

BIOTECHNOLOGY, FOOD SECURITY, TRADE AND THE ENVIRONMENT

A Synthesis of Issues Impacting on Consumers Rights in Africa

Compiled for Consumers International

by

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Abbreviations and Acronyms

AIA	Advance Informed Agreement
AU	African Union
CI	Consumers International
GE	Genetic Engineering
GM	Genetically Modified
GMO	Genetically Modified Organisms
IPRs	Intellectual Property Rights
SPS	Sanitary and Phytosanitary Measures
TBT	Technical Barriers to Trade
TRIPS	Trade Related Aspects of Intellectual Property Rights
UNEP/GEF	United Nations Environment Programme/Global Environmental Facility
USAID	United States Agency for International Development
WTO	World Trade Organisation

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Summary

The controversy around GMOs intensified in Africa following the 2002/3 drought experienced in a number of Southern African countries. This synthesis paper is based on two papers produced for CI-ACCRA entitled “Biotechnology, Food Security and International Trade in Africa” and “Environmental and Socio-Economic Impacts of GMOs in Africa”. The synthesis gives an overview of GMO developments and interventions in Africa, regulatory frameworks in place to govern the introduction and international trade of GMOs. Environmental and socio-economic impacts of GMO interventions and the consequent impacts on consumers are also reviewed. The synthesis concludes by giving available options that can be used to improve the food security situation of African consumers besides the reliance on GMOs.

1. Introduction and Overview

The impact of Genetically Modified Organisms³ (GMOs) interventions on African consumers is a subject of extensive debate. Strong views are being expressed both for and against GMO interventions. Genetic engineering (GE) is being used by biotechnology companies who in many cases have been accused of being interested in the profit potential the technology promises and expanding their market share through patents and royalties. Consequently GE has resulted in an increasing number of crop varieties. However, the new varieties might not be useful to improve the food security status for local and indigenous African communities as various researchers have shown in current and ongoing research. One such study by DeGrassi (2003) entitled “Genetically Modified Crops and Sustainable Poverty Alleviation in sub-Saharan Africa: An Assessment of Current Evidence” has shown the irrelevance of GMOs in alleviating poverty in Sub-Saharan Africa. Whilst there is hype over the supposed large benefits of GM crops for Africa, the reality is that the hype is not being lived up to.

The proponents of the GM technology on one hand argue that GMOs are the answer to food security in Africa. Consumer Organizations and various diverse groups opposing GMOs have expressed their concerns with regards the safety of GMOs as food and their

³ A GMO is defined as an organism in which the genetic material has been altered in a way that does not occur naturally.

impacts on the environment that consequently undermine food security. Debates have also intensified due to fears of genetic contamination of traditional varieties especially in developing countries that may arise by cross pollination, mixing with batches of GM seeds or illegal introduction of seeds. A number of cases of GMOs being introduced without the consent of a particular developing country have been coming up. Despite the raging debate about harmful effects of GMOs, many consumers continue to eat GMO food and most of them do so in ignorance. Some of the GMOs are consumed as food aid and as result the concept of food aid to curb hunger is now controversial. During the 2002/3 drought, Zambia rejected GMO maize on grounds that there was insufficient information on possible health hazards from consumption. The timing, the motives of the sponsors and even the content of the food aid, are being questioned from all corners. The discussions on food safety issues of GMOs have also raised questions about the adequacy of regulatory mechanisms for biotechnology and biosafety in most of the African countries. Various analysts have criticised international trade rules which in most cases they have pointed out that they favour biotechnology companies that have been introducing GMOs in Africa. As DeGrassi (2003) and Mathews (2003) noted, the flagship biotechnology projects in South Africa (cotton), maize in Kenya and sweet potatoes in Kenya, have shown that the benefits from the technology are much lower than the costs. Also they have shown that conventional breeding or agro-ecology based techniques require much lower investments.

