Asian Journal of Business and Management Sciences
Vol. 3 No. 04 [84-95]

INTEGRATING ETHICAL DISCOURSE INTO GM FOOD PRODUCTION

Prof. Angelo Nicolaides
UNISA Graduate School of Business Leadership
South Africa
E-mail: nicola@unisa.ac.za

ABSTRACT

Genetically modified organisms (GMOs) and genetically modified foods (GM foods) are continually in the public eye. Genetically modified organisms (GMOs), may be defined as those in which genetic material has been altered so as to make the organisms unnatural. When genes from different organisms are combined in a process called recombinant DNA technology, new organisms result which we call "genetically modified" or "genetically engineered". GM plants are produced which are used to grow GM food crops. While there may well be many perceived advantages to the production of such foods, there are also major issues of concern for human health and for the environment in general, related directly to GM foods and their manufacture. GMOs provide us with problems which are yet to be entirely understood by innocent consumers. This paper attempts to highlight some of the controversial issues relating to the production of GM foods and to the ethicality of GM food production in general, given that nature is been tampered with by the mixing of genes amongst diverse species, and is intended as a contribution to the ongoing debate on GMOs.

INTRODUCTION

"In all of humanity's past experience, living things enjoyed a separate, unique, and identifiable place in the order of nature. There were always rabbits and robins, oaks and ostriches, and while human beings could tinker with the surface of each, they couldn't penetrate to the interior of any. . . . The redesign of existing organisms and the engineering of wholly new ones marks a qualitative break with humanity's entire past relationship to the living world. . . . Engineering new forms of life requires a wholesale transformation of our thought patterns." (Rifkin : 1983)

GMOs have been planted in many countries and while it is true that labour costs have been greatly reduced, and yields have increased as a result, very little has been done to assess the environmental risk factors as well as loss of biodiversity and the ethical dilemmas involved in the planting of such crops. There has not yet been a meaningful long-term assessment to ascertain the impacts of genetically engineered foods on humans, animals or natural plants. Scientists in many countries are warning about the health risks posed by GMOs and cite increased incidences of allergic reactions in people as well as greater antibiotic resistance. It is thus ethically irresponsible to produce and sell GMO foods to innocent consumers who do not know whether or not what they are consuming is in fact safe to eat. Scientists who re-programme the genetic codes of life, claiming that they are enhancing increased resistance to herbicides and improving the nutritional content of foods, are not certain if their altering of millions of years of evolution are creating irreversible damage to our fragile planet.

In 2003, there were approximately 67.7 million hectares of land planted with transgenic crops by 7 million farmers in 18 countries. The United States grew 63% of the transgenic crops planted, Argentina grew 21% and South Africa 1%. These figures are

expected to increase considerably in developing countries. A vast amount of African soil has been planted with genetically modified crops (GMCs) such as herbicide and insecticide-resistant corn, soybeans, canola and corn (Human Genome Project : 2003). While there is some labelling on foodstuffs to point out which have been genetically engineered, the labelling is unintelligible to consumers and more public education and awareness programmes are needed, otherwise we have no way of knowing what we are imbibing and how it may impact on our bodies. In the process of manufacturing GM foods, genetic material is transferred from one organism to another. This means that different species are put together unnaturally, to create unique life forms that taste, look and smell like the intended outcome, and are far removed from the natural crop created by God.

Many doubts have been expressed by scientific studies about the efficacy of GM food production and a multiplicity of health risks have been exposed, for example, growing resistance to antibiotic medication and an increase in allergic reactions. Many GM crops are resistant to herbicides and only wild field plants are affected, resulting in many of them becoming endangered species. Many crops have genetically engineered material in them that are poisonous to insects that eat them. What will happen to the birds that consume these insects? What about organic farm crops, usually pure, being contaminated by cross-pollinating GM modified crops? How does one prevent cross-pollination by wind action or by insects? The organic farmer will invariably find that his grain is contaminated and consequently loses his organic farming status. The organic status guarantees him a higher level of income as this method of farming is more labour intensive and costly. He then also becomes dependent on the GM food producer for future seed. GE crops may devastate the environment irreversibly. GM pollen and seeds are said to be “contaminating” conventional crops as well as wild plants (Simms : 1999).

