1 Introduction

1.1 The project brief

ACIL Tasman and Farm Horizons have been asked to consider two key areas in relation to the possible introduction of GM canola. The scope of the analysis defined by the brief is cited verbatim below.

Market impact

> The project will identify key current and potential markets for Victorian canola and report on the potential impact of the commercialisation of GM canola, having regard to regulatory barriers, market access restrictions and customer preferences. Additionally, the project should examine the potential impact on markets for Australia's dairy and honey products.
>
> The project will similarly examine the potential market impacts on other commodities that are identified as at risk of having GM canola material present as an adventitious or unintended component (for example wheat and barley).
>
> It is noted that any such impacts will depend importantly on the ability of particular supply-chains to maintain segregation/identity preservation of products within tolerances acceptable to particular markets. However, it is beyond the scope of this project to assess supply-chain arrangements (subject of a separate project). Rather, the project should, where possible, report on the acceptable tolerances in different markets.

(The paragraph above has been interpreted as excluding from this report consideration of contractual arrangements and other legal issues in detail.)

Industry preparedness and capacity for segregation

> The project will examine the supply-chains for canola produced in Victoria, including canola grain, meal and oil, considering issues on-farm and from farm-gate to wharf (export trade) or end user (domestic trade). It will address the potential impact of GM canola on non-GM canola, other grains sharing the same supply-chain, and also dairy and honey production. Scenarios of restricted and unrestricted production of GM canola will be considered.

The consultations and report preparation were conducted from 1 August 2003 to the 15 October 2003. All data is accurate as of the 31 of October 2003.

1.2 About this document

This document analyses three separate but highly interdependent questions:

- What are the market implications of Victoria's GM status?
- What is the technical and commercial capability and preparedness of the Victorian grains supply chain to segregate GM canola from non-GM canola and other grains?
- How would the costs be borne if the currently licensed varieties of GM canola were introduced?

To answer these questions the consultants collected information from a range of sources:

- consultations with
  - scientists;
  - grain growers;
  - farm advisory firms
  - grain handlers;
  - grain marketers;
  - dairy industry representatives;
  - honey industry representatives;
  - harvesting contractors; and
  - transport industry representatives.
- research into the historical performance of markets and supply chains, especially with regard to canola;
- an examination of published work on the costs of segregation; and
- a study of empirical and theoretical literature on who bears the costs of segregation.

(A full list of parties consulted can be found in Appendix H.)

This report presents the results of these investigations. Readers will find three components to our analysis.

First the report describes the markets, domestic and international, for GM crop products and assesses what the market reaction in might be if Victoria allowed commercial release of GM canola.

Next we assess the question of segregation. We examine the economics of supplying GM and non-GM canola in Victoria. Supply volumes will be important determinants of separation costs.

Finally we discuss the interaction of market opportunities and segregation capability. Our analysis in this regard is similar, but on a larger scale, to that which farm businesses will do, if the moratorium is lifted and commercial production of GM canola is allowed.

2 Questions raised by GM technology

2.1 What is 'GM technology' in relation to agriculture and crop products?

As ABARE has observed in its most recent report on biotechnology in the context of developing countries (ABARE 2003), the boundary between what is termed genetic modification and what is not is arbitrary. Perhaps the most striking illustration of this is the story of the development of hybrid corn which stretches back more than 50 years.

The terms genetic modification and genetic engineering refer to scientific techniques used to alter the genetic make up of living organisms. Often this includes the transfer of genetic material across cells and organisms. The aim of this scientific interference is to produce organisms that carry and eventually express specific traits. Genetically modified organisms (GMOs), including genetically modified (GM) crops, are the products of these techniques and have now been released for a range of uses in many countries.

Broadly, the characteristics of GM crops can be described as either input or output traits. Input traits are those that have benefits in the production process and not directly for the consumer. Output traits are those that have direct consumer benefits such as increased nutritional value, health effects and lifestyle improvements.

Input traits may include increased productivity from hybridisation or improved environment adaptation. They may also include cost savings from reduced pesticide use, reduced tillage and a reduction in fertiliser use. These traits are not passed on directly to the consumer but do confer advantages to them through eventual price reductions if the cost savings are realised. Input traits do not require segregation through the whole chain as the economic value of the technology is captured before final consumption. Commercially segregation will only be pursued in the supply chain to where value is captured.

For example, Roundup Ready® canola is designed to allow farmers to increase the efficacy and reduce the costs of weed control in the crop. Once this process is complete, there is no economic incentive for the supply chain to maintain segregation of the seed at harvest because segregation will not add value for users or consumers. If on the other hand, a variety has processing benefits such as higher oil yields or improved meal characteristics the supply chain will be designed to segregate this variety until crushing.

Output traits have direct benefits to consumers such as increased nutritional value, lifestyle benefits such as ease of cooking, longer shelf life or health effects such as disease prevention. Output traits establish competitive advantages for manufacturers and retailers; consequently they are positively branded and are segregated in the supply chain to capture value. Output traits require segregation through to the consumer. For example, if a canola variety is released for the purpose of delivering oil characteristics that reduce cholesterol, then the delivery strategy will need to include segregation through to the consumer.

Genetic modifications are made to the DNA of organisms. These modifications may carry through into the food itself in the form of either strands chromosomes of the modified DNA or as the proteins that the DNA produces. They are seen as remnants of the process and are considered novel to the organism. The presence of novel DNA or proteins offer the only clue, apart from the trait they express in the organism, of genetic engineering.

Testing to detect novel DNA or proteins from genetic engineering to produce input traits is generally done to disqualify a product from some process or supply chain. Testing for novel DNA or proteins from engineering to produce output traits is usually done to qualify a product for a supply chain.

All of the testing is becoming more powerful. During our consultations for this report we have been informed that some testing is able to detect GM grain when mixed with other grains at concentrations as low as one part per million (ppm) (from discussions with marketers and DPI Victoria staff).

2.2 What are the broad economic issues for Victoria?

The economic policy issues associated with GM canola rotate around the degree to which adoption would be accompanied by "unpriced" spillover effects on others in the Victorian community like non-GM canola growers and others such as other grain farmers, dairy producers and honey producers. Technically speaking, unpriced effects are defined as costs imposed on others which remain uncompensated, either because no damages are paid to these parties or because the institutional arrangements are such that for some other reason a significant proportion of the downside effects are imperfectly allowed for in the decision making. Although they did not use this economic language exactly, the possibility of a market failure problem of this kind was the commonest reason given by the several parties concerned about the possible release of GM canola who the consulting team interviewed during this project.

A portion of the policy issue with regard to spillovers has already been resolved. The Office of the Gene Technology Regulator (OGTR) has declared that in its opinion, release of the two GM canola varieties in question in

Australia under conditions it has specified will not cause untoward environmental or human safety effects. In addition, the OGTR has assumed, the APVMA, which has regulatory responsibility for and oversight of agricultural chemical use will retain responsibility for resistance management in regard to the chemicals used with GM canola.

It is reasonable to assume that those matters have been dealt with and this has some implications for the remaining issues we are dealing with in this report. Evidently, the OGTR considers that if the licence holders plans are adhered to, the environmental effects will be benign.

The outstanding spillover issue for Victoria relates to:

- what adventitious presence risk, real or perceived, would GM canola imply for other crops, neighbours' fields, grain handling systems or other parts of the supply chain for canola and grains generally;
- how big a commercial issue would this risk be for non-GM producers and consumers (including what the growing of GM canola might do to the reputation in Australia and overseas of Victoria as a non-GM supplier of canola or other products); and most importantly
- how well would existing economic (and legal) systems resolve any commercial conflicts involved or, if there are deficiencies, what remedial policy action should be taken.

In an ideal world, unwanted mixing with GM canola would be avoided simply through separation of GM and non-GM material on farm and at all subsequent stages in the supply chain. In reality, almost nobody expects that 100per cent separation would be practical and some experts doubt that, money aside, it would ever be physically possible, at farm or other levels, once GM canola had been released. The ACIL Tasman/Farm Horizons consulting team has concluded that some degree of GM/non-GM contamination would be inevitable and this means there would be spillover effects between GM canola adopters and other parties which would become commercial issues between them.

Nonetheless, we would expect voluntary processes and commercial arrangements to cope well with these issues for the following reasons.

For one thing, we would expect the magnitude of the net spillovers between parties rarely to be large because:

- in view of the physical realities mentioned above, separation protocols will be struck on practical terms which tolerate small amounts of adventitious presence, rather than insist on impossibly "pure" conditions (Department of Environment, Food and Rural Affairs UK 2003)[1];

[1] Department of Environment, Food and Rural Affairs (UK), March 2003.

- the licence holders providing seed to growers will insist on protocols which protect their intellectual property from poachers, a factor that will aid on-farm and off-farm separation (Monsanto 2003); and
- the North American record indicates that any negative spillovers will be at least partly offset by positive spillovers (Desquilbet, 2003)[2] in the sense that the release of GM crops will actually serve to heighten consumer interest in organic and non-GM products. In the US, such a shift has enabled the organic farming industry to recoup from consumers the increased expenditure on separation (to the extent that any extra costs have been required).

Another thing that persuades us that voluntary processes and commercial arrangements will cope tolerably well is our expectation that damages claims via the common law tort system will play a role. We have studied some material on the subject[3] and are aware that the courts have become involved in GM canola issues in Canada which has a similar legal system to Victoria's. (For example, early in 2002 a 1000-strong organic farmer group in the Canadian province of Saskatchewan brought a class action against the GM canola license owners Monsanto and Aventis, a case which is continuing.)

