The Commercialisation of Genetically Modified Crops: The Case of Canola in Western Australia

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ABSTRACT

The introduction of genetically modified canola into Australian agriculture is associated with a number of problems. Various concerns are expressed by different groups of stakeholders which include researchers, the agricultural and the biotechnology industry and consumers. The concerns are about gene flow, the development of herbicide resistance in weeds and other adverse environmental and health effects. This study aims to investigate the causes of those concerns and to address possible and relevant solutions. A qualitative survey of Western Australian grain growers involving unstructured face-to-face discussions was conducted. Preliminary results confirmed that there is substantial lack of communication and co-operation among the major groups of stakeholders in the GM crop commercialisation process. Therefore, it is necessary to enhance such communication and co-operation. This will enable to resolve and, if possible, eliminate the concerns.

Keywords: genetically modified canola; Western Australia; perceptions.

1 INTRODUCTION AND BACKGROUND

This paper reports on a part of an ongoing PhD research project about the commercialisation of genetically modified (GM) crops in Australia. The paper presents preliminary results of a qualitative survey investigating the attitudes of Western Australian grain growers towards GM crops and GM food, which forms one part of the comprehensive and multi-disciplinary PhD survey. GM canola is used as a case study, because it will be introduced to the Australian agriculture in the near future, and it is associated with many concerns. For the purpose of this study, commercialisation is defined as the conversion of new scientific knowledge into a commodity.

It is argued in this paper that the introduction of genetically modified canola into the Australian agricultural system poses a problem for the Australian bio-socio-economy, due to the uncertainties about the effects of GM crops and GM food on ecosystem health. These uncertainties have raised considerable concerns among various groups of stakeholders that are involved in the commercialisation process. Four groups of stakeholders were identified for the purpose of this study. These are: researchers, farmers, the biotechnology industry and consumers.

Because of the concerns by the different stakeholders, GM crop commercialisation in Australia has been slow, compared to other countries such as the United States, Argentina and Canada, where GM crops are grown on a large scale. The paper is based on the hypothesis that, in order to address and, if possible, eliminate the concerns, it is necessary to increase and enhance communication and co-operation among the various groups of stakeholders, to make GM crop commercialisation in Australia more sustainable and beneficial to the whole bio-socio-economy.

Using qualitative research and evaluation methods, the attitudes of the four groups of stakeholders towards GM canola commercialisation are investigated. The views and perceptions of the four groups are compared, contrasted and related to each other, and it is shown where co-operation among the four groups is possible, to achieve better GM crop commercialisation in Australia. It will also be shown where the interests of the different groups might be in conflict with one another, and how such conflicts could be addressed by government policy.

The results of the study will be useful for decision-makers in the process of designing and implementing GM crop and GM food policies and strategies. The results will also be of value to biotechnology industries, farmers, consumers and researchers who might wish to gain better understanding of each others' needs and interests regarding GM crop and GM food research, development, production and sale. Such an understanding is crucial for successful and long-term co-operation among the four groups. Thus, the research findings can contribute to better co-operation among researchers, farmers, biotechnology industries and consumers in the commercialisation of GM crops and food, and thereby enhance sustainable GM crop commercialisation in Australia.

1.1 The economic importance of canola and GM canola

1.1.1 GM canola and other GM crops on a global scale

The global GM crop area is growing at a rapid pace. In 1999, 39.9 million ha of GM crops were grown worldwide (see Table 1). This represents a more than 20-fold increase from 1996, when GM crops were first grown on a significant commercial scale (James 1999). In 2001, the global GM crop area was 52.6 million ha (Table 1).

Table 1 Major producing countries of GM crops

	1999 (million ha)	1999 (%)*	2001 (million ha)	2001 (%)
USA	28.7	72	35.7	68
Argentina	6.7	17	11.8	22
Canada	4.0	10	3.2	6
China	0.3	1	1.5	3
Total	39.9	100	52.6	99

Source: James (1999, 2001)

* Notes: Figures add up to 100% due to rounding, even though, in 1999, there were other countries that also grew GM crops, namely: Australia (0.1 million ha), South Africa (0.1 million ha), Mexico, Spain, France, Portugal, Rumania, Ukraine (each less than 0.1 million ha). Indonesia commercialised GM crops for the first time in 2001. Despite the official ban of GM crops, Brazil, the world's second largest producer of soybeans after the US, is also growing GM soybeans. It is estimated that 30% of the national Brazilian soybean crop are GM (GENET 2001a).

The three largest GM crop producing countries are the USA, Argentina and Canada (see Table 1). In 2001, the USA accounted for 68% of global GM crop area, followed by

Argentina (22%) and Canada (6%). China has recently become the fourth largest producer of GM crops by increasing its transgenic crop area from less than 0.1 million hectares in 1998 to 1.5 million hectares in 2001 (James 1999, 2001). In the US, GM crops were first grown on a large commercial scale in 1996. Only three years later, half of the US national soybean crop (total crop area: 30.0 million ha) was genetically modified herbicide tolerant (HT) soybean. Adoption of GM cotton was even faster in the US: In 1999, 55% of the US national cotton crop (total crop area: 5.9 million ha) was either herbicide tolerant cotton, insect resistant (Bt-) cotton, or both herbicide tolerant and insect resistant cotton. Similarly, in 1999, 33% of the US national corn crop (total crop area: 31.4 million ha) was genetically modified for insect resistance, herbicide tolerance, or both (James 1999).