“We have already seen triple herbicide resistant weeds, making it necessary to use highly toxic weed killers, exactly the opposite of what GE is claimed to do. Herbicide use has increased since the introduction of GE crops, not decreased as claimed. Insect resistant genes have been shown to be persistent in soil and water, they affect soil life, earthworms and microbes. Once we let the genie out of the bottle, there is no way to put it back. Once genes are out there it is impossible to control them” (SAFeAGE).

Very few tests have been conducted to evaluate the safety of crop foods whose composition is highly complex and there are in fact no peer-reviewed publications of clinical studies to ascertain the human health effects of GM food on the body (Pusztai : 2001). We have no comprehensive understanding of the consequences of consuming GM foods. No long-term animal tests have been conducted on any varieties (Charles : 2001). Industry prefers to make compositional comparisons between GM and non-GM foods and maintains that if they are not noticeably different then they are “substantially equivalent” and therefore the GM crop is regarded as safe to consume. GM crops can thus be patented without animal tests having been conducted (Millstone et al : 1999). Furthermore, “substantial equivalence” is an unscientific idea that has no clear definition (ibid). Even if there is rigorous testing conducted on GM foods, this does not necessarily guarantee safety. A small sample of GM plants does not suffice and neither does comparative testing of one or other aspect of the foods composition (Lacey : 2006).

On 26 July 2000 an international initiative called the Global Compact was launched to bring businesses together with UN agencies, labour and civil society to support universal environmental and social principles. Today, many hundreds of companies from all regions of the world, international labour and civil society organizations are engaged in the Global Compact, working to advance principles in the areas of the environment, human rights, labour and corruption. The Global Compact stresses that businesses should support a precautionary approach to the handling of all

environmental challenges faced in the world. The Rio Declaration further sets out an extremely important idea, now widely accepted by policy makers, of a precautionary approach to environmental protection and this also is part of the UN Global Compact.

"In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation." (www.unglobalcompact.org/AboutTheGC/index.html)

GMO production cannot be ignored as a great area of concern relating to environmental degradation.

In terms of human rights principles, consumers should have a right to either accept the adoption or rejection of GM technology. From a utilitarian perspective, the benefits as opposed to likely detrimental effects of GM technology must be carefully balanced. We would hope that in terms of virtue theory, the further innovation, and careful regulation of GM technology that is ultimately proved to be beneficial to humanity will prevail and be sustainable if it is handled ethically.

WHY HAVE GM FOODS BEEN CREATED?

A multitude of reasons are put forward to validate GM food production. A number of politicians and scientists worldwide see GM crops as the answer to famine prevention and as an alleviator of suffering for the world's starving masses (Pearce & Wambugu : 2000). In fact, it may well be the case that GM crops will put small farmers out of business and damage wild plant populations through genetic introgression (Reiss : 2001). The foods are marketed to show some perceived advantage for the producer as well for the consumer. We are told that the shelf-life of products is lengthened and that spoilage is reduced which ultimately leads to increased profits for sellers. There are claims that GM foods do and will increase the food security for the worlds burgeoning population and have enhanced taste and greater nutrients. We are told GM organisms improve crop protection by making plants more resistant to plant diseases caused by either viruses or insects or through greater tolerance of herbicides. Plants are made more insect resistant by adding the gene for toxin production from the bacterium *Bacillus thuringiensis* (Bt) into the food plant. This toxin is used as an insecticide. There is also a "downside", because the target insects are perpetually exposed to toxins and this creates a very strong selection pressure for the development of resistance to the toxins (Deacon : 2006). "*The expression of the Bt gene can vary. For instance, if the temperature is not ideal this stress can lower the toxin production and make the plant more susceptible. Secondary pests are not controlled by Bt transgenic crops. Due to the constant exposure to the toxin an evolutionary selective pressure is created for resistant pests. There is a hypothetic risk that for example, transgenic maize will crossbreed with wild grass variants, en that the Bt-gen will end up in a natural environment, retaining its toxicity".* (http://en.wikipedia.org/wiki/Bacillus_thuringiensis).