The courts' involvement in any such cases, even if rare, would have a demonstration effect which encouraged adopters and others to take care over their actions. Court actions can be expensive, so the option of dealing with these issues out of court is likely to be relatively attractive. Out of court mechanisms could range from neighbourly courtesy and informal agreements to formal contracts amongst interested parties (as they do with other spillover issues in rural areas, such as pesticide use and water drainage).

The separation of organic and non-organic products currently observed in Victoria can be regarded as a case study of the separation of GM and non-GM products that might be expected to be observed following the release of GM varieties in Victoria.

The significant threat which organic produce farmers see coming from GM canola was made clear to us during our consultations. These groups identified costs to them as:

- the invasion of GM germplasm into practically all canola via pollen drift which would effectively eliminate canola from consideration by organic farmers as a wheat/pasture rotation plant; and

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2 Desquilbet and Bullock, January 2003.

3 Specifically, we have reviewed the issues presented in AFFA's September 2003 background paper on liability issues on GM crops and another by Kershan 2003, an American law professor.

- unwanted mixing of other grains with GM canola grain in storages, transport vehicles could occur to the point where organic farmers' access to organic food outlets here and overseas would be denied.

However, the organic farming representatives we spoke to also agreed that the increased price premiums earned by organic products after release of GM varieties in the US could be seen here[4] (see Table 1 below for a review of average organic produce premiums in the US from 1995-2001).

Table 1 **Percent price premiums for organic produce in the US (USDA 2002)**

	1995	1996	1997	1998	1999	2000	2001
Corn	35	43	73	88	98	69	59
Soybeans	114	85	141	202	217	175	177
Spring wheat	54	59	73	8	87	103	94
Oats	35	59	73	83	77	71	41

Note: The premiums are reported as the percent higher than prices for the conventional equivalent
Source UDSA ERS 2002

It appears to have been the case in the US that the existence and spread of a new type of non-organic product helped create a demand not previously expressed for material considered to be traditional in character. We return to and expand on these issues with the help of diagrams later in a section entitled Who would pay the segregation costs?

2.3 How would other grains and products be affected by a possible release of GM canola?

This report considers primarily the economic spillover effects resulting from contamination of other products by the presence of GM canola. The term adventitious presence (AP) is used in this report as meaning the accidental presence of GM canola, seed or meal, in other crop products. There are two important components to the term adventitious presence, which means accidental and presence which refers to the level of contamination. Testing is required to establish the "presence" and it is discussed later in a section entitled GM testing capabilities. When the term "adventitious" is used commercially it relies on a method of substantiation of that the presence is accidental.

Substantiating that the contamination is accidental requires the implementation of an identity preservation system that documents all steps in the supply chain.

[4] Correspondence with Scott Kinnear of Organic Farmers of Australia and Sam Stratham of the Biological Farmers of Australia 3/10/2003.

Those involved in handling the grain must be able to produce documentation that all of the protocols agreed to have been maintained. Requirements for this process are increasingly being demanded not just for GM but a range of possible contaminant and food safety problems (Hurburgh 2003)[5].

This study analyses the capability to reduce adventitious presence of GM canola in the following products:

- non-GM canola;
- wheat;
- barley;
- pulses;
- dairy feed rations and hence milk products;
- honey;
- other feed rations; and
- organic production.

The prospect of GM canola contamination of these products arises from GM canola sharing production and supply systems in some way with these products.

[5] Hurburgh, January 2003.

3 International biotechnology and grain market developments

Current trends in the international grains industry and the extent of adoption of GM crops globally are directly relevant to the GM issue for Victoria. As Australia exports the majority of its agricultural production it competes with other exporting nations such as the US, Canada and Brazil in many markets. The GM status of these nations and the market and productivity impacts of the technology experienced by them are important in determining Australia's ability to compete in global markets. Australia's competitive position is determined by the costs of production of these products and the prices received for them.

3.1 GM, part of a global trend in segregation and identity preservation

One of our key findings is that background conditions in the grains industry are changing in ways very relevant to the GM issue. If it were to occur next year, the release of GM canola in Victoria would coincide with complementary trends that are occurring in the grains industry worldwide (Fowler 2002)[6].

What are those trends? In brief, international grain production and grain marketing at all levels is undergoing a period of transition in response to increased consumer demand for greater specificity of products (Olson 2003)[7]. The ultimate drivers are rising consumer incomes and falling real prices of basic foodstuffs, both of which are making consumers more discerning.

At the same time, the adoption of new technology up and down the supply chain is reducing the cost of satisfying consumers' specificity demands. Supply- side changes of this type help explain the rising market share of organic production in most developed countries. They are also partly behind the investments by marketers in branding strategies that communicate a range of additional product attributes for the consumer - including lifestyle, health and environmental elements. For its part, through initiatives like the Natural Victoria campaign, the Government has been promoting Victoria's capacity to meet the rising world demand for foods of known and trusted identity.

All this is relevant to the degree and type of segregation likely to be observed if GM canola is released. In the new grains world, greater attention is being paid to what is termed "identity preservation" throughout the production,

6 Fowler, 2002.

7 Olsen, Jan 2003.

marketing and processing supply chain. As always, the extent of identity preservation undertaken will be driven by the trade off between consumer demand for segregation and the costs of delivering it, noting that both aspects will continue to vary to some degree over time.

3.2 International GM developments

Since the introduction of GM traits into four main broadacre crops – soybeans, maize, cotton and canola beginning in 1995 there has been a rapid adoption of these crops by farmers in North and South America.

In 2002, approximately 20 per cent of the total world area planted to these crops was planted to GM varieties with soybeans being the largest single GM crop accounting for 62 per cent of total GM plantings that year. However, this rapid adoption has not been uniform between countries with 99 per cent of total GM production grown in only four countries. The US is the largest single producer of GM crops with two-thirds of total GM plantings in 2002 followed by Argentina (25 per cent), Canada (6 per cent) and China (4 per cent). There were 14 countries producing GM crops on a commercial basis in 2002.

Where these crops have been adopted they have grown to account for a significant proportion of production. In 2002, 81 per cent of US soybean production and 40 per cent corn were produced from GM varieties. In the same year 95 per cent of Argentinean soybean and 30 per cent of corn production was GM. Also, 69 per cent of Canadian canola was GM in 2003 (ABARE 2003).

Other country and regions GM crop production:

- Asia
  - The Philippines has become the first Asian country to approve the release of a GM variety staple food crop - Bt maize. Half of China's cotton is GM. Japan has made agricultural biotechnology a focus of its science programs and has approved 38 GM crop varieties for commercial release and 55 have passed the health ministry's food-safety provisions. That said commercial release in Japan has been slow, reportedly due to consumer resistance (Nature 2003)
- India
  - Indian research into GM crops is focused on high protein potatoes, high yielding maize and drought and salt tolerant rice varieties. India is the worlds largest cotton producer and has approved the use of GM cotton varieties but they only now account for 0.5per cent of the cotton planting. (Nature 2003)
- Africa

  - South Africa is the only African country that has commercially released GM crops. 20per cent of the maize and 11 per cent of the soy beans produced in South Africa are GM (Nature 2003).
- South America
  - Brazil has recently lifted a ban on GM soybean which was being illegally imported from Argentina. Up to 80 per cent of soybean grown in some states was GM (Nature 2003).
- Mexico
  - Some GM cotton and some illegal GM corn varieties are grown in Mexico. Mexico banned the release of GM corn to protect some of the most extensive and oldest corn varieties that are found wild in the country. Illegal introduced GM corn has crossed with some of the native varieties causing some alarm and fierce debate about its impacts among scientists (Nature 2003)[8].

3.3 Recent developments on the Australian scene

GM cotton was approved for commercial release in 1996 in Australia when the Genetic Manipulation Advisory Council (GMAC), the predecessor to the Office of the Gene Technology Regulator (OGTR) approved the release of INGARD® cotton. Since then Roundup Ready® cotton and Bollgard II® cotton have also been approved for commercial production in Australia and approximately 40 per cent of the area grown to cotton in Australia is now planted to GM varieties. GM cotton oil accounts for 10 per cent of Australian vegetable oil consumption and is currently not segregated due to the lack of demand from buyers (Marohasy 2003)[9].

In July 2003 the OGTR issued its first approval for a major grain crop when a licence for the commercial release of Bayer CropScience's InVigor® hybrid canola was granted. Since then the OGTR has concluded similar findings to that of InVigor® for the commercial release of Roundup Ready® Canola and is currently in the consultation phase of the licensing process .

The national regulatory scheme administered by the OGTR deals with public health and environmental safety risks of gene technology. The OGTR does not consider marketing risks that may arise from a product being identified as GM. This aspect is being addressed by the State Governments as summarised below.

[8] Nature Magazine, 16 October 2003 Volume 425 No. 6959 pgs 645-747.

[9] Australian Public Affairs Review, Jennifer Marohasy, September 2003.

Designated areas principle

On 5 September 2003 the Gene Technology (Recognition of Designated Areas) Principle 2003 was established under the Commonwealth *Gene Technology Act 2000* and gazetted. This recognises the right of State and Territory governments to legislate to designate areas for GM and/or non-GM production for marketing purposes. Such areas will be recognised under Commonwealth law.

New South Wales

The NSW Government has enacted The Gene Technology (GM Crop Moratorium) Act, to designate the whole of NSW as an area in which certain GM plants may not be cultivated in order to preserve the identity of GM or non-GM crop or both for marketing purposes. A committee has been appointed under the Act to advise the Minister responsible for agriculture who may issue orders to allow or disallow certain crops. The Minister has issued an order under this legislation to prohibit the commercial cultivation of GM canola in NSW. The Act expires on 3 March 2006.

The NSW Government's GM Grain Advisory Committee has recently reported back the Minister on the applications by Monsanto and Bayer to expand their GM canola trials. A decision on this appears to be imminent.