Reasons for the quick adoption of GM crops in the USA are, for instance:

- ♦ no labelling requirements for US domestic market
- ♦ the US American population seems to be less concerned about the safety of GM crops for human health and the environment
- ♦ US farmers can benefit from the US government’s marketing loan program: This program ensures that declines in crop prices are cushioned by loan deficiency payments, regardless of what the cause for the price decline is (Kingwell 2000)
- ♦ US farmers do also get special loans, if they need to increase their on-farm storage capacity; part of this need for increased storage might result from segregation requirements for GM crops (Kingwell 2000)

The most important GM crop in 2001 was soybean which took up nearly two thirds (63%) of the global GM crop area, followed by corn (19%) and cotton (13%). GM canola was the fourth most important GM crop in 2001; it was grown on 2.7 million ha, equivalent to 5% of the global GM crop area (see Table 2).

At present, all commercially produced GM canola is grown in Canada. In 1999, Canada grew 3.4 million hectares of GM canola (Table 2), representing 62% of the total Canadian canola crop area which was 5.5 million hectares (James 1999). In 2001, the Canadian GM canola acreage had gone down to 2.7 million hectares (see Table 2). At the same time, Canada’s share of the global transgenic crop area decreased from 10% in 1999 to 6% in 2001 (see Table 1).

Table 2 GM canola on a global scale

	1999 (million ha)	1999 (%)	2001 (million ha)	2001 (%)
Soybean	21.6	54	33.3	63
Corn	11.2	28	9.8	19
Cotton	3.7	9	6.8	13
Canola	3.4	9	2.7	5
Total	39.9	100	52.6	100

Source: James (1999, 2001)

Transgenic canola varieties were first introduced in Canada in 1995. On average, the transgenic systems resulted in a 10% yield advantage over conventional varieties (CCC 2001). Empirical evidence from Canada and Australia suggests that increases in yield are not the most important decision criterion for farmers to grow GM crops. When asked for the reasons why they chose to grow GM canola, 50% of the Canadian farmers quoted better and easier weed control, while only 19% mentioned the expected increase in returns from the transgenic varieties (CCC 2001).

According to the Vice-President of James Richardson International (JRI), Terry James, agronomic benefits of GM Canola "had returned 25 to 30% more to the hip pockets of Canadian farmers and enabled year-round production" (Countryman, 5 April 2001: 7). JRI is Canada's largest privately held grain company.

However, the experience of individual Canadian farmers with GM canola depends on a variety of factors, including the geographic locations of individual farms, soil characteristics, climatic conditions, use of chemicals and other socio-economic factors. Due to the different agronomic and socio-economic conditions of Australian farming systems, Australian grain growers might not receive the same benefits from growing GM crops as Canadian farmers.

1.1.2 Canola in Australia and Western Australia

Australia is a small canola producer in global terms. In 2001, only 5% of global rapeseed was produced in Australia, compared to 33% in China, 24% in the European Union of 15 and 13% in Canada (see Table 3). The term European Union of 15 refers to the fifteen founding member states. The European Union was founded on 1 November 1993 by the following 15 states from the former European Community: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, United Kingdom of Great Britain and Northern Ireland.

Australia is currently the world's fifth largest producer of canola (Table 3). In 2001, Australia produced 1.9 million tonnes of canola and thereby contributed 5% to the total global output (see Table 3).

Table 3 Canola production in selected countries in various years in million tonnes

	1990	1991*	1993	1996	1998	2001	2001 (%)	1990-2001 (% increase)
China	7.0	7.4	6.9	9.2	8.3	11.8	33	69
EU (15)	6.9	7.9	6.6	7.1	10.0	8.4	24	22
Canada**	3.3	4.2	5.5	5.1	7.6	4.8	13	45
India	4.1	5.2	4.8	6.0	4.7	4.1	11	0
Germany	2.1	3.0	2.8	2.0	3.4	3.6	10	71
France	2.0	2.3	1.6	2.9	3.7	2.9	8	45
Australia**	0.1	0.2	0.3	0.6	1.7	1.9	5	1800
UK	1.3	1.3	1.1	1.4	1.6	1.1	3	-15
Poland	1.2	1.0	0.6	0.4	1.1	1.1	3	-1
USA	0.1	0.1	0.1	0.2	0.7	0.9	3	800
World	24.4	28.0	26.4	30.5	35.8	35.7	100	46

Source: FAOSTAT 2001

Notes: * In 1991, triazine-tolerant canola (TT-canola) was first introduced in Australia

** The figures given for Canada and Australia in this table might differ from the figures cited in the text, due to the use of different date sources.

Despite its only small global significance, canola is an important element in many Australian and Western Australian farm management systems. Canola is used as a break crop in crop rotations and is valued for its contribution to weed control strategies. Because canola is a broad-leaf crop, different herbicides can be applied on the canola crop than on other crops, for example, wheat and barley.

