Australian Nuffield Farming Scholars Association

Genetically Modified Crops - The Impact of Biotechnology on International Agricultural Research, Production and Marketing.

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Executive Summary

My Nuffield Scholarship gave me the opportunity to study the impact of biotechnology, in particular genetically modified crops, on agricultural research, production and marketing internationally. I spent time studying biotechnology in Canada, USA and the UK in addition to the group tour through Asia, UK and Europe.

I travelled through Singapore, Malaysia and Thailand for two weeks with other Scholars from Australia, New Zealand and the UK. This gave an insight into markets and agriculture in the region and the potential for expansion. It also highlighted the importance in accounting for cultural and economic differences when marketing products.

The four week European leg of the tour began in London where we were joined by Scholars from France, Canada and Zimbabwe. We spent time as a group in London then travelled through France, Brussels and the UK studying the Common Agricultural Policy and European agriculture. It gave an overview of the different environment European agriculture operates in and the forces behind government involvement in agriculture.

I returned home for six weeks before beginning my individual study in Canada, USA and UK. I studied biotechnology from research through to production and marketing in these countries growing GM crops commercially where I gained a valuable insight into how this may impact on our decision to grow them in Australia. I was impressed by the technology available that opened up a range of opportunities for vast improvements in production traits, quality of product, food safety and environmental and human health benefits. I also gained valuable knowledge of the challenges faced by Canada and the US in production, identity preservation, testing and marketing of GM crops. The new science had been in the marketplace since 1995 and farmers were experiencing real benefits from improvements in farming systems. Consumer attitudes in the US were more relaxed as the scientific community and regulatory process were widely respected. Canada was beginning to have some issues with identity preservation and consumer confidence particularly after the Schmeiser case.

My husband Alan joined me in London and we then travelled throughout the UK and Southern Ireland studying the very different perspective of GM technology. Research is continuing but under pressure from a very anti GM European public concerned about “Frankenstein foods” and food safety in general after recent BSE scares and the foot and mouth disease outbreak. Influential supermarkets were fuelling the debate using non GM as a selling point. Farmers were concerned about market dominance of large multinationals. However, it appeared that public sentiment was beginning to settle out after better public relations by biotech companies and improving communications between these and anti GM lobby groups.

My conclusion was that to ignore the benefits that the technology has to offer our production systems would leave us at a competitive disadvantage to other countries growing GM crops. Marketing ourselves as “GM free” will only offer short term benefits. As an industry we need to ensure that we make the most of the technology without becoming controlled by multinationals and need to lobby for a system such as an end point royalty to minimise this.

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I would also like to thank the numerous biotechnology and agricultural industry participants and overseas Nuffield Scholars who took the time to meet with me during my scholarship and who made it such an interesting and rewarding experience. In particular I thank Marilyn and Bob Sharp and Ian and Gloria McPhadden, Canada and John and Kelly Allrich, Minneapolis, USA for being wonderful hosts and organising contacts for me. I must extend a special thanks to Pamela Gladwin and Paul Mitchell who were wonderful hosts during my time in the UK.

Finally, and most importantly, I would like to thank my husband Alan for the support he gave me and for dealing with a difficult time on the farm while I was away on the group tour. I was very lucky that Alan could join me on the UK part of my scholarship to share the Nuffield experience.

I feel very privileged to have been awarded a Nuffield Scholarship and it has opened doors to a lifetime network of leading agriculturalists around the world. Alan and I have also made some lifelong friendships out of our Nuffield experience and we continue to enjoy being part of Nuffield.

I would like to dedicate this report to my father, who sadly passed away while I was on my scholarship and with whom I would dearly have loved to share some of my Nuffield experiences.

1.0 Introduction

I was awarded the 2000 GRDC Western Grain Grower Scholarship to study the impact of biotechnology, in particular genetically modified crops, on international agricultural research, production and marketing. I undertook my study in Canada, USA and the UK and met with public and private researchers, growers and marketers.

Biotechnology is already having a major impact on agricultural production in the countries that have chosen to commercially produce GM crops. In 2001 there were 52.6 million hectares of GM crops grown, 46 percent soybeans, 7 percent corn, 20 percent cotton and 11 percent canola. Four countries account for 99% of global GM area. The USA is the biggest producer with 35.7 million hectares, Argentina 11.8 million, Canada 3.2 million and China 1.5 million. In Australia, GM cotton is currently the only GM crop grown commercially.

