7 Segregation

7.1 The current canola supply chain in Victoria

Victoria usually produces over 5 million tonnes of grain annually of which wheat and barley are the major crops comprising 50 per cent and 30 per cent respectively. A significant proportion of this production goes to meet the State's large domestic demand with the residual going to export markets (see chapter 4).

Main features of the supply chain in Victoria are:

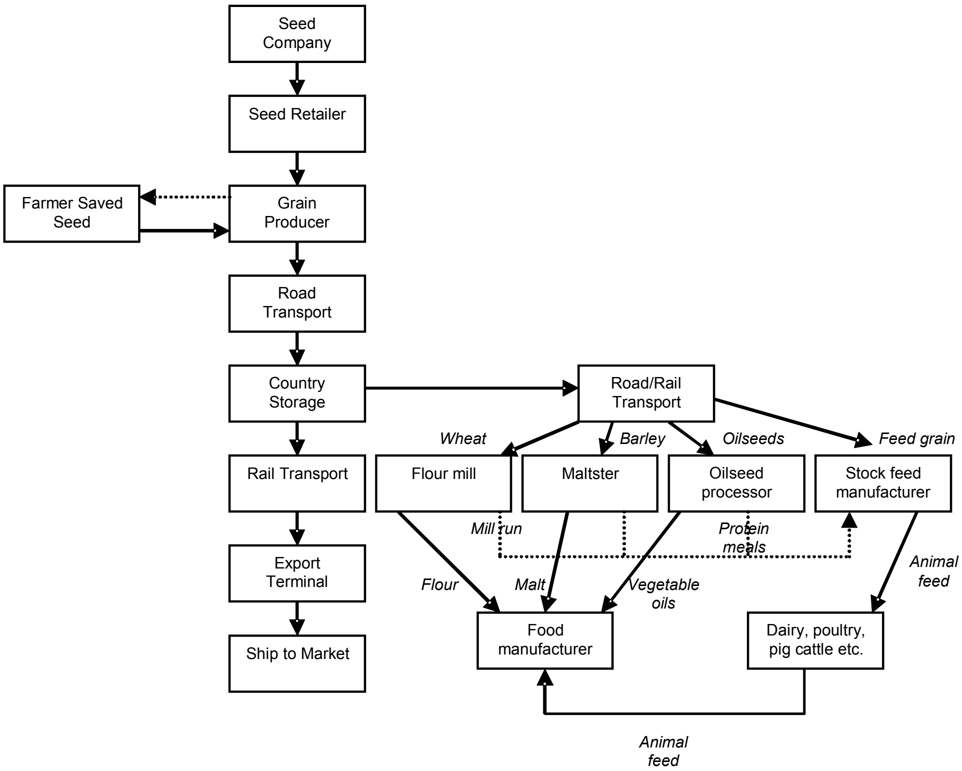
- a highly fragmented production base with canola grown in most cropping areas of the State; and
- a supply chain and marketing system that has evolved from highly regulated pooling and gain storage and marketing system.

Victoria's grain supply, as for most the world, is best pictured as a highly fragmented production base narrowing to a highly concentrated handling and marketing system.

Although some de-regulation is now occurring, long standing regulation of grain marketing has left a highly concentrated storage and marketing system. This is one of the more significant barriers to the introduction of new technology where identity or proprietary preservation is required.

Until recently the Victorian market was further concentrated by regulatory controls on the export and marketing of barley. The effect of canola vesting powers in NSW combined with much of the canola production regions in Southern NSW being freight advantaged into Victoria has created a situation where a significant proportion of the canola crush in Victoria can be sourced from NSW while pushing most of Victoria's canola production into export markets. The issuing of export licences by GrainCorp, the new manager of the vesting rights in NSW, may alter these flows as more NSW grain may flow to Victorian ports and more Victorian grain moves into the domestic crush.

Figure 3 **Victorian Grain Supply Chain**



Source: ACIL Tasman/Farm Horizons

7.1.1 Grain storage and handling

Grain storage and handling throughout Australia has seen significant structural change over the past decade with three bulk handling companies (BHCs) now dominating grain storage in Australia: GrainCorp, CBH and Ausbulk. GrainCorp is the dominant grain handler to east coast Australia. More recently, a number of new participants including AWB and the Australian Bulk Alliance (ABA) have built over 1.5 million tonnes of storage capacity in eastern Australia. Increasing efficiency and safety demands have resulted in the traditional bulk handling companies closing a number of the smaller and country receival facilities in favour of a lesser number of larger, more efficient country storage facilities.

GrainCorp is the major bulk handling company in Victoria operating approximately 125 country storage facilities and two export terminals, Geelong and Portland. AWB has built five, predominantly bunker type, country storage facilities in the past three years and ABA has built a further three similar facilities. ABA has also completed construction of their new Melbourne grain export terminal.

There is a range of different types of storage facilities used in Australia that can be broadly categorised into the following:

Table 14 **Handling equipment used in Victoria**

Type	Handling equipment
Vertical silo	Receival hopper with elevator to vertical storage cells. Provides greater segregation capacity but more expensive to build and maintain
Horizontal shed	Receival hopper with elevator to large horizontal storage sheds. Less expensive to bulk than vertical but reduced segregation capacity
Bunker	Receival hopper into a thrower or auger than locates grain on large storage pads that are covered with heavy plastic. Least expensive to build but limited segregation capacity.
Export terminal	Receival hoppers for rail and road. Multiple grain storage structures that could be a combination of all of the above.

Source Farm Horizons

The bulk handling system was developed to provide a cost-effective system to handle large quantities of bulk grain crops (with limited segregations) from farm to export ports or to domestic markets on the seaboard. However, changing customer demands and increasing food safety standards have resulted in a far greater use of grade and varietal segregations within the bulk handling system where there is now over 40 different wheat segregations maintained in Victoria.

Handling grains with sensitive requirements

Grain handling companies have demonstrated they have the technical ability to manage grains with sensitive requirements through the bulk handling system. A number of grain products already have tight segregation requirements, such as malting barley and milling wheats, where handling companies are required to maintain segregations throughout the supply chain to meet specific customer requirements. In addition to these general segregation requirements there are several examples where BHCs are routinely handling grains that have higher levels of sensitivity for specific market requirements.

1. Pesticide Residue Free (PRF) grain is required by some of Australia's major wheat markets including Japan and Korea. PRF grain has less than 0.1 mg/kg for organophosphates. PRF grain is kept in designated storages by the BHCs and identity preserved through to the export terminal where it is tested to ensure the grain is within allowable tolerances. Approximately 60 per cent of wheat stored in the BHC system in eastern Australia is PRF.

2. Bulk shipments of polished white rice are transported via rail from southern NSW for shipment through the Geelong export terminal. Special procedures have been developed to ensure the rice is free from impurities in order to meet the sensitive market requirements. This includes an agreed cleaning procedure of the entire grain path including rail wagons and export terminal prior to the movement of rice.

3. Approximately 50,000 tonnes annually of high oleic sunflowers from Queensland and Northern NSW has its identity preserved for domestic crushing requirements. This involves the issuing of specific identification dockets to growers that are presented to the BHC receival location upon delivery along with an agreed testing regime to ensure product quality.

Assessment and sampling points

Grain is sampled at several points along the supply chain in order to classify the grain and then ensure product integrity is maintained. The primary sampling points are where ownership transfers along the supply chain so quality and weight is assessed for payment. These are:

- sampling and assessing quality upon receival (depending on characteristic tested may take 5 – 10 minutes);
- sampling and assessing quality on out-turn at export terminal (which may take longer than at the receival site if more characteristics are tested for); and
- sampling and testing quality by domestic consumer upon receival from BHC (similar time to second point above).

In addition to these primary quality assessment points, quality can be assessed at a number of other points along the chain to further monitor product integrity. Accidental presence can occur through both human and mechanical error along the supply chain and these additional assessment points would allow accidental presence to be more closely monitored and corrective action to be implemented where necessary. These additional monitoring points are:

- monitoring using 500 tonne running samples after receival into country storage;
- visual assessment of product upon out-turn from country storage; and
- sampling and assessment upon receival at export terminal.

Current corrective actions if contamination is detected

As grain is sampled and tested at several points along the supply chain there are a number of points where contamination can be quarantined and dealt with before large quantities of grain are affected.

Corrective actions begin at the farm level where paddocks are inspected for likely levels of contamination from weed seeds and diseases. Once found the farmer is alerted to possible problems and can inspect the grain during the harvest operation. This is done by taking header samples directly from the header grain box and taking the sample to the local silo for assessment before the grain transported to the silo (the test at the silo will take 5 -10 minutes in addition to the travel time for the farmer into the silo and back). Depending on the results of the test the farmer can divert the grain to the most appropriate destination. For example, most canola markets have maximum ad mixture levels (presence of foreign material in the seed; NACMA standards are 3 per cent) that cannot be exceeded or the grain is rejected. The farmer can assess the level of admixture in the grain and decide whether to store the grain on farm if they think the grain will be rejected and clean it at a later date or deliver to the silo if the purity is within standards. Once GM testing is available at the silo a farmer who has doubts about the level of GM presence in the grain could send a running sample to the silo for testing before delivering the canola grain (at present a substantial amount of sample testing at local silos is carried out free of charge).

On farm testing kits for moisture and protein are available at a range of costs and are used extensively by that many grain producers. If GM canola is commercially released it is likely strip tests will eventually be made available to canola growers for use on farm.

Once the decision is made by the farmer to send the grain for delivery to the local silo each truck load is tested for a range of characteristics and banned contaminants before the grain is accepted into the system. If there are banned contaminants in the load the truck is sent away preventing delivery of the grain. (see attached GrainCorp receival standards 2003/04).

Once in the handling system a running sample of the grain is taken for each 500 tonnes of grain received. These samples are tested for a range of contaminants and kept for several years. The loads from the farmers that contribute to each of the 500 tonnes are identified and preserved through the system so that if a sample tests positive for a contaminant the farmers that contributed to the 500 tonnes in question can be traced.

If contamination is detected the grain can be diverted or dealt by the handling company and marketer. The consultant's discussions with handlers indicate that the current systems will incorporate GM testing as part of the running sample testing during handling significantly reducing cost.

7.1.2 Processing

The Australian oilseed processing industry is small by international standards — there is approximately 800,000 tonnes of annual capacity and it is primarily domestic market focussed. There is relatively little international trade in oil.

Table 15 **Australian Oilseed Production ('000 tonnes)**

	1998/99	1999/00	2000/01	2001/02	2002/03	2003/04F
Canola	1685	2402	1681	1608	790	1382
Sunflowers	195	125	72	70	22	100
Soybeans	107	102	76	72	14	55
Cottonseed	950	980	1082	875	450	300
Other	20	20	15	15	10	10
Total	**2937**	**3609**	**2911**	**2626**	**1276**	**1847**

Source: AOF 2003

Australian crushing capacity has contracted in recent years with the closure of the Moree and Brisbane facilities as the size of the annual cottonseed crush has decreased.

