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GM Canola Market Impact Review

Two multinational technology companies, Bayer CropScience Pty Ltd (Bayer) and Monsanto Australia Ltd (Monsanto), have been granted licences for the commercial release in Australia of canola varieties that are genetically modified. The varieties developed by Bayer are known by their registered trademark name, InVigor[®] canola, and those developed by Monsanto are known as Roundup Ready[®] canola. Together these are referred to as “GM canola”. As a result of the gene modifications, these varieties are herbicide tolerant. This herbicide tolerance and other traits confer a number of agronomic advantages to GM canola varieties over non-GM varieties. No GM canola has previously been grown commercially in Australia, although field trials have been conducted since 1996 as an earlier stage of the review process. These GM varieties have been grown commercially in some other countries since the mid-1990s, notably in the US, Canada and Argentina.

This review aims to examine the potential economic impact of the commercialisation of GM canola in Victoria on agricultural production and trade, areas that are not addressed under national regulatory arrangements. It will not consider health and safety and safety and environmental risks as these have been dealt with by the Commonwealth’s Office of the Gene Technology Regulator (OGTR).

1. The risks associated with commercial GM canola production

1.1 The essential nature of the problem

The introduction of GM canola varieties potentially poses a number of risks for growers of non-GM canola varieties and other broadacre crops and other products. It may also impact on the export sales of non-GM canola products and other crops and products. And it may pose risks for human health and safety and for the environment but, as mentioned above, these issues have been dealt with by the OGTR.

From the point of view of economic analysis, these effects are externalities or spillovers imposed by GM canola growers on other producers and by handlers of GM canola products on other grain producers and consumers/users. These groups are sometimes referred to as “stakeholders”. The essence of an “externality” is that it is an effect on these stakeholders that is external to the market concerned. There are no prices attached to these effects. Rather these effects occur in other markets or on other states such as the state of the environment or the state of human health. They have the potential to affect stakeholders in a negative way. In the absence of an obligation to compensate affected stakeholders via legal liability or other mechanisms, GM canola suppliers may not take these effects into account in making decisions to supply GM canola. This potential failure provides the justification for the Commonwealth and State Governments, as the guardian of the interests of all residents, to intervene by means of appropriate regulation if necessary.

These effects are risks rather than certainties and the Victorian market is a part of national and world markets. This combination of features provides a framework for analysis of the economic costs and benefits of introducing GM canola in Victoria.

In Australia, the release of genetically modified organisms is subject to regulation by both the Commonwealth and State Governments. Commonwealth legislation lays down a national regulatory framework for the assessment of risks to human health and safety and the environment, and measures that may be taken to counter perceived risks. The State Government participates in the national regulatory framework. It is also responsible for regulation of the grain supply chain and has concerns over the effect of the introduction of GM canola varieties on State economic performance, including exports of non-GM canola products and other crops and products.

In May 2003 the Victorian Government instituted a voluntary 12-month moratorium on commercial release of GM canola in Victoria. This was accompanied by a two-tier process of review. The first tier was an assessment of the market impacts of possible commercial production on Victorian exporters and the preparedness of the industry and its capacity to manage on-farm and off-farm grain handling systems which segregate canola in the supply chain. This was conducted by the consultants ACIL Tasman and Farm Horizons. The second tier is an independent review conducted by the present reviewer.

If approved, GM canola would be only the second major GM crop released for commercial production in Australia, the first being GM cotton which was released for commercial production in 1996. Cotton is not a food product, aside from the cottonseed oil by-product. There are trials being conducted now in Australia for a number of other GM broadacre and other agricultural crops for human food. Attitudes in the community towards GM technology are polarised. The Victorian State Government decision in relation to commercial release of GM canola will set a precedent that will be closely observed by other States and by both proponents and opponents of GM technology.

Some stakeholders who represent groups that might be adversely affected by the release of GM canola for commercial production argued before me that the existence alone of these negative effects on other stakeholders implies that the release should not be permitted. This argument is inadequate. A denial of a commercial release would impose costs on those seeking to grow GM canola in just the same way, as release would impose costs on other stakeholders. The approach of our society to these issues should be to allow all economic agents to exercise freedom to produce what crops they wish while at the same time seeking to avoid the imposition of economic costs on other producers or consumers.

These risks are not, moreover, fixed. They can be reduced by strategies adopted by growers and grainhandlers, and by measures introduced by the government. The approach of this study is to ask how these strategies and measures may reduce the

risks and, if risk reduction strategies and measures were adopted, is it in the overall interests of our society to release GM canola for commercial production.

1.2 Risks from growing GM canola in Victoria

There are a number of risks from on-farm operations associated with the commercial growing of GM canola.

Under the Commonwealth Gene Technology Act 2000, the Office of the Gene Technology Regulator (OGTR) is the Commonwealth Government agency responsible for regulating genetically modified organisms (GMOs). The object of the Act is to protect the health and safety of people and the environment. A release of a GMO requires a licence unless it is a low risk. Before issuing a licence, the OGTR must prepare an extensive risk assessment and a risk management plan for all licence applications. Licences issued by the OGTR may be subject to conditions, including measures to manage risks to the health and safety of people or the environment. However, the Act and the OGTR powers do not cover risks of damages imposed on growers of non-GM canola and other grain growers and products because of the comingling of grains, nor does it cover risks in international markets due to lower prices or failure to conclude contracts.

OGTR has conducted the risk assessments of the application from Bayer for a licence for the commercial release of InVigor[®] canola (OGTR, 2003a) and the application from Monsanto for a licence for the commercial release of Roundup Ready[®] canola (OGTR, 2003b). The risk assessments for both of these applications included extensive consultation with stakeholders.

These assessments identified a group of risks common to both applications. The potential hazards identified relate to:

- Toxicity and allergenicity for humans
- Toxicity and allergenicity for other organisms
- Weediness
- Transfer of introduced genes to other organisms
- Herbicide resistance.

Weediness refers to the possibility that areas outside those cultivated for the production of the GM canola itself could be contaminated by the adventitious or accidental presence of GM canola varieties resulting in greater prevalence or persistence of canola as a weed. Herbicide resistance in other weeds may result from inappropriate use of herbicides on GM canola. The transfer of genes could be to non-GM canola varieties, related Brassica species, wheat or other grains. In addition, there could be a transfer of protein containing GM material to other products such as honey and dairy feed rations. These transfers could occur on-farm or on neighbouring farms or at downstream economic activities.

Of these five categories of risk, the last three also arose in the consultations held by ACIL Tasman/Farm Horizons with stakeholders (ACIL Tasman and Farm Horizons, 2003, chapter 2.3).

The safety and labelling of foods derived from genetically modified organisms are the responsibility of Food Standards Australia New Zealand (FSANZ). FSANZ has determined that refined oil derived from the InVigor[®] and Roundup Ready[®] varieties is as safe for human consumption as oils derived from conventional non-GM varieties (FSANZ, 2000 and 2001). Canola oil is the only derivative of canola seed used for human food. No protein is allowed to be present in canola oil. Since all of the genetic code is contained in the protein fraction, there can be no transfer of genes to human foods from canola oil.

Another Commonwealth Government agency, the Australian Pesticides and Veterinary Medicines Authority (APVMA), has responsibility for regulating the use and labelling of pesticides that pose a risk for human health and/or the environment. APVMA coordinates its investigations with those of the OGTR. APVMA evaluates risks arising from residues and herbicide resistance. InVigor[®] is tolerant to the herbicide glufosinate ammonium, known as Liberty[®], and Roundup Ready[®] is tolerant to the herbicide glyphosate. Both Bayer and Monsanto have applied to the APVMA for the use of the herbicides used in association with their respective non-GM canola varieties.

In the examination of the applications for InVigor[®] and for Roundup Ready[®] canola, the OGTR found that risks to human health and safety or to the Australian environment from the commercial release of Bayer's GM canola are no greater than those posed by non-GM canola varieties (OGTR, 2003a and b). The Risk Management Plans in both cases imposes no conditions on the licences other than a condition that requires the technology companies to develop a test of the presence of GMO or their genes in other organisms and an annual reporting condition that includes reporting to the Regulator the amount of each GM canola line sold commercially or otherwise grown in each growing season for each State and Territory.

In its examination of the applications for the use of the herbicides associated with InVigor[®] canola and with Roundup Ready[®] canola, the APVMA identified herbicide resistance as an issue in both cases but was satisfied that it could be managed effectively. It approved the use of Liberty[®] on InVigor[®] canola varieties and of glyphosate on Roundup Ready[®] varieties (APVMA, 2003) under a number of conditions stipulated in a Herbicide Resistance Management (HRM) plan. An HRM plan is a part of the proposed Technology User Agreements between Bayer and Monsanto on the one hand and GM canola growers on the other.

Thus the Commonwealth Government agencies have concluded that the risks of on-farm operations to other farmers from herbicide resistance and to consumers and to the environment are negligible or very low and manageable by appropriate farm management plans. As these risks have been determined by the Commonwealth regulator, and following my terms of reference, they are not examined in this report.

