Genetic Modification/Engineering in Agriculture - A Better Future for All?

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What is the current status of genetically modified (GM) crops and foods in South Africa and what is the impact on the food industry?

To answer these questions, we need to answer several questions:

1. What is the global influence of GM crops and foods?
2. How has this impacted on South Africa?
3. What is the role of government and industry in food biotechnology?
4. What are the benefits to South Africans?
5. How do we know these products are safe?
6. What are the current regulations managing GM products?
7. What are the consumers' perceptions about GM foods?
8. How can you keep up-to-date?

WHAT IS THE GLOBAL INFLUENCE OF GM CROPS AND FOODS?

The adoption and global distribution of commercialised transgenic (GM) crops is unprecedented in the history of the agricultural industry.

There has been a 23-fold increase in the global area planted with transgenic crops from 1996 to 1999. These crops are mainly planted in first world countries (82%) with only 18 percent of the total grown by developing countries in 1999.

Argentina has been the prominent developing country to grow transgenic crops, (17% of the world total at 6.7 million hectares), with the balance grown in China, Mexico and South Africa. The main transgenic crops grown are soya bean (54%), maize (28%), cotton (9%) and canola (9%). Minor transgenic crops are potato, squash and papaya.

The transgenic crops that have been developed and still to be commercialised include: cucumber, grapes, carrots, chicory, sweet potatoes, banana, etc.

It should be noted that GM foods have been eaten in the USA for six years without any scientific evidence of any negative impacts on human health or the environment. This means that at least 100 million people have eaten products derived from GM crops for an extended period proving the safety of the products.

Whilst the rapid adoption of this technology may slow down in the future, a significant global trend has already been set.

HOW HAS THIS GLOBAL TREND IMPACTED ON SOUTH AFRICA?

South Africa has been researching this technology for 20 years and assessing the products of this technology for 10 years.

The Research and Development (R&D) capacity in South Africa in food and agricultural biotechnology is the most developed in comparison with other sectors. In South Africa there are over 160 agricultural biotechnology projects currently in progress. These projects focus on controlling pest and diseases, improving storage properties of food, improving weed control, improving yield and quality of foods, protecting natural resources and developing drought and salt tolerance crops.

The South African National Department of Agriculture has approved over 100 plant trials of transgenic crops since 1990. The crops that have been assessed include: cotton, maize, lucerne, canola, strawberry, sugarcane, soya, potato, eucalyptus, apple, sugar beet and arabidopsis.

Commercialisation of GM crops has been slow in South Africa where plant trials have been carried out for 10 years and only two transgenic crops have been commercialised. These crops are insect resistant yellow maize and insect resistant cotton.

WHAT IS THE ROLE OF GOVERNMENT AND INDUSTRY IN FOOD BIOTECHNOLOGY?

The role of government in food biotechnology includes:

- National biosafety and regulatory legislation and structures.
- National policy and strategic approach on biotechnology.
- National input into international biosafety regulations.

- Information to stakeholders and public on biotechnology.
- Promote safe biotechnology research, use and application.
- Act in accordance with biotechnology laws and regulations.
- Avoid misrepresentation or misleading information.
- Support the dissemination of accurate information.
- Support an open and informed debate.
- Inform research and government of their needs.

The following gaps have been identified in South Africa:

- Regulatory structures not fully operational.
- Lack of dissemination of information on biosafety.
- No national policy/strategy.
- Decision-makers not well informed.
- Lack of unity: industry, government and research.
- Lack of accurate information: media and general public.
- Little support for biotechnology based SMMEs.
- Inadequate involvement of scientists in the debate.

AfricaBio is addressing some of these gaps. However, a more active approach by government, industry, research organisations and scientists is required to ensure that South Africans will have access to this technology in the future.

The next question to answer, is:

HOW IS THE TECHNOLOGY AFFECTING THE FOOD INDUSTRY?

To determine this, let's look at the impact of this technology on one of the food related industries - the animal feed industry.

The animal feed industry has already embraced the technology and market forces have directed this reaction. Let's summarise what has happened in South Africa with GMOs in animal feeds.

1. The Western Cape Consortium imports 300 - 350k ton/annum of yellow maize, mostly from Argentine and USA because it is cheaper.

2. At least 50% of that maize could be GM.

3. Soya meal imported from North America is likely to be derived from GM crops, as farmers have seen the benefits of planting GM soya.

4. Local cotton seed cake could be derived from GM crops, as many small-scale and commercial cotton farmers want to grow GM cotton.

5. Namibia is requesting only GM-free yellow maize and animal feeds from South Africa because it affects their beef market in Europe.

6. The South African consumers are becoming increasingly aware of the GM issue.

7. The EU's negative approach to this technology is being transferred to South Africa and some want a GM-free label, which carries cost implications.

8. The EU's artificial trade barriers are affecting South African agricultural markets.

These are the issues faced by just one sector of the food chain. Each part of the food chain will be affected as the products of biotechnology move up the value chain.