Cargill is the largest oilseed processor with facilities in Narrabri, Newcastle and Melbourne. Riverland Oilseeds is the other major processor with facilities in Numurkah and Pinnalla (WA).

Around 400,000 tonnes of canola is crushed domestically each year with Victoria accounting for nearly 60 per cent of the national canola crush.

Canola oil is widely used in the food industry for margarine, salad oils and cooking. Canola meal is regarded as a good quality protein meal suitable for most intensive livestock industries.

Unlike larger international oilseed processing facilities in North and South America that focus on a single oilseed type, most Australian oilseed processing plants have the capacity to process multiple seed types and as such have multiple oil and meal segregations.

When moving between seed types operators normally "flush" the plant with the new seed type with the oil and meal continuing into the previous segregations before commencing the new oil and meal segregation in order to minimise contamination. In the event of the commercial release of GM canola varieties the major oilseed processors have advised that a similar system would be introduced where customers were seeking non-GM products.

7.1.3 End users

Vegetable oil

The Australian market for oils and fats utilises around 550,000 tonnes annually. Of this, soft oils (canola, sunflower, cottonseed and soybean) at 225,000 tonnes account for almost half. Canola represents around half of all soft oil consumed. Imported palm oil and tallow continue to be significant, accounting for around 200,000 tonnes in total. The retail sector remains significant using 185,000 tonnes; however, the major growth is in the commercial and food service segments accounting for the balance of usage.

Prior to their use in the food industry oils and fats are refined to improve the stability and appearance. This process involves the degumming, bleaching, neutralising and deodorising of the oil. The major refiners in Australia are Goodman Fiedler, Unilever and Peerless. These companies retail and wholesale vegetable oil and vegetable-oil based products.

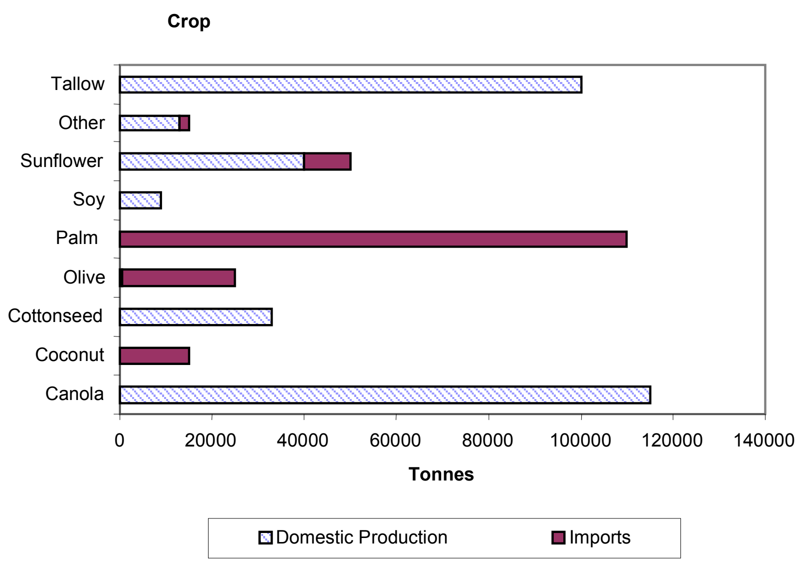
Oil usage in Australia can be separated into three major markets:

- *Commercial* – This sector comprises approximately 40 percent of annual fats and oil consumption in Australia and is used in the commercial foods such as biscuits, bakeries, salad dressings, snacks and frozen foods. Canola oil is used in some of these products.
- *Retail* – relates to the oils and fats used in margarines and cooking oils and makes up 35 per cent of domestic demand. Margarine comprises half of retail usage although this has been steadily declining. Canola oil is widely used in this segment.
- *Food services* – Hard oils, such as tallow and palm, which are best suited for deep frying, dominate this sector largely driven by price and flavour. Canola oil is not suited to frying so little is used in this sector.

Oil refiners have been exposed to GM vegetable oils for some time as approximately 40 per cent of the Australia cotton crop currently planted to GM varieties. GM cottonseed is not segregated from conventional varieties when the seed is ginned.

Cottonseed oil is not widely used in the retail sector because of its quality characteristics. Its main use is in the food service industry as frying oil. However, refiners advised that some margarines have been reformulated to avoid the use of cotton seed oil where it was previously included in blends. Although Food Standard 1.5.2 does not require the labelling of highly refined foods where novel DNA and/or protein has been removed (vegetable oils produced from an expeller/solvent extraction process), the major oil refiners have indicated a preference to purchase canola oil produced from non-GM canola.

Chart 5 **Australian vegetable oil usage; by crop , 2002-03**



Source AOF 2003

Protein meal

Livestock feedstuffs vary in composition but are primarily composed of cereal grains as a source or protein and energy. Protein meal (vegetable and animal) in conjunction with other dietary additives, is included to meet the nutritional and dietary requirements of the animal. Rapid expansion of intensive livestock feeding in Australia over the past decade has resulted in significantly increased demand for protein meals.

The Stock Feed Manufacturers Association of Australia (SFMA) estimates that Australia utilises over 10 million tonnes of stockfeed annually excluding pasture, hay and silage. A recent survey conducted by the SFMA, who's members represent over 90 per cent of all of the commercial feed sold in Australia, showed that in 2002/03 4.6 mt of feed was produced. Grain is the largest component of commercial rations accounting for around three-quarters of feed intake followed by oilseed meals (12 per cent), animal by-products (7 per cent) and pulses (5 per cent). Soybean meal is the major oilseed meal used. It accounts for approximately 40 per cent of annual consumption followed by canola meal (30 per cent) and cotton seed meal (20 per cent)

In addition, some producers mix their livestock rations on-farm from purchased grain, oilseed meal and additives.

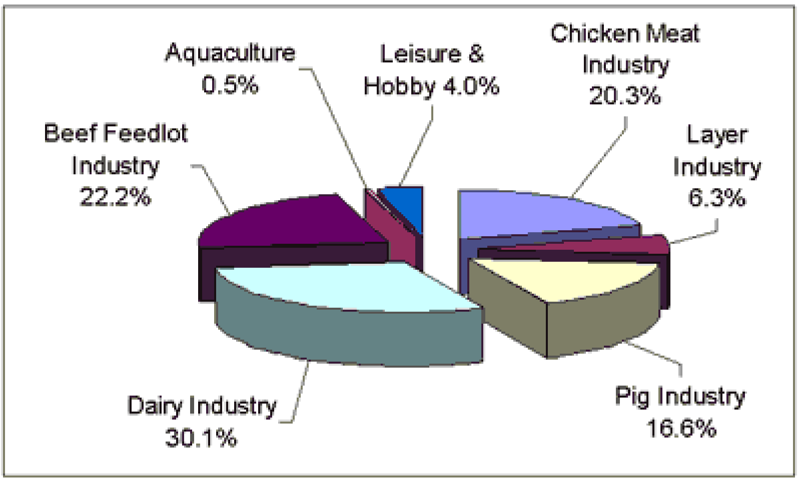
Table 16 **Australian vegetable protein meal consumption ('000 tonnes)**

000 tonnes	1998/99	1999/00	2000/01	2001/02	2002/03
Canola	183	183	192	203	192
Soy*	103	75	198	273	376
Sun	114	75	43	42	13
Cotton meal	234	252	144	144	144
Cotton seed whole	325	212	242	104	14

Source: AOF * includes imports

The dairy industry is the single largest feed consumer with 30 per cent of feed intake while beef feedlots, chicken and pig industries are also significant consumers.

Chart 6 **Stock feed usage by sector**



Source: ABARE 2002

Victoria accounts for over one-third of all commercial feed produced in Australia. Ridley AgriProducts is the major commercial manufacturer of stockfeed in Australia producing around 1.5 million tonnes annually although integrated manufactures, such as Ingham, Barters and QAF also produce significant quantities of feed for consumption within their pig and poultry enterprises.

Genetically modified feed ingredients

The stockfeed industry already uses significant quantities of GM protein meals in their rations with around 60 per cent currently coming from GM sources, notably soybean meal. The bulk of Australia's soybean meal is assumed (by the industry and users) to be GM as the bulk is imported from the US All of the cottonseed meal is also considered to be GM as over 40 per cent of Australian cotton is planted to Bt varieties which are not segregated due to lack of demand for non-GM cottonseed meal or oil.

Dairy industry – Milk processors (liquid and manufacturing) limit the inclusion of genetically modified feed ingredients to between 0 per cent and 5 per cent in lactating dairy cow feeds. The primary reason given by the dairy industry to stock feed manufacturers for GM feed ingredient constraints are the requirements of export markets.

Pig Industry - The Australian pig industry has flagged the inclusion of GM feed ingredients in pig feed as an area requiring review. This is largely due to the expanding Japanese export market that relies on the pork being GM-free. At this stage no formal feed ingredient constraints have been placed on stock feed manufacturers.

The following comments were made in the Australian Pork's submission to the draft biotechnology strategy for Agriculture, Food and Fibre December 2002:

"No country has yet put in place justifiable sanitary, phytosanitary or legislative barriers to trade in GMOs, nor offered a premium for GM-free produce, though there is emerging clear sentiment for GM-free in our traditional overseas markets and also niche markets requiring GM-free.

The Australian Pork Industry will be greatly affected by the introduction and increased use of biotechnology in the feed crops used in pig's diets. Current market demands indicate, at least in the short to medium term, this impact will be negative.

At the very least, Australian pork exporters should be able to guarantee that Australian pork meets a minimum of 5 per cent GM-free requirement."[31]

Poultry Industry – At this stage the Australian Poultry Industry Association, which represents the chicken meat industry, has shown no objection to the use of GM feed ingredients. Similarly the egg layer industry has not expressed concern over the use of GM feed material in chicken rations.

Conversely niche poultry markets (including turkeys and ducks) have expressed concern over the use of GM feed ingredients. In some cases turkey and duck producers have requested diets to be GM ingredient free (although tolerances have not been specified).

Beef feedlotting industry — The position of the Australian Feed Lotters Association is one of ambivalence to GM feed rations.

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31 Submission to the Draft Biotechnology Strategy for Agriculture, Food and Fibre; Australian Pork December 2002.

While there is no price differential they will choose non-GM feed. If or when it costs more to source non-GM then they will use GM feed.

They see no market advantage in utilising non-GM feed, particularly in Japan.

Several reasons are put forward to explain this situation. GM is not high on the list of issues for beef purchasers: BSE and substitution are more important

Major competitors in the Japanese market, including domestic producers, use GM in rations. The Japanese do not want to preclude any significant supplier from their market — similar to the situation for wheat.

7.2 The supply chain required to meet consumer demands

7.2.1 Tolerances

Those seeking to meet tolerances for adventitious presence of GM canola in non-GM canola or other grains and pulses will need to demonstrate that all reasonable care has been taken to avoid GM canola being present. This will require the establishment of quality assurance systems along the supply chain to maintain product identity and document that agreed standards have been met and procedures followed (see GM testing capabilities section). Documentation can provide appropriate assurances at some stages of the supply chain while testing to validate product identity will need to be instituted at certain stages, primarily when the grain changes hands.