On the other hand, it is expected that there will be substantial on-farm benefits from the release of GM canola. These may be classified as

- Improved yields of canola seed in land planted to canola (due to better weed management, the replacement of triazine tolerant canola which has a yield penalty compared to conventional varieties, improved yields from the hybridisation process of InVigor[®] GM canola and earlier sowing)
- Improved yields of oil from canola seed
- Improved yields of wheat where canola is used as part of a crop rotation
- Lower total use of herbicides and, therefore, lower total herbicide costs, and
- An expansion in the area where canola can be planted.

On the basis of field trials, Monsanto forecast that Roundup Ready[®] canola can be expected to give an average seed yield increase to Victorian farmers of 5-10 per cent over conventional canola and 10-15 per cent over triazine-tolerant (TT) canola. The corresponding forecasts from Bayer are even larger, 15 and 30 per cent respectively (communication from the technology companies). In the view of both companies, yield increases may get larger as breeding programmes develop better varieties in future. However, these trials were limited in area and the GM varieties of canola have yet to be tested under actual farm conditions in Victoria. Each grower must pay a fee to access the varietal technology. Using data for the Wimmera region of Victoria and more conservative yield increases, Norton (2003) estimates that, at current prices, the gross margin for canola growers will increase by 34 per cent. ACIL Tasman and Farm Horizons estimated that, under assumptions derived from these earlier studies, the value of the additional annual output would be approximately \$21 million for Victoria. There will also be environmental benefits due to improved soil organic matter and structure from reduced tillage, and reduced use of persistent triazine herbicides.

1.3 Supply chain risks

After leaving the farm gate, GM canola would pass through a supply chain with several links. As non-GM canola, wheat and other grains would use the same chain facilities as GM canola, there would be a risk of contamination of other grains at some point of the supply chain. This may jeopardise access for Victorian exporters to some overseas markets for non-GM canola products, other grains and other products and/or lower the average prices received for some products.

This problem is complicated by the fact that presently some 150,000-200,000 tonnes of the annual canola production in Southern New South Wales is freighted through Victorian road and rail facilities for crushing in Victorian plants, and in some years for direct export, because of a freight advantage over New South Wales plants or export terminals. Similarly, significant supplies of wheat and other grains grown in Southern New South Wales are transported through Victoria. This poses a risk that GM canola grown in Victoria could contaminate non-GM canola and other non-canola products of NSW origin destined for export. Conversely, if New South Wales permits commercial release of GM canola at some time in the future, and if some of this were transported through Victoria, Victorian production of non-GM canola, wheat and other grains could be contaminated by New South Wales-grown GM canola.

Prior to planting by the GM canola grower, the GM canola seed must be supplied by the seed company to the grower. There is less concern over negative effects on other producers at these stages as the amounts of grain transported are small, subject to a high degree of process control and the seed companies have a strong commercial incentive to ensure the purity of their supplies.

On-farm the measures to control non-GM purity would be governed by strategies developed by the companies supplying GM seed grain. The Technology User Agreements signed by the growers would specify procedures to segregate seed at the stages of planting, harvesting and saving seed for planting, and to control cross-pollination.

After leaving the farm gate of the GM canola grower, GM canola grain destined for export markets would be transported by road to country storage and then by rail or road transport to one of the export terminals in Geelong, Portland or Melbourne. Canola destined for crushing in Victoria is transported by road and /or rail to an oilseed processor and thence for sale to a food manufacturer (see figure of the Victorian grain supply chain in ACIL Tasman and Farm Horizons, 2003, Table 14). The canola meal by-product of the processing is sold to dairy, beef feedlot and poultry producers and much lesser quantities to other animal producers.

There are risks of contamination at each point in the supply chain.

2. Industry preparedness for segregation

2.1 Segregation, quality assurance and identity preservation

The transport, storage and handling facilities for grain in Victoria have evolved to handle bulk quantities of multiple grains. The strategy proposed to counter the risks of cross-contamination from GM canola grain is segregation combined with quality assurance or identity preservation of the products in the chain. Quality assurance in this context is the assurance that a product meets some specified standard of purity at some point in the supply chain. Identity preservation is the ability to maintain knowledge of the identity of the commodity or product through the supply chain. It requires the tracking of a product along the supply chain and the ability to trace or reverse track a product whose quality may be questioned. This is a more demanding standard.

The technology is available now to segregate crops in the supply chain and to provide quality assurance or identity preservation. Grain handling companies already have the technical ability to manage multiple grain flows with segregation requirements through the bulk handling system. Food standards, requirements in some export markets and customer demands have resulted in the development of grade and varietal segregations within the system. In addition, there are strict segregation requirements for some grains; for example, wheat exports to Japan and Korea must be pesticide residue free, polished white rice must be free of impurities and organic grains must meet nil-detectable standards of purity. At present there are no segregations of qualities of canola in the supply chain in Australia, although there are in Canada, but it is likely that canola segregations by quality will be introduced in the next few years (communication to the Independent Reviewer). Similarly, Australian plants that

process canola also process other oilseeds and have multiple oil and meal segregations. Some intensive animal producers who use canola meal have particular customer requirements of being non-GM in some markets; for example, exporters of dairy and pork products to Japan.

Segregation can be achieved in different ways. In some cases, hoppers or silos or trucks or railway wagons may be dedicated to specific grains. More commonly, facilities are cleaned or flushed after each crop flow. Quality assurance is by means of sampling and testing. Segregation technology is used regularly in the bulk handling system in Victoria. There are about 70 segregations currently in the Victorian grains industry.

A product that meets a zero or nil-detectible GM standard is said, conventionally, to be “GM-free”. A product that has GM content that is positive but less than a specified standard is said, conventionally, to be a “non-GM” product. Some stakeholders have objected that there is no legal basis for this distinction in Australia. The objection is that “non-GM” might be taken to mean in law the same as “GM-free”.

Segregation adds costs. The costs of segregation and identity preservation rise sharply with the degree of purity required (Productivity Commission, 2003, p. 37); for example, going from 0.9 per cent to 0.5 per cent tolerance levels would impose additional costs, however, the ACIL/Farm Horizons report indicates that some of these costs are already built into the grain handling system (ACIL and Farm Horizons, 2003, Section 8.2.13). It may not be possible to guarantee 100 per cent purity of a grain flow without dedicated facilities at all stages.

Segregation of canola is not new in Australia. When canola was first introduced, there were similar concerns over contamination of other grains handled in the system. The grain handling companies at that time dedicated grain paths and used sealed railway wagons and provided extensive training for staff to ensure canola did not appear in other grains.

Seventy one per cent of Victorian-grown canola output is exported as seed (see Section 3.1 below) and large quantities of NSW-grown seed are freighted through Victoria for direct exports in some years. Consequently, the export supply chain is the dominant consideration. Standards of quality assurance and identity preservation are higher generally in the export paths in order to meet customer specifications in international markets. If there is a limited release of GM canola, Graincorp, the main bulk handler in Victoria, has indicated it would establish dedicated sites for handling GM canola in its chain. Cargill, the major domestic crusher and a major exporter of canola oil, has an electronic identity preservation system in place.

In preparation for possible release of GM canola, standards relating to the adventitious presence of GM canola in various products have been set by the industry associations: the Australian Oilseed Federation, the Seeds Industry Association of Australia and the National Association of Commodity Marketers of Australia (NACMA). The standard set for the presence of GM canola seed has been set in non-GM canola planting seed (0.5 per cent), non-GM canola grain (0.9 per cent) and in grain (0.6 per cent) (Bayer and Monsanto, 2003, para 2.2.3). In a submission to the

Independent Reviewer, the technology providers and the Australian Oilseeds Federation indicated that their stewardship principles were targeted to meet these standards if there is a limited release of GM canola in 2004 (Bayer and Monsanto, 2003 and Australian Oilseeds Federation, 2003).

For segregation to be successful breaches of the tolerance levels must be rare. The main risk of cross-contamination in a system with segregation of non-GM canola grains is likely to arise from human error and mechanical failure along the supply chain. This may be minimised by appropriate staff training and close monitoring of grain flows.

In their report ACIL Tasman and Farm Horizons concluded that “the grain handling system is technically and commercially capable of meeting a range of GM tolerance demands if GM canola were made commercially available to Victorian farmers.” (ACIL Tasman and Farm Horizons, 2003, p. xiii). It would be necessary to put in place protocols and a method of tracing crops to test that the system lives up to its capability. The Supply Chain Coexistence demonstration trials proposed by the industry are discussed in Section 5 below.

There is an alternative means of segregation. Under the Commonwealth Government legislation, the Ministerial Council issued the Gene Technology (Designated Areas) Principle 2003. The Principle allows a State Government to designate particular areas to be GM-free. These are called designated areas. The South Australian Government has declared the Eyre Peninsula and Kangaroo Island to be a GM-free area. The Eyre Regional Development Board has been contracted to evaluate the logistics of a non-GM designated area in the Eyre Peninsula. A designated area would achieve 100 per cent segregation and identity preservation by means of totally excluding all GM products in the area. In effect, all facilities in the supply chain are dedicated to GM-free products. This might be called geographic segregation. The areas designated in South Australia are close to export terminals at Port Lincoln and therefore involve short supply chains. However, ships calling at Port Lincoln have to top up with grains loaded at other Australian ports and therefore incur additional freight costs.