The introduction of conventionally-bred triazine-tolerant canola (TT-canola) in 1991 has contributed markedly to the popularity of this oilseed crop. The tolerance of TT-canola to triazine herbicides, such as Atrazine and Simazine, has enabled more effective weed control in the canola crop, leading to better yields in the crop planted in the paddock in the following year. Due to its substantial contribution to weed management strategies, TT-canola has quickly become the predominantly used canola variety in Western Australia, even though it has a 10-20% lower yield ("yield penalty") and 2-3% lower oil content than non-TT varieties (GMCTWG 2001). By 2000, about 98% of all canola grown in WA is TT-canola (S. Powles, personal communication 2000).

One possible effect of the introduction of TT-canola into Australian agriculture is that canola production has been growing much faster in Australia than in any other of the major canola producing countries. From 1990 to 2001, Australian canola production increased by 1800% (see Table 3). The second largest increase in canola production was in the USA, where output increased by 800% (Table 3).

ABS and AgWest (2001) reported that, from 1996/1997 to 2000/2001, Australian canola production rose from 270,000 tonnes to nearly 1.5 million tonnes, reflecting a more than 5-fold increase. During the same period, Western Australian canola production increased more than 6-fold, from about 60,000 tonnes in 1996/1997 to more than 380,000 tonnes in 2000/2001.

Australia is the second largest net exporter of canola after Canada, excluding intra-European Union trade (ABARE 2001). Australian and WA canola is heavily reliant on markets in Asia, with more than 80% of the WA canola crop going to Japan and China in the 1998/1999, 1999/2000 and 2000/2001 seasons (ABS and AgWest 2001; Table 4). Germany was not an important market for WA canola between 1996 and 2000, with total export value of A$ 10,000, but it became the third most important export destination in 2001 (see Table 4).

Compared to Western Australia, canola exports from Australia as a whole are slightly more diversified, yet they still show a marked focus on markets in Asia, with five countries (four countries in Asia, plus Germany) accounting for 90% of all Australian canola exports. The most important export destinations for the national canola crop in 2000/2001 were (ranked by value): Japan, China, Germany, Pakistan, Bangladesh, Belgium-Luxembourg, Hong Kong, Malaysia (see Table 5).

Table 4 Exports of Western Australian canola (rape or colza seeds) in 2000/2001

Export destination	Value (A$ million)	Tonnes ('000)	% of export value
Japan	65	176	46
China	49	135	35
Germany	18	47	13
Malaysia	6	16	4
Pakistan	1	4	1
Other	2	5	1
Total	141	383	100

Source: ABS and AGWEST 2001

Table 5 Exports of Australian canola (rape or colza seeds) in the 2000/2001 season

Destination	Value (A$ million)	Tonnes ('000)	% of export value
Japan	141	376	26
China	108	295	20
Germany	90	254	17
Pakistan	83	224	15
Bangladesh	59	148	11
Belgium-Luxembourg	38	108	7
Hong Kong	19	56	3
Malaysia	6	16	1
Other	1	3	<1
Total	545	1,480	100

Source: ABS and AGWEST 2001

Genetically modified herbicide tolerant canola is likely to be introduced into Australia in 2002 or 2003 (GENET 2001b). One of the GM canola varieties, produced by Monsanto, is tolerant to the herbicide Roundup® (glyphosate), which means that grain growers can spray the emerging seedlings, even the mature plants, without damaging the crop. In Australia, glyphosate is a popular non-selective or knockdown herbicide which is perceived to be more environmentally friendly than other non-selective herbicides, such as Sprayseed® (paraquat).

However, the strong reliance of Australian and Western Australian farmers on glyphosate has fostered the development of glyphosate resistance for an increasing number of weed types. Researchers from the Western Australian Herbicide Resistance Initiative (WAHRI) have recently discovered annual ryegrass (*Lolium rigidum*) resistant to glyphosate in the Western Australian wheat belt. Before then, it was believed that there was no resistance of annual ryegrass to glyphosate in Western Australia (Lee 2001a, 2001b).

Experience in other canola producing countries, such as Canada, suggests that the adoption of GM herbicide tolerant canola can increase economic returns for farmers by improving crop yields and by providing a more effective tool for weed management (see above). The Canadian experience also suggests that growing GM crops on a commercial scale could be a potential benefit for the Australian agriculture and socio-economy.

On the other hand, there are a number of uncertainties of GM crops. Up to date, possible negative impacts of GM crops and GM food on the environment and human health have not been defined in sufficient detail by scientific investigation. It is therefore uncertain whether GM crops will have negative effects in the short, medium or long term, what the effects will be, and whether and how they could be controlled or, if possible, eliminated.

Information about the safety of GM crops and GM food for the environment and human health is often contradictory or not transparent (see, for example, Appendix 9.1), and consumers in many countries are uncertain whether or not to buy genetically modified food products (Anon. 1999; Kelley 1995; Kerr 1999; Kingwell 2000; Moses 1999; Polya 1999). One result of the consumer concerns is that grain producers in Australia are not sure whether GM crops will be economically viable, at least in the short to medium term. Australia has been growing GM pest-resistant cotton on a commercial scale for various years, but it has not yet grown any GM food crop commercially.