South Australia

The SA Government established a Select Committee to assess the impact of GM crops and advise on strategies if they chose to differ from the national framework. Key recommendations from the Committee to date included the introduction of State legislation for GM crops in relation to market risks, the establishment of GM-free zones for specific areas of the state (Kangaroo Island and Eyre Peninsula) and the establishment of clear criteria that must be achieved before GM crops can be released commercially.

The report has recently been released for public comment.

Western Australia

WA has introduced a five year moratorium on the production and importation of GM food crops through the *Genetically Modified Crops Free Areas Act 2003*. The legislation allows the government to declare areas within the state where GM crops could not be grown. According to the WA government the intention of the Bill was to protect the states reputation and a 'clean, green' source of agricultural products.

Queensland

The Queensland Government supports the national approach towards regulating biotechnology passing complimentary state legislation to the Commonwealth *Gene Technology Act 2000*. They have also established a Code of Ethical Practice for Biotechnology in Queensland, outlining the ethical boundaries for the use of biotechnology in the state. Further legislation dealing with GM crops in relation to market risks is not proposed.

Tasmania

The Tasmanian Government has also introduced a moratorium on the commercial release of GM crops, using State quarantine legislation. The moratorium has now been extended until June 2008 and the Government is moving to develop specific legislation dealing with GM crops in relation to market risks.

4 Victorian crop production, exports and competitor analysis

4.1 Overview of production

Victoria produces a diverse range of agricultural products. Wheat, canola and pulses are the main grains produced as summarised in Table 2. The majority of Victoria's grain production is winter-spring grown with canola and pulses grown in rotation (sequence) with wheat and barely. The vast majority of Victoria's grain production is dry land, not irrigated, and therefore relies on rainfall during the crop growth period to produce grain.

Canola has been a feature of Victoria's farming systems for 10-15 years and has contributed significantly to the productivity of cereal production as it offers disease breaks and alternative weed management strategies to them (see 7.5.4A). Canola is an oilseed crop which contains between 30 per cent and 50 per cent oil depending on seasonal growing conditions and variety. The majority is approximately 42 per cent oil and 58 per cent meal. The meal is the by-product of the oil extraction process or "crush" and is a valuable source of energy protein and fats. The meal is fed to livestock in rations made up of a range of grain products.

Victoria is also Australia's major dairy producing state. Australian dairy product exports to over 100 countries around the world average $2.5billion per year. Virtually all of the dairy cows in Victoria are grazed on pastures with protein and energy supplements contributing approximately 20 – 30 per cent of the total diet. The majority of this supplement is made up of cereals with 20-30 per cent made from protein meals such as soybean meal (imported), cotton seed meal from NSW and Queensland and canola meal from the Victorian and NSW canola crushing industry.

Table 2 **Selected Victorian Winter Crop Production 2001/02**

	Production(000 tonnes)	Proportion of Aust Production
Wheat	2,812	11 per cent
Barley	1,692	20 per cent
Canola	355	20 per cent
Lupins	42	3 per cent
Field peas	130	31 per cent
Chick peas	24	9 per cent
Faba beans	95	27 per cent
Lentils	130	49 per cent
Total	**5,280**	**14 per cent**

Table 3 **Exports of selected Victorian grain and grain products 2001/02 ($m)**

Wheat	940
Barley	2
Canola	114
Pulses	79
Malt	114
Total	**1,279**

4.2 Selected crops

4.2.1 Canola

Canola is the major oilseed crop grown in Victoria with only small quantities of sunflower, linseed and safflower being produced. Average Victorian canola production for the past five years is 332,000 tonnes, which is 18 per cent of the national crop. In 2001/02 Victorian canola production was around 355,000 tonnes or 20 per cent of Australian production. Canola is considered an important rotational crop providing a disease break in the winter cereal cropping program, especially after pastures.

The majority of Australia's canola crushing capacity is located in Victoria with an approximate annual crush of 230,000 tonnes out of a national annual crush of around 400,000 tonnes. Vegetable oil from canola is used in margarines, salad dressing and as cooking oil with canola meal, the by-product of canola seed crushing, being an important protein source for the intensive animal industries.

Table 4 shows the total consumption and exports of Victorian canola. It shows the reliance on NSW for most of the canola grain used for crushing in Victorian processors and the proportion of Victorian produced canola grain exported.

Table 4 **Summary of Victorian canola production utilisation and export (2001/02)**

	Seed (tonnes)	Oil (tonnes) (assuming 42 per cent oil)	Meal (tonnes)
Canola Grain Sources			
Vic Production	355,000[1]	-	-
NSW import	123,450[2]	-	-
Total Sources	**478,450**	-	-
Canola Grain Uses			
Total Vic crush	230,000[3]	96,600[4]	133,400
Whole grain consumption in Vic	10,000[5]	-	-
Victorian farmer saved seed	350[6]	-	-
Victorian Grain exports	238,100[7]	-	-
Total Uses	**478,450**	-	-
Canola Oil			
Domestic demand	-	81,600[8]	-
Exports	-	15,000	-
Canola Meal			
Domestic demand	-	-	138,000
Exports	-	-	100

Note: In 2001/02 450,000 – 500,000 tonnes of NSW grain was exported through Victorian ports.

Data source: Various.

1. ABARE 2001/02 production estimate
2. Balance between Victorian production and canola disappearance which equates to industry sources on NSW canola imports.
3. Industry sources.
4. Oil and meal yields based on 42 per cent oil and 58 per cent meal.
5. Industry estimates.
6. Based on one third of area being planted with farmer saved seed.
7. ABS canola exports, oil and meal exports based off historical ABS export data.
8. Domestic oil and meal demand - production less exports.

4.2.2 Wheat

Wheat is the major field crop grown in Victoria representing over half of total grain production in the state in 2001/02. Annual wheat production for the past five years in Victoria averaged 2.4 million tonnes representing 12 per cent of the Australian wheat crop. Hard milling wheat varieties, suitable for bread production are predominantly gown in Victorian although there are smaller quantities of soft wheat (suitable for biscuit and noodle production) and red feed wheat varieties. Table 5 shows Victorian wheat production from 1997/98-2001/02.

4.2.3 Barley

Victorian is an important barley production state accounting for 20 per cent of national production. Victorian production has averaged 1.2 million tonnes over the past five years. Barley is the second largest field crop on Victoria making up 32 per cent of Victorian grain production in 2001/02. Approximately 65 per cent of the barley is suitable for malting. The majority of Victorian barley production is consumed within the state either as a feed grain which goes predominantly to the dairy industry or servicing the state's malting industry. Over 40 per cent of Australia's malting capacity is located in Victoria with approximately two thirds of malt production exported.

4.2.4 Pulses

Pulse production in Victoria represents 8 per cent of the states total grain production. The major pulse crops grown are field peas, faba beans, lentils and chickpeas. Victorian chickpea production has decreased significantly since the 1998 ascochyta outbreak. Table 4 shows Victorian production by type and their national importance. In 2001/02, Victoria produced 421,000 tonne of pulse representing 17 per cent of national pulse production.

4.3 Grain export markets

Canola

Canola has grown to be an important export crop for Victorian with average exports of 250,000 tonnes over the past five years. It should be noted that significant quantities of interstate canola does flow into Victoria, predominantly from NSW, as a result of freight advantages to export ports.

Canola can be exported as either whole grain or, following processing as meal or oil. The vast majority is exported as grain.

Victorian canola seed exports were worth $114 million in 2001/02 and $598 million to Australia, with 96 per cent of this value in whole grain. In 2001/02 17 per cent of Victoria's canola exports were transported in containers with the remainder being handled in bulk shipments.

Major export markets for Australia in 2001/02 were Japan (31 per cent), China (26 per cent), Pakistan (24 per cent) and Bangladesh (12 per cent). Europe can be an important but opportunistic market in some years, such as in 2000/02 when Belgium/Luxembourg and Germany combined took 361,700 tonnes (24 per cent).

Table 5 **Australian Canola (rapeseed) exports by destination ('000 tonnes)**

	1997-98	1998-99	1999-00	2000-01	2001-02
Bangladesh	94.6	126.4	99.4	148.2	151.8
Bel/Luxembg	17.6	33.1	-	107.8	0.7
China	132.7	393.8	1212.0	294.8	335.8
Germany	69.3	160.5	-	253.9	-
Japan	230.3	293.2	370.0	375.9	395.4
Mexico	21.0	123.9	97.2	-	-
Netherlands	3.2	92.8	-	-	-
Pakistan	20.9	42.8	56.2	224.3	306.7
U.K	-	28.5	-	-	62.1
Other	0.5	24.8	57.8	74.0	25.7
Total	590.1	1319.8	1892.6	1478.9	1278.2

Source ABARE 2003

Japan is Victoria's major export destination with average exports for 2001-03 valued at $35.2 million, followed by Bangladesh with $22.9 million, Pakistan $22.9 million, Germany $20.8 million, Belgium/Luxembourg $12.6 million and China with $9.3 million.

Canada dominates global canola exports accounting for over half of the world's export trade. Since the introduction of GM varieties in 1996, Canada's total exports have continued to expand reaching a high of 4.8 millions tonnes in 2000/01. This has occurred despite lost access to Europe as a result of the cessation on the granting of regulatory approvals for new GM varieties. Canadian canola production and exports declined in 2001/02 and 2002/03 because of poor production conditions and resulting smaller crops[10]. The

[10] ABARE, 2003.

emergence of China as a major canola importer as well as increased exports into Japan and Mexico has accounted for Canada's increased canola exports. China is now the largest market for Canadian exports of canola.