In 2001, the Victorian Government conducted public consultations on genetic engineering (GE) free zones (State Government of Victoria, 2001). The report adopted a cautious approach and set out policy principles to guide future government policies rather than declaring in favour or against GM-free areas. From the point of view of the grains industry, an obvious disadvantage of a GE-free zone strategy is that it denies canola growers in the area the opportunity to plant GM canola.

It is possible under the Principle to adopt the opposite strategy of declaring some areas as GM technology areas. Again, such areas would have to be located near export terminals in order to limit the costs of geographic segregation. As a single strategy, this would require that non-GM canola varieties not be grown in any other areas that shared facilities in the supply chain or, if grown, they would be treated as GM canola. This too would restrict the choice of crop for growers.

A further possibility is a mixed strategy, with some product segregation and some geographic segregation.

2.2 Who should bear the costs of segregation?

Segregation is costly. Foster (2001) suggests that identifying and certifying non-GM status adds 5-15 per cent to the cost of grain delivery. A study by Leading Dog Consulting cited in Productivity Commission (2002) estimated that under present technology segregation and identity preservation could add 10-15 per cent to the cost of delivery. These estimates relate to GM crops generally. However, the costs would vary with the supply chain. They would not be so high for canola producers if the present capability for segregation could be adapted without major new investment. This would depend partly on the tolerance levels for adventitious presence of GM canola seed and partly on the pathway; some existing pathways developed for sensitive crops such as polished white rice with a zero tolerance for adventitious materials may be useable for GM canola flows. Costs of segregation may fall if the release of GM canola increases the aggregate throughput of (GM and non-GM) canola seed.

Who would pay these costs? This question is contentious in the industry as it affects the profitability of the different sectors. If the costs are borne by the GM growers and suppliers, it will reduce the profitability of GM canola and feed back on the adoption rate. If, on the other hand, they are borne by growers and handlers and transporters of non-GM canola, they may regard this as unfair. In either case, what matters is who bears the cost ultimately. The costs charged initially to growers and handlers of either non-GM or GM canola may, in some cases, be passed forward to the ultimate buyers of the products. Producers of non-GM products may have an ability to pass them forward but later discussion in Section 3.5 indicates that there is little evidence of a price premium for non-GM products. If there is no price premium the demand for segregation and identity preservation by retailers may diminish.

Pre-farm and on-farm costs will be borne by the farmers who incur these costs. Non-GM canola growers and other grain growers will bear costs of testings and certifying that their products are GM-free or non-GM. However, the marginal costs would be minor. Currently, canola delivered from a farm to a receival point is tested for oil and admixture and only a sample of deliveries might be checked for non-GM status.

The important aspect is the cost of post-farm grain handling, storage and transport facilities in the supply chain. These facilities are used jointly by a number of crops. The allocation of costs in a joint supply situation is one of the most difficult questions in economics. There is no clear answer as it is not possible to identify users for all costs. It is particularly difficult in this market situation as it is not clear who is demanding the segregation. The GM sector initially will require segregation as part of the stewardship principles but it may be argued that the demand for segregation arises from consumers of non-GM products demanding certification.

ACIL Tasman and Farm Horizons (2003) conclude that, for the first 2-3 years, GM canola growers and users would have to bear segregation costs. If adoption rates were the same as in Canada, it is likely, in their view, that GM canola production would make up half the annual crop and then costs would be borne by the non-GM sector.

Whatever the allocation of costs, it should be determined by negotiations between contract parties in the industry. It is not a matter for government regulation as there is no market failure.

3. The world market for canola

3.1 World markets

3.1.1 Australia's place in world markets as a supplier of canola products

Australia is a small producer of canola, accounting for only 2.4 per cent of total world output of canola seed in 2002/03. However, our consumption of canola grain, either in the form of seed or as oil and meal, is small relative to our production. We are, therefore, more important as an international trader.

Ninety four per cent of Australian exports of canola products (that is, canola seed, oil and meal) by volume are in the form of canola seed. Hence, we accounted for 9.7 per cent of world exports of canola seed by volume in 2002/03. Only a little over 5 per cent of our total exports of canola products are in the form of canola oil and our exports of canola meal are negligible whereas, for the world as a whole, 55 per cent of the total international trade in canola products is in the form of either oil or meal. We account for only 2.2 per cent of total world exports of canola oil by volume and virtually nil of the world trade in canola meal (calculated from ACIL Tasman and Farm Horizons, 2003, Tables 36, 40 and 41). (Exports of canola oil and canola meal have been converted into canola seed equivalents on the assumption that one tonne of canola seed splits into 0.42 tonne of oil and 0.58 tonne of meal.) Thus, compared to other canola exporting countries, we specialise in the export of unprocessed canola seed. The reason given in the industry for this specialisation is the high cost of crushing in the small multi-seed plants used in Australia. Australia is, in fact, a net importer of both oils and animal feed processed from oilseeds.

In the world market for canola seed, we are the third largest supplier, following Canada (which supplies over one half of the total world exports) and the EU (whose trade is mainly to other European destinations). The other major suppliers are a number of countries in East Europe and the Soviet Union. Over 90 per cent of our exports of canola seed go to Asian markets, chiefly Japan, China, Pakistan and Bangladesh in that order. Japan is the world's largest canola seed importer and China is a major destination.

3.1.2 Victoria's share in Australia's exports

Victoria is a major exporter of canola seed and, to a lesser extent, canola oil. For the year 2001/02, exports from Victoria accounted for 18 per cent of the total Australian

exports of canola seed (grain) by volume and exports of canola seed, canola oil and canola meal from Victoria accounted for 19 per cent of total Australian canola product exports by value (ACIL Tasman and Farm Horizons, 2003, Table 47).

There is a difficulty in interpreting these statistics as Victoria each year “imports” from Southern New South Wales substantial quantities of canola seed. In 2001/02, it is estimated that 123,000 tonnes of canola seed were imported from NSW for crushing and 450-500,000 tonnes were imported for direct exporting (ACIL Tasman and Farm Horizons, 2003, Table 4). Consequently, one has to distinguish between exports from Victoria in the sense of exports from Victorian ports on the one hand and exports of Victorian-grown canola seed and products made from Victorian-grown canola seed on the other. The second meaning is important in tracing the supply chain and possible contamination and its effects on export trade.

With this information, the destination of Victorian-grown canola seed output is calculated in Appendix Table 1. In 2001/02, 67.1 per cent of Victorian-grown canola seed was exported as seed. Victoria exports much more canola oil than the other States. If the exports of oil and meal processed from Victorian-grown seed are included, Victorian exports of canola seed, oil and meal amounted to 77.2 per cent of the Victorian output of canola seed.

Victoria’s major export destination is Japan, followed by Bangladesh, Pakistan, Germany, Belgium-Luxembourg and China.

The percentage of the total Australian exports of canola seed, canola oil and canola meal which came from Victorian-grown canola seed can be calculated. These figures are 18 per cent, 40 per cent and 4 per cent respectively for the year 2001-02 (ACIL Tasman and Farm Horizons, 2003, Table 48). When exports of canola oil and meal are converted into seed equivalents, the Victorian-grown share of all canola products exports measured in seed equivalents is 19.4 per cent.

3.2 Global market access restrictions on exports of GM canola

Some countries prohibit imports of GM canola food products or allow imports under stipulated conditions on the grounds of protecting human health or the environment, and some have restrictions on imports of canola seed or meal for animal feed. Some have labelling requirements. (A comprehensive general survey of administrative import regulations is provided in ABARE, 2003b.) Tariff rates are also an important determinant of market access.

The US is the most liberal market in its import treatment of GM canola, as it is in its release and supply chain management. There are no restrictions on imports of GM products as such. The Food and Drug Administration, which is responsible for

approval of foods for human consumption, and the US Department of Agriculture, which is responsible for approval of animal feeds, have taken the view that GM products are not fundamentally different from their counterparts derived from non-GM varieties.

In Japan, Canada and Mexico, imports of GM canola products have been approved for both human food and animal feed. In China, a final decision is pending and in the interim safety certificates are required for all imports. China is currently importing GM oilseeds.

The EU has shown the greatest sensitivity towards GM products, leading it to impose restrictions on domestic production and imports of GM varieties. From 1998 there was a moratorium, under the EU approval process, on placing new GM varieties on the market while a final decision was pending. The moratorium was based on the Precautionary Principle (see Section 5.4 below). As a result all imports of GM oilseeds have been prohibited. The moratorium has been lifted by new regulations issued in September 2003. These allow tolerance thresholds for the adventitious presence of GM canola in food and feed, provided the material has received favourable EU scientific risk assessment and the operator can demonstrate that its presence was technically unavoidable. To date no new approvals have been granted and imports of GM canola seed are still prohibited. Oil made from GM canola and products containing GM canola oil have been approved for human consumption and may be imported.

In September 2003 the EU also introduced new and tighter regulations for the labelling and traceability of food and feed products. These take effect in April 2004. Foods and feed produced from GM varieties must be labelled. Food will have to be labelled as containing GM elements if it has a content of 0.9 per cent or more (previously the threshold was 1 per cent), even if there is no GM protein in the imported product, as in the case of canola oil or products containing canola oil. This policy is based on the argument that consumers have a right to know the origin of what they are buying.

