide use	Herbicide costs were 40% lower for GM growers. There was a reduction of 1500 tonnes of herbicide applied in 1997 and 6000 tonnes in 1999 and 2000.
Increase in grower revenue	An average Can$5.80/acre increase on net return reported by GM growers in 2000.
Large indirect impact of GM technology	Total indirect impact of GM technology for 1997–2000 period estimated to range between Can$58–215 million.

Adapted from (Canola Council of Canada, 2005; Holtzapffel et al., 2007)

Market implications

Canada is one of the largest GM canola producers in the world, and yet it has found ready markets for its canola in Japan, China, Mexico, the US, Pakistan and the United Arab Emirates (ABARE, 2007). While Japan is often cited as a fiercely anti-GM market, Canadian GM canola makes up the bulk of Japan's canola imports (ABARE, 2007). Moreover, Japan pays the same price for GM and non-GM canola, and typically blends the two together. Only the EU has imposed any kind of market restrictions on Canada. However, even this situation is likely to change as the recent World Trade Organisation ruling states that the EU has maintained an illegal moratorium on GM crops.

Because the bulk of GM canola receives the same price as conventional canola, Australia is effectively wearing the burden of remaining non-GM for no discernable purpose.

Argentina

Argentine farmers

One of Australia's keenest competitors, Argentina, has had an explosive uptake of GM crops. Rapid uptake was facilitated by strong similarities between the agroecological conditions of the regions for which the crops were developed and those of the Argentine 'Pampean' region. Breeders were also quick to incorporate these new genes into locally adapted varieties and deliver seed to local growers. GM crops now dominate Argentina's agricultural production with GM varieties representing (Trigo & Cap, 2006):

- 90% of farmland planted to soybeans
- 70% of farmland planted to maize
- 60% of farmland planted to cotton.

Argentina is now the second largest producer of GM crops after the US, with 17 million hectares planted (Trigo & Cap, 2006).

Trigo and Cap (2006) cite two main farm-level economic impacts of the introduction of GM Crops to Argentina. The elimination of inputs and practices associated with the use of herbicides has resulted in an average cost reduction of US$20/ha. At a national level, this has resulted in a cumulative saving of over US$1.7 billion over the period 1996-2006.

The second source of benefits stems from the overall increase in the area planted to soybeans. GM crops enabled the expansion of soybeans into areas that were previously considered marginal land, resulting in an overall increase in the area of available arable land. Also, because no-till farming provided the opportunity to shorten the time span between wheat harvest and soybean planting, it facilitated the use of short-cycle soybeans as a double crop, thereby increasing overall pre-hectare productivity (Trigo & Cap, 2006).

Economic implications

Argentina's adoption of GM crops has had far reaching economic implications. In total, the effect of adoption is believed to have delivered a benefit in excess of US$20 billion over the period 1996-2005 (Trigo & Cap, 2006). Of this figure, soybeans in particular have had a phenomenal effect on the Argentine economy. As can be seen in Table 2, the great bulk of the benefits derived from soybeans have gone to the farmers, with significant revenues also earned by the national government from export taxes implemented in 2002-03.

Table 2. Distribution of the benefits of GM soybeans in Argentine agriculture

Season	Gross benefits GM (million USD)	Area planted with GM (ha)	Farmers (million USD)	Technology suppliers (million USD)		National government (million USD)
				Seeds	Glyphosate	
1996-97	200.21	370,000	189.41	5.62	5.18	0.00
1997-98	518.00	1,800,000	467.24	27.36	23.40	0.00
1998-99	651.38	4,875,396	526.08	74.11	51.19	0.00
1999-00	941.36	6,870,511	722.33	109.93	109.10	0.00
2000-01	1,265.07	8,783,542	1,062.35	71.67	131.05	0.00
2001-02	1,849.32	10,381,943	1,640.85	83.06	125.41	0.00
2002-03	2,863.06	11,756,084	2,132.45	82.76	122.26	525.59
2003-04	3,105.06	13,057,989	2,322.13	94.02	120.13	568.78
2004-05	3,928.21	14,407,585	2,928.18	87.60	184.42	728.01
2005-06	4,415.39	15,859,058	3,296.33	134.48	164.93	819.64
Total	**19,737.06**		**15,287.34**	**770.61**	**1,037.09**	**2,642.02**
%	**100.00**		**77.45**	**3.90**	**5.25**	**13.39**

Adapted from (Trigo & Cap, 2006)

From an employment perspective, herbicide tolerant soybeans may have contributed to the creation of almost 1 million additional jobs, representing 36% of the total increase in employment over the period 1996-2005 (Trigo & Cap, 2006).

Australia

Australian farmers

Australian cotton growers are already enjoying the benefits of transgenic cotton varieties. Insect resistant cotton is delivering economic benefits to Australian growers through reduced use, and therefore cost, of insecticidal chemicals. In New South Wales, growers of GM cotton typically use around 60% less insecticide in half the number of applications required for conventional cotton crop (Apted, McDonald, & Rodgers, 2005). This is estimated to result in the lowering of insecticide application costs by 85%, and a reduction of total production costs of around 2% (Apted et al., 2005).