Table 6 **Canadian canola exports by destination ('000 tonnes)**

	Europe	Japan	China	Mexico	USA.	Others	TOTAL
1992/93	272	1,485		104	14		1,876
1993/94	868	1,662		434	371	14	3,347
1994/95	1,139	1,655	252	495	288	83	3,912
1995/96	322	1,679		531	272	1	2,804
1996/97	163	1,734		356	265	2	2,519
1997/98	11	1,829	110	593	391	29	2,964
1999/00	1	1,815	1,269	529	278	9	3,900
2000/01	1	1,801	1,211	570	280	22	3,885
2001/02		1,874	1,890	846	249		4,859

Source: Statistics Canada 2002

Wheat

Australia is the world's third largest wheat exporter behind the US and Canada accounting for 16 per cent of global trade. Average exports from 1999/00 – 2001/02 were 16.7 million tonnes valued at $4.1 billion. Victoria accounted for 15 per cent of national wheat exports over this period with an average value of $676 million.

Detailed exports by destination are not published for Victoria however Table 7 provides the major export destination for Australia. Victorian wheat exports generally reflect Australian exports with the exception of Japan which buys large quantities of Prime Hard and Hard wheat which is not produced in Victoria. The most common wheat grade produced in Victoria is Australian Premium White which suits the Middle East and North African markets.

Table 7 **Major Australian wheat exports 1999/00-2001/02 ('000 tonnes)**

Egypt	1.25
Indonesia	2.09
Iraq	2.36
Iran	2.28
Japan	1.32
Korea	1.09
Malaysia	0.74
Other	5.61
Total	**16.74**

Source ABARE

Other grain exports cannot be broken down into further markets as this information is commercially sensitive to the AWB. As this segment is large and important to the analysis of market impact for Victoria some detail of the total Australian wheat export market has been provided in the following section.

Barley

Australia is a major exporter of barley accounting for approximately one quarter of global exports. Purchases by Saudi Arabia, China and Japan dominate barley exports accounting for 60 per cent of all Australia's exports. Saudi Arabia is the major feed barley buyer of Australian grain with annual imports of up to 6 million tonnes with Japan also being a significant importer of feed barley. China is the dominant malt barley buyer, accounting for nearly half of all barley exports.

Average exports from Australia for 1999/00-2001/02 were 3.75 million tonnes and worth $846 million. Feed barley made up 58 per cent of the export volume and 52 per cent of the value. Australian exports of barley are typical of the major international importers with Saudi Arabia, China and Japan being our major destinations.

Table 8 **Major Australian barley exports 1999/00-2001/02 ('000 tonnes)**

China	855
Japan	750
Saudi Arabia	625
UAE	120
Unidentified	706
Other	692
Total	**3748**

Source ABARE

Again other destinations for Victoria's barley exports cannot be dissected further as this information is held as commercial in confidence although they

would be similar to the national export profile. Victoria is a relatively small barley exporter because of the large domestic demand but a large exporter of malt with average annual exports for 1999/00-2001/02 of 262,000 tonnes having a value of $134 million.

Levels of canola contamination in barley are limited under the Victorian barley receival standards as set by ABB Limited and the National Agricultural Commodity Marketing Association (NACMA), the industry body that establishes and publishes grain standards in Australia.

Canola is classified as a Small Foreign Seed under the 2003/04 Victorian Barley Receival Standard which is limited to 0.6 per cent (by weight) in malting barley and to between 1.2 per cent and 2.0 per cent in feed barley depending upon the specific grade.

Handling companies representatives have indicated that analysis of historical receival data concludes that only minute quantities of canola that are well below receival tolerances is present in cereals handled in the supply chain. AWB also indicated that levels of Small Foreign Seeds upon export are in most cases well below allowable levels.

Pulses

Victoria is a regular exporter of pulses including field peas, faba beans, lentils, and to a lesser extent chickpeas. The average value of pulse exports from Victoria has been $120 million per year for 1999/00-2001/02.

In global terms, Australia has 10 per cent of the international pulse export market, most of which are lupins from Western Australia. Canada is the largest exporter with 25 per cent of global trade followed by the European Union with 18 per cent.

Pulses are an important food in the Indian sub-continent and parts of the Middle East and North Africa. India, Bangladesh, Pakistan and Sri-Lanka are major markets for field peas and lentils. Egypt is a major destination for red lentils, faba and broad beans.

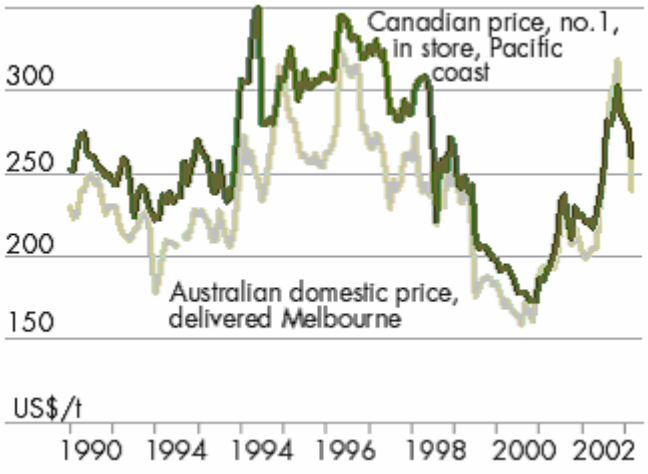
4.4 Prices

Being a major exporter of canola onto the international market, Australian canola prices fluctuate with changes in the world supply and demand dynamics for canola and the broader oilseed complex. Normal factors that influence canola values include:

- supply and usage forecasts for canola;

- world vegetable oil prices;
- world protein meal prices; and
- canola prices from competing origins including Canada and Europe

Chart 1 **Canadian and Australian canola prices**



Source ABARE 2003

As Canada dominates world canola exports with over 40 per cent of global trade, Winnipeg canola futures are the main canola world price indicators. Australian canola is generally priced on an export parity basis against Canadian canola. However in smaller production years, such as in 2002/03, this relationship may weaken as Australian domestic demand factors become more important.

Domestic shortages will force Australian canola prices to import parity. This is termed a strong domestic "basis" (the difference between one market and another) as the difference between Australian canola prices and Canadian narrows or even inverts (where Australian prices are higher than Canadian). Once production returns to normal these prices fall back to longer term trends.

As can be seen in Chart 1 US$ domestic Australian canola prices closely mirror US$ Canadian prices. However, ABARE (2003) noted there is some evidence of narrowing in the gap between Canadian and Australia values over this period and suggested that this may be reflecting increased supply security for Australian seed or continuing production problems that have occurred in Canada in recent years. It is also possible this may also reflect improving quality attributes for Australian canola, particularly higher meal protein, as noted in the Canola Association of Australia's annual quality survey (Canola Association of Australia 1995-2000).

4.5 Interstate trade flows

Canola prices within States reflect export prices delivered to major export grain terminals in each State — thus canola prices posted at export terminals in different States are the same. As a result, canola typically flows to the nearest or most freight advantaged export terminal. This is normally to the export terminals in the state where the canola is produced, however, areas in southern NSW, south of the Murrumbidgee River, are freight advantaged into the Melbourne/Geelong export terminals and will normally be drawn back into this zone.

The quantities of canola that flow from NSW into Victoria vary considerably depending on crop sizes, but can be as much as 25 per cent of the NSW canola crop. This grain is crushed and marketed with the Victorian produce, the majority of which is exported.

Figure 2 **Victoria and Southern NSW grain flows**

Source: GrainCorp.

Canola produced in NSW is vested in a board under NSW state marketing arrangements. These powers also extend to the export of NSW canola grain exported through Victorian ports unless it is done by the organisation administering the vesting rights or unless prior approval has been granted by this company. There are no restrictions on use of NSW canola for domestic processing in Victoria. The amount of NSW seed imports can vary considerably as was seen in 2000/01. Record Victorian canola exports of 709,000 tonnes this year while canola production was only 400,000 tonnes, are explained by significant NSW exports through Victorian ports. In 2001/02 we estimated the interstate movements to be approximately 136,000 tonnes.

5 Other agricultural products potentially impacted on by GM canola

5.1 Dairy

Victoria dominates the Australian dairy industry producing over 7 billion litres of milk in 2001/02 which represents 66 per cent of national milk production. Around 85 per cent of all dairy exports originate from Victoria.

Cheese is the most valuable segment. Exports total one third of production ($834 million in 2001/02), making up one third of total dairy exports. Japan is the major destination for Victorian cheese, taking approximately 40 per cent, followed by Saudi Arabia (17 per cent), the Netherlands (4 per cent), Korea (4 per cent) and the US (4 per cent).

Whole Milk Powder 2001/02 exports were only marginally less at $789 million with skimmed milk powder representing a further $667 million or 26 per cent of Victoria's dairy exports. Major importers of Victorian milk powders are Philippines, Malaysia, Taiwan, Indonesia and Thailand.

Butter exports accounted for the majority of the remaining 10 per cent, with Egypt, Thailand, Singapore and Mexico being amongst the largest buyers.

Table 9 **Victorian Dairy Exports 2001/02 ($m)**

Cheese	834
Skim milk powder	667
Whole milk powder	798
Butter	257
Total	**2,556**

Source ABARE

5.2 Honey production

It is estimated that Australia produces approximately 30,000 tonnes of honey each year with 45 per cent coming from NSW. Less than half of the honey produced in Australia is exported. By world standards Australia is a relatively smaller exporter compared to Argentina, China and Canada.

Victoria is a consistent exporter of small quantities of honey. Average annual exports for the period of 1999/00 – 2001/02 were approximately 3,000 tonnes valued at about $7.5 million[11]. Exports decreased in 2002/03 with the drought

[11] ABS Victorian trade data.

conditions. Saudi Arabia, Thailand, Malaysia and Japan are amongst the largest importers.