Plants are made more virus resistant by the introduction of a gene from viruses which cause plant diseases and which makes plants less susceptible to diseases. Herbicide tolerance is also achievable through the introduction of genes from a bacterium which conveys resistance to various herbicides (WHO : 2003). Crops are also claimed to mature a lot faster than natural crops and that the yield of the crops is far larger. Many GM crops are also said to be resistant to disease and to pests and do not have the same effects from herbicides as do natural crops. The animals which consume these plants are said to be more resistant to disease and yield better meat, eggs and milk. Generally animals consuming these plants are said to be healthier. Further so-called benefits

include soil and water conservation and bio-friendly herbicides and insecticides. The GM industry is going to great pains to convince consumers to eat GM products and wants to use GMOs to boost the energy properties of crops for ethanol production. The latter is attracting great interest in the international market as a relatively benign renewable energy source that is cost-effective at current oil prices (Mail & Guardian : June 2, 2006).

GM foods produce sterile seed which allows only a single growth cycle. The implication is that buyers of seeds are then obliged to purchase new seeds for every growing cycle, from a supplier who has the total right over the sought grain. The purchaser is thus made a captive of the manufacturer and in essence, becomes economically dependant on him.

In reality then, GM food production is creating a scenario of economic dependence in which foods are licensed for the ultimate economic benefit of the manufacturer and altered genetically, without a careful interrogation of the facts on how these foods impact human health.

POSSIBLE HEALTH RISKS

The 1992 Rio Declaration on Environment and Development, stated that " . . . lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation." This view has led many countries to declare a moratorium on GM crops on the hypothesis that the development of GM crops may ultimately lead to environmental degradation. What is clear is that there are always two sides to a story-the positive and the negative.

There are many health risks and other hazards associated with GM food manufacture. Despite bans in many other countries, the SA Department of Agriculture has licensed the local use of the genetically engineered bovine growth hormone rBGH/rBST. Milk from rBST or rBGH treated cows has higher-than-normal levels of IGF-1, an insulin-like substance linked with increased cancer incidence in humans. Scientists have noted lameness, shortened life-spans and increased mastitis in treated cows, leading to higher antibiotic use. This in turn can increase antibiotic resistance in humans who drink the milk from treated cows (SAFeAGE).

There are generally three main areas of concern as far as health goes (WHO). These areas may be described as allergenicity, out-crossing and gene transfer. Allergenicity is the main concern as GM foods may cause allergies and anaphylactic reactions in people that eat unlabelled GM food products. Many children in both the United States and the European Union have developed life-threatening allergies to various foods such as peanuts. If genes are from crops that are known to be allergenic, it is relatively easy to assess whether the GM food is allergenic as has been demonstrated in GM soya beans expressing the brazil nut 2 S protein (Nordlee et al : 1996). Dupont soybeans spiced with genes from brazil nuts caused allergic reactions in people who are allergic to nuts. Consequently, the product was recalled (www.anarac.com/aregmfoodssafe.htm). GM foods need to be tested extensively if consumers are not to be harmed. In this regard, it is imperative that GM foods are appropriately labelled.

The problem is that there is no regulated health safety testing. Pjil Angell, a corporate communications director of Monsanto which is very a large producer of GMOs, has gone on record as saying: *"Monsanto should not have to vouchsafe the safety of biotech foods. Our interest is in selling….Assuring its safety is the FDA's (US Food and Drug Administration) job."* (www.cqs.com/50harm.htm). Monsanto soybeans were fed to fish for 10 weeks before being approved. No long-term testing on humans was conducted to

ascertain allergenicity (www.anarac.com). Monsanto also produces the most commonly used broadleaf pesticide in the world, glyphosphate--or Roundup. In addition to its inherent toxicity as a chemical pesticide, Roundup has now been found to aid the spread of fusarium head blight in wheat. This disease creates a toxin in the infected wheat, making the crop unsuitable for human or animal consumption. Canada's wheat industry is currently being ravaged by this disease.
At the same time, the widespread use of Roundup has resulted in the formation of "super weeds" which are unwanted plants that have developed an immunity to all of these pesticides. (www.organicconsumers.org/monlink.html#thirdworld)