The WTO-legality of EU restrictions on GM products is questionable. WTO rules do permit members to impose restrictions of imports on the grounds of protecting human and animal health and the environment but the conditions under which they can do so are tightly laid down. Article XX (b) provides a general provision for import-restricting measures that are necessary to protect human, animal or plant life or health, provided a measure is not a disguised restriction on trade and does not discriminate according to the source of the import. The rules were amplified in the Agreement on the Application of Sanitary and Phytosanitary Measures (SPS) and the Agreement on Technical Barriers to Trade reached in the Uruguay Round. These agreements lay down that import restrictions may not discriminate between domestic and imported products and may not be overly restrictive of trade. The SPS Agreement lays down that any restrictions must be based on scientific principles and after careful risk assessment. In May 2003, the US, Canada, Argentina and Egypt requested the establishment of a dispute panel on EU treatment of imports of GM

products under the WTO's Dispute Settlement Procedures. The request was joined by seven other countries, including Australia. The complainants claimed that the failure to approve a number of products of agricultural biotechnology was contrary to the SPS Agreement and overly restricted imports of agricultural and food products. These products included Bayer and Monsanto GM canola, as well as other biotech products such as GM cotton and sugar beet. The panel has not yet reached a decision. In the US, a number of exporting and biotech corporations are pressing the US Government to take action against the new food labelling laws too.

In almost all other countries no import regulations have been introduced. In these countries canola is traded according to the specifications laid down by grain customers, subject in some countries to labelling requirements.

Where imports of GM canola products are not prohibited, they are subject to tariffs in most countries. Under WTO rules, a tariff imposed on imports of a tariff item cannot differentiate between like products. Consequently tariff rates must be the same on non-GM and GM products. One important feature of the structure of tariff rates on canola products is that, in most countries, tariff rates are higher on more processed products. In particular, tariff rates on oil are higher than tariff rates on seed (see Appendix Table 2). This may have contributed to the fact that Australia's exports of canola products are mostly in the form of seed.

3.3 Commercial supply of GM canola by other countries

The two main canola-exporting countries other than the EU – Canada and the US – released GM canola some years ago. Canada and the US are Australia's major competitors on world canola markets. The varieties considered for licensing in Australia have also been approved for growing in Mexico, Japan, Argentina and Brazil. Statistics of world trade in canola seed and canola products do not distinguish between GM and non-GM canola or canola products. Given the large share of GM canola in canola seed production in these countries, a substantial part of the canola seed exports from Canada and the US must be GM canola seed. These countries do not segregate supplies of GM canola seed from those of non-GM canola seed in their supply chain and all their supplies are regarded as GM.

More developing countries may start to grow GM canola in the next few years.

The EU has not introduced GM canola varieties and neither have the East European States because they will accede to the EU in 2004 and are bound by EU laws and regulations. With the output of the acceding states included in EU output, the EU will become a larger net exporter of GM-free canola products. Exports from the enlarged EU may expand further as the East European states benefit from EU farm subsidies and export subsidies.

3.4 The effect of release of GM canola on Australian canola prices

Some growers of (non-GM) canola varieties see a risk that the release of GM canola varieties will negatively impact on the average prices they receive for canola seed. The release of GM canola varieties may lower the price of canola seed to Australian growers in two ways. First, the agronomic advantages of GM canola over the current non-GM varieties of canola may increase the yields in present acreage and expand the area devoted to canola production, thereby increasing the output of seed. This could affect the price of both GM canola and non-GM canola products. However, Australia is a small producer on world markets and an increase in Australian supply is unlikely to affect world prices. ABARE has constructed the most sophisticated model of the canola market (Foster, 2003). On the basis of an average seed yield improvement of 13.7 per cent, ABARE forecast that Australian output of canola seed would increase by 17 per cent, leading to a fall in the world price of 0.3 per cent. They also forecast an increase in the Australian producer price of 0.5 per cent because of the higher oil content of the seed. Even if the domestic price does fall, these effects are internal to the market and no different from the introduction of any new technology. They are not grounds for regulating the industry.

The second way in which release of GM canola may affect average prices received for non-GM canola products is that it may jeopardise sales in markets where consumers prefer GM-free or non-GM canola products or damage the reputation of Australian non-GM canola products because of an adventitious presence of GM canola seeds in non-GM canola seeds. The concern here is with the export of canola in seed form. The oil does not contain GM material and Australia exports negligible quantities of canola meal.

There is also a concern that markets in Australia for products containing material derived from GM canola may be affected. Some Australian companies that process, distribute or retail foods have a policy of removing GM foods from their product lists. However, in some cases, this policy means marketing no products that are not non-GM products, rather than a more strict policy of no products that are not GM-free. For these companies, the ability of the segregation system to deliver non-GM products that meet low tolerance levels is the key to their product list.

3.5 Consumers' views in the canola market – evidence of a non-GM canola products premium?

In almost all countries, food and products processed from GM varieties can be sold, subject in some countries to labelling requirements. It should be noted that any move by governments in the markets for these products to prohibit imports of products containing GM material, along the lines of the EU measures, might be challenged in the WTO if the current complaint against the EU succeeds.

Hence, the crucial question is - is there a premium for non-GM canola seed over GM canola seed in overseas canola markets? A premium will arise if significant numbers of overseas consumers of canola oil or of products containing canola oil are prepared to pay a higher price for the products containing GM-free or non-GM canola oil over the products containing GM canola oil. A premium at the retail level would be passed back to the seed suppliers. Thus one might find evidence of a premium at either the retail level or in the grains markets.

This question of a premium is one on which there are widely varying views and little hard evidence. Proof of a premium requires careful comparison of prices for a GM and a non-GM product at the same time and for the same qualities in either retail or in grains markets. Unfortunately, no statistics are compiled of prices of canola products in retail markets in any country and none are compiled of the import prices in any importing country. There are occasional reports of premiums paid in Japan and EU markets but it was not possible to check the timing and qualities of products in these sales.

In the US and Canada, food products containing non-GM and GM canola material are both sold in supermarkets but there is no labelling requirement. It is not possible, therefore, for consumers to tell the difference unless the products are labelled. There is no evidence of a premium in these markets. In the EU GM canola seed is not produced or sold but products containing GM materials may be sold subject to labelling. I could find no data showing a premium in EU markets.

Japan is the largest single market for exports of Australian canola products. A number of Japanese Consumer Cooperatives have expressed a preference for food that is GM-free and have approached oil manufacturers to supply GM-free or non-GM oil. What matters, however, is the premium these cooperatives and other larger retailers are prepared to pay for GM-free oil or processed products in the marketplace. Current demand for non-GM canola by Consumer Cooperatives is for less than one per cent of total canola grain imports (West Australian Department of Agriculture, 2003, p. 24). In fact, Japan is reliant on GM canola oil as Canada alone supplies around 80 per cent of annual imports of canola products. In China, consumer concerns about GM have been low and awareness of GM products among Chinese customers is almost non-existent. The West Australian Department of Agriculture (2003) and ACIL Tasman and Farm Horizons (2003) find there is a low likelihood of a price effect in these markets.

In overseas markets for canola seed (other than the EU), there is little evidence that suppliers of GM canola have lost market share or suffered a lower price. The main interest here lies in Canadian exports as Canada supplies over half the world trade in canola seed and in oil and is a GM supplier. Since 1998 Canada has been excluded from the EU markets for canola seed but it has not lost share in world markets in the aggregate and remains the dominant supplier. It exports to China and other East Asian markets where it is the major competitor of Australia.

The average price received for Canadian exports fluctuates considerably, mainly as a result of competition from soybeans and other oilseeds. Australian canola seed for export is generally priced at export terminals on an export parity basis against Canadian canola, with the prices posted at export terminals in different states being the same at any one time. Canadian f.o.b. (free-on-board) prices at ports have been higher than Australian f.o.b. prices. This price spread was maintained after the introduction of GM canola in Canada in 1997.

Even if there is a premium in overseas markets for non-GM canola seed, this would not impact on the Australian price of non-GM canola seed if segregation in Australia of GM and non-GM supplies to export markets kept the adventitious presence of GM

materials within acceptable limits. Thus, price risk is fundamentally a matter of developing a segregation system that is acceptable to overseas customers. The EU is the only market where Australia could not meet the current standards if GM canola seed were produced but the EU appears likely to remain an opportunistic market for Australian canola seed.