Some of Australia’s export markets, for example, the European Union, Japan and Korea, require exporting countries to label their exported foods, if the foods contain or are derived from GM crops and plants. In the EU, food that contains up to 1% “unintended presence” of genetically modified material does not need to be labelled. In Japan, the most important export destination for Australian and Western Australian canola (see Tables 4 and 5), as well as in Korea, the labelling threshold is 5%.

Other Australian export markets are also becoming more strict in the regulation of their imports of genetically modified food and feed products. For example, China, the second most important export destination of WA canola (Table 4), recently introduced new rules regulating the import of genetically modified produce. The new rules, which will become effective on 20 March 2002, require all foreign firms to obtain safety certificates for GM cargo arriving at Chinese ports.

The segregation of GM crops from non-GM crops and the identity preservation of the different crop types imposes additional costs on the producers and other actors in the food supply chain, which will reduce the economic returns gained from the novel crops. As a result, crop producers and grain elevators might have to decide whether they are able to cover all or part of these additional costs.

In a discussion paper for the Western Australian Department of Agriculture, Kingwell (2000) suggests that Australian farmers may profit from not adopting GM crops, at least in the short term, due to the high costs of identity preservation, that is, the ability to provide sufficient documentation about whether the exported grain comes from a GM or non-GM source.

A survey carried out by Pioneer Hi-Bred in 2000 estimated that 24% of US grain elevators would segregate GM corn and 20% would segregate GM soybeans. The costs for segregation in the US, Brazil and the EU have been estimated to lie between 5 and 15% of the farmgate price of a variety of crops (Kingwell 2000).

In Australia, “segregation costs” (that is, costs for the separation of GM produce from non-GM produce) are predicted to rise by 10% (The West Australian 2001), or up to AUD$40.00 per tonne (Kingwell 2000). Some markets, for example, Europe, request GM free canola. But Canada, which does not segregate its canola crop, cannot guarantee GM free status of its canola crop. Therefore, in 2000, Australia exported 30% of its canola crop to Europe (The West Australian 2001).

In 1999, KPMG estimated that mandatory labelling in Australia would increase food prices by 5 to 12%. In addition to this, the size of technology fees associated with GM varieties, yields of GM varieties in Australia, weed control benefits and rotational benefits of GM versus non-GM are yet to be determined (Kingwell 2000).

A second important consideration is that a more intensified use of glyphosate is likely to increase weed resistance, which might worsen the weed management problems faced by Australian grain growers today. At present, Australia has the highest level of weed resistance in the world, and Western Australia the highest in the country.

The management of transgenic varieties will play a crucial role for the future sustainability of Western Australian farming systems. However, such management is not currently supervised and controlled by government bodies. Pending an agreement by the Standing Committee on Agriculture and Resource Management (SCARM) members to establish a permanent body that will assist in the development of GM crops, there is currently only an interim technical group that has been established by SCARM (TGA 2000).

In the absence of a permanent body to implement the crop management plans, the Australian Commonwealth Government established a Deed of Agreement with Monsanto to ensure the compliance with the management plans for both INGARD® and Roundup Ready® cotton. The Deed of Agreement requires Monsanto to monitor the cotton and report adverse effects such as resistance to the Gene Technology Regulator (GTR), to assess the effects of GM cotton in an experimental program and to report annually to the GTR.

2 THE LEGISLATIVE FRAMEWORK OF GM CROPS IN AUSTRALIA

As has been shown above, the integration of GM crops into Australian agricultural production and distribution systems will likely be different from the integration process in the USA and Canada. Firstly, Australian farmers are unlikely to receive the same benefits as US farmers. In addition, Australian consumers are more worried about the health effects of GM crops and GM food, and about environmental impacts of GM crops than US citizens (Kelley 1995; NCSU 2000; Biotechnology Australia 2001). Therefore, adoption of GM crops in Australia could be much slower than it has been in other important grain producing and exporting countries, for instance, in the USA.

In response to this, the Australian Commonwealth Government and some State Governments, for instance, Western Australia and Tasmania, have set out strict regulatory controls for GM crops and GM food. The new regulations shall increase consumer confidence in Australia and make GM crops more socio-economically viable.

2.1 Federal level

2.1.1 Gene Technology Act 2000

The *Commonwealth Gene Technology Act 2000* was passed in December 2000 and entered into force on 21 June 2001. The full title of the Act is: An Act to regulate activities involving gene technology, and for related purposes, Act No. 169, 2000. The Act introduces a national system for the regulation of the growth and field trials of genetically modified crops.

2.1.2 Biotechnology Australia

Biotechnology Australia (BA) was established in 1999. It is located within the Department of Industry, Sciences and Resources; BA reports to a council of five Commonwealth Ministers. BA's main tasks are:

- to develop a national strategy for biotechnology
- to develop a public awareness program to provide information about biotechnology
- to support and train developers and managers of intellectual property; and
- to secure better access to genetic resources and gene collections

2.1.3 GM Food: ANZFA Food Standards Code

Labelling regulations entered into force in Australia and New Zealand on 7 December 2001. After this date, all products manufactured or packaged for retail sale must be labelled. Exceptions to this rule are: GM food containing less than 1% of GM material ("unintended presence"), highly refined foods, food processing aids where no GM material is present in the final food, flavours which are present in the final food in a concentration of 0.1% or less, and food prepared at the point of sale (ANZFA 2001).