Richard Steinbrecher, a geneticist working for the Women's Environmental Network in the United States has stated that *"To use genetic engineering to manipulate plants, release them into the environment and introduce them into our food chains is scientifically premature, unsafe and irresponsible."* (Ibid). Certain GM foods have toxic pesticides inside their cells and the long-term impact of these on a consumer's health is not known. Monsanto's Roundup Ready s insecticide-resistant soybeans have an allergen that inhibits protein digestion and which has been linked to retarded growth and enlarged pancreatic cells in animals. In the United States, about a quarter of the people tested who consumed GM foods that included dairy products, wheat, eggs and nuts, reported adverse reactions to one or more of these foods (Lacey : 2001).

Generally, GM foods have lower levels of vital nutrients such as phytoestrogen, which is necessary to help a body combat cancer. Scientists are very concerned that antibiotics will become less effective in combating diseases. The British Health Association has expressed concern that there is a great risk to human health from antibiotic resistance developing in micro-organisms and that this is one of the major public health threats of the 21st Century (www.anarac.com). Cows injected with rBGH virus for GE, have been found to have greater levels of udder infections and need greater amounts of antibiotics which leaves high levels of antibiotic residues in milk and ultimately leads to increased antibiotic resistance in consumers of the milk. Nathan Batalion, in "50 Harmful Effects of Genetically Modified Foods", has asserted that the use of rBGH in cows also causes a rapid growth in birth defects and could result in shorter life-spans in cows (www.cqs.com). Viruses can easily mix with other viruses and even with retroviruses such as HIV. There is absolutely no guarantee that organic food supply chains will not be contaminated by GMOs in South Africa and this contamination will ultimately affect the entire production chain as was the case in the USA where widespread contamination of the food supply of animal feed GM Starlink occurred in 2000 and 2001(Freeze & Mayet in Mail and Guardian : 2006).

Gene transfer from GM foods to the cells of the human body or to bacteria in the gastrointestinal tract is a possibility and a cause for concern. It is especially a concern if antibiotic resistant genes used in GMOs are transferred to people. This is why the WHO of the UNO has advised the use of GMO technology without antibiotic resistant genes. Yet another problem area is out-crossing. This refers to the movement of genes from GM plants into natural crops as well as the mixing of crops derived from natural seeds and GM seeds. In the United States, maize for fodder use and human consumption maize was found to be mixed. This prompted the adoption of strategies to limit mixing, especially by the geographic separation of GM crops and natural crops. As stated, this is a great risk area as it virtually impossible to prevent cross-pollination.

People have already died as a result of GM. In 1989, dozens of Americans died and thousands were afflicted by a genetically altered version of the food supplement-L-Tryptophan. Consequently a settlement of $2 billion was paid out by Japan's third largest chemical company, Showa Denko (Batalion : 2006). How many more must die before we stand up and take a stand?

Comstock (2008) states that: "… genetic engineering treats life in a reductionistic manner, reducing living organisms to little more than machines. Life is sacred and not to be treated as a good of commercial value only to be bought and sold to the highest bidder." There may of course be many benefits to GMO technology and production and this may be the saviour of the future world where billions will propbably be starving at the current rate of agricultural production.