WHAT ARE THE BENEFITS TO SOUTH AFRICANS?

The benefits in the food chain at this point in our history are primarily aimed at producers and processors of crop plants with not too much benefit being visible to consumers yet. Let's look at the benefits of the technology to producers. Using gene technology, we now have disease and pest resistant crop plants. For example, we have maize resistant to maize stalk borer, potatoes resistant to potato virus X and Y, sweet potato resistant to feathery mottle virus which often destroys two-thirds of farmers' crops in Africa.

Some products are of benefit to the consumer, such as delay ripening tomatoes with enhanced taste but products are being produced now that have improved fat composition, are better tasting and more nutritious. For example, potatoes for chipping are being developed that do not absorb so much oil. Products that have health benefits will make an impact on consumers in the future. For example, transgenic rice with vitamin A has been developed for Asian countries where blindness due to vitamin A deficiency is common.

In livestock production, the technology is used for improved vaccines, genetically modified drugs and disease resistance. In addition, livestock are being studied and utilised for the production of high value pharmaceutical products such as specific human proteins produced in the milk of cows and pigs.

When discussing the benefits of this technology, it is most important to look at the benefits for developing countries such as South Africa. What are we doing in South Africa with this technology? We are developing disease resistant crops, drought tolerant and more nutritious crops. To illustrate the benefit to small-scale farmers in South Africa, let's look at the results obtained in field trials of insect resistant cotton in the Makatini Flats in Kwa-Zulu Natal. The data obtained shows an average

of 29-percentage increase in production without applying insecticide. This technology provides emerging and small-scale farmers who do not have access to agricultural equipment and knowledge, to be competitive with commercial farmers. In turn, through the use of this technology, there will be an impact on food security and economic development in developing countries.

HOW DO WE KNOW THESE PRODUCTS ARE SAFE?

This technology involves the isolation and transfer of a specific gene or genes into a plant or animal. The genes that are isolated are fully characterised before transfer into the plant or animal genome. In this way we know much more about transgenic crops than we do about those produced by plant breeding techniques. This is because when traditional plant breeding is carried out thousands of genes are crossed and whilst breeders select for the desirable genes they do not know what other genes have been transferred along with the desirable genes. Before a GMO or transgenic crop can be released into the environment it has to pass a biosafety assessment. The assessment of a GMO includes:

- Nutritional composition
- Wildlife safety
- Disease susceptibility
- Allergenic potential

Additional assessments may be carried out but these depend on the product (e.g. animal feeding performance may be required if the product will be used in an animal feed).

WHAT ARE THE CURRENT REGULATIONS MANAGING GM PRODUCTS IN SOUTH AFRICA?

South Africa's biosafety structures are determined by the GMO Act of 1997, which was implemented in December 1999. Regulation of transgenic crops until then was carried out by the Department of Agriculture through its existing legislation and the services of a scientific advisory committee called SAGENE.

There is no mandatory labeling required in South Africa at present for foods containing GM products. The South African government is still deliberating on the issue of labeling. However, the Groceries Manufacturers' Association's current position is that labeling should be voluntary. Products containing GMOs should not be labeled, as these products are safe and there is no definitive test to provide accurate information on the percentage content of GMO in the final product. A GM-free label can be used but these products would require a certification system, which can be monitored and shows that the product is made from GM-free raw materials and does not use GM products in the processing procedure.

The main issue is the cost implications of labeling. We have not been able to determine accurately the cost of labeling to the food industry and the consumer in South Africa. However, we can get an idea of the cost implications of mandatory labeling by studying the figures determined by the Australia New Zealand Food Authority based on the food industry in those countries.

Mandatory labeling would result in an overall cost to the food industry of 3 billion Australian dollars in the first year and 1.5 billion annually thereafter. The cost to the consumer would be an increase across the board of 10 to 15 percent. We need the food industry to determine if this is necessary and can we afford these increased costs in South Africa.

International regulations that are affecting South Africans or will affect us in the future, include:

- EU regulations
- International Biosafety Protocol
- Codex regulations

The EU regulations instituted on the 1st of April 2000, effectively mean that to label GM-free on a final product, all components of that product must have been derived from GM-free sources. Each raw material must have tracking documents right back to source to show no GM component or GM enzyme is involved in the process of manufacture of the final product. This system is called identity preservation.

If the GM component (protein or DNA) of the final product is more than 1 percent then the product must be labeled GM-derived. However, there is doubt that these regulations can be imposed as the detection methods available at present are not providing reproducible results.

These regulations are already impacting on South Africa with companies who trade with the EU being requested to provide proof of identity preservation.