Canola provides an important source of pollen for the honey bee industry with up to 70 per cent of honey production coming from private land. The OGTR concluded that only minute quantities of pollen (0.006 per cent-0.3 per cent) were typically found in commercial honey[12], well below the Australian food labelling requirements of one percent.

[12] OGTR Monsanto RARMP Paragraph 186.

6 Market access and GM canola

Market access restrictions for GM crops could impact trade flows for canola and other grains and, potentially other products that use these grains, such as the dairy industry. In this chapter we examine the specific market access issues for the domestic and international markets and the factors that are likely to influence this.

6.1 Domestic regulatory environment

All dealings with GMOs in Australia are regulated by the *Gene Technology Act 2000,* which came into force on 21 June 2001. This legislation is supported by corresponding legislation in each state. The Act's objective is to protect the health and safety of people, and the environment, by identifying risks posed by or as a result of gene technology, and managing those risks by regulating certain dealings with GMOs. The legislation is administered by the Office of the Gene Technology Regulator (OGTR).

A key role of the OGTR is to assess all applications for the intentional release of GMOs in Australia. For a license to be issued, the OGTR must be satisfied that the release of the specific GMO will not pose any risks to human health and safety or the environment that cannot be managed.

Approval for the use of GMOs in food is the responsibility of Food Standards Australia New Zealand (FSANZ). Food Standard 1.5.2 regulates Foods produced using gene technology. The overall aim of food standards is to protect the health and safety of people in Australia and New Zealand by maintaining food safety. Food standard 1.5.2 extends this aim to include foods produced using gene technology.

The standard has two separate elements:

- mandatory pre-market safety assessment for all foods using gene technology thereby regulating the sale of these foods; and
- mandatory labelling requirements for foods

Foods that contain GM protein or DNA and GM food products that have altered characteristics require labelling. Foods that have an unintentional presence of GM of no more than 1 per cent and highly refined foods such as processed oils where GM protein or DNA are no longer present do not require labelling. Adventitious presence is only allowed for GM foods that are approved by the standard. Zero tolerance is applied for GM presence that is not approved for human consumption.

ABARE (2003) noted that few food products bear GM labels because of concerns over potential consumer rejection. Following the introduction of the mandatory labelling requirements, food manufacturers have removed GM inputs from their products to below levels that require labelling for GM presence.

6.2 International regulatory environment

With the widespread introduction of GM crops, many governments have introduced or are in the process of introducing regulations controlling the use and trade of GMOs to deal with health and environment safety issues. Mandatory labelling policies for GM foods are also being developed in response to consumer sensitivity towards the use of the technology. These regulations vary considerably between countries with different requirements on which products require labelling, and differing import country approvals and tolerance levels for the accidental mixing of GM grains.

International laws relating to the export access for GM crops can be categorised into specific import requirements and labelling requirements. Table 10 outlines the key requirements for major Australian export destinations. It should be noted than many countries have no specific laws relating to use or import of GMOs.

Table 10 **Import and labelling requirements for major Australian export destinations**

Country	Import Requirements	Labelling Requirements
Japan	All GM materials must be approved by the Japanese authorities since April 2001. So far 44 GM materials for food have been approved (mainly varieties of maize, canola, potato and cottonseed	Mandatory labelling of any GM foods with detectable content above 5 per cent for 44 specified foods. Oils and other highly processed foods are excluded because current testing can not verify GM content
China	From 2004 all processed and unprocessed agricultural GM material requires a safety certificate and approval before import approval can proceed	Ministry of Health requires all food containing GMOs to be labelled although this has not been enforced so far
Korea	Mandatory safety assessment for all GM crops and materials since 2003 applies	Mandatory labelling applies relevant GM foods (mainly soybean, maize and potato & products) where DNA is detectable in final product. Threshold of 3 per cent
Taiwan	From January 2003 all GM materials and products are required to be approved by Taiwan authorities prior to import	Mandatory labelling has been progressively introduced since Jan 2003 for soybean and maize products with detectable GM ingredients above 5 per cent of total
Malaysia	As of April 2004 imports require a risk assessment and approval	Mandatory labelling is being introduced where GM material is above 3 per cent by volume
Thailand	No restrictions apply	Mandatory labelling was introduced in May 2003 where foods products with over 5 per cent GM content in any of main 3 ingredients
Indonesia	All imports of GM materials require government approval	General legislation is in place requiring GM labelling but specific labelling requirements not yet established
Philippines	All GM plants and plant products have required approval for import since 2002	GM labelling is currently voluntary but the Government says its in the process of developing GM labelling regulations
India	All GM foods require Government approval with only one product – GM soybean oil – currently approved. Some undeclared and unapproved materials have been entering illegally	The Indian Government has stated its support for mandatory labelling and has formed committees to develop further recommendations
Pakistan	No regulations on imports although the Government is in the process of developing a framework legislation	None
Bangladesh	No regulations on imports although the Government is in the process of developing a framework legislation	None
Sri Lanka	None	Sri Lankan Government is developing a GM labelling system
European Union	All imports of GM products must gain approval Novel Foods Regulations where there has been effective moratorium on the granting on new approvals. Some varieties of GM maize and soybeans were authorised under previous legislation (Directive 90/220/EEC)	New legislation extends previous requirements to include all GM food and feed irrespective of the detectability of GM protein or DNA with a 0.9 per cent threshold.
Saudi Arabia	All shipments of GM products must be accompanies by a health certificate stating the GM ingredient has been approved in the country of origin for consumption. Imports of GM animals, birds and their products are banned	All GM products require mandatory labelling. There appears to be a 1 per cent threshold for unintended presence of GM material

Source: Farm Horizons

As can be seen in Box 1, these requirements vary considerably between countries. In the EU the tolerance for accidental contamination of GM is 0.9 per cent whereas it is 5 per cent in Japan. Highly processed foods and refined foods, such as refined foods such as vegetable oils where modified DNA or protein can no longer be detected still require labelling in the EU whereas in Japan, for example, labelling is not required. The EU also required all animal feeds produced from GM ingredients to be labelled.

Box 1 Regulations and labelling in the European Union (EU)

The European Union (EU) has shown the greatest sensitivity towards GM foods and crops and has strengthened the regulations controlling the use of GM products. Since 1998, the EU has imposed a de facto moratorium on the approval of new GM varieties. This has stopped exports of US corn and Canadian canola to the EU as these varieties had not received EU approval prior to the cessation of new approvals being granted.

In July 2001, the European Commission (EC) adopted two proposals for regulations on GM Food and Feed and Labelling and guidelines for the traceability of GM organisms. This legislation is likely to come into force in 2004 and the key aspects of these proposals are;

- All food, feed and processed products produced from GM products must be labelled, including products that no longer contain detectable traces of GM
- A 0.9 per cent tolerance for adventitious presence (AP) of EU approved varieties of GM in food, feed and processed products. Above this AP level products must be labelled.
- A 0.5 per cent AP tolerance for EU non-approved varieties of GM

Current EU legislation has an AP tolerance of 1 per cent and does not require labelling for products with no detectable traces of GM protein or DNA or any animal feed products.

The EU has been holding discussions on establishing coexistence guidelines for GM crops with conventional and organic production but member states remain divided on these issues, with some supporting the Commission's plan for non-binding guidelines while others are calling for EU-wide legislation.

In May 2003, the US, Argentina, Canada and Egypt announced they would file a World Trade Organisation (WTO) case against the EU over the moratorium claiming that it is illegal. This action was supported by nine other countries including Australia and New Zealand.

6.3 Profiles of important export markets for Victoria

Japan

Japan is the world's largest canola importer and Victoria's most significant canola market. Victorian canola exports to Japan were $32.8 million in 2003 and were as high as $45.5 million in 2001.

A number of Japanese Consumer Cooperatives are anti-GM and have approached oil manufacturers and requested them to produce non-GM oil although with little success as non-GM canola accounted for less than 1 per cent of Japan's total canola imports for crushing of 2.06 million tonnes in 2001/02[13]. Only one oil company is supplying non-GM oil to the major supermarket and it has been reported there has been some difficulty in selling it as it is more expensive[14].

Japan is already highly reliant on GM canola as Canada, where 69 per cent of canola production is from GM varieties, supplies 80 per cent of its annual canola imports.

China

China is an important market for Australian food exports with total sales of $1.05 billion in 2001/02[15], and an important destination for Australian canola and malting barley. In 2000 China accounted for 60 per cent of Victoria's canola exports and was worth nearly $80 million although average exports for the past three years have been less that $10 million.

Mandatory labelling requirements for GM foods were introduced in China in 2001. As well all imports require a safety certificate that shows the product has been approved in the country of export and is safe for use in that country. Initially there was concern that the requirements for safety certificates may disrupt trade of GM grains. However record imports of soybeans in 2002/03 of over 20 million tonnes[16], the majority of which comes from GM producing countries, have provided confidence that trade disruption will not occur.

Canola imports into China have fallen significantly from a high of 3.6 million tonnes in 1999/00 to a forecast of only 350,000 tonnes[17] in 2002/03. However, this cannot be ascribed to the presence of GM content as the reduction in canola imports has been matched by rising soybean imports from GM producing countries.

Strong investment in biotechnology in China's domestic agricultural industries[18] also suggests that China will continue to be a low risk market for Victoria.

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13 Department of Agriculture WA – assessment of international markets for GM canola 2003.

14 Department of Agriculture WA – assessment of international markets for GM canola 2003.

15 ABARE Market Access Issues for GM Products – implications for Australia.

16 USDA PDS soybean world supply demand distribution.

17 USDA PDS rapeseed world supply demand distribution.

18 WA Agriculture, 2003.

European Union

Europe has been at the centre of the GM debate and presents the greatest immediate market risk. Both Canada and the US have lost markets into the European Union (canola and maize respectively) as a result of the cessation of granting of regulatory on approvals of new GM varieties in 1998.