THE SOUTHERN AFRICAN SCENARIO

Since 2000, approximately 400 000 hectares of GM crops have been planted in South Africa and an estimated 40 million people have consumed GM foods. In the Eastern Cape Province alone, 120 new farmers using GM crops, succeeded in obtaining a yield of 3,5 tons per ha as opposed to the normal natural yield of 1,5 tons per ha (Lombard : 2006). The participants in the first SACC (South African Council of Churches) consultation on GMOs held at the ESCOM Convention Centre, Midrand, South Africa from 26-28 May 2004, called on the government, while it is still allowing GM technology to operate and have an impact on our environment, to affirm that GM technology is a high risk technology and to impose a moratorium on any further permits granted for GMOs in South Africa. They also called on the SACC and its members to take the issue of the right to food seriously and co-own the issue of GMOs as an issue of justice in line with our longstanding commitment to solidarity with the poor and marginalised. Further concerning GMOs, they expressed concern about, and were further driven by, their vision of the dignity of the human person; the common good; solidarity; dependency; integrity of creation; socio-economic and environmental justice. They were also concerned about the manner in which complex issues on GMOs are treated by proponents of GMOs and South African legislation in a 'purely technical' manner, de-linking science from ethics, values, economic and political ideology, and our African communal spirituality about life and food.

The SACC also expressed concern for the link between the promotion of GMOs and neo-liberal economic globalization with its inherent unequal power relations as well as the scientific uncertainties related to the long term economic, nutritional, health, ecological risks of gene transfer technologies in view of the irreversibility in the release and use of GE products. What was equally worrying to them was the elevating of natural scientists and civil servants to be experts and adjudicators in regard to issues of GMOs even as they pertain to human life, the environment and the spirituality related to life. They further felt that there was an insufficient representation of relevant sciences (including ethics) to advise government, and the apparent non-independence of advisors to government and government institutions in the development and implementation of GMO policy and a lack of public awareness and debate on GMOs (SACC).

Genetically modified (GM) crops currently make up about 29% of total crop production worldwide and South Africa is the only country in Africa to commercially grow GM crops. GM is used in South Africa primarily in maize and soybean cultivation for human consumption and for cotton and cotton oil for non-food usage. Despite the lack of regulations to provide for food labelling that allows for consumer preferences, many products carry negative or positive labels with regard to their genetic modifications. The aim of a study undertaken by Viljoen, Dajee and Botha, was to test different maize and soy products to determine the uptake of GM food into the human food chain as well as the validity of "non-GMO" (genetically modified organisms), "GMO free" or "organic" labels, on local as well as imported products. Of the 58 products they selected and sampled randomly, 44 tested positive for the presence of GM. Furthermore, of the 20 products with a GM related label, 14 tested positive for GM. These results demonstrate the extent of GM in the human food chain in South Africa and highlight the need for

effective regulations to protect consumers against misleading claims (Viljoen et al : 2005). In South Africa, GM is controlled by Genetically Modified Organisms Act of 1997 in terms of which all proposed GM products need to be applied for. The application is submitted to an advisory committee which is tasked with carrying out a scientific evaluation of the proposed GM product. Depending on the outcome, recommendations are made to an executive council which is comprised of representatives from six government departments including trade and industry, agriculture, labour, science and technology, health and environment, who are all involved in the decision-making process concerning the GM product application.

According to the UN Food and Agricultural Organization's (FAO) October 2004 report, twenty-three countries in Sub-Saharan Africa are in need of emergency food intervention. Subsidies for grain are called for, from especially the United States. In 2002 there was a similar crisis and the United States shipped tons of GM maize to Southern Africa, in a move that was seen to promote GM food production. Farmers in recipient countries such as Malawi, cannot save GM seeds and will thus have to buy them at higher prices, thus becoming dependant in the provider for their survival. The problem is exacerbated by the fact that countries with GM crops are unable to sell them to the EU which has imposed bans on the importation of GM foods. Countries which accept handouts of GM seeds from donors are in essence sowing and growing the seeds of their own destruction.

WHERE IN SOUTH AFRICA ARE GE CROPS GROWING?

The Department of Agriculture first granted a permit for GE cotton field trials in 1992. By Feb 2000, 165 field trials permits and 4 commercial insect-resistant GE crops had been granted general release permits i.e. GE plants are widely grown. By July 2000, 17 more permits were granted for field trials and herbicide-resistant Roundup Ready cotton was approved for general commercial release. Three more applications are now pending. GE Maize has been granted commodity clearance, which means it is imported and exported as animal feed.

