

UNDERSTANDING GENETICALLY MODIFIED ORGANISMS

South Africa is far from an ideal country for crop production. Less than 15% of its land is arable and there are serious climatic constraints such as periodic droughts, floods, etc. Despite these circumstances SA has to achieve maximum productivity to provide food security for its growing population.

- In the past, crop yield and quality has been significantly increased by procedures such as selection and crossbreeding. But as our understanding of genetics has increased, scientists have found ways of speeding up the process.
- By means of genetic modification techniques, desirable characteristics can now be incorporated into plants in a more accurate way.
- Genetic modification allows us to grow better-quality crops with higher yields while at the same time sustaining and protecting the environment, thereby providing a way of meeting the growing demand for food without placing additional pressure on our scarce resources.

As with many new scientific innovations, genetic modification has generated debates and has been subjected to sensational media coverage. The questions raised need clear answers.

What is genetic modification?

A genetically modified organism (GMO) means any organism; the genes (or genetic material) of which have been modified in a way that does not occur naturally through mating or natural recombination or both. (A gene is a biological unit that determines an organism's inherited characteristics). An example of a GMO is a plant that has been modified to contain a gene from a common soil bacterium *Bacillus thuringiensis*, giving it a built-in resistance to the maize stalk borer, an insect that attacks and destroys maize crops.

What are the benefits of genetic modification?

- Plants can be modified to increase their resistance to insects, diseases and other pests that are capable of destroying or seriously damaging crops.
- This not only results in an increase in the yield of these crops, but also reduces the need for using pesticides.
- Reduced pesticide use implies decreased pollution and increased safety for farmworkers and those living nearby, as well as less harm to animal life.
- Food quality is improved because there is less fungal infection, insect damage and residual pesticide.

- In addition, less time and energy is spent in crop production.

- Plants can also be modified to have stress-tolerance qualities, improved taste and appearances and better processing characteristics.
- Improvements can be made to nutritional qualities such as vitamin A, which can play an important role in combating deficiency diseases in millions of people.
- Eliminating nutritional deficiency helps to promote a healthy population and productivity.

Are genetically modified (GM) foods safe to eat and how is human health risk assessed?

All genetically modified foods are thoroughly assessed during the developmental phase to ensure that they are safe for animal and human consumption. This is done before they are made available to the public. The safety assessments of GM foods are based on guidelines and principles developed by Codex Alimentarius (Codex), an international body involved in food safety, together with the World Health Organization (WHO) and Food and Agriculture Organization (FAO) of the United Nations. Codex principles include the need for a case-by-case safety assessment; the use of scientific risk-based assessment methods, consideration of newly introduced genetic material, new proteins and other characteristics of the GM food, consideration of intended and unintended effects of genetic modification and a comparison with conventionally produced foods. GM-foods that are on the market have been approved by government and are considered as safe as their conventional counterparts.

Should GM foods be labelled?

The Department of Health is responsible for the implementation of legislation governing the labeling of GM foods and currently requires that a GM food be labelled if it differs significantly in composition, nutritional value, or in mode of storage, preparation or cooking from that of the corresponding existing foodstuff. The regulations also require a GM food to be labelled as such if a plant-derived food contains genetic material derived from a human or an animal, or if animal-derived food contains genetic material derived from a human or from a different taxonomic animal family.

The labeling information on the table is not a warning that these foods are unsafe. It is important to realise that Government declares these foods to be safe as conventional foods before they are released for human consumption. The label merely gives information on the ingredients of the foodstuff or product as an internationally acceptable standard.

Will a human or animal who/that eats GM food become a GMO?

A human or animal that eats a transgenic food product will not become a GMO. The foreign gene in the GM food and the protein it produces, are digestible like many other food proteins. To change the genetic makeup of an organism, new DNA needs to be stably inserted into its genetic material.

A common misconception among many is that only GM foods contain DNA. This is not so, humans have been exposed to DNA from conventional crops, animals and their associated microorganisms for as long as we have been eating these products. So far, there is no evidence that DNA from transgenic crops is dangerous to humans compared to the foods they have been eating to date.

What are the issues of concern for the environment?

The major environmental concern is outcrossing, where genes from GM crops may become established in conventional crops or closely related wild species. The process of outcrossing is not unique to GM crops, but is a predictable process that will occur only among closely related plant species that are growing in close proximity and flower at the same time.