These countries represent our major competitors for global markets that are important to WA with its export focus. With the release of GM canola in Australia targeted for the 2003 season, I was keen to study the issues surrounding GM crops from development of the technology through to grower experiences with GM's and marketing issues. I could then be well informed to determine how these issues would impact on our decision to grow commercial GM crops in Western Australia.

2.0 Research

I think the importance of biotechnology research on the future of agriculture is captured in a statement made by Colin Merritt, Monsanto, Cambridge, UK "Monsanto is no longer pursuing any further development work on new chemicals – all developmental research will now be in the area of biotechnology". This statement was confirmed recently when Monsanto outsourced chemical business to Nufarm. Investment by large multinational "Life Science" companies such as Monsanto is an indicator of the future of biotechnology in agriculture.

The nature of research being a very competitive industry means there is a complex system of funding and joint ventures between public and private organisations.
The extent to which companies and government invest in research is influenced by consumer views in that country and potential market of the final product. There is large investment in research in Canada where genetically modified crops such as Roundup Ready® and Liberty Link® canola are widely grown and testing is not under any great threat of sabotage by the public. Conversely, in the UK, the research into products such as Roundup Ready® Sugarbeet and Oilseed Rape is progressing more slowly as field testing is restricted by threats of sabotage by a very anti GM public and companies have to direct more resources to public relations.

The majority of crop transgenics have been in the area of input traits such as Roundup Ready® Canola and Soybean and BT® Corn with production benefits for growers. The move is now towards capitalising on the benefits of output traits such as enhanced oil qualities in canola. Biotech companies such as Monsanto and Aventis are now marketing products which benefit consumers through enhanced output traits in an attempt to both capitalise on investment in research and win back consumer confidence in GM's. The market for pharmaceutical, nutraceutical and industrial enhanced output trait products is also a very lucrative one.

2.1 Canada

Canada has been growing GM canola commercially since 1995 and in 2000 60% canola was GM. This commercial production has substantial backing from private and public research and development. Collaborative research between government and the private sector and government incentives for biotech research are commonplace. The Canadian Federal government operates a matching investment initiative fund and federal and provincial (state) tax credit schemes, enabling companies to do research for 30% of the cost. The Canadian government released an Innovation White Paper in September 2001 that outlines the plan to make Canada a leader in biotech by 2010 and providing between $12 - $20 billion Canadian to achieve this. The emphasis is on the "bioeconomy" or exploitation of living materials. The Canadian government is also working on the issue of "freedom to operate" where there is access to products for R & D where currently there are restrictions with further development of patented technology, such as the Roundup Ready® gene.

Provincial governments have also set up other alliances with the private sector to further expand biotechnology industries. For example, the Saskatchewan government has poured resources into Saskatoon to turn it into a leading Agbiotech city. It boasts a Biotech community "Innovation Place" and 40 private/government partners in both plant and animal biotech research. Funding has also set up Agwest Biotech Inc that offers start up assistance for companies to market biotech products overseas as well as a public education role. Public support is with the science and food regulation industry in Canada and with successful commercialisation of GM products research is strongly supported.

Biotech Products

As Canada is a major world producer of canola, biotech research has focussed on this grain. Collaborative work with the USA in wheat, soybeans, potatoes, pig and cattle production is common although mostly within the private sector. The move towards output traits has led to development of a range of products including:

- Biofuels – using high erucic acid type oilseeds.
- Nexera® canola – (mutogenic not GM) with longer shelf life and higher "smoke" point for higher temperature frying which means faster cooking times and less fat absorbed by food.
- Anti coagulants - using anti coagulant properties from leeches in canola for cost effective pharmaceutical production.

2.2 USA

The USA is a world leader in biotech research with 300 core biotech companies in 2001 spending $A12 Billion on R&D. As the US is the largest producer of GM crops in the world, the scientific community has the backing of a strong commercial production base, public support and substantial private and government funding. As a result, research into agricultural products with enhanced input and output traits is moving at a rapid pace. Some examples include:

- Roundup Ready® Wheat– There is a big question mark against its release due to market implications for US and Canada as major world wheat producers.
- Terminator gene – This can solve the problem of volunteer Roundup Ready® wheat, outcrossing to conventional varieties and pre harvest sprouting. It has been developed in the labs and it looks unlikely that Aventis will commercialise this due to public concerns over control by multinationals of seed stocks.
- Roundup Ready® Alfalfa
- Modified Corn Starch – Dow Agroscience is working on bio plastic production from transgenic corn.
- Spider Silk **–** developed from goat's milk using strands of protein to create a silk like fabric used in aeronautics.
- Phyto Remediation – using genetically modified plants to clean up oil spills by detoxification or uptake by plants.
- Nutraceuticals – Enhanced nutritional content of foods eg Golden Rice®