The Dept of Agriculture releases information of the districts where GE crops are grown but not the farm locations.

- MAIZE: grown by Agrevo, BASF, Carnia, Pannar and Monsanto in Delmas, Nelspruit, White River, Skeersport, Rustenburg, Viljoenskroon, Hoopstad, Potchefstroom, Swartberg, Middelburg, Wolmaranstad, Malelane
- COTTON: grown by Monsanto in Welpe, Messina, Nelspruit, Brits, Rustenburg, Groblersdal, Whiteriver, Settlers, Burgersford; Stoneville in, Marble Hall; Delta Pine in Marble Hall, Pongola, Makhatini, Setlagoli, Magogong, Jan Kempdorp, Grootdrink, Upington, Groblersdal, Krokodildrif
- SOYABEAN: grown by Carnia in Petit, Hendrina, Thabazimbi, Vrede, Vryheid, Nelspruit, Bethlehem; Monsanto in Delmas, Greytown; Pannar in Delmas
- POTATOES: grown by First Potato Dynamics in Koue Bokkeveld, Ceres
- TOMATO: grown by Seminas at ARC - Roodeplaat
- APPLE: grown by ARC-Infuitec in Stellenbosch
- CANOLA: grown by AgrEvo in Krommeree, Elsenburg
- HONEY: may be contaminated by GE pollens. (SAFeAGE).

LABELLING OF GM FOODS IN SOUTH AFRICA

Is it not time to require labeling that indicates whether a product has been genetically altered? If there were rigorous labeling this would surely be one way to increase trust in the process of GMO food production. Consumers will be empowered to select whether or

not they wish to expose themselves to the potential risks of eating GMOs. In the European Union it is a requirement that lany food with 1 percent or more genetically modified ingredient/s must be labeled as such. In 2004, labelling regulations for foods with GMOs were introduced, Consumers have the right to know what is GE and what is not. A sample of 60 consumers who were students at a university in Johannesburg, aged between 19 and 25 years of age were asked questions relating to GMOs. The responses were rather interesting and the findings are highlighted below:

- 19 had never heard about GM foods.
- 34 consumers did not believe that GM foods had any benefit for them.
- 22 thought GM food production was good for the environment.
- 25 consumers said they would like to see more public information on GM foods and its effects.
- 46 would appreciate governmental awareness programmes on GM foods.
- 21 were suspicious about GM food and would avoid it if possible.
- 39 stated that they were not able to make informed choices concerning GM food as they did not see labels on foodstuffs.
- 9 said they believed GM foods were 'bad' and had negative health effects.
- 41 had vague recollections of some or other protests a few years ago relating to crops.
- 6 believed that GM foods were healthier than organic foods.
- 13 believed that GM foods were irradiated.
- 4 thought GM foods were only for animal feed.
- 34 believed that manufacture of GMOs was interfering with nature.
- 5 believed that more research was needed to ascertain long-term damage to the environment.

In the international arena, there are numerous debates concerning the labelling of GM foods. The FAO and WHO of the UNO have established the Codex Alimentarius, a body which sets international food standards. Consequently a debate on GMO labelling has developed which centres around declaring the methods of production of all foods and which stresses that consumers have a right to know what they are eating. If foods such as eggs, groundnuts, soybeans, milk and wheat, to name but a few, are allergen-containing, they should be labelled as such (Van Rijssen : 2004). The South African Bureau of Standards (SABS) and the government as well as other stakeholders is developing an Identity Preservation (IPS) for non-GM foodstuffs and this will give consumers a choice between GM and non-GM foods. Labelling of foods will thus be compulsory and any claims made by producers will be subject to validation and certification (ibid.)

WHERE DOES ETHICS FIT IN?