Since then, the European Commission (EC) has conducted a review and during 2003 has amended the regulation of GMOs and introduced comprehensive new laws that require all GM food and feeds to be labelled with a threshold for adventitious presence of 0.9 per cent for approved GM varieties and 0.5 per cent for those that are not approved.

It remains to be seen how these new laws will impact market access for GM crops. The more comprehensive labelling regime may open the way for the granting of regulatory approvals for new GM crops, however, consumers may continue to seek non-GM supplies. Following the introduction of the new regulations, the European Commission introduced their own recommendations on guidelines for coexistence between GM, conventional and organic crops[19]

Canola exports to Europe are opportunistic and only occur when domestic production is in short supply although the EU can be an important market in some years. Total average annual sales of canola to EU countries for 2001-2003 were $42 million[20].

Although the EC has introduced coexistence rules its is not clear how member countries will go about implementing these rules and while there is significant anti-GM consumer sentiment Europe should be regarded as a high risk market for GM canola.

The EU has a large canola seed production capacity; intra-EU canola trade between 1991 – 2001 was 20 mt, while non EU imports of canola over the same period accounted for 7.7 mt. (Rennick in Eurostat 2003[21]). The majority of the intra-EU trade is from central European countries particularly the Czech Republic (355,000), Slovakia, Hungary and Romania. Exports from the ex-Soviet Union (Russia and the Ukraine) are small but increasing. In 2004, central and eastern European accession countries have the possibility to join the EU, providing them with easier market access.

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[19] Commission recommendation of on guidelines for the development of national strategies and best practices to ensure the co-existence of genetically modified crops with conventional and organic farming, 23 July 2003.

[20] ABS trade data.

[21] Rennick, T Canola, Maize and Soybeans in the European Union; The GMO Import Situation.

Republic of Korea

The Republic of Korea is an important market for a range of Australian agricultural produce including meats, grain and dairy products. Korea has implemented mandatory labelling requirements for GM foods where the primary product contains GM maize, soybeans, soybean sprouts and potatoes at a level of greater than 3 per cent.

Like Japan, Korea is highly dependent upon imported grains for food security. Korea imported 8.5 million tonnes of corn and 4 million tonnes of wheat in 2001/02 as well as over 1 million tonnes of soybean meal. Korea flour millers have publicly stated their opposition towards the use of GM wheat and this position has also been articulated by AWB. However, Korea has shown it will distinguish between the production of GM wheat as such and potential adventitious presence of it through its continued purchasing of wheat from both the US and Canada. We regard this market as low risk.

Saudi Arabia

Saudi Arabia is the world's largest barley importer with annual purchases of over 5 million tonnes, although Victoria's large domestic demand base means that only relatively small quantities of barley are exported to this or other destinations.

ABB, Australia's largest barley exporter has expressed concerns regarding the risk to this market that would be presented by adventitious presence of GM canola and the difficulty, if GM canola were permitted to be grown in Victoria, of providing non-GM certification. Australia is the largest exporter of barley to Saudi Arabia. Nevertheless, both Canada and the US have continued to ship significant quantities of barley to this market following the introduction of GM varieties. There are relatively few barley exporting countries and it is unlikely that the introduction of GM canola would compromise Australia's market access to this market given it has continued to import from other countries with GM crops.

Egypt

Victorian faba beans are regularly exported to Egypt. Average annual imports of Australian faba beans from 2000-2002 were approximately $20 million. Egypt has shown no concerns towards purchasing wheat from countries that are producing GM crops such as the US, although faba bean buyers may not react in the same way. It may be that some of these smaller markets, where the buyers have greater purchasing options are at a greater risk than some of the larger markets.

Pakistan

Pakistan has become an important canola market for Australia in recent years with 24 per cent of all Australian exports in 2001/02 being shipped to this destination. Average annual Victorian canola exports to Pakistan for 2001-2003 were worth $23 million.

There is limited understanding of GM crops in the general community in Pakistan. This market imports Canadian canola and presents a low risk for the introduction of GM canola to Victoria.

Bangladesh

This market has also become an important canola market for Australia and Victoria. Average Victorian exports to Bangladesh for 2001-2003 were $23 million dollars. Similar to Pakistan, Bangladesh has shown no concern towards the use of GM canola and presents a low market risk to Victoria.

6.4 Market access impacts for GM maize and soybean

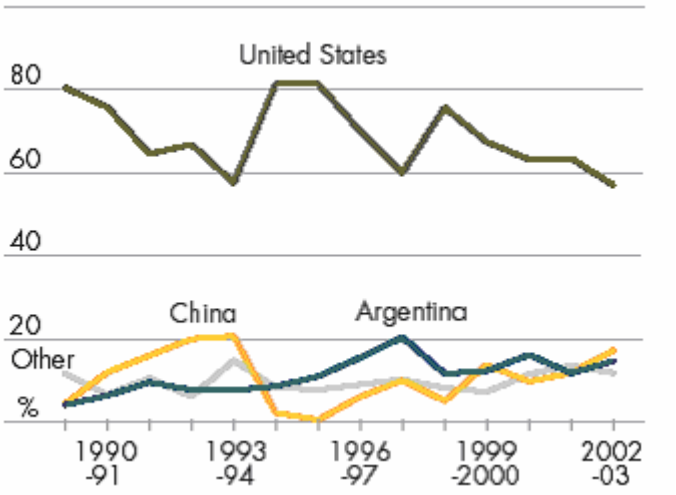
It is useful to examine the market impact access situation for other crops to provide a clearer understanding of the global scene and markets for GM canola.

6.4.1 Maize

The de facto moratorium on the approval of new GM crop varieties has led to the loss of the EU as a market for US maize. US maize exports to the EU declined from 3.6 million tonnes in 1995 to 300,000 tonnes in 1998 (USDA ERS 2001).

More recently the Starlink incident, where a US GM maize variety approved for animal feed use only was found in the food supply chain, has also negatively impacted US maize exports. Exports into the important Japanese and Korea markets were greatly impacted as these markets introduced stringent measures to avoid maize contaminated with this variety (USDA 2001). GM maize from other countries, such as Argentina and South Africa, where Starlink canola was not produced, has continued to be accepted in these markets, indicating that the concern is not with GM produce *per se* but with the particular Starlink product

Chart 2 **Shares in the world maize export market**



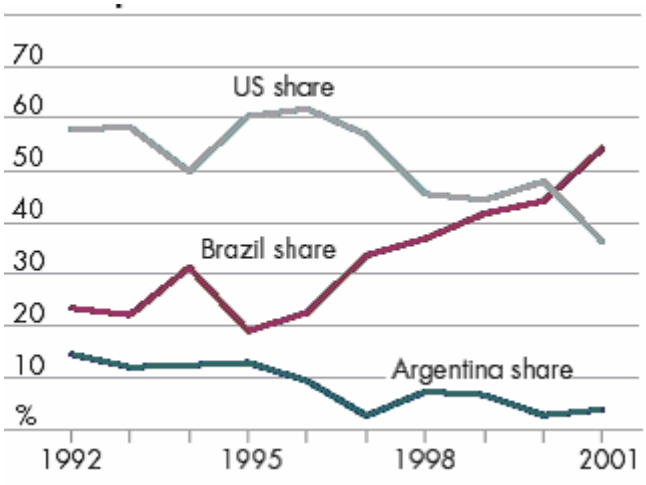
Source: ABARE 2003.

6.4.2 Soybeans

While GM soybeans have regulatory approval for import into the EU, the US has suffered a decrease in market share into the EU following the introduction of GM soybean production in the US in 1996. The EU is a major importer of soybeans accounting for 28 percent of world 2002-03 soybean imports of 63.7 million tonnes (USDA PDS tables).

Brazil soybean exports, including into the EU, have increased significantly since 1996. This can, in part, be explained by the massive increase in soybean plantings in Brazil although labelling requirements and other market access issues for GM canola may also explain some of the additional export demand. Whether significant market advantage has arisen from non-GM soybean production may become clearer as Brazil moves into GM production. Industry has estimated that up to one third of the recent Brazilian soybean crop has been planted illegally to GM varieties. This led the Brazilian President to announce in July 2003 that the illegal plantings could no longer be ignored and the planting and sale of GM varieties would be legalised (Reuters 2003). (See Attachment B.1 for more information on the illegal importation into Brazil of GM soy bean seed).

Chart 3 **Non-EU country share of EU soybean imports**



Source ABARE 2003

6.5 Potential impact of GM canola on canola markets

Canola (including rapeseed) ranks as the world's second largest oilseed crop behind soybeans and provides approximately 10 per cent of the world's vegetable oil supplies and 13 per cent of protein meals. China is the major producer of canola with 28 per cent of global production (average of 1998/99–2002/03) followed by Canada (17 per cent), India (12 per cent), France and Germany (10 per cent each). Australia produces around 4 per cent of world canola production. Around one quarter of world production is exported.

Canada is the major canola exporter with 43 per cent of global trade followed by France (22 per cent), Australia (15 per cent) and Germany (8 per cent). EU exports (France and Germany) are mostly intra-EU trade so rarely competes with Australian canola. When EU exports are excluded, Canada's share of global exports increases to 60 percent.

Japan is the single largest importing country accounting for 24 per cent of world imports for the five years from 1998/99 to 2002/03, consistently importing approximately 2.1 million tonnes annually. A key determinant of Chinese canola imports is the relative price of soybeans. Imports have ranged from a high of 3.7 million tonnes in 1999/00 to 350,000 tonnes in 2002/03. EU countries, including Germany, Belgium/Luxembourg, Denmark, Sweden and the UK, accounted for 28 per cent of imports (some of this is intra EU trade).