2.3 United Kingdom

In contrast to Canada and the USA, research in the UK is progressing much more slowly. There is considerable public opposition to any form of genetically modified foods and this is fuelled by powerful environmental groups such as Greenpeace, Friends of the Earth and the more moderate Soils Association and Royal Society for the Protection of Birds. The more extreme groups have used the GM debate to generate public support. Food safety incidents such as BSE in beef, dioxins in chicken, continuous outbreaks of food poisoning and more recently Foot and Mouth disease have left the public with little faith in

government regulators and the scientific and farming community in general. There have also been several sensationalised incidents with GM research that have further fuelled the debate. Large biotech companies such as Monsanto had failed to address the different level of public concern in the UK about the technology, citing results from Canada and the USA and suggesting that it would not be an issue for the UK consumer. Powerful supermarkets have taken advantage of the anti GM public sentiment to turn the issue into one of marketing. Supermarkets own branded products are now non-GM where prior to 1999 GM foods, such as the flavour saver tomato paste were clearly labelled and sold.

The environmental debate is the key driver of the anti GM lobby and a major concern is a loss of biodiversity from increasing monoculture, reducing food and habitats for wildlife. The environment and agriculture in the UK have evolved together over hundreds of years and any change in crop management will impact on wildlife. There is also the fear that modified genes will harm non-target insects and also result in chemical resistant insects. Super weeds may be created by outcrossing of genes into the general weed population and modified crops could become weeds themselves. These issues are subject to much tabloid press and counteracting publicity campaigns by biotech research organisations.

The complex environment issue is the focus of much of the GM research in the UK. One major example is the trial funded by the Royal Society for the Protection of Birds and English Nature and run through DEFRA with involvement from Monsanto and Aventis. This trial investigates the management of GM crops and the impact on the environment at 60 sites across the UK. GM crops of sugar and fodder beet, fodder maize and spring and winter oilseed rape are compared directly with their conventional counterparts. Final results will be released after the trial is completed at the end of 2002.

Despite the direct financial involvement of the two largest nature organisations in the UK, trial sites are still subject to sabotage by anti GM extremists. Extremist groups prevalent in the UK and certainly in Europe as a whole have a big impact on rational debate and any meaningful research into GM crops and the British tabloids feed off this activity in publicity campaigns.

3.0 Production

Commercial production, like research, is very much determined by public sentiment towards GM's and the position in world markets. USA, Argentina and Canada are the leading producers of GM crops in the world whereas there is no commercial production of GM crops in the UK at present.

3.1 Canada

About 55% of the 12 million acres planted to canola in 2000 were either Liberty Link® or Roundup Ready® canola grown by 80% of growers. Smart® or IT canola (mutogenic not GM – Canadian equivalent of our Clearfield® canola) constitutes at least 20% while conventional canola now makes up less than 25% of the total canola plantings in Canada. A report into the impact of transgenic canola on the industry was commissioned by the grower organisation Canola Council of Canada. One of the key findings was a reported increase of $C5.80/acre net return compared to conventional canola in 2000. This equates to an equivalent increase in price for conventional canola to be around 10% to justify production.

There is excellent farmer acceptance of GM crops due to reduced chemical usage and time required to establish and manage crops. With less than a three month growing season for summer crops in Canada any tool such as Roundup Ready Canola which enables crops to be established at the first sowing opportunity without the need for a knockdown of weeds prior to sowing has advantages in terms of management and profitability. Canadian farmers have had subsidies reduced considerably over the last few years and support is now in the form of a government subsidised crop insurance scheme. This has increased the need for more efficiency and profitability at the farm level and GM canola is helping achieve this.

There are also some downsides to the wide scale production of GM crops. Canadian farmers were very concerned about control by large multinational companies over production. There was strong opposition towards payment of the "Technology Use Agreement" to Monsanto as part of the Roundup Ready® canola package. This is a $C15/acre cost imposed separate to seed and chemical sales aimed at recovering the cost of developing the technology. This equates to about $A45/ha which I would question as a disincentive for Australian farmers to grow GM canola without looking at the overall benefits. An end use royalty system of capitalising on the technology may be a more attractive system for us.