We do net yet have a single widely agreed ethical framework within which GM crops can be evaluated, and there may well never be. There are also far too many 'grey areas' with regard t o the consequences of GM crop production and this is exacerbated by different people having different value systems both within and between cultures (Reiss : 2001). Reasoning according to the ethical paradigm of virtue, means that ethical correctness in terms of whether or not any action, practice or strategy promotes or is consistent with virtues, is generally determined by the ethical or moral tradition that pervades a society. Virtues are ideal character traits or states of being that are defined by a the community and its traditions. It is the duty of people not to endanger the defined way of life of a society or act in ways that prevent people from acting in a virtuous manner (Crisp & Slote, 1997).

Many people globally, are of the opinion that the use of genetic engineering in food and agriculture is morally wrong and that it goes against nature or their spiritual beliefs. It is also wrong because it allows huge corporations to gain more control of the food chain and to manipulate consumers globally, thus creating dependence. The only real beneficiaries of GM foods are the multinational corporations promoting them. Where do small holders or poor farmers and farm-workers fit in? Have ethical concerns been considered that new technologies and products are fit for human consumption and will not in any way degrade the environment or harm consumers? Will GM technology be the universal panacea to solve the increasing food needs of the world? Clearly industry should have the burden of proof to prove the usefulness of GMOs. The government of South Africa should issue new rules on pesticides and GMOs, to insure that the levels of agrochemicals used are lower. There should be far more serious concern about resistance and the use of antibiotic markers. While calling for GMO research to include a focus on the needs of the Third World, the panel specifically acknowledged that a larger production of food stuffs will not solve the problems of the Third World.

"Business is only interested in GE because of the ability to own and patent life. When someone changes a life form they patent that thing. This means that a seed for a plant that has been genetically engineered can be owned, thereby forbidding anybody else to use it without payment. This means that the few companies who have invested in GE could gain the rights to all the seed for all the food in the world. Recently many of the world's smaller seed companies have been bought by large multinational giants, so that 6 seed companies now effectively control a significant amount of the seed market. Monsanto, responsible for most of the worlds GE plantings, has announced its South African presence by purchasing two of our biggest seed companies, Carnia and Sensako. This degree of vertical integration is unprecedented." (SAFeAGE).

The fact is that genetic engineering (GE) allows scientists to take genes from one species and insert it into a completely different species with which it could never naturally breed. It is not inconceivable that kosher, vegetarian, halaal and other religious rights may be infringed by the production of GM foods. Humanity should carefully contemplate whether or not it should have the right to experiment with the blueprint of life and abuse God-given living organisms for personal wealth creation at the expense of society, particularly when scientific evidence suggests that GM foods are anathema.

The government should involve itself in regular post-commercialisation monitoring of the impact of GMO products and regularly inspect the results by appointed regulators. This means there should be public access to the monitoring of all results and a prerequisite should exist that modification or revocation of consents should be possible if the monitoring suggests that what is produced is counter to the welfare of society in general. There should clearly be extensive monitoring of the effects of GM foods and all stakeholders must be considered. What is needed is a clear separation of GM farming and organic farming. If GM organisms are not contained effectively, and if further proof arises as to the non-viability of GMOs, then the consequences of non-containment will be negative (Reiss : 2001). There is also the need to maintain seed banks to preserve untainted diverse food plants and also to have untainted animals which are bred for human consumption.

Trust between consumers and the GMO producers cannot be increased by merely conducting additional laboratory experiments to verify the safety of genetic engineering since the real risks of GMOs are not yet fully comprehended. Companies with huge marketing budgets are able to placate the market with ease by using spin-doctors and catchy adds. Consequently Before any applications for GM crops are approved for commercial planting they should be supported by verifiable declarations of the manner in which the planting is expected to be managed in the field, as well as a detailed

analysis and assessment of the expected wider environmental impact. Consumers have the right to be informed about the food they are consuming http://www.nch.go.jp/imal/Ethical_Com/Nuffield_Coouncil/gm_crops_summary.pdf

If we reject absolutist expressions such as genetic modification is akin to playing God or genetic modification results in better living via science– we may be locating ourselves in the realm of "consequentialism" according to which a morally acceptable decision is arrived at by a cost-benefit analysis of the consequences of an action that we undertake. The problem we face is that in the case of genetic engineering, we do not fully grasp the future consequences. We thus need to rely on the ethical and moral judgements of manufacturers and marketers of GMO foods and hope they are socially responsible from a corporate perspective.