In the longer run, as more genetically modified crops are engineered, the market situation may well be different. Already a number of GM crops are produced and marketed in some countries. The major GM crops are soybeans, cotton and corn as well as canola. GM technology is developing very rapidly. Gene transfer by means of genetic modification has a number of advantages over transfer by traditional breeding methods (ABARE, 2003a, chapter 3). In Australia, field trials have been approved by OGTR for a number of our major export crops and products, including wheat, barley, sugarcane and some fruits. The UK Agriculture and Environment Biotechnology Commission (2003, para 173) foresaw possible applications for release in the UK and the EU of broadacre crops such as wheat and barley and of legumes and other products such as potatoes, some vegetables and fruits and, perhaps most importantly, grasses. Some developing countries too are developing varieties of GM crops. These include China and India in the Asian region. The Productivity Commission (2002, Appendix C) provides a survey of consumer willingness to buy GM foods around the world. This shows that resistance to GM foods has been declining. As more foods containing GM material are marketed, it may be that consumer acceptance of these products will continue to increase. If this occurs, any premium for non-GM products will disappear. For these reasons, more GM products will be traded internationally too, especially if the WTO Panel upholds the complaints against the EU restrictions on GM products.

3.6 Effects on international markets for other grains and products

One of the concerns of farm groups is the risk that release of GM canola will negatively affect the prices received for wheat and other grains and other agricultural products. The products that may be affected fall into two groups. The first group is the grains that share the grains handling facilities with canola. For them, there is a risk of contamination of non-GM grains supplies by GM canola seed somewhere in the chain. The second group is a group of products that use canola meal as feed, and honey. For producers of these products, there is a risk that, in some markets, they could not market their products as free of GM material and may suffer a price loss.

The main export grain with contamination concerns is wheat. (This assumes wheat itself remains a GM-free crop.) Wheat is marketed overseas exclusively by the AWB. The AWB is not opposed to new biotechnologies and supports the coexistence trials but is concerned about the ability of supply chain segregation to meet the low tolerance levels required in some markets, in particular Japan and Korea. The standard of adventitious presence of GM canola in grain proposed by NACMA is 0.9 per cent, which meets the statutory requirements in all importing countries but some of their customers have requested GM-free wheat. If GM-free or non-GM standards are not met, they fear the loss of some contracts. ABARE (2003b) and ACIL Tasman and Farm Horizons (2003, Section 6.1.5) found no evidence that Canada and the US, which are major competitors with Australia in wheat markets and have adopted GM

canola varieties, had lost market share in sensitive wheat markets since the adoption of GM canola.

ABB Ltd, Australia's largest barley exporting company, raised similar issues. Buyers from Japan and Saudi Arabia have expressed sensitivities to adventitious presence of GM canola in barley and are requesting certification of GM-free or non-GM status of their imports of barley. ABB provides GM-free or non-GM certification now. Their concern is again with the ability of the industry to deliver standards. They want to have release of GM canola delayed until there is an identity preservation system with traceability along the whole chain in place and one that will be acceptable to their customers in sensitive markets. In the absence of a system satisfactory to their customers, they fear a loss of market share and lower prices. ACIL Tasman and Farm Horizons (2003, Section 6.1.5) analysis of barley exports from countries that have adopted GM crops again shows that they do not appear to have lost market share in sensitive markets.

In the second group of products, representatives of dairy farmers and milk processors have expressed concerns that feed used by the industry might be contaminated by GM canola beyond the tolerance levels specified. (This assumes that dairy farmers themselves will not graze cows on GM grasses.) This might jeopardise their sales to sensitive markets in Japan and Korea. Milk from cows fed on feed processed from a GM grain such as GM canola does not contain any genetically modified material. (The same applies to the meat from beef cattle, pork or poultry fed with GM feed.) It is indistinguishable from milk supplied from GM-free feed. The customer concern is, like that of consumers of GM canola oil and products containing GM canola oil, purely one of perception based on no knowledge that the product contains no GM protein or on ethical principles.

Our main competitor in these dairy markets, New Zealand, has abandoned its blanket opposition to GM technology and it has allowed GM trials; Australia and New Zealand are jointly researching GM forage crops. It may not, however, commercialise GM products for some years.

In the Victorian dairy industry, protein meals are a small part of the cows' diet and in the feedlot segment of the industry, canola meal is mixed with other non-GM meals. These practices reduce substantially the likelihood of GM feed exceeding tolerance levels. Moreover, unsegregated and therefore nominally GM, imported soybean meal and domestically-produced cotton seed meal are currently used in dairy rations but, as already noted, dairy products are GM-free since no GM protein can be found in milk. The current standard is that GM feed on a dairy farm shall not exceed five per cent of the total feed. This standard can be easily met. Incongruously, in the allegedly sensitive Japanese market, domestic milk producers feed a substantial amount of nominally GM soybean meal to their own cows.

The situation is similar in the honey industry. Pollen is present in honey, up to a maximum concentration of 1.5 per cent. GM food labelling legislation in most markets allows for the adventitious presence of GM material up to some tolerance level without requiring GM labelling; for example, in the EU it is 0.9 per cent and in Japan it is 5 per cent. Under current Australian labelling standards set by FSANZ, honey is allowed 1 per cent of GM material if that presence is unintentional. The

OGTR (2003b, para 181) found that only minute quantities of pollen (0.006 – 0.3 per cent) were typically found in Australian commercial honey. Beekeepers have a number of strategies to reduce or eliminate risk of any GM material content in their honey. As bees fly a maximum of around 8 kilometres, beekeepers can identify honey that is not GM-free, provided they know of any GM canola varieties in the neighbourhood. The areas likely to be planted in GM canola are a small part of the range of bees in Australia. In areas where GM canola is grown, much of the nectar collected is used to strengthen the hives rather than for commercial honey production. Currently packers require beekeepers to sign a declaration that there is no GM material in their honey. GM-free honey can be supplied from areas where no GM canola (or cotton) is grown.

A number of pulse markets have expressed concern over adventitious presence in exports of pulses. These include Saudi Arabia and Egypt. Pulse Australia, the major exporter, expressed doubt about the capacity of the storage and handling systems to achieve satisfactory segregation. However, more than half of the pulses grown in Victoria do not use the bulk grain handling facilities and for the remainder tolerance levels can be met.

4. Compensation via common law remedies and legal liability regimes

4.1 Legal Liability regimes

Legal remedies may be available to persons (individuals and companies) in the event of a loss arising from spread of GM canola via volunteers or the transfer of genes, or contamination of non-GM canola crops and products in the supply chain, or a potential buyer deciding not to buy or to offer a lower price for a canola product that is not GM-free or non-GM. Availability of legal remedies has two advantages. First, if all potential losers are compensated in full there are no actual losers. The externalities associated with the production and distribution of GM canola products would be resolved. The second and even more important advantage is that liability for losses imposed on other persons provides an incentive to all of those in the production and supply chain to avoid the imposition of these costs in the first place.

Those who grow or handle GM canola in Australia may be legally liable for any losses resulting from the adventitious presence in other crops or products under existing common law relating to trespass, nuisance and negligence. Such losses might be caused at any point in the supply chain, assuming that growing and supply does not take place in a designated zone. A set of contracts is evolving to specify the actions and responsibilities of parties at these points. While they clarify the obligations of contract parties, these contracts do not address directly the effects of adventitious presence of GM canola on outside parties. However, in a long supply chain involving many parties, some adventitious presence and associated damage is inevitable.

AFFA (2003) and others have identified a number of potential gaps in the Australian common law system in relation to growers. For any party claiming damage, it would be necessary to be able to prove the identity of the party causing the damage. In a long supply chain, this would require a system of full traceability but, even with such a system, proof would be difficult at times. If the point of damage can be identified, it is not always clear who should be responsible, especially if a farmer or grain handler

had followed all conditions specified in a contract and/or an industry code of practice. It would be necessary to prove the extent of the damages too. Where the adventitious presence occurs despite all parties involved having complied with all relevant contracts and requirements, it is possible that those affected would have to bear the associated costs. Economic losses arising, for example, from an organic farmer not being able to use his land for organic farming because of the adventitious presence of a GM crop, might not be covered by legal remedies. Economic losses arising from a lower price in a market might not be covered since common law remedies are directed towards the protection of rights of individual persons. Legal action is costly and may take a considerable time, or the defendant may not have sufficient funds, all of which reduce the net present value of any compensation received by a successful plaintiff.

These difficulties are not unique to Australia. Similar concerns and findings have been made in New Zealand, the UK, the US and other countries (see the survey by AFFA, 2003; New Zealand Law Commission, 2002; the UK Agriculture and Environment Biotechnology Commission, 2003; Kershen, 2002).

These difficulties with legal remedies under existing laws raise the issue of legal reform. Some stakeholders in the canola industry have called for new legislation. One possibility is legislation by the Australian Government to impose in all States and Territories a liability regime specific to GM canola or GMOs generally with strict liability for harm caused by activities that breach the legislation. A liability regime has been discussed in the EU and New Zealand. When drafting the Gene Technology Act 2000, the Australian Government rejected liability provisions for damages imposed by GMOs, considering that common law and existing legislation were adequate. This is consistent with approaches taken to date in the UK, New Zealand, Canada and the US. The New Zealand Law Commission (2002) concluded that it is unlikely that any liability regime could ensure that all losers are compensated.

Another issue is that of indemnification. Most growers and many other producers in the supply chain such as contractors and grain handlers may have insufficient resources to pay liability claims if liability is proven. One important tactic that may increase the ability of the legal system to deliver compensation to losers is the practice of one party indemnifying another party to a contract in the event of a claim for damages by a third party. For example, one global producer of animal feedstocks, will indemnify farmers in Australia purchasing feedstock that is declared to be GM-free or containing no more than a specified content of GM material (communication to the Independent Reviewer). Indemnities are a form of risk sharing.