Farmers were also keen to maintain competition between companies in the marketplace and were concerned by large multinationals such as Monsanto investing in many smaller seed and biotech companies and reducing competition.

There are also rising concerns, fuelled by media hype, about "superweeds" and outcrossing of resistant genes to conventional types and wild species. During my Nuffield study in Canada the Percy Schmeiser case was going through the courts. This involved a farmer from Sascatchewan claiming his field of non GM canola had been contaminated by pollen flow from neighbouring GM crop versus Monsanto claims that GM seed had been planted without the appropriate technology use agreement and fee being paid.

Herbicide resistance is also a growing concern amongst producers and resistance by weeds to glyphosate in Canada is inevitable given its widespread use in other crop rotations as it is here in Australia. Given the existing problem we have with annual ryegrass resistance to glyphosate we need to weigh the benefits of adoption of glyphosate tolerant canola against the increased selection intensity for resistant ryegrass. A "systems" approach to including glyphosate tolerant canola in crop rotations would be an important first step to adoption in conjunction with workable stewardship programs.

Despite these issues, the overall impression I had from talking to farmers was that the benefits of GM canola outweighed the real and potential costs and this has been reflected in an increase in area of GM canola in 2001.

3.2 USA

There is widespread community financial and moral support for the US farmer who is seen as a family farmer struggling against low prices and the vagaries of the weather. In reality, commercial grain producers receive up to 30% of their incomes from the government and are not hamstrung by a regulation. The benefits of GM technology have added to this ideal production environment. In 2000, 60% of cotton production was BT Cotton – either YieldGuard for boring insect control or BollGuard® for Bollworm control, 18% of Corn and 60% of Soybean was Roundup Ready®. Uptake of GM Soybean has

been particularly good as weed control was previously difficult due to its sensitivity to a range of chemicals.

There has been much positive publicity about the benefits of GM crops, and facts such as a reduction of a million gallons in applied insecticides to GM cotton carry weight with the public. The use of hazardous, residual chemicals in soybeans has been replaced with the safer glyphosate chemical. Issues that have arisen such as the impact of BT Corn on the Monarch butterfly have been quelled by scientific evidence that the effects are minimal. The more recent Starlink® corn case did cause more public concern as the public faith in regulatory bodies was tested. The litigious nature of the US also came into play in this case, with potential financial gains to be made from suing for supposed "allergens" contained in Starlink® corn which was registered for stockfeed use only but found its way into the human food chain. The repercussions of this incident on the company producing the product went a long way to addressing public concerns.

The US farmer is also quite happy with the flexibility that GM crops give in terms of ease and timeliness of weed and insect control to work in with off farm employment.
To ignore the production benefits that GM crops are bringing to the US farmer by not adopting the technology in Australia we would be left at a disadvantage on the world market.

3.3 United Kingdom

Currently there is no commercial production of GM crops in the UK. The general feeling among the farming community is one of acceptance of the technology as the potential for improving production efficiency is obvious. The intensive, high yielding nature of crop production in the UK would benefit immensely from GM technology, especially in the area of disease resistance. Output trait products would also be well suited to these intensive systems. However, there is concern about the marketability for products given current public opinion, although focus on marketing of products is distorted by the desire to make maximum gains from the subsidy system. There is also concern about farm and personal security with the threat of sabotage of crops by extremist groups.

Public opinion towards the farming community has softened a little and awareness of some of the issues affecting UK farmers has increased in the last twelve months after the foot and mouth disease (FMD) outbreak. Devastating footage of piles of dead animals being burnt has brought some sympathy, although tempered a little by claims of major compensation payouts to destocked farms. The GM debate has also been highlighted by FMD in terms of food safety and biotech companies are working hard in the public arena to dispel fears of the science. There now appears to be a slight change in attitudes and first commercial production of GM crops may even take place in 2005. The European stance on GM's is an important one for us to follow as it impacts on markets and consumer views not only in Europe but also South East Asia.

4.0 Marketing

Marketing issues are the key drivers to biotechnology research and production around the world. Public perception ranges from acceptance of GM's but with growing concern in the USA to very strong opposition in the UK. What I found most interesting was the limited concern amongst producers in Canada to the market implications of growing GM crops and the attitude of the US in marketing GM products into the European market. The key issues for marketing are the moving target of consumer preferences in major markets, identity preservation and testing procedures.