2.2 Regulation of GM crops in Western Australia

Currently, 80% of WA's agricultural produce is exported (AgWest 2001a), as is the predominant share of the Western Australian canola production (Pluske and Lindner 2001).

However, if GM crops are grown commercially in WA, it is possible that WA will not be able to guarantee total GM free status. Even if the most stringent segregation, identity preservation and testing procedures were to be applied, it is very likely that non-GM produce will be mixed and contaminated with GM produce, due to inadequacy of test results, lack of segregation facilities, and human error.

Therefore, after the integration of GM crops into the Western Australian farming system, WA might no longer be able to guarantee GM-free status of its agricultural produce, which might result in the loss of important overseas markets. As a result of this, the Government of Western Australia recently announced a five-year moratorium on both the commercial growth of GM crops and field trials of GM crops in Western Australian farming areas (WA Government 2001).

Some Western Australian, for example, Lake Grace, Williams, Mingenew and the Victoria Plains Shire, have expressed their concerns about the uncertainties of GM crops and their effect on the Western Australian agriculture, trade and environment, by declaring themselves “GM free” and by banning both the commercial growth and field trials of GM crops (Farm Weekly 2001).

2.2.1 GM free zones and GM zones

In December 2001, the Western Australian Government released a discussion paper for public consultation about Genetic Modification-Free Zones (AgWest 2001b). The consultation period concludes on 28 February 2002. In the discussion paper, the Government proposes the establishment of GM free and/or GM zones on the basis of section 21 of the *Commonwealth Gene Technology Act 2000*.

Section 21 of the *Gene* Technology *Act 2000* regulates the issuing of policy principles by the Ministerial Council, for the recognition of areas that are designated under State law to be GM free for marketing purposes. The Ministerial Council consists of one Minister from each jurisdiction and the Commonwealth. The full text of Section 21 is given in Appendix 9.2.

State legislation is currently being introduced in WA through the Western Australian *Gene Technology Bill 2001*, to enable the establishment of GM free and/or GM zones. The *Gene Technology Bill 2001* contains a consequential amendment to the *Agriculture and Related*

Resources Protection Act 1976, which will enable the making of regulations about GM free and/or GM zones. Other Australian States, for example, Victoria and Tasmania, are also considering the designation of GM free zones and have enacted or will enact legislation to enable the designation of such zones (NRE 2001; DPIWE 2001).

A GM free and/or GM zone could be designated by reference to an administrative boundary, a port zone or shipping zone; it could be the entire catchment from which a specific crop may be drawn, or it could refer to other specific geographical boundaries. In addition to this, GM and/or GM free zones could also be formed by individual producers, through voluntary arrangements between adjacent producers, or through industry accreditation (AgWest 2001b). By enabling individual producers to declare their land as GM free, the new Western Australian legislation acknowledges that, in view of the many uncertainties of GM crops and GM food, the decision of whether or not to grow GM crops is a very personal one and can vary from one farmer to another, as well as over time.

However, it can be questioned whether such “micro GM free zones” will be effective in the long term. Due to the possibility of genes flowing from genetically modified plants to the conventional crop and vice versa, individual producers might not be able to guarantee that their GM free zone will remain absolutely free of genetically modified crops in the long term, especially if each small GM free zone happens to be surrounded by many, possibly larger, GM zones.

For instance, a recent study by the Co-operative Research Centre (CRC) for Weed Management Systems investigated the likelihood of outcrossing of genes (that is, the natural movement of genes from one plant species to another plant species via pollen flow) between adjacent canola crops (Rieger 2001). Trials were carried out at paddock scale in South Australia, Victoria and New South Wales. Smaller scale trials were also carried out in Western Australia. The study established that cross pollination between conventionally bred (non-GM) Group B herbicide tolerant canola and conventional canola is very low and depends on the distance between the two crops. The highest frequencies of occurrence of tolerant seedlings ranged from 0.225% for Western Australia to 0.151% for Victoria. No record of outcrossing could be found beyond 3 km of the pollen source (Rieger 2001).

2.2.2 Labelling

In its November 2001 Direction Statement, the Western Australian Labour government supports the labelling rules by the Australia New Zealand Food Authority (ANZFA) which became effective on 7 December 2001 (see above); it even goes one step further by advocating that all food where the GM component is less than 1% should have labelling that advises that the GM free status of the product cannot be guaranteed (WA Government 2001).

The WA government also acknowledges the precautionary principle in the regulation of ongoing research and development of genetically modified organisms (GMOs). The precautionary principle allows to make a decision about GMOs, even if there is insufficient relevant scientific information and knowledge regarding the extent of potential adverse effects of those GMOs.

2.2.3 The GM Canola Technical Working Group

The GM Canola Technical Working Group (GMCTWG), formed in April 2000, is an initiative of the canola industry. The membership of the group comprises representatives from the Western Australian government as well as from the private industry. Members of GMCTWG are, for example, the Western Australian Department of Agriculture (AgWest), Avcare, the Canola Association of Western Australia (CAWA), the Western Australian Farmers Federation (WAFF), the Pastoralists and Graziers Association (PGA), the Grain Pool of WA (GPWA) and Co-operative Bulk Handling Ltd. (CBH).