The tolerance level for the adventitious presence of GM canola will be determined by the market and ultimately by consumers and tolerances are likely to differ across markets and over time.

Factors that will impact upon tolerance levels are domestic and international market demands, and the relative level of value of the non-GM attribute compared to other food attributes such as food safety, price and other sensory or lifestyle attributes.

The GM or non-GM attribute remains one of a bundle of attributes that markets will prioritise. Establishment of supply chains based solely on supplying GM or non-GM products may reduce future competitiveness as markets shift priorities.

To ensure that Australian products remain competitive supply chains will need to be dynamic and capable of responding to changing demands and competitive forces.

7.2.2 Testing and contracts – identity preservation

At present the Victorian grains industry uses testing and contractual arrangements that incorporate low levels of quality assurance as the grain moves down the supply chain. Currently testing is used rather that identity preservation particularly at the point where grain enters the handling system.

Our analysis of the international grain markets and observations of the evolution of the domestic market indicate that the grain supply chain is trending toward:

- a greater reliance on identity preservation rather than testing and contracts;
- a fragmentation of the handling and supply components and greater concentration of production; and
- small segregated facilities where 2,000 tonne instead of 50,000 tonne is the norm.

The key features of the supply chain that will manage coexistence are:

- flexibility to meet changing consumer attitudes;
- ability to meet tolerances for adventitious presence when profitable to do so; and
- ability to demonstrate that any presence is adventitious. This will lead to the development of QA systems and the onus will be on non-GM growers and at additional cost. IP will be introduced if and only if demand for non-GM is sufficient to meet this cost.

Licensing and questions of liability will require that GM canola growers will have developed a minimum quality assurance or identity preservation system. The implementation of the Crop Management Plans under the Technology User Agreements and associated auditing would appear to satisfy most of these requirements.

It is interesting to note that similar segregation concerns as those currently being put forward were raised when canola was first introduced into the grain supply chain. Discussions with industry participants who recollect those times indicate that concern over contamination of wheat and barley exports was initially so strong that the grain handlers of the day took extensive steps and built segregation systems into the supply chain that were previously not considered.

This included dedicated grain paths, sealed railway wagons and extensive training for staff to ensure canola did not appear in other grains. This extra cost was borne by the first canola industry participants.

7.2.3 Seed selling and distribution

The integrity of non-GM segregation starts with the seed industry. Seed companies have implemented a range of measures to ensure acceptable levels of purity. These include, planting seed certifications schemes, codes of practice[32] and internal quality assurance systems[33]. Even so, evidence suggests that seed companies will not guarantee 100 per cent seed purity[34] because of the risk of small traces of accidental mixing with other seed types that may occur through the various stages of seed production and handing.

Recently the Seed Industry Association of Australia (SIAA) established a 0.5 per cent tolerance[35] (by weight) of approved GM canola in non-GM canola seed. At the same time the SIAA also released guidelines for managing adventitious presence admixture in the production, processing and marketing of canola seed[36]. The guide lines outline the justification for establishing the threshold level of 0.5 per cent as well as identifying management processes required to maintain seed purity (see Table 17).

Table 17 **SIAA management procedures**

Stage	Estimated Additional AP	Management Procedures
Cross Pollination	0.10 per cent	Reiger et al 2002; Salisbury 2003 Scientific Committee on Plants , European Commission 2001
Volunteers	0.20 per cent	Scientific Committee on Plants , European Commission 2001
Harvesting	0.01 per cent	Scientific Committee on Plants , European Commission 2001
Transport	0.05 per cent	Scientific Committee on Plants , European Commission 2001
Storage	0.05 per cent	Scientific Committee on Plants , European Commission 2001
Manufacturing	0.05 per cent	Food Industry TGM/HACCP Analysis.

Source SIAA

32 The major certification systems are the Organization for Economic Cooperation and Development (OECD) Seed Scheme for the Varietal Certification of Planting Seed Moving in International Trade http://www.oecd.org/; and the Operation Procedures and Genetic and Crop Standards of Official Seed Certifying Agencies (AOSCA). http://www.aosca.org/aoscaflash.html. The SIAA has implemented Codes of Practice for the labelling and marketing of seed and the use of seed treatments.

33 The OGTR has required that technology companies must be accredited organisations and comply with the guidelines and conditions of accreditation.

34 The Economics of Non-GM Segregation and Identity Preservation, D Bullock, M Desquilbet, E Nisti. Link??

35 http://www.sia.asn.au/

36 http://www.sia.asn.au/

The Gene Technology Grains Committee (GTGC), which comprises representatives from across the grains industry including producers, research institutions, technology providers, bulk handlers and food processors, has identified the management practices required to ensure seed integrity for commercial canola planting seed in their "Canola Industry Stewardship Principles"[37].

7.2.4 Conclusions about maintaining seed purity

Evidence suggests the seed industry is well advanced in its readiness for the introduction of GM canola varieties, provided there is acceptance of a reasonable tolerance level for adventitious presence of different types of canola. Readiness of the industry is indicated by the development of the SIAA Guidelines for Managing the Adventitious Presence, and Seed Testing Protocols for Adventitious Presence in canola seed. However, even during seed production which is subject to far greater degrees of process control than are available during the commercial phases of the canola supply chain, it is apparent that small tolerances of adventitious presence levels are unavoidable. It needs to be recognised that the seed industry cannot achieve zero tolerance, despite the strict process controls in place for seed production. It stands to reason that greater tolerances will be required during commercial canola grain production because of the reduced controls available during this phase of the supply chain.

7.2.5 Commercial production

On farm measures to control non-GM purity will be governed by the stewardship strategies developed by the technology companies. These strategies are consistent with the national guiding principles prepared by the Plant Industry Committee (PIC) of the Primary Industries Ministerial Council (PIMC). The specific requirements for growing GM crops outlined by PIC in the guiding principles included:

- on-farm crop management plan which forms the foundation of the stewardship program;
- communication and education;
- compliance, auditing and enforcement;
- reporting and assessment of agricultural and environmental impacts; and
- contingency plans.

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[37] GTGC Canola Industry Stewardship Principles can be found at http://www.avcare.org.au/default.asp?V_DOC_ID=887 pp 11-15.

The stewardship strategies developed by both Bayer Crop Sciences and Monsanto meet the guiding principles. The strategies are underpinned by detailed Crop Management Plans (CMP) under which growers agree to implement specific management procedures when they sign the Technology User Agreement prior to accessing the technology. In addition to this growers and/or agronomists are also required to attend education and accreditation programs to ensure these initiatives are understood and fully implemented.

The GTGC Canola Industry Stewardship Principles prepared by the industry Gene Technology Grains Committee (GTGC), which are also consistent with the PIC guidelines,[38] document the management principles required to achieve crop hygiene and promote responsibility along the supply chain.

Farmer saved seed

The use of farmer saved seed (FSS) is a common practice in Australia with an estimated 30 per cent of canola farmers in eastern Australia regularly saving seed to meet all or some of their planting seed requirements.

The use of FSS is only an issue for Roundup Ready® Canola but not for InVigor® canola as this is a hybrid variety and the seed is not suitable for replanting. Monsanto has said that FSS would not be permitted in the first year of commercial production although it is likely that a system that would allow FSS would be piloted in subsequent years with selected growers.

The production and use of FSS will be governed under the Technology Users Agreement which requires the adoption of specific practices to guarantee the highest quality of seed is maintained. This would include a requirement that the seed is produced under similar conditions as to certified seed which would include the use of 400 metre isolation zones, nominating an in-field service provider and strict storage and handling hygiene procedures.

Allowing for the use of FSS with GM canola varieties adds an additional complexity in understanding where these varieties may be grown. However, given the importance farmers place on the use of FSS, it is important that open pollinated GM canola varieties incorporate systems to manage this circumstance. There is a strong incentive for Monsanto to ensure seed quality is properly maintained through the FSS system to protect the effectiveness of the technology and make certain they get paid for the use of the technology.

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[38] OGTR comment in RARMP for Bayer and Monsanto.

Maintaining purity at planting

Purity at planting is a function of the seed purity and cleanliness of planting equipment. The time required to clean planting equipment varies with the type of planting equipment and the cleanliness desired. The time required by farmers cleaning planting equipment between traditional seed varieties or grain types is likely to be less than maintaining GM/non-GM segregation, where the planter must be cleaned down more carefully.

Alternatively, farmers may choose to implement management systems to minimise the risk of adventitious presence such as planting the non-GM varieties first and eliminating the need to clean down prior to planting.

A study assessing the time it would take to clean down typical planting equipment used in the US Midwest to effectively segregate GM and non-GM soybeans showed that high levels of purity could be readily achieved with good planter hygiene[39]. It concluded that it would take approximately 25 minutes to obtain 99 per cent purity in a 12 row planter and 55 minutes for 99.9 per cent purity. While Australian planting equipment varies considerably from that used in the US, in addition to seed type differences, this does provide an indication of capacity to achieve sensitive thresholds for planter hygiene as well an indication of time requirements to achieve a satisfactory clean down.

Discouraging cross pollination

While canola is a predominantly a self-pollinating species[40] there is a risk of cross-pollination between GM and non-GM canola varieties being a potential source of adventitious presence of GM material in non-GM crops.

A large number of studies have been undertaken to examine the rates of out-crossing in canola with a range of results. Differences in outcrossing rates reported in the scientific literature may be attributed to (or are likely due to) differences in cultivars, experimental design, the size of pollen source and recipient crops and spatial arrangements, local topography and environmental conditions[41]. A review of the major studies [42] showed that:

- levels of outcrossing decrease with increased distance from the pollen source, with most outcrossing occurring in the first few metres;
- low levels of outcrossing have been reported up to 400 metres with some irregular outcrossing seen at distances of up to 2.5 km, presumably due to insect transfer;

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39 Hanna 2000; Hanna and Greenless 2000.

40 Salisbury 2002.

41 Eastham and Sweet 2002 (OGTR Bayer RARMP).

42 Salisbury 2002.

- a recent Australian field scale study[43] assessing outcrossing between imidazolinone tolerant canola variety and traditional canola recorded a maximum outcrossing rate of 0.225 per cent immediately adjacent and no outcrossing was detected at 69 per cent of the sites; and
- the results from this Australian study showed that in the great majority of cases, even in adjacent canola fields will have pollen flow in a range of 0-0.07 per cent.

In his review of international and Australian scientific reports regarding canola pollen flow and volunteer management, Salisbury[44] said that no system of commercial field production could guarantee 100 per cent purity because of pollen flow and seed movement. He concluded that good management practices including the use of separation distances between GM and non-GM crops should ensure that required purity levels are met.

In their respective CMPs, Bayer Crop Sciences and Monsanto have recommended a separation distance of at least 5 metres, combined with other nominated good agricultural practices, to keep the probability of adventitious presence below 1 per cent in commercial crops and 400 metres for foundation seed canola or FSS. Farmers growing GM varieties will be also be required to advise adjacent neighbours of where they will be planting these varieties.