The international biosafety protocol is another regulation that will impact on the food and agricultural trading practices in South Africa. This protocol is the international agreement on handling live modified organisms (LMO) still to be ratified. The protocol relates to the cross boundary movement of seed, live grain and fruit and vegetables that contain seed. The main aspect of the protocol is that an advanced informed agreement must be obtained from the country receiving a LMO intended for release into the environment for the first time. There are, however, regulations relating to LMOs destined for food, feed or processing which also affects the food industry (a report on the implications of the biosafety protocol is available from AfricaBio).

Finally, the Codex Alimentarius Commission, which is involved in setting world food safety standards, is also involved in making international labeling regulations that will affect GM foods. These regulations will not be enforced for several years.

WHAT ARE WORLD ORGANISATIONS AND RELIGIOUS LEADERS SAYING ABOUT BIOTECHNOLOGY AND GM FOODS?

World bodies such as the WHO and FAO are in favour of the technology but stress the need to ensure the environmental and human safety aspects of GM products. There is a general understanding that this technology is of major importance to developing countries and has a role to play in alleviating hunger and poverty.

Religious leaders have also been positive about the technology as indicated by the following statements:

"I have stopped all those who demand the condemnation of these products. Research in the biotechnological field could resolve enormous problems as, for example, the adaptation of agriculture to arid land, thus conquering hunger". Vatican Director of Bioethics, Bishop Elio Sgreccia 12/10/99.

"Perhaps the most widely articulated opposition to GM foods is based on the belief that they are radically unnatural and that to produce them is for humans to be guilty of 'Playing God'. Certainly, they represent possibilities that could not come about without direct human action upon nature. However, much technology and most medicine is based on human intervention into natural processes... genetic engineering does not seem very different from other forms of scientific advance". Church of England's General Synod Board for Social Responsibility 13/8/99.

"The Muslim world that is mostly devoid of fertile agricultural land should seize the opportunity provided by the more resilient GM crops.... As with countless other knowledge bestowed upon humans by Allah, this breakthrough too can be used for good of mankind. Above all, moral panic should check not hinder development". Institute of Islamic Understanding, Malaysia 5/6/99.

WHAT ARE THE CONSUMERS' PERCEPTIONS ABOUT GM FOODS?

In South Africa, the majority of the population wants safe, good quality, cheap food. The majority of the population is also not informed about modern biotechnology and its products. In a consumer survey carried out in 1999 it was found that 84 percent of female consumers in South Africa had not heard of biotechnology or GM foods. A small sector of the population is very negative about the technology due to their concerns about the safety of the products, environmental issues, religious or ethical interests. In addition, there are certain interest groups that are taking an anti-GM stance to protect their markets, for example the organic farmers. There are environmental groups who believe (without proof), that this technology is a threat to nature, even though these processes take place in nature all the time and traditional plant breeding has been moving genes around in crops for hundreds of years.

There are other groups, in Europe particularly, who wish to ensure that the glut of food produced in Europe is not under threat by cheaper, better quality foods. To achieve this, the European Union has imposed an artificial trade barrier by legislating for labeling of GM foods and products derived from GM raw materials.

Then there is the real concern of consumers who want to know what they are eating and is it safe. Most of the anti-GM campaign has been carried out (very effectively), through media hysteria. Much of this hysteria has been created by using misinformation, emotional and sensational approaches such as the inaccurate statement that the technology will kill monarch butterflies, or that people have died from eating GM foods. The facts are quite different. The monarch butterflies don't feed on maize pollen and Americans have been eating GM foods for over 6 years and no deaths have occurred due to GM foods.

What is required in South Africa, is to ensure that public understanding is enhanced, the decision-makers have factual knowledge of the technology, that misinformation spread by the anti-GM campaigners is refuted and that the media is continually given the facts.

To carry out these tasks, AfricaBio was formed in October 1999. At the inaugural meeting of AfricaBio (an organisation set up to provide accurate information on this technology) on 9th February 2000, the Director-General of Agriculture, Ms Bongiwe Njobe, clearly indicated that the government supports modern biotechnology and its products.

She stated that South Africa's needs are different to Europe and we must be aware that this technology has benefit for Africa. She cautioned about incurring extra costs for consumers by needing to identify organic foods, GM foods and conventional foods. She also requested that industry, the technology developers and scientists become more active in informing the public on biotechnology and its products.

A recent statement from Ms Njobe's department says that the environmental groups who are demanding a five-year moratorium on GM foods will be denying South Africa's rural masses access to cheap food. It is, therefore, important that we assess this technology without

reacting to media hysteria created by a few interest groups.

The final question to ask, is:

HOW CAN YOU KEEP UP-TO-DATE AND MAKE YOUR VOICE HEARD ABOUT THE ISSUES RELATED TO YOUR INDUSTRY AND YOUR PRODUCTS?

Become a member of AfricaBio, the South African Association for Food, Feed and Fibre. The role of this organisation includes:

- Provide accurate information about the technology and its products
- Encourage an informed debate
- Promote the safe use of GMOs
- Interact with government
- Interact with international bodies
- Provide education and training
- Facilitate research