The group looks at issues relating to GM and non-GM canola which are currently under development, such as field evaluation, crop management, cross-pollination from GM to non-GM canola (gene flow) and outcrossing from canola to related weeds, for example wild radish. The group also assesses the capacity of the WA State to comply with market requirements (AgWest 2001a). In November 2001, the GM Canola Technical Working Group released the report: "Genetically Modified Canola in Western Australia: Industry Issues and Information. A summary of Western Australian canola production in relation to biotechnology and genetic modification issues." The report contains information about possible benefits of GM canola for farmers and the community, addresses concerns about human health and environmental impact concerns, investigates the marketability of GM canola and possible traceability systems of the grains industry which could be applied to GM canola (GMCTWG 2001).

3 RESEARCH OBJECTIVES

The review of the literature and Government policy about GM crops in Australia shows that a number of problems are associated with the pending introduction of GM canola into Australian agricultural industry. Some of these problems seem to stem from lack of communication and co-operation among the different groups of stakeholders that are involved in the commercialisation process. However, these problems have not been addressed in sufficient detail by scientific investigation. In order to make a contribution to the reduction of this knowledge gap, this research has the following objectives:

- to investigate the differences in attitudes towards GM crop commercialisation by four different groups of stakeholders, namely: farmers, researchers, the biotechnology industry and consumers
- to find out areas of possible co-operation, as well as conflict, between the four groups of stakeholders
- to indicate how policy could be improved to foster better GM crop commercialisation in Australia

4 RESEARCH METHODOLOGIES

The PhD study project combines and relates a number of different surveys, such as a farmer survey, a consumer survey, and surveys of the Australian biotechnology industry, as well as of researchers from various countries. This paper comprises preliminary results of the farmer survey, which was carried out in the months from December 2001 to February 2002. The sample size for the farmer survey is 16 randomly selected grain growers from all over the Western Australian wheat belt (see Figure 1). The data gained from the farmer survey will be analysed and evaluated using NVivo software. The aim of the survey was to get in-depth and detailed information about what Western Australian grain growers think about GM food and GM crops, especially Roundup Ready® canola.

A small sample size was chosen deliberately, because of the specific design and the aim of the farmer survey. In order to learn more about the perceptions of Western Australian farmers about GM crops and GM food, it was important to establish a good and friendly relationship with the grain growers, based on mutual understanding and trust, to foster a discussion environment that supported farmers to express freely what they think. Such in-depth and intensive survey can only be carried out with small sample sizes and would be very difficult, if not impossible, with much larger samples.