Similar benefits are possible with GM canola. A 2003 (Norton, 2003) report found that GM canola could allow Australian farmers:

- to sow earlier
- to achieve better weed control compared with current systems
- to avoid the inherent yield and oil penalties associated with triazine tolerant varieties.

The report estimated that if GM canola were allowed to replace 50% of existing TT canola and 40% of conventional canola, coupled with additional plantings of 160,000 ha, the results for Australian growers would be:

- an extra 200,000 ha of canola grown under direct drilling or minimum tillage
- a per annum reduction of 640 tonnes of triazine herbicide
- an average yield increase from 1.27t/ha to 1.38t/ha (representing a total increase of 295,000 tonnes per annum)
- an increase in wheat production of 64,000 tonnes
- an additional $135 million in revenues for the Australian grains industry.

While our competitors currently enjoy these productivity gains and reduced on-farm inputs, NSW farmers must go without. Instead they are forced to compete with Canadian farmers who are free to use whatever varieties they choose.

Market implications

A commonly heard catchcry of those opposed to the use of GM crops is that Australia can secure premiums for remaining non-GM, and carve out a global niche as a GM-free exporter. However, despite these claims, there is little to no evidence for such premiums (ABARE, 2007). Presently, the bulk of GM canola is sold in international markets at the same price as conventional canola. Given the lack of evidence for a price premium for Australian non-transgenic canola, Australian growers are being denied the economic benefits of the technology for no reason. Moreover, they are suffering economic losses as a direct result of the moratorium.

In fact, as the next generation of GM crops with human health benefits come online, it is entirely likely that the reverse will be true, and we will see price premiums emerge for specific GM crops. This scenario is already playing out in world soybean markets, where high oleic acid soybeans are carefully segregated to ensure premiums are received.

In 2006 the severe drought meant that Australian farmers could not satisfy domestic demand and, with bitter irony, Australia was forced to import 50,000 tonnes of GM canola from Canada. Again this absurd situation sends the message that GM crops are acceptable for consumption by Australian consumers, yet our farmers are to be denied access to the technology while their competitors are free to enjoy the many benefits.

Economic implications

Apted et al (2005) conducted a study on the national economic implications of continuing the various state moratoria and failing to adopt transgenic crops. The study assumed that additional GM crops would be released commercially, and that growers in competitor countries would achieve:

- a 5% productivity gain for wheat
- a 10% productivity gain for maize.

The study estimated that the continuance of the state moratoria would result in a loss of gross national product of $3 billion over the period 2006-2015 (Apted et al., 2005).

In the past Australian farmers have been able to maintain their competitiveness, even in an environment where their competitors are heavily subsidised, by being at the forefront of new developments. There is clear evidence that new GM technologies enable farmers to be more efficient and reduce costs. If Australian research and the implementation of the latest technology are stifled, Australian farmers will be disadvantaged. They will be left behind by the productivity gains and cost reductions possible with the GM crops, and future markets will be jeopardised.

Consumer attitudes

Many food companies and marketers do not have any *in principal* objections to GM products; however, they feel they cannot risk a rejection by consumers, regardless of the basis for concern.

Since the drafting of the Act we have witnessed a dramatic shift in consumer attitudes to GM crops. Recent data published by Biotechnology Australia (Eureka Strategic Research, 2007) show that there has been a significant increase in support for the use of gene technology in food and agriculture applications. More than 80% of Australians consider genetic modification in plants for food production to be a useful application of the technology. This is up from 64% in 2005.

The reason postulated for this increase in support is quite simply an increase in familiarity. Consumers are much more familiar with the concept of GM foods, indeed, many are aware that they are already eating foods derived from GM crops. Given the strong link between awareness and acceptance, there is every reason to assume that acceptance will continue to grow as consumer awareness increases through exposure to new GM crop applications.

While there are no doubt community members with concerns about GM crops, it is important to place these concerns in context. When compared with other perceived environmental issues, concerns about GM foods occupy a relatively minor position (Biotechnology Australia, 2003). As can be seen in Table 3, GM foods were less of a concern than pollution, nuclear waste and the greenhouse effect.

Table 3. Concern over GM crops compared with other environmental issues

Issue	2001	2003
Pollution	29%	35%
Nuclear waste	24%	26%
The greenhouse effect	23%	17%
Cloning	13%	12%
GM foods	11%	11%

Adapted from (Biotechnology Australia, 2003)

Similarly, as shown in Table 4, a study by the Rural Industries Research and Development Corporation found that GM crops were less concerning to consumers than five other food issues including food-borne illnesses and antibiotics in meat (Owen, Louviere, & Clark, 2005).

Table 4. Concern over GM crops compared with other food issues

Ranking	Issue	Net %
1	Diseases in beef that could pass on to humans	23.7
2	Bacteria and disease in foods	12.7
3	Hormones to accelerate growth in animals	8.8
4	Antibiotics in meat	3.4
5	Pesticide residue on fruit and vegetables	3.3
6	Using genetically modified ingredients in food	2.1
7	Fruits and vegetables that have been genetically engineered	2.0
8	Chemical preservatives and food additives	0.7
9	Food tampering in supermarkets	-0.3
10	Handling of food in restaurants/takeaways	-1.9

Adapted from (Owen et al., 2005)

These data indicate that GM crops are of relatively low concern to consumers, and are gaining increased support as people become more aware of their applications in mainstream agriculture.