4.2 Insurance

As a risk reduction tactic, growers and others in the supply chain may wish to insure against the risk of being held liable for adventitious presence of GM canola or market risks. Insurance performs several functions. For the insured, third party liability insurance is another form of risk sharing. While the insured bears a fraction of the cost in the event of being held liable for some damages, the rest of the cost is distributed over the pool of those insured and the insurance and reinsurance houses. This would encourage farmers and others in the supply chain to produce more GM canola. Insurance may, however, also reduce the incentives of these insured to be vigilant and could increase risks. This is known as moral hazard. It is a general

problem with all forms of insurance. From the point of view of the problems of damage imposed on unwilling external parties, the availability of insurance would increase the likelihood of payment of compensation claims.

Claims have been made by some stakeholders opposed to the release of GM canola that liability insurance will not be available to growers and others in the Australian GM canola industry. The UK Agriculture and Environment Biotechnology Commission (2003, para 280) found that insurance would not be available at present to a GM farmer and the New Zealand Law Commission (2003, para 121) found that full insurance is unlikely to be available for all GM events that might be approved in that country. If available in Australia, insurance might be prohibitively expensive. The fundamental difficulty is that of establishing an insurance market in a new area with distinct risks when the insurance companies have no history of claims to determine premiums.

These questions need to be explored with the insurance industry. Insurers must be informed of the risks and to do so they need full information of the processes of industry review and the nature of the segregation, quality assurance and identity preservation plans being developed. Some guidance might be obtained from experience in the insurance industry in relation to policies covering adventitious presence of non-GM crops under existing segregations and from experience with GM cotton in Australia or GM canola in Canada and the US. Growers and others in the industry need to know of the availability and price of insurance cover if GM canola is released. The policies should be structured to minimise moral hazard.

Some stakeholders in the canola industry have called for mandatory insurance. In relation to GMOs, Germany and Austria has legislated that all companies must obtain liability insurance sufficient to meet their liabilities. The Gene Technology Act 2000 has provision for mandatory insurance:

“Licence conditions may also include conditions requiring the licence holder to be adequately insured against any loss, damage, or injury that may be caused to human health, property or the environment by the licensed dealing.” (s62(3)).

This provision relates to risk as defined in the Gene Technology Act 2000 and would appear not to cover many economic losses.

Other possible arrangements to cover risks are assurance bond schemes and compensation funds. Both the New Zealand Law Commission (2002) and the UK Agriculture and Environment Biotechnology Commission (2003) found several problems with these schemes. It is unlikely that either the Australian Government or the State Government would be prepared today to assume liability for damages caused by private persons.

The implication of these deficiencies and problems with legal remedies and insurance, is that problems arising from costs imposed on third parties cannot be avoided. The release of GM canola in Victoria would, therefore, be accompanied on occasions by uncompensated losses being borne by farmers who do not produce GM canola and by others in the supply chain.

5. Victorian State regulation of GM canola production and supply

5.1 Bayer-Monsanto proposal for 2004

Bayer and Monsanto put a joint proposal to the Independent Reviewer for the year 2004 (Bayer and Monsanto, 2003). It involves a one-year trial in Victoria to demonstrate the feasibility of coexistence of GM and non-GM canola grain and other grains in the supply chain. A similar trial has been proposed for the State of New South Wales in 2004.

In terms of release, the main element is a trial limited in total area to 5,000 hectares on up to 100 sites. Forty to one hundred of these are sites for growers as a part of the coexistence trial, the others are sites for seed production demonstration, technology demonstration and R& D trials. There is a pre-farm gate component relating to seed production and supply. The pre-farm and on-farm components will be managed by the two technology providers. All growers will be obliged to sign Technology User Agreements. The technology providers have prepared crop management plans and technical manuals which must be followed by all growers of GM canola, and all growers must undertake a training programme. For the coexistence trial in 2004, the proposed isolation zone in the demonstration trial between GM canola and non-GM canola is 50 metres. (The term isolation zone is used in this report to indicate the distance between crops that are grown along a shared boundary.) The proposed isolation zone between GM canola and non-GM canola for certified seed production is 400 metres because of the necessity to have a zero tolerance in planting seed. There is a post-farm gate component encompassing grain storage, handling and transport. Appropriate grain receival sites and transporters will be selected to ensure full traceability along the supply chain. The programme is based on the Canola Industry Stewardship Principles (see below).

The 2004 programme is intended to provide an opportunity for Victorian farmers, the grain handling industry and the community in general to assess costs and benefits of introducing GM canola technology under Victorian farming conditions. During the term of the trial, operational parameters for the management of the technology and for compliance will be developed. The parameters cover many elements such as isolation zones distances, herbicide resistance management, standards for the adventitious presence of GM canola in non-GM planting seeds, non-GM canola grain and in other grains.

There is considerable debate about the distances that define an isolation zone. For example, the Gene Technology Grains Committee considers an isolation zone of 5 metres will be adequate. However organic producers contend that much larger distances are necessary; for example, 15 km in the case of canola (Organic Federation of Australia, 1999). This is in relation to environmental concerns. From a market perspective, the key consideration is the distance that is required to meet the standards of adventitious presence in grain harvested from neighbouring crops.

5.2 Forms of regulation

5.2.1 Self-regulation

The industry is planning to introduce a system of growing GM canola and managing the supply chain that can be described as one of self-regulation within an industry system of oversight. The Gene Technology Grains Committee (GTGC) is an industry working group with representatives from all segments of the supply chain and farmers' representatives. It has prepared national Canola Industry Stewardship Principles for Coexistence (CISP) (GTGC, 2003). The objective is to keep the adventitious presence of GM material in other products within tolerance levels and to provide full traceability of products through the supply chain. This project is based on growing and bulk handling of grains within a "contained management system". The system has pre-farm, on-farm and post-farm gate components. The Principles provide a set of guidelines for the development of industry standards and practices. Implementation will depend on the contractual arrangements between parties.

The Principles are managed by a Canola Reference Group set up by the GTGC. On behalf of the Canola Reference Group, the Australian Oilseeds Federation plans to conduct Supply Chain Coexistence demonstration trials in order to demonstrate that coexistence of GM and non-GM products is feasible. These trials have the support of key supply chain stakeholders, including some of the stakeholders who may be negatively affected by commercial release of GM canola. The plan includes monitoring and evaluation at all stages by an "independent" body set up by the Australian Oilseeds Federation and the GTGC. The outcome will be the establishment of "parameters". These are standards for the adventitious presence of GM materials in grain, non-GM canola and other products, and other standards. The trial will include re-testing the isolation zones between GM canola and other crops. It is described by the industry as a "proof of concept".

The implementation of segregation and quality assurance is based on a series of supply chain contractual agreements, training, the quality assurance arrangements of the individual companies in the chain. The three key points in the chain are the supply of seed by the seed company to the grower, the delivery of grain from the grower to the bulk handlers, and the delivery by the bulk handlers to the export terminal or customer. Contracts at each of these points will detail the obligations of the parties.

At the beginning of the chain, the Seed Industry Association has a Code of Practice for Seed Treatment that sets out quality assurance standards.

At the second point, the two technology companies have a joint Technology Provider stewardship programme to control market risks from adventitious presence in non-GM canola seed and other crops resulting from pollen flows and co-mingling and the spread of GM canola volunteers. Following the structure of the Canola Industry Stewardship Principles, the programme has pre-farm, on-farm and post-farm gate components. Farmers licensed by the technology providers to grow GM canola will sign Technology User Agreements. They must follow a Crop Management Plan provided by the companies, use of an agreed grain transport contractor and supply grain to an approved grain marketer with delivery of grain to specific receival site and record keeping.

At the third point, the Australian Bulk Handling Association is developing protocols to cover sampling and testing only. The project has been sub-contracted to the Stored

Grain Laboratories of the CSIRO. Most of the project work is done but it has yet to be tested under “field” conditions.

There will be a system of full traceability from the seed supply to the delivery to export terminals or customers.

Self-regulation on the basis of protocols developed by the industry may not provide sufficient incentives to the suppliers at points on the supply chain to abide by the protocols. The contractual arrangements are intended to provide these incentives for actions between the contract parties but they may not control co-mingling.

5.2.2 State regulation

As a part of the nationally consistent scheme laid down in the Commonwealth Gene Technology Act, the Victorian Parliament passed the Gene Technology Act 2001. The Victorian Act mirrors the Commonwealth Act. It extends the powers of the OGTR to the State of Victoria. Among other things, its powers provide for designated areas. The State Government is solely responsible for the regulation of the supply chain, although the Australian Government could under the Australian Constitution regulate the supply chain nationally if it chose to do so. Any Victorian State prohibition or regulation of the growing of GM canola and/or the supply chain would require new State legislation.