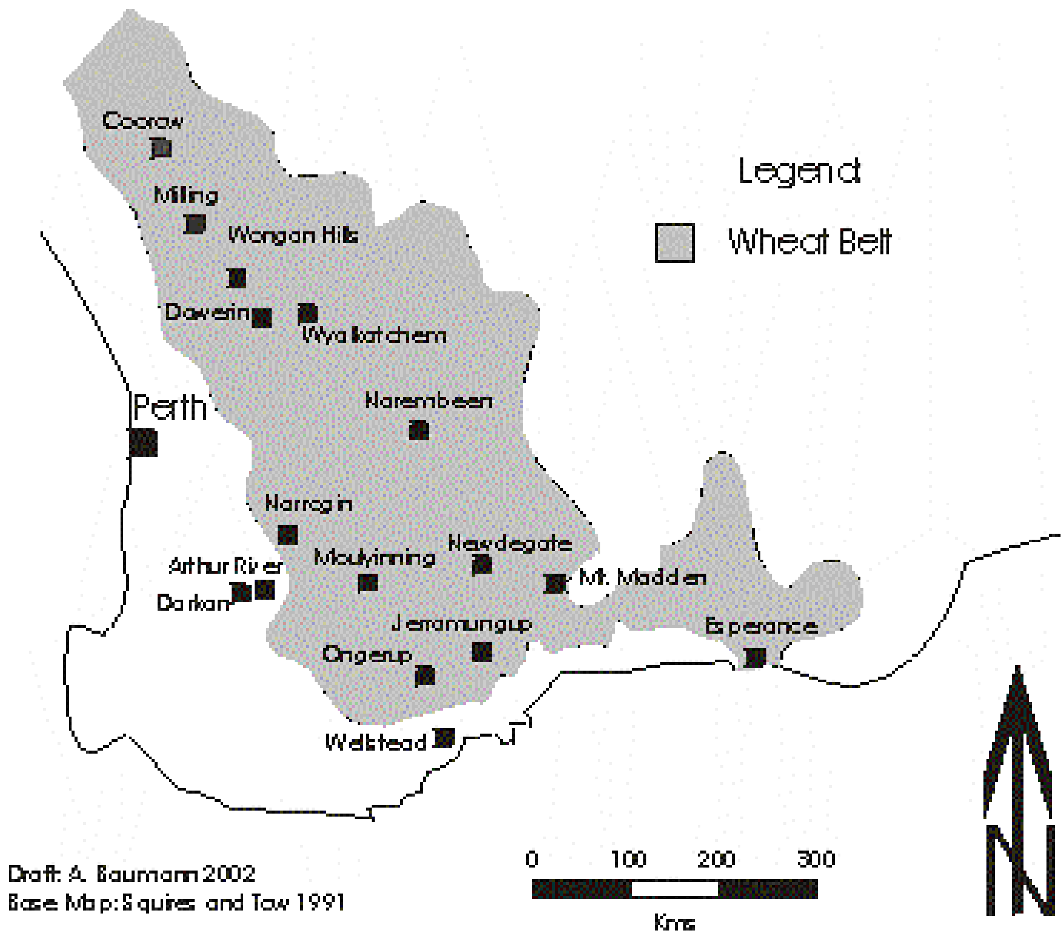

Figure 1 Locations of grain growers

Informal and unstructured face-to-face discussions with the grain growers were carried out. The discussions lasted approximately two hours on average. They were not based on a questionnaire. Rather, a number of previously defined and broad topics were covered in random order during the course of each discussion.

Farmers surveyed for this study were visited on their farms (the locations of the farms is given on Figure 1). Most discussions took place in the farm houses of the grain growers, and all family members present were invited to participate in the discussion. One discussion took place in the shearing shed of the farmer.

In order to obtain in-depth information about the perceptions of WA grain growers about GM crops, the most important aspect of each discussion was the open, relaxed atmosphere throughout the whole discussion, which encouraged grain growers to answer spontaneously and in an very personal and anecdotal way.

Each discussion started out from a broad topic that was spontaneously selected, depending on the individual situation of the discussion. For example, some farmers were invited to start out by describing when and how they first became aware of GM crops. Other farmers were first asked about this year's yield and their plans for next year's crop (some farmers were visited in the middle of the harvest period). Sometimes, the grain growers themselves started out the discussion by referring to articles in newspapers or magazines about GM crops that they had recently read or heard about.

The reason why farmers were selected from such a large area and not from a smaller section of the wheat belt is that the study aims to define whether farmers' responses vary depending on the climatic conditions, history, or other socio-economic conditions of the farming regions in which they live and work. For instance, the data analysis will consider the question whether farmers in the relatively younger farming regions, such as Esperance, think differently about GM crops than farmers in the older and more traditional Western Australian farming regions, such as Darkan (Figure 1).

All discussions were taped and notes were also taken. Discussions will be transcribed and evaluated using NVivo Revision 1.1 software. This software provides a tool to break up unstructured text into small parts which are then coded, sorted and rearranged. NVivo enables to define the most relevant codes (that is, the codes with the highest frequency) and also codes of lesser relevance (codes that appear less frequent).

In addition, NVivo supports the configuration of relationships between different codes. The establishment and definition of relationships between codes enables to get a better understanding of how farmers think about GM crops and GM food and which topics and issues of GM crops and GM food they consider to be closely linked together.

5 PRELIMINARY RESULTS OF WESTERN AUSTRALIAN GRAIN GROWER SURVEY

The preliminary results of the farmer survey indicate that farmers generally have a positive attitude towards GM crops, if they pose an economic benefit to the farm business. However, the survey also clearly showed that farmers have a number of serious concerns.

The preliminary results are:

- WA grain growers are in favour of GM crops, if the crops have an economic benefit. For example, one farmer mentioned an email from the GPWA mailing list. The email described that China recently rejected two shiploads of soybean from Brazil, due to concerns that the soybean might be genetically modified. The farmer, who had so far been very supportive of GM crops, said that, after reading the email report, he was not so sure about the economic viability of GM crops any more
- Farmers are certain that growing GM crops will affect their current farm management practises, but they do not know in which way these practises might be changed
- Farmers think that the development of new herbicide-tolerant canola varieties with gene technology is important, but they would prefer a HT canola variety that is not resistant to Roundup®, due to fears that Roundup® might lose its effectiveness (Roundup® and Sprayseed/Paraquat are currently the only two knockdown or non-selective herbicides used in WA)
- When asked to compile a "wish-list" of their favourite GM crops, farmers mentioned three types of crops:
    - a) Lupin that grows on heavy soil
    - b) Salt-tolerant crops or other salt-tolerant plants
    - c) Canola-"legume" (canola variety that adds nitrogen to the soil)
- Farmers do not like the idea of having to sign contracts with large multinational companies that supply GM seed, due to fears of losing their independence
- Most farmers are currently saving seed on their farm, and they would like to be able to do so in the future
- GM technology is seen by many farmers as "the next step forward in agriculture"

- Many, but not all, farmers would prefer to buy non-GM food if it costs the same as GM food. At the same time, farmers expect that they will not always be able to choose non-GM food, because shops in small country towns might only supply GM food products
- Farmers do not approve of the use of animal genes in GM crops and plants. They think that the gene pool in the plant kingdom is diversified enough to allow multiple combinations of genes to generate GM crops that are useful and beneficial for Australian and Western Australian agriculture and socio-economy. Grain growers think that the use of animal genes for the production of new GM crops is therefore not necessary and might bear risks that could and should be avoided
- Many farmers mentioned difficulties in obtaining sound and unbiased information about GM crops. Farmers are aware that they need to use a variety of sources of information, in order to get a more objective understanding of the advantages and disadvantages of GM crops and GM food. However, this is often not possible, due to time constraints and lack of access to information

6 CONCLUDING REMARKS AND RECOMMENDATIONS

Western Australian grain growers are in favour of growing GM crops, if the novel crops are economically viable and beneficial to farm management, in the short term as well as in the long term. However, there is considerable uncertainty and confusion about whether the new GM canola varieties that will be introduced into Australia in the immediate future fulfil these criteria.