Managing volunteers

Volunteer control is a normal part of cropping management and this will also extend to GM canola varieties. Canola has the ability to persist in the in the soil allowing the emergence of volunteers over several years[45]. Overseas studies have shown that seed losses at harvest can range from 1.5 per cent to 9.9 per cent[46]and improper harvester settings and excessive harvester speed are seen as contributing factors[47]. Seed loss at harvest can also be reduced by windrowing prior to harvest[48].

Trials of GM canola have shown that the vast majority of germination occurred in the first year. There was a greater tendency for second or third year germinations in the late spring and summer sown trials.

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43 Conducted by Rieger 2002 and reported in Salisbury 2002.

44 Salisbury 2002.

45 OGTR Bayer Monsanto RARMP paragraph 264.

46 CETIOM 2000 France (1.5-8.5 per cent) and Gulden *et al.* 2003 Canada (3.3-9.9 per cent).

47 Gulden *et al.* 2003.

48 Thomas 2000.

The monitoring reports for GM herbicide tolerant trials during 1996-2001 indicated that volunteer populations following the trail were generally adequately controlled by broadacre cultivation and herbicide application[49].

The CMPs recommend that a combination of thorough planning for volunteer management and good agricultural practice will provide an effective control of GM canola in cropping systems.

Maintaining purity at harvest

Machinery hygiene plays an important part in minimising adventitious presence throughout the supply chain. At the on-farm level this extends to planting, windrowers, harvesting equipment, storage facilities, transport equipment as well as items such as augers and chaser bins.

The CMPs provide a good insight into specific components of these machinery items where seed is likely to lodge and recommended management practices to ensure good hygiene.

Windrowers are commonly used prior to canola harvest to cut the semi mature canola plants to reduce harvesting risk and improve harvesting efficiency. Similar to harvesters, windrowers are a potential source of transporting weed seeds between farms and are thus subject to thorough cleaning procedures.

Cost of achieving purity on farm

Table 18 presents an estimate of the costs involved in machinery clean down but it has to be noted that these will vary considerably between farms depending on the type of machinery, clean down methods employed and the number of pieces of machinery to be cleaned.

Table 18 **Indicative costs to maintain machinery hygiene on farm (based on 200 hectare canola crops at 1.5 tonnes/ha)**

Activity	Labor	Assumed Wage	Labor Cost	Quantity Flushed	Premium for non-GM	Flushing Costs	Labor +Flushing Costs	Total production	Labor + flushing costs/tonne
Clean planter	1 hour	$40/hr	$40.00	n.a.	n.a.	n.a.	$40.00	300 tonnes	$0.13
Clean harvester	0.5 hours	$40/hr	$20.00	2 tonnes	$5/tonne	$10.00	$30.00	300 tonnes	$0.10

Source Farm Horizons / AcIL Tasman Adopted from Bullock, Desquilbet & Nitsi (2000)

49 Salisbury 2002 p 34.

However, it does provide a level of magnitude of the cost that can be associated with machinery clean down. As has been discussed already, these costs can also be further reduced by first using the machinery for non-GM grains reducing the need for the machinery cleans down during harvest.

Total farm capacity to minimise adventitious presence

The European Commission conducted a similar investigation[50] of potential rates of adventitious presence on-farm for self-pollinating oilseed rape in 2001 in Europe (Table 19). The findings were based on farmers using good agricultural practice and segregation systems.

Table 19 **Estimated average potential rates of adventitious presence at various stages of farm production***

	Likely Australian AP based on submissions to this report and international trials.	EU findings
Seed	<0.5 per cent	0.3 per cent
Planting	0 per cent	0 per cent
Cross Pollination	0.1 per cent	0.2 per cent
Volunteers	0.2 per cent	0.2 per cent
Harvesting	0.01 per cent	0.01 per cent
Transport	0.01 per cent	0.05 per cent
Storage	0.01 per cent	0.05 per cent
Total	**0.83 per cent**	**0.81 per cent**

* Based on the use of good agricultural practice and following systems outlined in the Crop Management Plans

Source Farm Horizons / ACIL Tasman

7.2.6 Harvesting

There are several means if achieving harvester hygiene to allow for an effective non-GM segregation including the use of different harvesters or a combination of different clean down procedures ranging from an extremely rigorous process to remove virtually all seeds from the harvester to less exacting measures. [51] Most US certified seed producers use a combination of a thorough clean down, which takes two people approximately two hours[52].

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50 European Commission Scientific Committee on Plants – Opinions on the Scientific Committee.

51 Bullock, Desquilbet & Nitsi 2000.

52 Ingemansen 2000 (Bullock etc).

Alternatively, high levels of seed purity can be obtained by using less rigorous measures to manually clean grain from the harvester combined with a flushing of the harvester. [53] By using this procedure it took two people approximately fifteen minutes in the field to clean the machine, then harvested approximately two tonnes of soybeans to "flush" the machine, and obtained at least 99.8 per cent purity[54].

Similar findings were reported in a harvest machinery study conducted by Monsanto in Southern NSW during the 2002/2003 harvest. The study assessed a series of harvesters for residual canola accumulation at three different times:

- upon completion of harvesting and prior to cleaning;
- upon completion of a standard "farmer-type" clean down; and
- upon completion of thorough clean down procedure.

The "farmer-type" clean down was typified by blowing down the harvester at the normal grain accumulation points followed by a brief running of the machine with all of the hatches open, although, it did not include removing the sieves and cleaning the auger table. Whereas the thorough clean down procedure required a greater degree of difficulty and could not be routinely achieved in a harvest scenario.

- eight harvesters were assessed for seed residual after harvesting canola and prior to cleaning with results ranging from 0.057-0.12 per cent of the bin size of each machine;
- five harvesters were assessed for canola residual after a "quick-type" farmer clean with results ranging from 0.041-0.006 per cent of the bin size of each machine; and
- two harvesters were assessed after a thorough clean down with negligible amounts of canola remaining.

Both studies indicate that high degrees of harvester cleanliness can be achieved with relatively quick and easy cleaning procedures and management practices. The CMPs outline recommended harvester cleaning techniques.

7.2.7 Transport off the farm

Following harvest (and a possible but unlikely period of on farm storage after harvest) the canola is usually transported by truck to a nearby country receival location. A number of different truck configurations are used to transport grain although they are all of a self-cleaning design to maximize unloading efficiency. In most cases trucks can be easily swept clean.

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53 The mixture of GM and non-GM would then have to be segregated as GM canola.

54 Greenless, 2000; Greenless and Shouse 2000 (Bullock).

Industry guidelines for transport hygiene have been developed outlining the management practices required to maintain good hygiene, such as the Australian Oilseeds Federation (AOF) Reference for Bulk Transport of Oilseeds[55].

GrainCorp's decision not to accept side delivery trucks beyond the 2004-2005 harvest is likely to further decrease the opportunity for adventitious presence.[56] This is because the rear tipper delivery trucks that will replace them are less as likely to hold small quantities of residual grain after emptying and they are easier to inspect and clean.

7.2.8 Grain storage and handling – Country Elevators

Grain storage and handling throughout Australia has seen significant change over the past decade with three bulk handling companies now dominating grain storage in Australia. GrainCorp, CBH and Ausbulk are the major companies with GrainCorp being the dominant grain handler to east coast Australia. More recently, a number of new participants including AWB and the Australian Bulk Alliance (ABA) have built over 1.5 million tonnes of storage capacity in eastern Australia, with most of this storage capacity being of bunker type construction. Increasing efficiency and safety demands have resulted in the traditional bulk handling companies closing a number of the smaller and country receival facilities in favour of a lesser number of larger, more efficient country storage facilities.

Handling procedures

Upon receival at a country receival location, all grains are weighed, sampled and assessed for a range of quality parameters that varies depending upon grain type. In the case of canola, the load is assessed for weight, oil content, impurities, moisture and broken seeds. If the grain meets the minimum receival quality for its specific grain type it is then segregated accordingly.

The grain receival docket records all of the weight and quality information as well as providing the legal transfer of ownership from the grower to the marketer. When the grower or their authorised delivery agent signs the grain receival docket, they are also verifying several aspects regarding the grain quality that can not be readily analysed upon delivery. This includes the variety (which is important in wheat and malt barley classifications) and that that all pesticide applications meet regulatory requirements. The grain receival docket also had a provision for a GM declaration which asks whether the grain is a

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55 AOF www.australianoilseeds.com.

56 GrainCorp GrainLine harvest edition Newsletter Vol. 29 October 2003.

genetically modified variety. GrainCorp will require this to be completed upon any commercial release of GM canola.

In discussions with GrainCorp they advised they have established a year one plan to handle GM canola in Victoria based on a limited release of less than 10,000 ha that would involve the establishment of dedicated sites for GM canola. Deliveries of non-GM canola into these storages will not be an issue but adjacent non-GM storages would implement a prudent testing regime to identify mis-represented GM deliveries. Deliveries to non-GM storages would be required to declare the load was non-GM and a sample would be retained as a historical reference point for trace back purposes. Storage operators would receive specific training to understand the additional sensitivities and requirements relating to the handling of non-GM canola. A 500 tonne running sample would be tested to ensure the GM content was below a threshold of 0.9 per cent adventitious presence. Under this scenario, the risk of accidental mixing of GM canola in the dedicated non-GM storage would occur through miss-representation of a GM delivery which would be captured through the 500 tonne running sample test. The identification of a positive GM would then initiate testing of the appropriate trace back samples to identify where the miss-identification had occurred.

The level of complexity to achieve non-GM segregation would increase as the production of GM canola increases. While initially it is planned that GM canola would be stored in separate locations it would become necessary to have storages that received both GM and non-GM canola and mixed delivery sites handling GM and non-GM canola as well as other grains as GM canola production expands. In this scenario, the probability of possible contamination through the grain handling process increases.

7.2.9 Transport from country silos

Grain is typically transported from the country receival location to the export terminal or domestic market by rail. Specific grain wagons are used to transport grain consignments. The wagons are of a self-emptying design and each has a capacity of approximately 50 tonnes, and the number of wagons per train varies between ten and thirty. Increased efficiency demands have seen a trend towards unit trains that only pick up from one country elevator rather than a "milk run" approach. However, the majority of trains in Victorian would still pick up from more than one country elevator.

Freight Australia is the major train operator for grain in Victoria.

Prior to loading trains are inspected for cleanliness by the loading attendant however the position of the loading platform and the nature of the wagons do not allow for detailed examinations. Anecdotal evidence from Freight

Australia suggested that residual in the wagons after dumping was less than 5 kg which is mainly caught on the construction seams in the wagon.[57] After loading each wagon is accompanied by a wagon certificate stating its weight and quality details.[58]

In the case of polished white rice, the marketer has requested a "nil" tolerance and appropriate measures have been implemented to ensure an extremely high level of purity.[59] This includes each wagon having to be washed in a purpose build facility at Echuca prior to loading polished white rice. There are several increased costs associated with this process as each wash costs $60 per wagon although time loses of up to two days associated with wagon relocation could be more significant.