Australian canola exports have averaged 1.3 million tonnes over the past 5 years making us the second largest non-EU supplier after Canada. Japan and China are the largest importers of Australian canola accounting for over 60 per cent of annual exports. Japan is a regular buyer of Australian canola importing

approximately 400,000 tonnes annually in recent years. China is also an important export destination although quantity varies considerably based on availability and price. Pakistan and Bangladesh have grown to be important markets taking one third of Australian exports in 2002.

The major market access barrier for GM canola is the European Union (EU) where no new GM crop approvals have been granted since 1998 only and those GM crop varieties approved prior to 1998 can be imported.

As a result Canada has lost access to the EU market. However Canada's canola exports have continued to expand reaching a record 4.8 million tonnes in 2000-01 as new markets such as China have developed. Canadian canola exports declined significantly in 2001-02 as a result of poor production conditions (ABARE 2003).

Chinese imports of Canadian canola decreased from an average of 1.45 million tonnes for 1998/99-2000/01 to 214,000 tonnes in 2001/02. One explanation for this decrease is the Chinese requirement for safety certificates for GM crops however the rapid increase in soybean imports from 10.4 million tonnes in 2001-02 to a record 19.5 million tonnes suggests this is not likely to be the primary reason. The fact that Australian exports to China fell over the same period as Canada endorses the view that it is not a GM issue.

A recent report (Department of Agriculture, Western Australia) based on the observation that these markets are already being supplied with GM canola from Canada (Japan, China, Malaysia and Pakistan) with Belgium-Luxembourg being seen as high risk due to the higher public concern and import restriction into the EU.[22] Its reasoning was that these markets are already being supplied with GM canola from Canada. This conclusion may be equally applied to Victoria as is supplies the same markets.

6.6 Potential impact of GM canola on other grain and pulse markets

Concerns have been raised over the potential impact of GM canola on market access for non-GM wheat, barley and pulses that share parts of the same supply chain as GM canola and may be subject to the adventitious presence of GM canola

6.6.1 Wheat

It is AWB policy that it is opposed to the commercial release of GM canola until guarantees can be provided there will be no accidental mixing with

[22] Department of Agriculture, Western Australia, 2003.

wheat.[23] This is because of fears that GM canola may potentially negatively impact the AWB's export wheat program. However, this position may be softening an recently AWB has stated that it is are in favour of a small controlled demonstration trial to test the capacity to effectively manage the segregation of GM canola in the supply chain.[24]

Several wheat importers routinely request non-GM certification from AWB which is provided on the basis that Australia currently has no commercially released GM grain we have cotton crops. Some major wheat importers have clearly stated their opposition to GM wheat including Japan and Korea. [25] However, both of these countries continue to import significant quantities of other GM grains including soybeans, maize and canola.

AWB Ltd has raised concerns relating to the potential contamination of wheat destined for export markets by GM canola. The company has stated that a number of export customers were said to now require documented evidence that the wheat is "GM-free." As a result AWB is requiring an "iron clad guarantee" that the protocols governing the handling of grain are sufficiently robust to ensure that contamination does not occur. AWB called for a one to two year moratorium to further refine the protocols designed to govern the management of GM canola in the supply chain. AWB conducted a survey of its international and domestic customers in September 2003 (by and independent marketing company) to assess their attitudes towards GM crops and low level thresholds.

To date buyers' requests for "GM-free" certificates have been able to be provided since no commercial GM grain crops have been permitted.

AWB remains concerned at the ability of the storage and handling system to meet low level tolerance that may be required from some markets, in particular Japan and Korea. However, it is supportive of the concept of "coexistence trails" provided that identity preservation systems are implemented.

There is no evidence that the consultants have found to suggest that other wheat exporting countries that have already adopted GM crops are experiencing market access difficulties into their wheat markets. Canada and the US have maintained market shares into markets that are considered to be most sensitive (see Chart 4).

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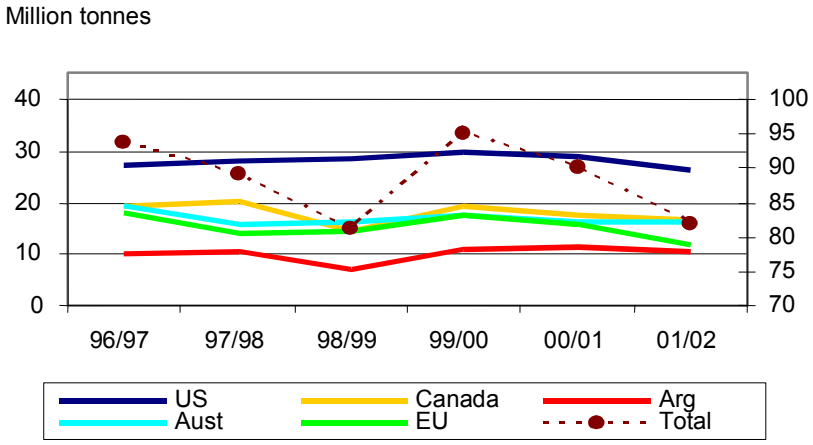
[23] http://www.awb.com.au/AWBL/Launch/Site/AboutAWB/Content/PublicPolicy/PublicPositionPapers/GMCanolaRelease/.

[24] Discussions held with AWB GTGC representative.

[25] Interview with G McMullen.

Chart 4 **Major wheat exporting nations export volumes from 1996/97 – 2001/02**



Source: Australian Oilseeds Federation 2002.

Chart 4 shows the relative export volumes for the major exporting nations, it shows that while there are fluctuations there does not appear to be any significant trends that have developed over this period.

6.6.2 Barley

ABB Limited, Australia's largest barley exporting company has also raised concerns of potential market access impacts in the event of the commercial release of GM canola. Buyers from Japan and Saudi Arabia that have expressed sensitivities to adventitious presence are requesting non-GM statements with the shipments of Australian barley.

Table 8 (Chapter 4) highlights the major barley importers and the market shares from countries that have already introduced some GM crops. Recent analysis conducted by ABARE assessed the market impact on both Canada and the US following the introduction of GM crops such as soybeans, maize and canola. The availability of smaller quantities of barley for export from both Canada and the US has resulted in no exports to Saudi Arabia in 2001/02 but there is no evidence that either country has been experiencing difficulties in market access resulting from the introduction of GM crops[26].

In the event that GM canola were to be commercially released, the 0.6 per cent allowable tolerance in malting barley is lower than the levels that would trigger a requirement to label the product as containing GM in international markets.

Contamination in feed barley may present a market access problem in major feed barley markets such as Saudi Arabia and Japan if all or most of the

[26] ABARE, 2003

allowable contamination of between 1-2 percent were to be present as GM canola.

ABB also expressed support for the establishment of coexistence trails and the development of a system to ensure that sufficient tractability and non-GM certification measures are available for sensitive markets.

6.6.3 Pulses

A number of pulse markets including Saudi Arabia and Egypt have also raised concerns about potential accidental mixing with GM canola in the event of its commercial release. Pulse Australia is concerned about the potential impact the commercial release of GM may have on pulse exports such as those to the Egyptian market. ABARE found no evidence that the commercialisation of GM crops impacted market access for Canadian pulses[27]. Canada is the world's largest exporter of pulses and also the largest producer and exporter of GM canola and competes in many markets with Australia.

Pulse Australia has expressed concerns about the capacity of the storage and handling system to achieve effective segregations between GM and non-GM grains.

6.7 Potential market impacts on dairy and honey products

Concerns have been raised by stakeholders over the potential impact of GM canola on market access for dairy and honey products that utilise canola as a source material

6.7.1 Dairy

The dairy industry is by far the largest agricultural contributor to Victoria's gross product, totalling $2.55b in 2001/02.

The United Dairy Farmers Ltd submission to this study contained the following:

> "The Australian Dairy Council's policy recognises the significant potential benefits from the use of Gene Technology in varying forms along the whole supply chain and the need for it development and application, in an integrated systems approach. The industry recognises the rights of consumers and customers' choice in product selection based on sound information being available. The industry also recognises

[27] ABARE, 2003.

the rights of producers, processors and retailers to have choice in the application or otherwise of Gene Technology for their business needs."[28]

Milk processors (Bonlac, Murray Goulburn and National Foods), while supporting GM technology, expressed three major areas of concern:

- maintenance of the ability to source non-GM feed from credible suppliers who will provide certification and substantiated assurances;
- ensuring that the introduction of the technology does not reduce their competitiveness in international markets; and
- the maintenance of choice between GM and non-GM so that the dairy industry can realise market opportunities if identified.

The principal marketing concerns relate to the competitive position of dairy exports particularly to Japan, and South Korea where the main competitor is New Zealand. Murray Goulburn Dairies indicated that it will oppose the introduction of GM if it thinks it would give the NZ suppliers a "free kick" in the Japanese market. Murray Goulburn is currently reviewing its major markets and has clearly restated the company's position that it needs feed manufacturers and the wider grains industry to be able to provide substantiated assurances on the source of animal feeds.

Murray Goulburn is also of the view that once the canola is released there is no going back. Its preferred approach is the development of a trial of segregation using non-GM canola to test the system.

There are two significant factors that we believe avert the dairy industry's concerns. They are that:

- the majority of meal used by Victorian dairy farmers is derived from NSW origin grain; and
- current dairy industry codes of practice, as conveyed to us by the stock feed manufactures and the dairy processors in consultations, indicate a variety of tolerances that range from 1.0 per cent to 5.0 per cent. Currently the canola industry is working on protocols that would tolerate 0.9 per cent adventitious presence of GM canola in non-GM canola.