4.1 Canada

As Canada competes with Australia for major canola markets into Japan, China and Mexico and 60% of Canada's production is GM, there were some interesting lessons to be learnt from their experiences. Similarities such as Canada being a net exporter of grains and with little government support also highlight the usefulness of the Canadian experience. The limited concern amongst Canadian producers to the overseas market implications of growing GM crops was interesting. To put this in perspective though, the major market for Canadian canola is Japan which does not require specific GM labelling for highly processed foods such as canola oil and tolerance thresholds for labelled products are 5% compared to 1% in most other markets. Japanese public opinion is not strongly anti GM so lack of concern by Canadian producers is not surprising. There have been glitches in this system that highlighted the need for strict adherence to registration requirements of GM products sold to other countries.

Canada has a small market of 110 000 tonne of non GM canola into Europe at a tolerance level of 1% GM content. The "Identity Preservation" (IP) of this from GM canola has tested the grain handling system through Western Canada to Vancouver and Eastern Canada through the Great Lakes system. There have been some issues of co-mingling through this system and it does appear that the Canadian grain industry is playing catch up with its IP and testing systems in an attempt to keep up with GM production increases and overseas market requirements. These systems will need to be fine-tuned when output trait products come into the marketplace. This experience is one of the most important ones Australia can draw on in choosing to grow GM crops. To have these systems in place before the introduction of GM's is essential.

Regulation of GM's or plants with "novel traits" within the domestic market works on the assumption of "substantial equivalency". This is a regulatory term used to define a product and is a starting point from which the differences, not similarities between GM and normal foods are compared. To take a product from a starting point to the market takes between 3 and 7 years and each variety of seed needs to go through a merit system with a marketing board and seven Federal Agencies for comment on food safety. With the current products on the market companies will need 750 000 acres planted each year for three years to recoup costs.

Within Canada there are well structured and funded opposition groups such as the Sierra Club and the Council for Canadians who work hard at promoting anti GM sentiment amongst the public, but generally the Canadian consumer is accepting of the technology.

4.2 USA

The US domestic market consumes almost 80% of grain produced and of the main crops corn and soybeans a large proportion produced is GM. The grain handling system is not able to easily handle IP systems and there could be no guarantee of GM free grain with a tolerance of less than 5% GM content.

The USA is similar to Canada in respect that the GM crops currently grown are "substantially equivalent" to conventional varieties. According to the US Food and Drug Authority (FDA) there is no need to label or segregate these differently and so they are co-mingled with conventional varieties. The public has faith in their regulatory authorities and there have not been the food scares as there have in the UK and Europe. Opposition groups such as Greenpeace do not have the same credibility with the public and there is a general trust of government process. Biotech companies have chosen to have GM food reviewed due to the risk of law suits so have gone through a voluntary process to achieve this.

Other regulatory bodies such as the Environment Protection Agency (EPA) and the US Department of Agriculture are also involved. There is a more complex process involved with registering a new GM crop than a new pesticide. The risk of commercialising a new crop is now reduced with the benefit of experience in the testing process.

The US producer does not seem overly concerned about marketability of GM products. With government support through the US Farm Bill and the large non discerning domestic market the risk of not being able to sell a product is reduced. There are some concerns beginning to emerge with the question mark around the release of Roundup Ready® Wheat and its acceptance in world markets and this is bringing a new realisation of overseas consumer views into the debate.

4.3 United Kingdom

With the wide choice and consistent supply of food available in the UK it is difficult for the consumer to see the benefit of GM foods that offer benefits only to the producer. Biotech companies such as Monsanto aim at recouping their investment in technology with input trait crops before releasing the more consumer focused output trait products. Products such as the modified "Nexera®" oil (although mutogenic not GM) which offer consumers health and economic benefits will drive acceptance and demand for GM products in the future. The Western society demand for choice of what they eat will eventually provide a market for these output trait products. However, this will only occur if the benefits can be rigorously demonstrated to consumers and food safety and health fears can be addressed.

"Flavour Saver" GM tomato paste was sold in supermarkets in the UK in early 1998. It was sold at the same price as non-GM paste but packaged in a bigger container. There was widespread consumer acceptance as it was perceived as value for money. However, at this time there were two incidents involving scare campaigns around GM's, involving misinterpreted research into insect resistant GM potatoes and unlabelled GM soybeans imported from the US. GM tomato paste was removed from the shelves of supermarkets and the public could now see no value in GM technology, only uncertainty and misinformation from the regulatory and research organisations.