The introduction of GM canola is not likely to impose any additional costs onto the rail industry to achieve a one per cent tolerance. However, if market requirements trying to achieve nil tolerance then it is likely that additional and possibly significant freight costs may be incurred to cover wagon cleaning and relocation costs.

7.2.10 Victorian export terminals

Victoria has three grain export terminals. Geelong and Portland are owned by GrainCorp and the Melbourne terminal is owned by Australian Bulk Alliance. All of the terminals ship multiple grain products including wheat, barley, canola and legumes with Geelong also shipping bulk rice. Geelong and Portland also ship woodchips.

By design, export terminals are high throughput facilities that are constantly receiving and shipping grain throughout the year. As a result they are usually more complex than country receival facilities with multiple grains and multiple grain paths. Each of the terminals can receive by road or rail although the vast majority of receivals come via rail because the greater economies. The capacity to segregate grain varies considerably at each terminal but all have a degree of segregation allowing them to store multiple grain types which allows them to more efficiently receive and ship.

Procedures

Upon receival at the export terminal grain is sampled, assessed and checked against wagon quality certificates and then segregated according to a quality segregation plan. GrainCorp has developed a range of procedures to cater for

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57 Interview with T. Roache of Freight Australia September 2003.

58 Unit wagons only have certificates for the first and last wagon.

59 GrainCorp does not guarantee nil tolerance but aims to achieve a nil detectable level.

different purity requirements from different marketers from delivery into the country receival storage until export. GrainCorp is already using systems to handle sensitive grains and market requirements that they will use as a model to manage GM canola in the supply chain.

GrainCorp has already developed plans to handle grains with sensitive purity requirements which will be readily adoptable for GM canola. Grains demanding identity preservation with the highest levels of purity (<0.1 per cent) such as polished white rice and organics is already being achieved through designated storages but requires significantly more cleaning and testing along the chain to ensure purity levels can be achieve. Whereas identity preservation requirements to achieve purity requires such as PRF (<1 per cent) cargoes typically handled through the normal storage and handling system without any special cleaning operations of handling equipment, with testing prior to shipping to ensure they are within the market requirement.

7.2.11 Cost of maintaining GM purity in central storage system

Bulk handlers that the consultants have spoken to have indicated that they will be adopting a user pays philosophy towards the introduction of GM canola whereby GM growers would be required to pay for any additional segregation costs associated with these varieties. This will mean that while GM canola volumes remain relatively small the cost of GM canola storage is likely to be slightly higher than conventional canola varieties possibly as low as $1-2/tonne extra. Systems and procedures are already being used to manage products with higher purity sensitivities such as PRF and these systems can be readily adapted to identity preserve GM canola. Any additional fees to store GM canola would be to cover additional cleaning requirements following storage, extra testing and costs of associated with opening additional storages if this were to be required.

Additional costs may also be incurred to maintain the identity preservation of GM canola at export terminals as well. Export terminal costs would vary significantly depending on the level of purity demanded by the market. Higher levels of purity such as is required for polished white rice are likely to incur significant additional costs to compensate for significant additional cleaning requirements and reduced operational flexibility. GrainCorp indicated export receival charges for polished white rice shipments were significantly higher than for standard grains[60].

However, beyond the initial introduction the grower take of GM canola, market demands for segregation requirements or the extent to which they can

[60] Personal conversation with P Clamp, GrainCorp.

be commingled with conventional canola varieties will all impact the ongoing costs of segregation.

Box 2 **Eyre Peninsula**

The practicalities of regional zoning.

Since state governments were given the right to designate themselves GM-free under the Gene Technology (Recognition of Designated Areas) Principle 2003, the Eyre Peninsula and Kangaroo Island have been granted the right to declare themselves GM-free.

The decision was based on a range of information, a large part of which was presented to the SA Parliamentary inquiry held in 2003. During this inquiry market information was presented by several organisations including the AWB. As part of the AWB submission a strong suggestion that its markets, although unsure of the exact level of tolerances, was indicating zero requirements for GM material. The AWB also in its submission expressed doubt as to ability of the current supply chain to deliver these tolerances. It appears that the AWB has softened in this approach somewhat agreeing recently that a limited commercial release of GM canola would allow a testing of the supply chain.

Port Lincoln on the south eastern tip of the Eyre Peninsula is South Australia's only deep water port where panamax ships can fill to capacity. As a consequence of this the Port is used to top up shipments collected around South Australia. The inability of exporters to finish shipments of canola in this port will mean Eyre Peninsula and other port zones in South Australia will incur additional freight costs.

7.2.12 Maintaining GM segregations in domestic markets

Cargill, the major oilseed processor said a similar system to the current flushing practices would be introduced as required in the event of the commercial release of GM canola varieties where customers were seeking non-GM products. While the production of GM canola is relatively small it will be relatively easy for domestic buyers to access non-GM canola by geographic purchasing strategies.

7.2.13 Certification requirements

While a number of domestic markets are expressing the desire to buy non-GM oil and meal, they are still largely unsure of what type of non-certification they require. Overseas experience has shown that the type of identity preservation required can have a significant bearing on the cost structures that are imposed.

The cost structure certification will vary depending on the type of identity preservation requirements are agreed upon to verify the integrity of the product. A "soft IP", that is where buyers are satisfied with certificates stating the product has been purchased from an area where GM varieties are not grown and minimal testing is required, such as purchasing soybeans from Brazil, can be relatively inexpensive. Whereas a "hard IP" which involves a more rigorous approach and a higher costs structure involving identity preserved storage and an increased testing regime will be more expensive.

When GM soybeans were first introduced into the US non-GM soybeans were readily available and most markets were satisfied with a "soft IP" and premiums for non-GM soybeans ranged from between US$5-9 per tonne. By 1999-2000, when over half of the US soybean crop was produced from GM varieties[61], premiums for non-GM soybeans had increased to US$20-25 per tonne and markets, such as Japan began to demand "hard IP" to substantiate non-GM claims[62].

A similar pattern is likely to develop in Australia whereby markets that require non-GM canola will source readily accessible non-GM canola and as the production of GM canola expands, buyers demanding non-GM seed would be forced to pay premiums to access this quality.

7.2.14 GM testing capabilities

Testing methods

Suitable testing methods to determine the presence of GM material in the supply chain remains an essential component of preparedness if GM crops were to be commercially released in Australia. Agriculture Fisheries & Forestry Australia (AFFA) and the Australian Government Laboratories (AGAL) published a report which provides a detailed assessment of the available methods for the detection of GM materials within Australia. [63]

The report identified two main testing methods available for the detection if GM materials along the supply chain:

- DNA based or PCR (Polymerase Chain Reaction) tests; and
- Protein based tests (ELISA and Lateral Flow Strips).

Both of these test methods have widely different characteristics that influence their suitability for testing of GM materials in various situations.

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[61] United States Department of Agriculture – Agricultural Statistics Board Acreage Report June 2000.

[62] Correspondence with R Rawling Cargill UK

[63] Review of Technologies for Detecting Genetically Modified Materials in Commodities and Foods 2002, K Griffiths, L Partis, D Croan, N Wang and R Emslie.

DNA-based tests are very sensitive tests that have to be performed in specialised laboratories whereby specific DNA is copied and multiplied in order to identify particular GM materials. This testing method can be used to provide a quantitative assessment of the amount of a specific GM material present in a sample. It is time consuming and expensive because of the specialised equipment and highly skilled personal required to perform the tests.

Table 20 **General Characteristics of PCR Methods**

Advantages	Very Sensitive Any tissue type can be analysed since all parts of the plant cell carry the same DNA Suitable for a range of applications from screening to event specific methods and quantification
Disadvantages	Time consuming in preparation time Generally more expensive that protein-based methods (A$100-500 per test) Moderate to high equipment costs Strict quality assurance required to minimise risk of cross-contamination Generally, a laboratory analysis
Limitations	Suitable for a range of raw to processed products provided that DNA can be extracted in sufficient quality and quantity Moderate technical skills required There is no single PCR method that will detect all GMOs

Source Farm Horizons / ACIL Tasman

Protein based testing for GMOs relies on identifying specific proteins produced by a GMO cell. This is usually done through the use of antibodies that identify specific GM proteins. There are two main types of protein tests; ELISA and Lateral Flow Strips.

ELISAs range from very sophisticated tests that provide semi-quantitative results to relatively cheap systems that are suitable for on-site use that simply provide a visual, qualitative result.

Table 21 **General Characteristics of ELIZA Methods**

Advantages	Moderate sample preparation Relatively fast test (2-4 hours including preparation) Qualitative or semi-qualitative Low-medium costs (A$10-50)
Disadvantages	Less sensitive that DNA detection methods ELIZA kit must be stored at 4°C Lack of availability of relevant antibodies Generally a laboratory analysis
Limitations	Suitable for a range of raw to processed products provided that DNA can be extracted in sufficient quality and quantity Sensitivity ~0.5 to 1 per cent GMO Moderate technical skills required There is no single PCR method that will detect all GMOs The majority of ELISA kits only test one protein

Lateral Flow Strip technology is the other major protein detection method. It is a variation of the ELISA method but the antibodies are configured onto a test strip in specific zones similar to pregnancy testing kits sold by pharmacies.

Sample preparation for the lateral flow tests is quick and easy simply involving crushing the sample and mixing it with a protein extraction provided in the kit. The lateral flow strip test is then dipped into the prepared solution and after a short time the protein zones on the test strip will change color if GM proteins are detected.

Table 22 **Characteristics of Lateral Flow Strips**

Advantages	Minimal sample preparation Rapid results (5-10 minutes) Qualitative Relatively cheap, (A$5-20) Strips can be stored at room temperature Simple to perform with minimal training No expensive equipment required Suitable for on site testing
Disadvantages	Not very sensitive (~1 per cent (w/w) GM protein) Lack of availability of relevant antibodies Development of appropriate antibodies can take months or years
Limitations	Limited to one or a small number of traits per test Lateral flow tests are not event specific Some GMOs do not express a detectable level of the target protein Only available for a limited number of GM products Most suited as a rapid test for raw, whole or ground, uncooked commodities

Source AFFA 2003

Sampling procedures

As is the case in broader grain sampling techniques, uniform and adequate sampling procedures play a critical role to ensure representative samples are drawn prior to testing. In order to define suitable procedures for the testing of GM grains in Australia AFFA, the Stored Grain Research Laboratory (SGRL) and the Bulk Handlers Association have been conducting an ongoing study to identify appropriate testing principles and procedures along the supply chain. This report is expected to be released in 2004.

Similarities between grain handling systems between countries mean that other international studies, such as "Sampling for the Detection of Biotech Grains"[64] by the USDA Grain Inspection (GIPSA) service are likely to provide a significant insight into suitable sample systems for Australia. The AFFA study examines in detail the factors affecting a sampling plan and outlines the

[64] http://www.usda.gov/gipsa/biotech/sample2.htm.

suitability of various test methods for different types of canola products such as raw whole seed, canola meal, cold pressed oils and highly refined oil.