In considering whether or not to approve commercial release of GM canola in the State of Victoria, the State Government has a number of options. These range from one extreme of a total permanent ban (a GM-free canola market) to the other extreme of no restrictions on the growing of GM canola or supply chain management (an unregulated market). Between these extremes, there are several options that would allow commercial release under regulated conditions. These include the following:

- continue small-scale field testing of GM canola with a further moratorium on commercial planting,
- allow restricted commercial trials to assess commercial production and supply-chain management and decide later to allow or not allow commercial production, and
- allow commercial production of GM canola

The second and third of these options could be with Government regulation of growing and/or regulation of supply chain management.

In making a choice, the State has to balance a number of objectives, which may conflict. In 2000, the State introduced a Biotechnology Industry Development Plan (Department of Innovation, Industry and Regional Development, 2000). It is Government policy to develop Victoria as one of the world leaders in biotechnology research and development, commercialisation, production and marketing. A component of this is AgBio21, a plan for the development of internationally competitive capabilities in agricultural biotechnology.

During the election campaign of November 2002, the Labour Party made a number of specific commitments. It committed a Labor Government to requiring, before approval of commercial production, that the industry demonstrate a capacity to responsibly produce GM canola and to manage the necessary segregation in the supply chain. It committed to supporting the establishment of a policy principle that allows states to declare Genetic Engineering Free Zones. It also promised an international marketplace review.

5.3 Consequences for the Victorian regulatory regime of other Australian States' decisions regarding release of GM canola

GM canola is unlikely to be grown in significant quantities in Queensland, the Northern Territory or the ACT. All of the other five States have a prohibition or moratorium at present on the release of GM canola for commercial production, though the legal bases and the review processes differ among them. None has made a final decision with respect to release.

When the decisions have been taken by all individual States there are two possible scenarios:

- mixed scenario: some States approve release for commercial production, some do not;
- uniform scenario: all approve or not approve.

The first outcome has one advantage. Under this scenario, it would be possible for Australia to continue to supply GM-free canola into markets where there was some consumer concern from a state that did not allow commercial release. This would eliminate altogether the international market risk from growing GM canola and reduce domestic market risks. This outcome could be called segregation by state.

However, the decisions taken by the states will influence each other. The first mover state may set a precedent which the others will all follow. Thus, if Victoria decides to allow commercial release, there will be strong pressures on the governments of other states to follow. Canola growers in these states will demand the same right to grow GM canola varieties as growers in Victoria in order to have access to their agronomic advantages over conventional canola varieties, and technology companies may shift R & D to the state or states that approve GM varieties. If any one state other than Victoria made a decision to allow commercial release, the same pressures would apply in Victoria and other states. Hence, the first mixed scenario may not be sustainable.

Is there any feature of the Victorian agriculture that might justify Victoria making a decision contrary to that of other states? In Victoria, the dairy industry is much more prominent but the analysis of the international risks in the international dairy markets in Section 3.6 concluded that there was no substantial risk in this market. On the other hand, Victoria has a biotechnology industry that is well developed but it is still necessary for the state to balance the interests of all stakeholders.

There are practical as well as political advantage to the states making the same decision. If some states approve the release of GM canola for commercial production while some others do not, there could be problems of contamination of grains grown in the non-approving states from grains grown in the approving states. Some canola

for sale in markets as grain or for processing crosses inter-state boundaries; the example of grain from southern New South Wales moving to Victoria was noted above. Similarly, grain for export collected in one state may be topped up on shipboard by grain loaded from a port in another state, and some canola seed for planting moves inter-state. Such inter-state movements of canola seed provide an extra problem of risk management under a mixed scenario.

On economic grounds, therefore, it is desirable that the canola-growing states act in concert, or at least the Eastern States of NSW, Victoria and South Australia do so. The principle of concerted action was recognised in the Commonwealth Act in relation to a national system of regulation of GMOs and a Ministerial Council comprising one or more Ministers from the Commonwealth and each State and Territory has been established to provide broad oversight of a consistent national regulatory framework. However, this system is limited in the Act to decisions to permit release for commercial production under licence and conditions attached to a licence. Concerted action should cover more than just the decision to release GM canola for commercial production or not and the licence conditions. If the decision is to allow a limited release for trial along the lines of the Bayer-Monsanto proposal, trials in more than one State would allow a greater range of experiments with segregation by different methods. If the decision is to release GM canola for general commercial production, concerted action should apply to regulations to manage coexistence of GM canola and non-GM canola. It should also cover single national standards relating to isolation zones, the adventitious presence of GM canola in non-GM canola and other grains, sampling and testing, tracing and labelling. (A single standard is compatible with some variation in conditions among States or areas within States when the physical conditions of supply warrant it.) Single standards would provide the same incentives in different States to farmers and grain handlers to manage production risks and would assist the management of risks to international markets for all agricultural products that might be co-mingled or whose international markets might be affected by production of GM canola.

If a State regulatory system is introduced, it raises the question of the enforcement of regulations laid down by the State. Statutes could lay down standards, provide inspection and fines for breaches of standards. The UK Agriculture and Environment Biotechnology Commission foresaw problems in having sufficient flexibility in a statute to accommodate local variations and changes over time in growing and market conditions and in recovering costs, and some members feared that it could delay the release of GM crops.

5.4 Difficulties of deciding policies when risks are unknown

One particularly difficult aspect of the decision to release GM canola or not is the method of assessment of the market risks involved. When the extent of risks is known, standard techniques of social cost-benefit analysis provide ways of assessing the consequence of a decision and for weighing costs and benefits against each other. However, the extent of the risks, in the precise sense of knowledge of each level of damages, may not be known. Where the extent of the risks is not known, these standard methods are not adequate.

In the case of release of GM canola, the sources of market risk have largely been identified but there has not yet been the opportunity to quantify the risks. This holds for the domestic risks due to co-mingling and for the export market risks. Where the extent of the risks is not known, these risks can normally be described qualitatively. Sections 1 and 3 commented qualitatively on the nature of the risks from releasing GM canola. In most cases, the extent of these risks is knowable but no studies have been done in Australia to ascertain their extent; for example, the domestic risks of co-mingling with other grains and international market risks are knowable, as are the risks of gene transfer.

When risks are not known, one method of decision-making is application of the Precautionary Principle. Essentially, it states that, where there are risks of serious or irreversible damage to the environment, the lack of knowledge of the extent of the risks shall not be used as reason for postponing measures to protect the environment.

The Precautionary Principle is a principle of international environmental law. It could, however, be used for decision-making involving risks other than environmental risks, such as the domestic production and international risks arising from release of GM canola. The Precautionary Principle has been adopted in the UN Declaration on Environment and Development, the Cartagena Protocol on Biosafety and some other international treaties. The Precautionary Principle has been written into EU environmental law where it was the basis of the 1998 moratorium on placing new GM varieties on the market.

It is doubtful that the Precautionary Principle is consistent with WTO law. The Principle is not written into the Agreement on the Application of Sanitary and Phytosanitary Measures nor the Agreement on Technical Barriers to Trade nor any other part of WTO rules. In the WTO the US challenged an EU prohibition on imports of beef containing growth hormones in a case that has several similarities with the current US challenge to the EU ban on imports of new GM varieties. The Panel hearing the Hormones dispute did not recognise the Precautionary Principle as part of customary international law and this was upheld by the Appellate Body of the WTO. (For discussions of the Precautionary Principle in international trade law, see Charnowitz, 1999 and Cameron, 1999).

In Australia, the Precautionary Principle was adopted in the Commonwealth Gene Technology Act and in the Victorian Gene Technology Act. The Victorian Act (s4(aa)) provides:

“...where there are threats of serious or irreversible environmental damage, a lack of full scientific certainty should not be used as a reason for postponing cost-effective measures to prevent environmental degradation.”

The Precautionary Principle does not, under the Gene Technology Act, apply to domestic and international market risk which are the focus of this review. However, some stakeholders in the GM canola release decision argued to the Independent Reviewer that it should be applied to the assessment of market risks as well as environmental risk in Victoria.

There are several problems with the application of the Precautionary Principle in the context of risks associated with the release of GM canola. First, the implications of

the Precautionary Principle are unclear. It is sometimes interpreted to mean that, where there are risks of serious or irreversible damage to the environment, the lack of knowledge of the extent of these risks shall be used as a reason to adopt measures to protect the environment. This is a different and stronger principle, which is not implied by the first. Neither of the two interpretations is an adequate basis for decision-making under uncertainty. An assessment of risks associated with a new GM technology or any other new technology should take account of the potential benefits as well as the costs. (Linacre and MacLaren, 2003 offer a critique of the Precautionary Principle along these lines in the specific context of Australia's Gene Technology Act.) Secondly, the stronger interpretation of the Precautionary Principle is sometimes taken further to mean that the activity generating the risks should be prohibited. However, the measures that might be taken include approval accompanied by measures to reduce risks or their harmful consequence. The choice is not just between approval and not approval. The extent of (risky) costs and benefits are themselves dependent on producer strategies and government measures. Approval subject to risk reduction strategies and measures may be socially preferable both to no approval and to approval with no conditions.

An assessment of risks associated with a new GM technology or any other new technology should, therefore, take account of the potential benefits as well as the costs. When the extent of the risks is not known, a decision must be taken on the basis of qualitative judgements of risky costs and risky benefits. This is difficult but inescapable.