Segregation

Segregation, the process of growing, handling, transporting and processing a crop to ensure it maintains its unique identity, is widely practised in the grains industry. We currently segregate many different varieties of wheat, and gain many benefits from doing so. For example, the quality premiums that grain marketers receive for different grades of grain are achieved through a system of segregation.

The key issue for consideration is tolerance levels. Admixture between crops is an industry reality. No food is 100% pure – even organics. A study commissioned by the Victorian government in 2003 (ACIL Tasman & Farm Horizons, 2003) found that:

> *"The grain handling system would be technically and commercially capable of meeting a range of GM tolerance demands if GM canola were made commercially available to Victorian farmers."*

Specifically, the report found that a limit of 0.9% of GM canola in non-GM canola can be achieved at low cost. As evidence, the authors pointed to pesticide-free wheat, which meets a tolerance of 1% for other wheat and grains at no additional segregation cost (ACIL Tasman & Farm Horizons, 2003).

Internationally, tolerance levels of around 1% are generally accepted. Simple measures such as buffer zones between GM and non-GM crops and reasonable care with harvesting, transportation and storage will ensure such tolerance levels are met. If realistic tolerance levels are accepted, coexistence of GM and non-GM is possible. If however, a policy of zero tolerance is adopted, the use of genetically modified breeding technologies will not be feasible, and the many benefits derived from these technologies will be denied to Australian farmers.

The rights of all farmers to produce conventional, GM or organic produce should be recognised, and this freedom of choice should not be constrained by imposing moratoria. Those wishing to grow GM crops and benefit from new technologies should not be hindered by others who wish to restrict their crops to non-GM.

Research & development

One of the primary concerns of the Molecular Plant Breeding CRC is that the continuance of the GM moratorium will dampen investment in research.

The Molecular Plant Breeding CRC has been responsible for the first ever Australian field trial of GM drought tolerant wheat. It is the group responsible for research into the world's first pasture grasses with the unique combination of increased digestibility and increased nutritive content for livestock, and decreased pollen allergenicity for hay fever sufferers. It is also the centre where frost tolerance genes from Antarctic hairgrass are being studied as a means of developing frost-tolerant wheat.

However, these world-leading scientific developments are placed in jeopardy by the threat of a continued moratorium. Taking a new GM crop to market is a prohibitively expensive process. The cost of negotiating the extensive regulatory frameworks here in Australia and overseas can be as high as AUD$100 million – well beyond the reach of government and university funded research institutions. To secure funding for this process it is incumbent on the Molecular Plant Breeding CRC and other organisations to attract funding from the large agri-biotech and seed companies.

These companies are extremely hesitant to invest in government and university research programs when a moratorium is in place. Moratoria eliminate the possibility of developing a market for biotech-derived seed. The continuance of the moratorium makes it extremely difficult to encourage investment by such companies. We have already witnessed the withdrawal of investment in Australian research by Monsanto Australia, who diverted investment to other opportunities in the Asia-Pacific region with greater investment certainty (Corish, 2006). With this opportunity lost, it will take some years to develop locally adapted GM varieties, even if the moratorium was overturned immediately.

The Molecular Plant Breeding CRC has been successful in attracting investment for a number of its projects, but these collaborative agreements are at risk of being undermined by an extension of the moratorium. One such project is the CRC's partnership PGG Wrightson, Australasia's largest producer of temperate pasture cultivars. The joint venture between the two organisations, 'Gramina', is working to develop and commercialise the world's first GM ryegrass and tall fescue with enhanced animal and human health traits. The total value of the deal AUD$36 million.

Another substantial investment in MPBCRC's research is a collaboration with global biotechnology company BASF Plant Science. The $28 million deal to develop wheat with tolerance to drought and fungal disease could result in yield increases of as much as 10-20%. In a global wheat market of US$17 billion per annum, this represents a considerable market opportunity. Again, this investment is undermined by the presence of the moratorium and risks diversion of investment to competitor countries with a more favourable outlook on GM crops.

With the potential for research investment being diverted from Australia comes the possibility of losing key Australian scientists to competing research programs overseas. This agricultural biotechnology ‘brain drain’ would further contribute to a decrease in research capability. Research institutions such as the Molecular Plant Breeding CRC could ill-afford such losses. High quality PhD students are already at a premium because of competition from the medical biosciences. Extending the moratorium would only serve to reinforce the perception that plant biotechnology is an area with limited opportunities for Australian students.

It is imperative that the state moratoria be overturned. MPBCRC, together with its commercial partners invests over $60 million in transgenic research. This investment is jeopardised by the uncertainty created by ongoing GM moratoria. Federal legislation already provides adequate regulation of GM crops via the Office of the Gene Technology Regulator and via Food Standards Australia and New Zealand. Continuing the moratoria only serves to hamper research and restrict choice for farmers.

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