CONCLUSION

GMO technology has not been available for a great deal of time, there is thus understandably relatively little research which has been carried out on the long-term effects on human health. We therefore face a danger in that we are now not in a position to effectively anticipate possible risks attached to GMO technology. Of particular concern is the effect on the environment of GM crops and food production. From a utilitarian perspective it may be argued that GM producing companies have a duty to operate in such a way as to consider the long-term effects of their operations. While it is important to keep the shareholders of a company happy by having a strong 'bottom-line', it is more important that the company keep all stakeholders happy by considering its ethical and social responsibilities to society at large in "triple bottom-line" approach. Ethics and consumer perspectives on GMOs must be included in any decision making about GMO technology. Currently, ethics are not included and are not given enough weight, as this does not suit the producers of GMOs. Both companies that produce GMOs and the government should make meaningful risk assessments on the use of GMOs. Manufacturing companies should have to pay fees for the acceptance of their products and the money should go to support further pubic research and education on GMOs. Ethical concerns about GMO need to be reflected at all levels of legal procedures and on a long-term timeline and should undergo vigorous and continuous debate. Farmers need to be accountable for their actions and should endeavour to preserve the soil and endangered wildlife and should not simply be concerned about maximizing their profits.

Life as a gift from God is the prerequisite of all other physical, spiritual and moral values in the world. Life is thus held by both individuals and society as a trust and we do not therefore morally have total control over it. We should be striving to protect and enhance life. Companies do not have the right to place GM foods on the market without a significant regard for the direct personal benefits of consumers. There should be adequate information given to consumers regarding the risks involved in the consumption of GM foods. Companies that produce whatever food, have a responsibility for public health. All GM products should undergo allergenicity assessments in accordance with the standard of the FAO-WHO of the UNO (Macer, 2003).

We need to ask if the technology used in GMO production promotes the general welfare of society and does it in essence improve food safety and reduce the use of chemical pesticides in agricultural production? What are the hidden risks for consumers? To what extent is the environment being degraded further by GMO production and GE in general? Will humanity benefit by GMO production or will it simply be the corporations that flourish at the expense of humanity? What recourse will consumers have if they discover that their health has been seriously compromised?

Ethically speaking, no individual or company has the right to behave as an unrestricted exploiter and manipulator of the natural environment. From a moral perspective, the earth and its fullness may be used for human needs. This 'use' implies that there are certain limits which may not be over-stepped, as that is when 'abuse' sets in. We are obligated to be concerned and have a moral responsibility to monitor and control agricultural and economic activities so that the environment is not harmed. We need to display more 'humanitarianism' in dealing with the plant and animal world and not be controlled by greed and passing economic considerations. Once there is a realization that ethicality is necessary, it is imperative that this aspect of GMO production is not perceived by employees, customers, and the public to be a negotiable policy of expediency, but should rather be seen as an expression of integrity and of doing the right thing for society and for both current and future generations. There are those who argue that GM production will lead to antibiotic and vaccine-resistant strains of diseases. During the process of GM0 Production proteins which have never previously been ingested by people are now contained in the foods that people consume on a daily basis. These have potentially devastating effects on the human body. Another hugely negative aspect is that herbicide use could be increased, and this is bound to have a negative effect on the adjacent environment. In addition people may be faced with additional allergens that could be life-threatening in some cases. The impending implications for the environment and for the health of consumers makes it critical that environmental sustainability and food safety be factored into the evaluation of the ethical acceptability of GMO production and GE. Economic costs and huge financial benefits for corporations should not dominate the debate on GMO and GE.

The genetic modification of crop plants, may however also be proved not to differ from conventional plant breeding and may be the ultimate tool to achieve advanced reproduction goals more accurately and promptly so as to accommodate the ever-increasing consumption demands of a global population expected to top the 9 billion mark by 2050- time will surely tell.

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