In order to address the farmers' concerns and, if possible, eliminate them, the knowledge of Australian grain growers needs to be integrated into the GM crop research and commercialisation process, to create crops that benefit the farmers and enhance the viability and international competitiveness of Australian agriculture. In addition to this, it is desirable to increase the exchange of sound, detailed and scientific information among researchers, the biotechnology industry, farmers and consumers. There is also a role for the Australian government to become more strongly involved in the management and control of commercially grown GM food crops. These measures will increase consumer trust in genetically modified food. They will also foster better co-operation among the different stakeholders and will hereby facilitate the sustainability of GM crop commercialisation for the whole Australian bio-socio-economy.

Areas for future scientific investigation

In light of the current status of knowledge about GM crop commercialisation in Australia, more research needs to be done in the following areas:

1) End-point/crop improvement/product royalties
2) Efficiency of the Australian segregation system
3) Effects of GM crops and GM food on the Australian environment and human health

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9 APPENDICES

Appendix 9.1 Truths or Myths of GM Crops?

Golden Rice

Golden Rice is a vitamin-A enriched rice variety which has been developed by researchers in Zurich, Switzerland, and will be marketed by Astra Zeneca. The rice is currently in its trial phase with contained trials. After the completion of the research trials, the rice will be distributed to poor countries free of charge (FAO 2000). However, according to scientists from the International Rice Research Institute (IRRI), it might take many years before such a release can take place, because many genetic elements – such as an antibiotic resistance gene

– need to be changed or removed before the rice is safe to be released into the environment (Greenpeace 2001a).

Golden Rice had been promoted by the biotechnology industry as an important crop to fight malnutrition in poor countries. The pharmaceutical company Syngenta, which owns many patents on Golden Rice, claims that one month's delay in the marketing and distribution of Golden Rice will cause 50,000 children to go blind. However, critics of Golden Rice argue that the rice variety does not solve the problem of vitamin-A deficiency. In order to make use of the vitamin A in Golden Rice, the body requires a diet adequate in fat and protein, something that most people in poor countries are lacking. In addition to this, Greenpeace calculations show that an adult would have to eat at least 3.7 kilos of dry weight rice, that is, around 9 kilos of cooked rice, to satisfy his or her daily needs of vitamin A from Golden Rice. A normal daily intake of 300 gram of rice would, at best, provide 8% percent of the recommended daily vitamin A intake. A breast-feeding woman would have to eat at least 6.3 kilos in dry weight, converting to nearly 18 kilos of cooked rice per day (Greenpeace 2001b).

Appendix 9.2 Commonwealth Gene Technology Act 2000:

Section 21 Ministerial Council may issue policy principles

(1) The Ministerial Council may issue policy principles in relation to the following:

- (a) ethical issues relating to dealings with GMOs;
- (aa) recognising areas, if any, designated under State law for the purpose of preserving the identity of one or both of the following:
  - (i) GM crops;
  - (ii) non-GM crops;

  for marketing purposes;
- (b) matters relating to dealings with GMOs prescribed by the regulations for the purpose of this paragraph.

Note 1: Section 57 provides that the Regulator must not issue a licence if to do so would be inconsistent with a policy principle.

Note 2: Subsection 33(3) of the *Acts Interpretation Act 1901* confers power to revoke or amend an instrument issued under an Act.

(2) Before issuing a policy principle, the Ministerial Council must be satisfied that the policy principle was developed in accordance with section 22.

(3) Regulations for the purposes of paragraph (1)(b) may relate to matters other than the health and safety of people or the environment, but must not derogate from the health and safety of people or the environment.

(4) Policy principles are disallowable instruments for the purposes of section 46A of the *Acts Interpretation Act 1901*.

Appendix 9.3 List of abbreviations

ABS	Australian Bureau of Statistics
AgWest	Western Australian Department of Agriculture
ANZFA	Australia New Zealand Food Authority
BA	Biotechnology Australia
CAWA	Canola Association of Western Australia
CBH	Co-operative Bulk Handling Ltd.
CCC	Canola Council of Canada
CRC	Co-operative Research Centre
DPIWE	Department of Primary Industries, Water and Environment
GM	Genetically Modified
GMCTWG	GM Canola Technical Working Group
GMO	Genetically Modified Organism
GPWA	Grain Pool of Western Australia
GTR	Gene Technology Regulator
ha	hectares
HT	Herbicide-tolerant
JRI	James Richardson International
NCSU	North Carolina State University
NRE	Department of Natural Resources and Environment
PGA	Pastoralists and Graziers Association
SCARM	Standing Committee on Agriculture and Resource Management
TGA	Therapeutic Goods Administration
TT	triazine-tolerant
WAFF	Western Australian Farmers Federation
WAHRI	Western Australian Herbicide Resistance Initiative