Availability of tests for InVigor® and Roundup Ready® canola

There are currently several types of Lateral Flow Strips available for both the InVigor® and Roundup Ready® canola. InVigor® Hybrid canola utilizes the same herbicide tolerance gene as Liberty Link® grain varieties in North America and as such can use the same test kits. Similarly Roundup Ready® canola can use test kits designed for other Roundup Ready® products in use in other parts of the world. Tests conducted by AGAL have shown that both the Liberty Link® and Roundup Ready® test kits were effective in identifying the presence of the specific proteins in each of the canola varieties under Australian conditions.[65]

AGAL has reported that the Roundup Ready® test kits can detect below 0.5 per cent presence while the InVigor® had limit of reading of 1 per cent[66].

There is no one Lateral Flow Test that can detect both Liberty Link® and Roundup Ready® canola so two separate strip tests would need to be used to identify the presence of GM canola if both varieties were to be commercially released. The cost of these test kits from a distributor of a leading supplier of Lateral Flow Strip tests is $11.95 per test based on 100 strips.[67]

GrainCorp has indicated that Lateral Flow Strips would be used to identify the presence on GM canola in accordance with their segregation strategies. The AFFA report also indicates that Lateral Flow tests are suitable for detecting GM material in canola meal. Cold pressed canola oil can be tested for GM material with PCR tests however highly refined oils, such as the vast majority of canola oil produced in Australia can not identify if it has been produced from GM material because the DNA has either been removed or destroyed during processing.

ELIZA and PCR tests are also available for both varieties however their use is likely to be influenced by the type of non-GM certification that is required by the market.

The testing regime likely to be used by GrainCorp and other handlers will rely on the lateral flow or “strip test” particularly in the early years should commercial introduction of GM be allowed. The test is cheap and takes only 5 – 10 minutes for a result. The testing is likely to be done on a running sample

65 Personal conversation with K Griffiths AGAL.

66 Personal conversation with K Griffiths AGAL.

67 Based on product list from Foss Pacific the Australian distributor of test kits manufactured by Strategic Diagnostic Inc (SDI).

system where regular checks of grain stacks are done to ensure any mistakes are identified early and before large quantities of grain are affected. The cost is likely to be $12.00 a test (one test per GM canola variety will be needed) and will form part of GrainCorps standard testing regime and stack assurance protocols that incorporate a range of quality tests.

PCR tests will be done if required by the buyer and at the buyers (user pays) expense. At $500 per test, and a turn around time of 2 – 3 days, they are considerably more expensive and will probably used where tolerances are lower than industry standards.

7.2.15 Segregation costs

There are currently no differential costs for grains that have standard handling and transport requirements. For example, there are a number of different wheat types handled in Victorian. These varieties range from feed grades to higher protein bread making wheats and have a range of different end uses. These grades do not attract increased handling or storage charges based on segregation. It is only if a grain where to have substantially different handling requirements or more extensive clean down or preservation systems that extra costs are incurred and those requiring these extra standards would pay the additional costs.

Table 23 outlines the known costs and likely levels of contamination of the canola to canola as detailed through this section. This is not intended to be an exhaustive review of all of the costs but does provide an indicative guide as to the likely direct costs that are currently known and the levels of commingling likely at each point. Where costs are not fully known overseas experience has been used to identify likely ranges expected.

Table 23 **Summary of identifiable cost and sensitivities**

	At < 0.9 per cent segregation $/tonne	Adventitious range likely
Seed	Contained in the seed price	0.0 – 0.5%
Production Seeding equipment clean Auditing and monitoring Training	 $0.13 $4.00 $1.00	< 0.3%
Harvesting (clean down costs only)	$0.10	0.041-0.006%
Transport to elevator	Negligible	< 0.00021%
Country terminal	User pays depending on volumes	NACMA standards for GM/non-GM canola are set at 0.9 per cent max and 0.6 per cent for conventional canola in wheat and malting barley
Transport to Port		
Port Handling		

Note: farmers costs of auditing and training are based on a property producing an average of 300 tonnes of canola per year

Source: Farm Horizons / ACIL Tasman

Bullock (2000) has concluded that the majority of the costs associated with the costs of segregation occur not at farm level where farmers practice good machinery hygiene principles and clean down procedures but in the reorganisation of grain handling infrastructure. Bullock proposes that the majority of the costs will be incurred by increased segregation requirements imposed on a grain handling system not originally designed for it. Bullock estimates these costs to be approximately $10.00 US dollars tonne for non GM soybeans (Bullock 2000). This would equate to approximately $13.50 – $14.50 per tonne for Australian grain handlers. Bullock's analysis does not take into account any increase in grain quantities produced which would offset some of the increased costs associated with under utilisation. Nor does he consider the positive effects in efficiency that may result from improved practices and management from the introduction of quality assurance systems if implemented.

Table 23 summarises the range of cost incurred by the Iowa Cooperative Grain Elevator from the introduction of GM and other segregations (Bender 2003). The costs determined in these trials support the conclusions drawn in Table 23 show the variations likely with different segregations and products.

Table 24 **Total average additional production costs ($US/bushel), for selected value added crops in Illinios**

Value added crop	Production costs	Harvesting and Marketing	Total producer costs
White food grade corn	0.03	0.46	0.49
Yellow food grade corn	0.40	1.21	1.61
Tofu soybean	0.48	2.54	3.02
Non-GM soybeans	0.07	0.10	0.17

Data source: Bender K and L Hill 2000

Table 25 **Total average additional handling costs ($US/bushel), for selected value added crops in Illinios**

Value added crop	Total Handler Costs
White food grade corn	0.15
Yellow food grade corn	0.11
Tofu soybean	0.06
Non-GM soybeans	0.10

Data source: Good D and K Bender 2001

Hurburgh (2003) and the Iowa State assisted a large grain elevator with the application of quality management systems product tracing and implementation of related statistical process controls. After monitoring the firm they reached the conclusion that:

> "Source verification and certification will change the mindset of agricultural businesses. In addition to providing security for very specialised products with restricted markets, this effort will reduce operating costs because a rigorous study of work processes is required for implementation. The conversion of commodity markets to produce markets will improve the profitability and efficiency of market participants. The tolerance for purity in both specialty and commodity markets will determine the actual costs associated with the programs."

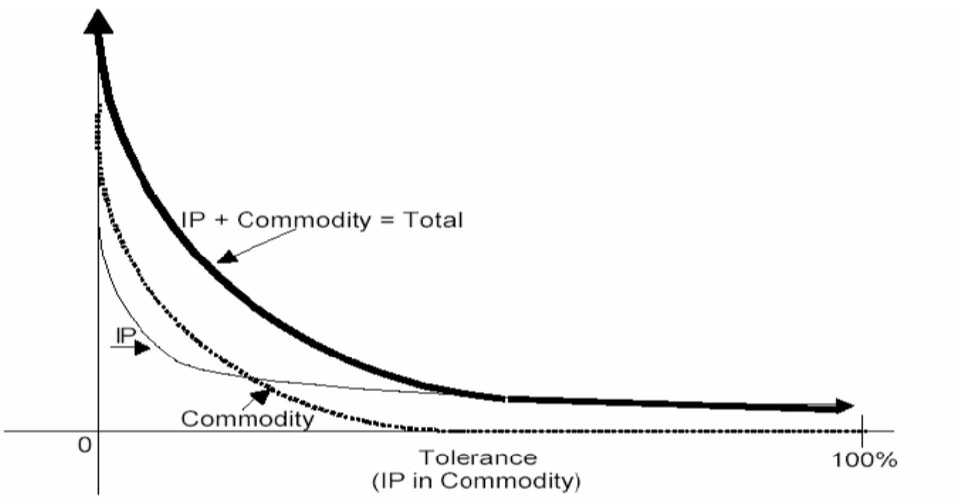
Table 26 **Annual cost – benefit summary for quality management system at one elevator**

Operation	Cost Savings
Grading	$1,085
Inventory Control	$10,675
Operations Efficiency	$2,180
Regulatory Compliance	$5,300
Employee Development	$3,400
Total	$22,640
Cost of QMS	$11,250
Ratio:	2:1

Source: Hurburgh (2003)Farmers Cooperative Elevator Co., Farnhamville, Iowa

Chart 7 demonstrates the cost effect of changes in levels of purity as analysed by Hurburgh and the Iowa State government and the Farmers Cooperative Elevator Company in 2003. From this chart we can see that the costs of IP is partially dependent on not only on the volumes of grain handled but the level of tolerances demanded.

Chart 7 **Cost of isolation/segregation to IP and commodity programs**



Source: Hurburgh (2003)

Adventitious presence in non-GM grains at levels of greater that one per cent are most likely to occur as a result of breakdowns in internal processes, human error or machinery malfunction such as faulty doors or valves rather than an inability of the supply chain to achieve this level of tolerance. For this reason it will be important that thorough, systematic approaches towards the handling of GM products which encompass a quality assurance based approach with regular testing intervals are implemented.

Most components of the Australian supply chain, including seed production, storage and handling and rail transport, already have well developed quality assurance processes built into their business systems. Quality assurance systems are not as widespread in other areas of the supply chain which are more fragmented such as grain production and road transport. However the requirements imposed on GM canola growers under the Crop Management Plans by the Bayer and Monsanto rely heavily on quality assurance principles and provide a systematic framework to allow for effective segregation on farm and with the use of road transport.

In the vast majority of cases, industry has shown that it is well prepared for a phased introduction of GM canola with detailed plans already developed for how GM canola would be managed along the supply chain. In most cases, industry preparedness planning is well developed, largely through the GTGC, but also through the individual Crop Management Plans of the technology companies, the seed industry guidelines as well as individual planning by a number of companies most directly involved in storage and handling, processing and rail transport. The proposed CRG monitoring further strengthens this self-regulatory coexistence model by establishing a single independent body to monitor and report on coexistence performance.

While a few people have raised concerns about a self-regulatory approach to coexistence, international experience has suggested that countries already producing GM crops have been able to maintain sensitive non-GM markets and sales of other non-GM grains through existing commercial arrangements without the need government involvement.

7.2.16 Likely adoption scenario

It can be expected that if GM canola is approved for release in Victoria early in 2004, the take-up by farmers will be tentative, at least for a year or two. There are at least three reasons for this assessment:

(1) farmers will be uncertain about how much agronomic advantage the technology will provide in their particular climatic, managerial and market situations;

(2) farmers will take time to make decisions about the acceptability of the terms the GM companies offer for access to the technology; and

(3) even after release, a few uncertainties will remain about the regulatory regime that will apply to the growing of GM canola. For example, beyond the date of release:

(a) the APVMA, which has regulatory responsibility and oversight for agricultural chemical use will retain responsibility for resistance management in regard to the chemicals used with GM canola; and

(b) the OGTR has said it intends to keep under review and report after three years on the implementation of GM canola commercial plantings and it will call for public input to the proposed report as part of the responsible oversight of the progress of this and other GM plants that may be released.