It is our understanding that Japanese domestic milk producers feed a substantial amount of soybean meal to their herds. This meal is sourced from the US and is not considered to be GM-free.

The NZ Government's decision to allow the test and possible eventual use of GM crops and pastures (subject to health and environmental assessments) will

[28] From the written submission to the Independent Canola Review Committee, September 2003.

likely lead to some adoption of GM crops and pastures in that country in the medium term.

Our analysis is that a segregated and identity preserved grain handling system will provide the dairy industry with the assurances and flexibility it needs. The Stock Feeds Manufacturing Association is working to develop identity preservation and quality assurance systems and strongly recommends that industry standards be set for identity preservation systems in the whole grain supply chain.

Manufacturers and exporters have indicated to the consultants that there is no regulatory requirement for labelling for the use of GM animal feeds either in Australia or in countries that have important export markets for our dairy products such as Japan and EU. Whilst there is no regulatory requirement in these markets some overseas buyers have sought assurance that GM animal feeds are not used and dairy manufacturers have introduced restrictions on the use of GM animal feeds by dairy farmers. The level of tolerance demanded by the dairy processor is determined by the market they are selling to and the status of competitors. These market requirements are achieved through an integrated systems approach based on supplier contracts, on farm quality assurance programs and stock feed vendor declarations.

From submissions presented to this study from stock feed manufacturers it is clear that protein meals are a small proportion of a cows total diet if incorporated with grazing pastures. It is also apparent that unsegregated, and therefore nominally GM, imported soybean meal and domestically produced cotton seed meal, are currently utilised in some dairy rations (from a submission made by a prominent stock feed manufacturer to this report) with no apparent market impacts.

It is also worth noting that the intentional use of these ingredients in these rations means that the industry may not be calling for adventitious presence tolerances but may instead establish permitted maximum acceptable levels of GM content, where GM ingredients may be intentionally included.

Table 11 details the breakdown of a typical dairy cow diet. Table 12 outlines the resultant percentage of the cow's diet that would be GM based on the level of GM in the protein concentrate source at varying levels.

Table 11 **Dairy cow intake break down**

	Potential GM per cent
Total dairy feed intake	100 per cent
Grass proportion of feed	75 per cent
Concentrated feed proportion	25 per cent
Protein in concentrate feed (15-18 per cent)	17 per cent
Protein proportion of total feed	4.25 per cent

Source: Farm Horizons 2003.

Table 12 **GM dairy cow supplement scenarios**

	GM per cent in total feed
Protein is 100 per cent GM	4.25 per cent
Protein is 50 per cent GM	2.13 per cent
Protein is 10 per cent GM	0.43 per cent
Protein is 5 per cent GM	0.21 per cent
Protein is 1 per cent GM	0.0043 per cent

Source: Farm Horizons 2003.

6.7.2 Honey

Pollen, which commonly occurs in honey at concentrations ranging from 20,000 to 100,000 grains per 10 g (and rarely to as much as 5 million grains per 10 g), is thought to represent the most likely source of GM material in bee products. If we assume that an "average" pollen grain weighs 0.03 m g, these values are equivalent to honey containing 0.0006 per cent to 0.03 per cent w:w pollen, with a maximum value of 1.5 per cent w:w (Malone, 2002)[29].

GM food labelling legislation in most markets allows for the adventitious presence of GM material without requiring GM labelling. At present the tolerances for labelling are:

- 0.9 per cent in the EU;
- 1 per cent w:w in New Zealand, and Saudi Arabia;
- 3 per cent w:w in South Korea; and
- 5 per cent w:w in Japan (Malone 2002).

[29] Ministry of Agriculture and Forestry NZ, 2002.

The honey bee association has a comprehensive quality assurance program that is being extended to all members[30]. Under Australian labelling standards honey is allowed 1 per cent of GM material if that presence in unintentional as is stated in the user guide to food standard A18/1.5.2 (Food Standards Australia 2002).

For the honey bee some strategies to reduce adventitious presence in honey products suggested by NZ studies which are applicable to GM canola may include:

- separating GM and non-GM crops (effectiveness will depend on bee flight distances);
- using GM plants where the transgene is not expressed in pollen, or the transgene occurs only in chloroplasts, or where pollen or flower formation is blocked; and
- removing pollen grains from honey by filtering after harvest.

The Ministry of Agriculture and Forestry NZ has reported that: "Some shipments of honey from Canada, where bees can forage on GM canola and GM food labelling is not required, were rejected by Germany in 1999. This event has received considerable publicity, but the Canadian Honey Council reports that this market has now recovered. Reports of difficulties with honey exports from Argentina, the United States or Australia could not be found."

6.8 Market impacts summary

While some markets have indicated that their customers have preferences for non-GM products reflecting consumer sensitivities at no stage during our research and consultations was any marketer able to articulate any specific price differential for GM and non-GM produce.

The Australian canola industry competes directly with the world's largest producer and exported of canola seed and oil, Canada. Canada currently does not segregate GM from non-GM canola seed and has increased its canola exports in total over the last 5 years. In all of Australia's regular canola importers there is no evidence that Australia has a price or access advantage over Canada. The proportion of Canadian exports has changed due to seasonal conditions, soybean price fluctuation and the lack of EU regulatory approval for the importation of GM canola grain. However, there is no evidence that the EU has become any more than an opportunistic market for Australia as a result of this. Recent regulatory changes have opened the way for the granting of new GM crop approvals in the EU (see Box 1) and Canada may be able to re-enter this market with GM canola in the medium term. It is

[30] Information provided in discussions with the Australian honey bee industry representative.

also possible that the EU will itself produce GM canola in the same time frame.

Wheat and barley marketers have also indicated market sensitivities to adventitious presence of GM canola. As with canola markets there is no clear evidence that these sensitivities are being translated to price or access issues. In Japan, perhaps the most sensitive and highest value market per tonne for Australian wheat and barley, there is no evidence of an increase of market share of Australian wheat and barley over its two largest competitors in this market, the US and Canada. The consultants can find no evidence in any of the smaller markets of Australian grain that market sensitivities are impacting on price or access.

Honey producers are similar to the grains industry in that they compete with honey producers from GM grain producing countries. They do not appear to have gained any market advantages to date.

Dairy processors have expressed clear preferences for retaining a non-GM status and have negotiated with feed supplies on assurances and certification. The Victorian dairy industries' main competitor in valuable Asian markets, NZ, can currently claim a non-GM status. This makes the introduction of GM a potentially higher risk for dairy than the grains industries that compete with GM producers. The dairy industry has set adventitious presence tolerances from 1 per cent - 5 per cent and are demanding clear evidence of the ability of the grains industry to segregate and substantiate claims. The dairy industry, unlike the grains industry is already managing GM product in the supply chain as soy and cotton seed meal are used in some livestock rations and currently pass through the stock feed supply chain.

The extent of the market impacts of the introduction GM canola, should the moratorium be lifted, will be determined by the ability of the grains industry to segregate GM canola from non-GM canola and other non-GM grains and end uses. The ability to source non-GM products from GM products in the Victorian grains industry, if the current market sensitivities translate into price differentials, is the central concern to most of the marketers we have consulted with in Victoria in this study.

In summary, Australia's agricultural markets can be categorised as follows:

- Category 1 — Markets that represent a low risk if GM canola was to be introduced.
  - These markets are unlikely to require additional segregation systems
- Category 2 — Markets that have been accepting GM presence but at low levels.

  - These markets may require segregation systems needed to demonstrate non-GM status
- Category 3 — High risk markets – shown to be highly sensitive towards GM products.
  - represent a higher risk to exports if GM canola was commercialized
- Category 4 — Effectively zero tolerance and banned GM imports.

Australian agricultural product markets considered in this context are reviewed in Table 13.

Table 13 **Australian agricultural markets and GM market categorisation summary**

Grain/product	Category 1	Category 2	Category 3	Category 4
Canola	Bangladesh, Pakistan, China and Japan. There markets import GM canola from Canada and there is no clear evidence of a market premium for non-GM canola. These markets purchased three quarters of Victorian average exports 2000-2002. Chinese imports have declined markedly as the price of soybeans has fallen relative to canola.	Some domestic canola markets have indicated they will require segregation for non-GM canola.		EU buyers cannot import GM canola such as from Canada. Only product containing less than 0.9 per cent GM AP from approved varieties is permitted. The EU is an opportunistic canola importer (importing only during infrequent shortfalls in domestic production) but total imports can be significant. This market accounted for one quarter of Victorian canola exports over 2000-2002.
Other grains (wheat, barley, pulses)	The majority of grain exports fall into this category. Most markets have not expressed specific concerns in relation to the possible commercialization of GM canola and associated issue of AP.	Several important markets including Japan, Korea and Saudi Arabia have shown some sensitivity towards AP canola in other grain shipments. There is no evidence that these countries have stopped or reduced purchases of other grains because of the additional risk of AP of GM grain. Canada and the US are together the dominant, suppliers of grain to these markets		There is no evidence where concerns about AP in non-GM shipments, such as wheat, have impacted on sales into markets such as the EU.
Dairy	Covers two thirds of Victorian dairy exports and includes Philippines, Malaysia, Taiwan, Indonesia and Thailand. Regarded as price sensitive markets and GM is not an issue.	Australian cheese exporters are sensitive towards their competitive position into Japan and South Korea vs. New Zealand supplies. These markets account for 44 per cent of Victorian cheese exports which is around 14 per cent of the Victorian dairy exports. Most dairy processors have systems to limit the use of by -product meals from GM in feed supplements.		
Honey	Honey production is routinely segregated by production source already. The majority of honey exports come from GM producing countries.			

Source ACIL Tasman / Farm Horizons