6. Conclusions and recommendations

6.1 Assessment of the risks of Victorian commercial production of GM canola

There are undoubtedly risks arising from a decision to release GM canola in the State of Victoria. Events would happen on-farm and off-farm that impose costs on other producers. In a long supply chain, some adventitious presence is inevitable. There may be risks to sales of non-GM canola and other crops in international markets.

An assessment of risk must also take into account the benefits to farmers due to the agronomic advantages of GM canola varieties over conventional non-GM canola varieties. It is expected that GM canola will increase average seed yields and farm incomes substantially but these gains too are uncertain.

In view of the findings of Section 4, I conclude that, in the event of general release of GM canola, the existing common law in Australia has potential gaps that may mean that some parties would not be compensated for damages they suffer from the adventitious presence of GM canola in other crops or products or other effects. I also find that insurance may not be available to some at least of the growers, grainhandlers and others in the supply chain. Consequently, externality problems arising from costs imposed on third parties are an inescapable part of the release of GM canola in Victoria.

The risks associated with commercial release of GM canola can be reduced by strategies adopted by growers and grainhandlers, and by measures introduced by the government. The approach of this study has been to ask how these strategies and

measures may reduce the risks and, if risk reduction strategies and measures were adopted, is it in the overall interests of our society to release GM canola for commercial production.

Strategies that might be adopted by farmers include risk management on-farm. They include notification of neighbouring farmers. These producers can take evasive action to reduce the risk of gene transfer only if they are informed of the presence of GM canola nearby. For grainhandlers, they involve developing segregation, quality assurance and identity preservation and tracing mechanisms. Strengthening the liability regime would make more growers and grain handlers liable for any damages imposed on others. This in turn would provide a stronger incentive for growers and grain handlers to avoid these costs in the first place.

In view of the findings of Section 2.1, I conclude that the industry is technically capable now of segregating crops to specified tolerance levels. However, segregation to these levels would require appropriate training and monitoring and enforcement, and it would be necessary to put in place protocols and a method of tracing crops to test that the system lives up to its capability. If these farm strategies and government measures relating to canola production and to grain handling are adopted, breaches of the tolerance levels should be rare.

In view of the findings of Section 3.4, I conclude that the release of GM canola would not significantly affect the price to growers of canola in the State of Victoria.

In view of the findings of Section 3.5, I conclude there is no clear evidence of premiums paid to non-GM canola products over canola products containing GM material in world markets.

In view of the findings of Section 3.6, I conclude that there is no evidence that the US and Canada have lost share in wheat or barley markets because of the release of GM canola in these countries. In those export markets requiring labelling of products containing GM material, the ability to meet these standards will depend on the ability of the supply chain to meet the tolerance levels. Price risk is fundamentally a matter of the development of a segregation system that is acceptable to these customers. For dairy products and honey, the risk of exceeding tolerance standards is low and can be managed by strategies already adopted by dairy farmers and beekeepers.

6.2 Release with regulation and recommendations

A decision by the State with respect to release and regulation of GM canola would have ramifications beyond those of the canola market and its stakeholders. It will set a precedent that will be examined closely in other States deciding whether to release GM canola for commercial production or not. It would also be considered by stakeholders in markets for other agricultural GM crops that might be considered for release in Australia in the next few years. The decisions taken by Victoria and other States with respect to GM canola will affect investments in agricultural biotechnologies in many crops. These have a potential for large net benefits to the nation, if the associated risks are small or manageable.

These considerations make it imperative that best efforts be made to get the form of release and regulation right from the outset.

The uncertainties with respect to both the agronomic benefits and the risks to other producers from the release of GM canola mean that it would be unwise to give an immediate unconditional release to GM canola in the Victoria.

These risks are, however, such that they can be assessed by controlled coexistence trials for a predetermined period.

The findings lead to the conclusion that the State of Victoria should permit limited release of GM canola varieties in the State for a coexistence trial beginning in 2004, along the lines of that proposed by the technology companies. A coexistence trial provides an opportunity to test the risks and risk management. The length of the trial period should be adequate to test the parameters of the risk management.

This limited release beginning in 2004 should be subject to measures taken by the State that allow it to assess the extent of the risks under actual farming conditions in Victoria and to design appropriate measures to manage the risks if a decision is taken to allow release beyond the trial period. The coexistence trials proposed by the GTGC provide an opportunity to develop appropriate standards relating to pesticide management, isolation zones, adventitious presence of GM canola in other grains and products, notification of GM canola production, sampling and testing, tracing, definition and labelling of GM-free and non-GM products and other matters that may be regulated.

There is an urgent need for more public discussion of the issues based on more information about the process and the issues. During the trial period tests of all trials should be conducted, monitored and reported publicly. This should also be a continuing dialogue between stakeholders; for example, a dialogue between the technology companies on the one hand and the food processors and retailers who are restricting the sale of GM grains or products on the other might resolve some of the marketing problems. Polarisation of views is exacerbated by a lack of information and discussion.

Recommendation 1

The State of Victoria should permit a limited release of GM canola for a trial period beginning in 2004. It would be appropriate for the scope of the release to follow that proposed by the technology companies and the industry. The trial period should be for at least one year and preferably longer. The decision with respect to the length of the period should be made by the State after taking appropriate advice from the industry and from parties independent of the industry regarding the time needed for adequate trials and the development of industry standards. During the trial period tests of all trials should be monitored and reported publicly.

Decisions to release GM canola or not taken by Victoria and by other states will influence each other, as noted in Section 5.3 above. It is desirable that the growing states act in concert, or at least three Eastern States of NSW, Victoria and South Australia do so. This would improve risk management in the industry arising from inter-State movement of canola seed and would allow a greater variety of coexistence trials.

Recommendation 2

The decision by the State of Victoria for a limited release during the coexistence trial period should be taken in concert with the other Eastern States if agreement can be reached among the States. Coexistence trials in more than one State would allow a greater degree of certainty in relation to segregation, quality assurance and identity preservation due to its testing under controlled conditions.

The conduct of coexistence trials in Victoria, or in cooperating States if cooperation among states is possible, and the evaluation of the results should be overseen by a Committee whose members have no commercial interests in the industry. Collectively the members of the Committee should provide expertise on all aspects of pre-farm, on-farm and post-farm production of GM canola seed and its movement along the supply chain. All stakeholders should be consulted and kept fully informed of the conduct of the trials and the evaluations of the results.

Recommendation 3

The conduct of the coexistence trials in Victoria, or possibly among cooperating States, and the evaluation of the results should be overseen by a committee. Members of the Committee should have no commercial interests in the industry. All stakeholders should be consulted and should be kept fully informed of the conduct of the trial and the evaluation of the results.

At the end of the trial period, the assessment by the State of Victoria of the risks and the benefits should determine whether release for general commercial production could be permitted or not.

Recommendation 4

At the end of the trial period, the State should assess the evidence relating to coexistence before taking a decision to release GM canola in the State of Victoria for general commercial production or not.

Release of GM canola for commercial production would be subject to whatever regulations and controls are deemed necessary to manage the risks. The State of Victoria, or the cooperating States as a group if cooperation among growing states is possible, should determine industry standards. Self-regulation by the industry does not adequately address the issues in an industry with systemic problems affecting other stakeholders.

State regulation could also include area limits, as in the case of the approval of GM cotton in Australia. While area limits would contain the magnitude of canola production and the associated risks, they would not address directly issues of risk management and they provide no incentives to reduce damages imposed on external parties.

Recommendation 5

If, at the end of the trial period, the decision is to release GM canola, this release should be permanent and should not be subject to area limits. It should, however, be subject to government measures to reduce the risks associated with production on-farm, in the supply chain and in international marketing. In this event, it would be

desirable if there are single national standards for all States that have approved commercial release of GM canola relating to

- *pesticide management and weed control*
- *isolation zones on-farm,*
- *notification of neighbouring farmers, beekeepers and equipment contractors,*
- *the adventitious presence of GM canola in non-GM canola and other grains,*
- *sampling and testing,*
- *tracing,*
- *definition and labelling of GM-free and non-GM products, and*
- *any other matters that are regulated.*

At this later stage, a decision to release GM canola would be subject to review by the State Government at any time. However, this would be likely to occur only if new information became available that resulted in a major change in risk assessment. It is desirable that Government provide certainty to growers and other producers in the supply chain and other stakeholders. Moreover, there is the possibility that parties affected by a change in government policy could take legal action against the Government of Victoria. In this regard, I note the possibility that an investor-to-state provision will be included in the US Australia Free Trade Agreement under negotiation. This provision would allow private parties in the US to take action against a sub-national government in Australia if its policy decisions or actions were considered to be in breach of a commitment made by the Australian Government in this treaty.

Other measures that need to be considered are the adequacy of the legal liability regime and the availability of insurance, as discussed in Section 4.

Recommendation 6

The State and Territorial Governments and the Australian Government should jointly resolve whether the legal liability remedies that are currently available under common law need to be modified or extended, but this should not hold up coexistence trials.

Recommendation 7

The technology companies and representatives of the canola industry should consult with insurance companies and the Insurance Council of Australia with a view to making insurance available, at fair prices, to producers at all points in the supply chain.