Nonetheless, the pace of adoption of GM canola will not be constrained (as was the case with GM cotton, for example) by the imposition of area limits by the OGTR. The VFF's submission supports this view, as did the evidence we collected during consultations with industry. The farm organisations representing most farmers said GM technology offers agronomic and end-product advantages that a large number of Victorian cropping enterprises are interested in adopting.

It is difficult before the event to defend anything but fairly general claims about the commercial worth of the technology. The fact remains that the extent of adoption will ultimately be determined by the on-farm economics and this will vary from case to case.

7.3 Canola pricing

Over time, if the technology proves to benefit canola growers, which our analysis directs us to conclude, then the costs savings of farmers will be passed on to consumers. This price decline follows established patterns of commodity price movements which are well documented. Canola price decline will be the result of technology introduction across soybean and canola and other fat and oil production systems.

The main Victorian canola price drivers are:

- export parity pricing, driven by Canadian canola production and the soy bean crush complex;
- domestic basis depending on switching from import to export parity;
- global demand for fats and oils; and
- technology costs of production and segregation.

7.3.1 Likely pricing evolution

Introduction of technology years 1 -2 ?

- GM producers will incur most of the costs of segregation as their crops will be small in area. However, this grain is likely to go straight to port for export which may lower these costs. Monsanto may contract crops at farm gate and subsidise most of the costs.

- Non GM growers will get the usual export parity price.

Intermediate stage pricing (switching period)

- Technology adoption will increase the area of GM relative to non-GM. Additional to adoption by current canola growers;
  - the canola area is likely to increase as crops are grown in areas previously not possible;
  - canola will better compete on a gross margin basis against other crops and particularly legumes; and
  - the canola area will expand as farming in general, reliant on break crops that could not be grown before, expands.

Long term pricing

At this point the costs of segregation will begin to shift from GM to non-GM. If demand for non-GM grows it is likely that the cost for segregation will shift to non-GM. This will establish a price spread between GM and non-GM equivalent to the costs of segregation. Non-GM will begin to cost more than GM.

Several important elements will contribute to this price spread. The technology of segregation and the level of tolerance required. Technology costs will decline as volumes move through the system (scale effect) and as technology improves.

Added to this cost of segregation is the general trend of segregation in the grains industry. In line with expected international trends more and more segregation will be demanded. Therefore allocation of total segregation costs will no longer be on non-GM but a range of crops.

Underpinning the price for GM and non-GM in Victoria is the export parity price. This determines the cost of domestic GM canola. Therefore the cost of non-GM canola in Victoria will be export parity plus the cost of segregation.

The price profiles of GM will be export parity (Winnipeg price less traditional Australian premiums and discounts and freight spreads) plus non-GM price spread determined by cost of segregation at various tolerances (with a likely base of 0.9 per cent).

Over time the price benefit of GM technology will be shared between producers and consumers. Competition will ensure that as Canadian and Australian canola producers reduce their costs of production the average GM canola price will decline.

This decline in canola price will reduce the non-GM canola price as non-GM will track GM. Additionally the GM/non-GM spread will decline due to likely improvements in segregation technology.

7.4 Who would pay the segregation costs?

In Chapter 2 above we summarised what we considered to the most likely impact on organic and non GM canola of the release of GM canola early next year. In short, we made the points that:

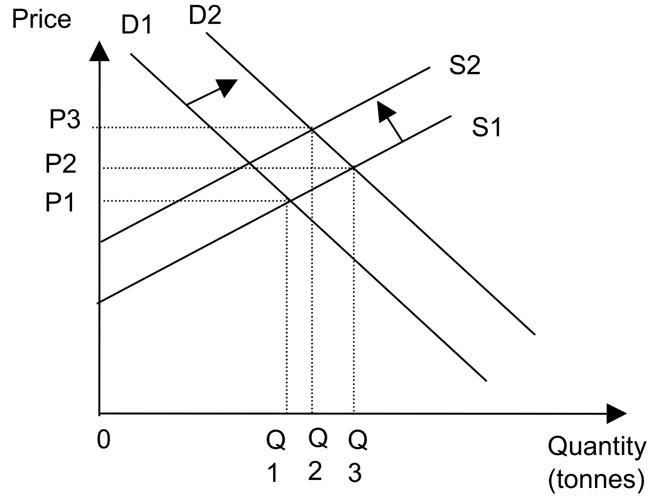
- the separation of organic and non-organic products currently observed in Victoria can be regarded as an indicative case study of the separation of GM and non-GM products that might be expected to be observed if GM varieties were to be released in Victoria;
- the invasion of GM germplasm into practically all canola via pollen drift would effectively eliminate canola from potential consideration by organic farmers as a wheat/pasture rotation plant (if zero tolerances are maintained by most organic certification schemes). Currently there is little organic canola in Victoria due to difficulties in producing economically viable crops; and
- contamination of other grains with GM canola grain in storages, transport vehicles and so on could occur to the point where organic farmers' access to organic food outlets here and overseas would be denied.

However, the demand side of the organic food products story appears to offset some of the supply cost fear outlined above. In particular:

- it has been observed that in the US price premiums increased for organic products after release of GM varieties;
- Australian organic industry representatives agreed that a similar pattern could be observed in Victoria;
- such increases might occur in part due to a new demand for 'natural' products (of which organic foods are the archetype) that would be expressed by some consumers once GM varieties entered the market with the higher prices reflecting the higher unit costs of production of organic status.

The hypothesis here is that the existence and spread of a new type of non-organic product will create a demand not previously expressed for material considered to be traditional in character. Figure 4 below is a depiction of the demand and supply for organic foods before and after a GM release. The demand effect of GM introduction for organics is illustrated by a movement in the demand schedule from D1 to D2. For any given supply situation (eg S1), this implies a higher price to the producer.

Figure 4 **The market for organic food products**



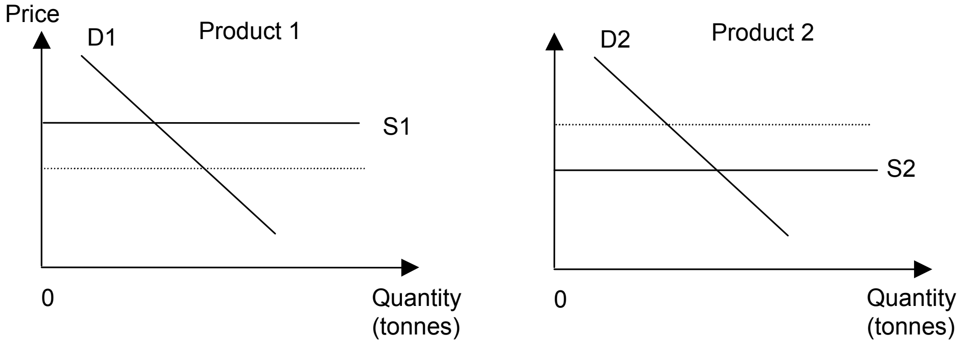
At the same time Figure 5 illustrates the likely increase in segregation costs with the movement of the supply schedule inwards from S1 to S2. The position reached after both influences have worked their way through (say 2 – 3 years down the track) is represented by the intersection of S2 and D2 and a resultant price of P3. As it happens in the diagram this results in a price and quantity for organics that is higher than the pre-GM canola position. We would be the first to admit that the dimensions of the diagram have no empirical meaning at this stage but it illustrates the principle that one would expect a number of offsetting influences to be at work.

Having considered the evidence we believe that the demand shift in favour of organics would probably have a small and perhaps indiscernible effect on prices, because the supply curve for organic food products is probably fairly flat or elastic per tonne.

That is, supply costs do not change very much for changes in quantity supplied. An expansion in organic production is unlikely to bid up the price of farm and distribution inputs need to deliver organic products.

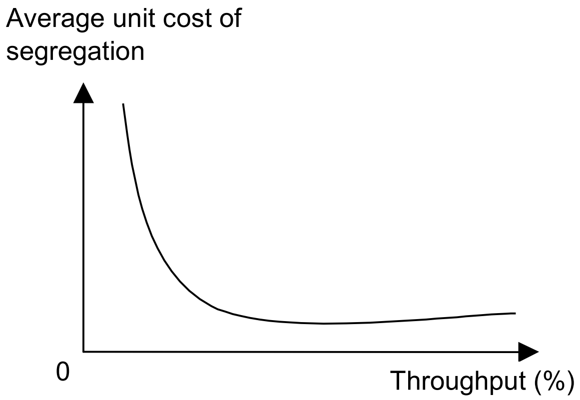
Thus at the end of the day it is cost differences that can be expected to determine the price impact of segregation (Figure 5). If Product 1 (eg organic food) bears the cost of segregation there is a price increase accordingly and a reduction in the quantity demanded unless there is an outward shift in the demand schedule. The segment of the diagram for Product 2 (eg GM canola), illustrates the equivalent impact in that sub market if it bears the cost of segregation.

Figure 5 **Costs of segregation and sale prices with elastic supply**



The consideration of which segments of the canola market would bear the costs of segregation is aided by an inspection of Figure 6 below. The diagram depicts the common sense view that the costs of segregating a particular product will depend on the proportion which that particular grain represents of all of the grains produced and separated. To summarise, we would say, as the diagram illustrates, that for as long as GM canola represents a small proportion of Victorian canola output, its cost of separation will be high on a per unit basis. This we would expect to be the situation in the first three to four years after release.

Figure 6 **Relationship between grain segregation costs and throughput relative to that of other grains**



By contrast if GM were to become the dominant grain type its separation cost burden would be reduced. Technology improvement and the wider demands for greater segregation would work in the same direction, ie reduced unit costs of separation.

Our hypothesis is that these issues are the important ones in determining who bears the cost of segregation, if GM canola is released.

Figure 7 **The market for canola grown in Victoria**

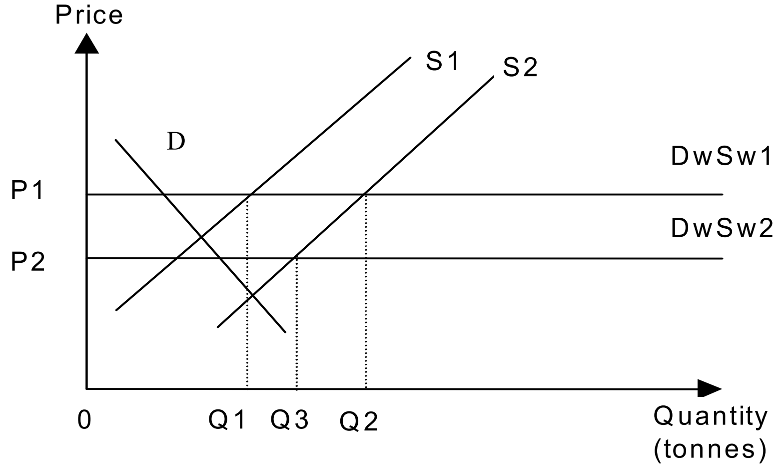


Figure 7 above is meant to depict the Victorian market for all locally grown canola, before and after a hypothetical release of GM varieties. Dw, Sw is what is termed a "world wide price line" — an expression for both world demand and world supply from a Victorian (and Australia) point of view. One of the main insights conveyed is the expected dominating influence of world prices on canola prices. DwSw1 is drawn as a flat line to depict the almost perfectly elastic world prices Victoria and Australia face currently — ie, before widespread adoption of GM canola. DwSw2 is the world price following widespread adoption (the cost savings to producers are reflected in the lower average price for the commodity) that needs to be offered to encourage the production of any given quantity. In Figure 7 the domestic supply schedule S1 is assuming to move to S2 as Victorian production costs are reduced. The quantity produced in Victoria increases as a result from Q1 to Q2 but the subsequent worldwide fall in canola prices reduces the quantity produced to Q3 at a new lower price level P2.