Companies such as Monsanto recognise this as a serious threat to adoption of the technology and have now taken a much more consultative approach with the public. In the last two years efforts have been directed towards public relations – informing the public and aiming for more rational debate. Collaborative research work with environmental groups on the impact on the environment is part of this process.

Paving the way for acceptance of GM's with commercialisation of output trait or quality enhanced products with demonstrated consumer benefits may be a means of gaining consumer confidence.

As the United Kingdom is a major player in the EU, the strong anti GM stance of the EU is also restricting commercialisation of products. Through the WTO, the Sanitary and Phytosanitary agreement enables countries to check the unjustified use of health regulations that may restrict trade. The EU are endeavouring to introduce a "Precautionary Principle" into this agreement which would restrict trade where science is not able to give a complete answer on the safety of products. This could be used to demonstrate that there are reasonable grounds for harm to humans, animals or the environment. Other countries are concerned that this could be a form of trade barrier. However, if foods have been passed by the FDA in the US there may be little grounds for this principle to be enforced, thus forcing the EU to accept these products. It is interesting to note that since the BSE outbreak in Europe, there has been an increase in the amount of vegetable protein fed to animals, mostly GM soybean meal from the US.

To remain GM free the European consumer will have to pay a cost for identity preservation and at present it is difficult to determine if the general population will pay more for what appears to be the same product.

5.0 The Situation in Australia

The Australian consumer views on GM foods are positioned somewhere between those of the USA and UK. There is general caution towards GM foods and the debate has increased in the last twelve months with the commercialisation of GM crops getting closer. Currently there are no GM food crops grown in Australia but GM cotton and carnations are commercially produced.

The Federal government introduced some of the strictest labelling legislation in the world with a tolerance of 0.1% GM content. This is the limit of the level that current testing procedures can test to. This will make it virtually impossible to source GM free processed foods in the supermarket. It is difficult to achieve a sample of crop that is 99.9% pure and most processed foods contain some form of soybean. GM free foods will have to come from the organic sector.

The WA State government has placed a two year ban on commercialisation of GM crops which runs out next year. Across Australia, there is a three tiered system of regulation set up after GM legislation was passed through government in December 2000. In WA trials are being carried out but a number of Local Government Authorities have banned GM trials in their Shires. Tasmania has a complete ban on growing any GM crop including trials.

The Grain Pool of WA is currently undertaking an identity preservation trial with a new variety of non-GM canola to test handling and testing systems. It is endeavouring to support the commercialisation of GM canola in co-existence with non-GM production.

The agricultural community is now at the crossroads of making the choice on GM crops. Debate has increased and much misinformation has gone out to the public from overseas anti GM campaigners through local sympathisers. The industry as a whole needs rational debate and solid information from the scientific community and marketers in order to make a well informed decision. We need the technology to remain competitive but also need an understanding of what our customers require.

Australia is a valuable market for GM technology and there are products ready to be commercialised that will be attractive to farmers. However, the area based "Technology Use Agreement" will not suit the current crop production system so an end point royalty would better suit the diverse range of production zones in Australia.
Industry also needs to develop a self-regulated Stewardship program to minimise the risk of resistance and crop volunteers becoming weeds. These programs can be built into existing quality assurance schemes.

6.0 Conclusion

The study of biotechnology gave me a valuable insight into the GM issue around the world. This will be valuable to me as we make our decisions here on the adoption of GM crops in the future. After studying the situation in Canada, USA and United Kingdom I think agriculture in Australia will only benefit from adopting GM technology.

Although there is still varying degrees of uncertainty about GM crops in our major markets, I think the benefits of GM's will prevail in the future and the technology will become a part of life.

GM crops are based on good science and will enable us to target markets with specific products suited to our environment and achieve better profitability. We also need to be proactive as an industry to maximise farmer benefits and reduce the risks with the technology through an end point royalty system and Stewardship program.

In WA we are in an enviable situation where we are currently not growing commercial GM crops and are in the process of making that choice. There is no doubt that we need to adopt GM technology in order to remain competitive in the world market. The key is to capitalise on the opportunity to get it right the first time and avoid the problems Canada and the US have with GM production. There is no doubt that the technology will provide us with another valuable tool for more efficient production and market segmentation but at the same time we need to ensure we can identity preserve GM's from each other and from non GM's. We need to commit resources into developing very good testing and identity preservation systems backed by strong regulatory, research, development and production processes to get it right. All of this needs to be done in an environment of market awareness and the moving target of consumer preferences.