All GM crops are thoroughly evaluated to assess the potential of outcrossing. The GMO Act requires that GMO trials observe prescribed isolation distances from other crops. If safety to the environment cannot be demonstrated, the product is not approved for trials or commercial release.

Is genetic modification restricted to the food industry only?

No, there are many useful applications of genetic modification, especially in medicine and health care. Medicines and vaccines are already being produced through genetic modification. Advances in molecular biology, immunisation, and genetic engineering have revolutionised our understanding of diseases and their management. Globally there are about 35 to 40 biotechnology-derived therapeutics and vaccines in use. One example is insulin, which is widely used by diabetics.

Are GM foods assessed differently from conventional foods?

Generally consumers consider conventional foods safe because they are familiar with it and have been consuming it for a long time. When new foods are developed by natural methods, some of the existing characteristics of foods can be altered, either in a positive or negative

way. Specific regulatory systems have been set up for the rigorous evaluation of GM organisms and GM foods because Government is committed to ensure access to sufficient, safe and nutritious food. These systems evaluate both human health and the impact these organisms can have on the environment.

Are there international safety requirements during the movement of GMOs?

Yes, the Cartagena Protocol on Biosafety, (established under the Convention of Biological Diversity), is an international agreement that aims to ensure an adequate level of protection in the field of safe transfer, handling and use of living modified organisms resulting from modern biotechnology. South Africa is Party to this Protocol, which means that the Department of Agriculture, Forestry and Fisheries has to adhere to these international safety standards when conducting activities involving GMOs.

How is the review process of GMOs in South Africa handled?

The Registrar for GMOs receives all applications for activities with GMOs. Once he/she is satisfied that the application is compliant with the provisions of the GMO Act, the application is forwarded to the Advisory Committee. Members of the Advisory Committee are appointed by the Minister for Agriculture, Forestry and Fisheries and consist of scientists who are experts in fields related to GMOs. This Committee evaluates risk assessments (scientific data relating to food, feed and environmental impact) submitted with every application. Based on the findings of the Committee, the application is recommended to the Executive Council for a decision. The general public is also informed and consulted on intended activities related to GMOs by means of notifications in major newspapers. Comments from the public are also considered in the process of evaluating an application. This promotes credibility and transparency in the regulatory process of GMOs.

The Executive Council is the decision-making body and consists of officials from six government departments; the Departments of Agriculture, Forestry and Fisheries; Health; Environmental Affairs; Labour, Trade and Industry and Science and Technology, as well as the chairperson of the Advisory Committee. If the Executive Council is satisfied that a certain activity with a GMO may be conducted, the Registrar is authorised by the Council to issue the necessary permit. The Act allows for anyone who feels aggrieved by a decision of the Council to appeal to the Minister for Agriculture, Forestry and Fisheries, who shall make a final ruling.

Let's talk about GMOs!

The Department of Agriculture, Forestry and Fisheries would like to promote debates in the area of genetic modification to enhance public understanding and stewardship in managing the technology. Information and GMO statistics are updated continuously on our website:

<http://www.daff.gov.za/divisions/biosafety>

Comments and suggestions by the public are welcomed.

Government has also established a forum for engaging in debates on biotechnology through a programme called "Public understanding of Biotechnology (PUB)" under the Department of Science and Technology, website: <http://www.pub.ac.za>

Important web links

Department of Health: www.health.co.za
Department of Environmental Affairs (DEA): www.dea.co.za
Department of Science and Technology: www.dst.co.za
Public Understanding of Biotechnology (PUB): www.pub.ac.za
Convention on Biological Diversity: www.biodiv.org
Biosafety Clearing-house: www.bch.biodiv.org
Codex Alimentarius: www.codexalimentarius.net
Food and Agricultural Organization: www.fao.org
World Health Organization: www.who.int/fsf

Contact information

The Registrar
Genetically Modified Organisms Act
Private Bag X 973, Pretoria, 0001
South Africa

Telephone: +27 12 319 6199/6382 Facsimile: +27 12 319 6329
Email: GillianC@daff.gov.za
www.daff.gov.za

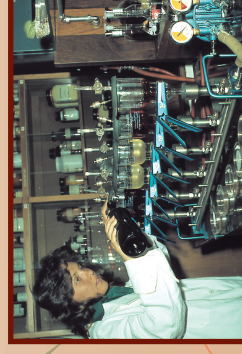
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Understanding

GMOs



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