Thus the longer term production impact on GM release is seen to depend significantly on the availability of GM canola to other producers — elsewhere in Australia and internationally — their responses to the reported lower costs of production.

Additional Victorian production would not, of itself push down world price. However, taken in combination with additional production from elsewhere in Australia and elsewhere in the world, world prices would be likely to fall as illustrated above. World canola prices are possibly already significantly lower as a consequence of Canada's adoption of GM given its importance in world canola trade.

Therefore initially at least (pending any further changes in world prices and leaving aside any possible adverse demand side responses to GM canola)

Victorian producers could gain higher net returns through lowering their costs of production.

7.5 Comparison of current and required supply chains at each point

7.5.1 Background and structural issues

As mentioned earlier, as a general rule, regardless of the canola situation, the ability of Victorian food supply chains to compete in global markets will be in part determined by their ability to provide appropriate levels of segregation and identity preservation of all products including grains.

Both the local and overseas evidence indicates that segregation and identity preservation in the grains industry are commercially and technically possible. The Australian grain supply chain has numerous examples of the delivery to international and domestic customers a range of specified products which includes, malting barley to Japanese maltsters, high value rice products to Japan, a variety of milling wheats and the supply of organic wheat barley and oats amongst other organic products. Indeed AWB Ltd says it now offers over 40 grades of wheat for sale to the export market. Each requires a separation process along the entire marketing chain.

At present there are numerous levels of tolerance that are regulated which markets are refining. These tolerances are not static and will respond to new characteristics and issues as they arise.

GM is, and will remain, part of a bundle of values that various markets prioritise. The ranking of these traits will change over time. To compete successfully Victorian producers will need to be able to respond to these market changes. As Victorian producers compete with a bundle of attributes, which includes price, regulated restrictions on what constitutes this bundle would ultimately diminish their ability to compete.

It could be argued that some GM content rules adopted in importing countries are little more than non-tariff barriers intended to protect high cost local producers from international competition. Nonetheless, at present the sentiment of most regulators is to set adventitious tolerances at levels that will not significantly diminish competition in the market. The Japanese position illustrates this as it balances the demands of consumers with the reality that there are only three major grain suppliers able to service its market. Two of these exporting countries' production systems, those of Canada and the US, are committed to GM crops, which make up substantial proportions of their grain output.

Markets are more nimble than regulators and will seek to meet consumer demands if it is profitable to do so. They will seek to satisfy a market demand if the risk is commensurate with the rewards. Again the organic industry is an example of a market demand being satisfied with a commercially developed and administered identity preservation system where the costs of transacting this exchange are accepted by the consumer. A feature of the organic food industry in Australia as elsewhere is the number of different standards associations and monitoring agencies that exist in parallel, each presumably provided services to different clienteles.

7.5.2 Commercial production

While they have shown historically that they can manage segregation, farmers have not always been required to provide evidence that what they produce has been managed in a fashion that would be reasonably expected to minimise its contamination. To be able to do this producers will need to be able to provide evidence of their actions.

It seems clear that farm level quality assurance (QA) systems which present such evidence will eventually be needed if GM canola is permitted to be grown, particularly if, as is expected would occur, new GM output traits are introduced and further GM varieties are licensed and commercially released. In the short term, the combination of the crop management plans (which are a form of crop specific quality assurance) and testing at the silo should it be introduced will be able to provide a sufficient level of assurance that the AP maxima demanded are maintained.

Identity preservation or QA systems involve some costs. Pressure for the introduction of such systems is building due to the need to comply with increasing OHS, chemical usage and licensing demands. Also environmental demands are increasing the pressures on farm businesses to better manage soils, water and biodiversity. Catchment management plans and the Bush Tender System require farming businesses to be able to substantiate management practices that have been agreed to.

The VFF is currently developing a whole of farm quality assurance system that incorporates:

- chemical usage and inventory and reports directly to the EPA;
- OHS records;
- environmental management and Landcare activities; and
- livestock management and disease control.

This system, based on a simple to use software system will capture most of the information required to preserve the identity of grain on the farm.[68]

Several forms have been tried with limited success — such as Great Grain[69]. The major reason for the limited success of most of these systems in the past has been their highly generic nature and lack of a clear or distinct need. Farmers could see little payoff for the introduction of these systems.

If new systems are to be successful, support from traditional and non-traditional sources of information will be required. The farming systems groups such as Southern Farming Systems and the Birchip Cropping Group will be relied upon to assist farmers adopt the technology and gain maximum benefit from it. These groups will also be important sources of information for the seed companies and the technology owners for reviews and feed back on the performance of the technology that will be used to design the next generation of GM crops.

Qualified agronomic advice will be required by many. Plans indicate that this will be provided in Bayer's case by certified agronomists attached to the retail outlets. Monsanto is planning to train and certify an agronomist of the farmers' choosing.

Peer pressure and community understandings have allowed the management of a range of technologies involving contamination risks — including those involving herbicides (particularly phenoxy herbicides where horticulture is practiced in proximity to broadacre farming, footrot, OJD, sheep lice and a range of weeds such as parthinium (NSW/Qld) wild radish and herbicide resistant ryegrass.

Victorian farmers are already used to conventional canola stewardship with TT, Monza, IT canola varieties. On farm identity preservation will need to be invested in along with training and introduction of management systems.

There will be significant management benefits from the training and monitoring of GM canola for those farmers taking it up. The identity preservation systems that will be implemented will generate a whole range of information that will benefit the farm business. Not only will this information assist the management of chemical residues (increasingly being tested for at lower levels by most markets) it will develop paddock management records that will have a range of benefits including:

- better nutrient management; and

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68 Obtained in conversation with Alan Blackburn developer of the VFF, QA system due for implementation in 2004.

69 Discussion with Paul Parker, NSW district agronomist, Young NSW and developer of the Great Grain package.

- better management of weed and herbicide regimes for a range of chemical including sulphonureas already experiencing resistance problems.

It is reasonable to assume that the farm monitoring systems that GM technology will require will improve the level of crop management and quality of the grain produced more generally and that this will help compensate for the cost of the development of these information technologies.

7.5.3 Grain storage and handling

Like producers, if the growing of GM canola is permitted, the bulk handling companies wwouldill need to be able to demonstrate that any presence of GM in non-GM is within required limits. This would require the appropriate documentation associated with QA systems. Testing for GM will also play a significant part of the handling system.

Initially the bulk handling companies can be expected to dedicate entire country receiving sites to GM exclusively. In discussions, GrainCorp suggested to us that this would be the most cost-effective way of management as volumes of GM canola build. It is expected that GM grain would then be sent directly to port and exported to GM markets. Indications are that the cost is unlikely to be significantly higher for GM or non-GM growers. As volume builds, site dedication to GM will be more difficult but grain pathways direct to port will not alter significantly unless domestic demand changes or NSW allows for the commercial release of GM canola.

Gaps in handling systems' capacity and the changes required if GM canola is released next year vary from company to company. Cargill indicated to us that it has a fully integrated identity preservation system installed and ready to use. This system resides in its current management system and is an extension of that used in North America. GrainCorp has quality assurance systems and procedures in place to manage segregation but does not appear to be as advanced as Cargill in this respect. We understand that its approach initially would be to minimise the cross over of the GM and non-GM grain paths as much as possible.

The marketing systems of a range of agricultural products, dairy and honey included, are demanding greater detail in the information that accompanies produce. More frequently there is an insistence that claims made be substantiated with the appropriate QA and identity preservation systems. The ABB related instances to us of the level of access to logistics systems for inspection by its customers that is being demanded and granted. Most companies interviewed related similar experiences.

To make the transition from theory and precedence to reality with GM canola, many grain handling industry representatives we spoke to indicated a preference for a limited commercial release and close monitoring by a composite industry committee. Our perception is that the BHCs could readily participate in such a process.

7.5.4 Incentives and sanctions in the supply chain

Incentives to ensure that segregations are maintained within market requirements, and sanctions in the event this can not be achieved, will be critical components of supply chain management if GM canola is commercially released (Table 27). The capacity to use sanctions is greatest where there are specific contractual obligations between supply chain participants. Any breaches occuring between contracting parties will be subject to normal remedies. Contracting parties usually agree to the types of sanctions and in addition to this the common law plays an important role.

Table 27 **Incentives and sanctions at key areas of the supply chain**

Supply Chain Component	*Incentives*	*Sanctions*
OGTR License Technology Provider	• The major incentive is being able to market their product • The OGTR also works with the technology company on a cooperative compliance basis through education, routine monitoring and communication	• Sanctions that can be imposed by the OGTR are considerable these include; • Criminal prosecution of Licensee • Cancellation of License • Court Orders
Crop Management Plan	• Monsanto introduced a rebate on the technology fee for cotton growers who complied with the CMP requirements although it is not clear if this system will be used for canola • Growers and agronomists will be required to undertake education prior to gaining access to the technology	• The requirements of the Technology provider to advise the OGTR of any breaches proved to be a considerable sanction in the case of GM cotton. In one situation growers were required to plough in GM cotton where it exceeded their permitted planted area. • Technology companies have also advised they will deny growers access to the technology where they do not comply with conditions of the CMP and inform the OGTR if these breaches are not rectified
Grain handling	• Growers will be required to declare the GM status of canola upon delivery • Growers will be made aware that a sample will be retained upon delivery for trace back purposes • Legal liabilities on the bulk handling company in the case of contamination of GM grains into non-GM segregations will be a major incentive. • Issues such as maintaining their reputation as a reliable handler of grain and possible recourse where grain is not within specification already plays and vital role in current grain handling arrangements and will also be important if GM canola was to be introduced	• Bulk handlers have legal recourse where growers misrepresent deliveries as they would have where a grower delivers a load of pickled wheat. GrainCorp advised the approach towards the use of this sanction varies with the circumstances. • In discussion with GrainCorp they indicated that breaches of current standards or "hot loads" are rare. On average there are approximately two hot loads (a total of 50 tonnes) in 12 million tonnes is delivered each year through the GrainCorp system.