2. Current GMO Developments and Interventions in Africa

African agriculture has faced numerous challenges in the past based on the inability of governments to feed their own people. The great droughts experienced in the 1980s, epitomised through media description of the famine in Ethiopia and in 2005 in Niger has brought to the fore the nature of the crisis in African agriculture, and specifically on famine and how to respond to it. Throughout the 1990s and from 2000, various parts of Africa have experienced droughts and floods accompanied by famine of intense proportion. Besides appealing for international food aid, governments in Africa have failed to find locally alternative ways of addressing the problem of famine. However,

famine in Africa has coincided with scientific improvements on crop and livestock production based on conventional breeding and has veered towards biotechnology or what is commonly referred to as Genetically Modified Organisms (GMOs). Given the difficulties in agricultural production and sustained output in Africa, the genetically modified organisms have been marketed as offering an alternative way of feeding Africa's hungry population.⁴

Since 1996 nearly 250 million hectares of GM crops have been grown in 16 countries worldwide by six million farmers. The main focus of transgenic research has been on soyabeans, maize and cotton. Of the three crops, maize is an important staple food in most of Africa. Whilst dominant biotech companies are increasingly pushing the products of genetic engineering on the market, one can not stop to question whether GM research is aimed at protecting and improving the crops or selling herbicides especially considering that some of the most common traits (herbicide tolerance, insect resistance (bt), Bt/herbicide tolerance, virus resistance) where major research has been carried out.

In Africa GM crops were first cultivated in South Africa in 1997/98 and currently South Africa is the only country in Africa growing GM crops on a commercial scale. In 2004 according to Africa Centre for Biosafety (2005) about 500 000ha of GM crops were planted in South Africa. South Africa is also one of few countries in the world that produces GMO white maize for human consumption. A total of nine countries (Burkina Faso, Egypt, Kenya, Morocco, Senegal, South Africa, Tanzania, Zambia and Zimbabwe) have reported field trials of GM crops in Africa over the past five years. According to Africa Centre for Biosafety (2005):

- 20 countries (Benin; Burkina Faso; Cameroon; Egypt; Ghana; Kenya; Malawi; Mali; Mauritius; Morocco; Namibia; Niger; Nigeria; Senegal; South Africa; Tanzania; Tunisia; Uganda; Zambia; Zimbabwe) are engaged in GMO research and development

⁴ Odame, H. Kameri-Mbote P. and Wafula, D., 2001. Innovation and policy process: the case of transgenic sweetpotato in Kenya, Institute of Social Studies, the Hague, the Netherlands.

- At least 24 countries (Algeria; Benin; Botswana; Burkina Faso; Cameroon; Egypt; Ethiopia; Ghana; Kenya; Madagascar; Malawi; Mali; Mauritius; Morocco; Namibia; Niger; Nigeria; Senegal; South Africa; Tanzania; Tunisia; Uganda; Zambia; Zimbabwe) have the capacity and institutions to conduct research and development into agricultural biotechnology
- 27 African countries had ratified the Cartagena Protocol on Biosafety by February 2005
- 1 African country, Ghana has completed the national bio-safety framework in line with the Cartagena Protocol that will develop a national bio-safety clearing house for information exchange.

Table 1 shows some selected examples of GM crop trials that have been carried out in Africa. An examination of the crops of biotechnology research presented in Table 1 shows that maize and cotton are among the most researched crops. There are questions on whether the field trials being carried out are comprehensive on risk assessments, which is a major area of debate in the international arena.

Table 1 Public sector GMO research in Africa

Country	No of events	Crops involved	Phenotypic category*
Egypt	17	Cotton, cucumber, maize, melons, potatoes, squash and marrow, tomatoes, water melons, wheat	Agronomic properties, Fungal Resistance, Fungal Resistance/Herbicide Tolerance, Herbicide Tolerance, Herbicide Tolerance / Insect resistance, Other, Product Quality, Virus resistance
Kenya	4	Cotton, maize, Sweet potatoes	Herbicide Tolerance, Herbicide Tolerance / Insect resistance, Other, Product Quality, Virus resistance
South Africa	20	Apples, grapes, lupin, maize, melons, pearl; millet, potatoes, sorghum, soybean, strawberry, sugarcane, tomatoes, indigenous vegetables	Agronomic properties, Bacterial Resistance, Fungal Resistance, Herbicide Tolerance, Herbicide Tolerance / Agronomic properties, Insect resistance, Product Quality, Virus resistance
Zimbabwe	5	Cotton, cow peas, maize, sweet potatoes, tomatoes	Fungal Resistance, Herbicide Tolerance / Virus resistance, Virus resistance

Source: Adapted from Cohen, (2005).⁵

3. Meeting the Needs of Consumers – Food Security, Policies, Regulatory Frameworks/Mechanisms and Initiatives

3.1 Food Security

The evidence currently available has not offered any assurance to consumers about the potential adverse side-effects of consuming GM foods. The methods that exist for testing a food product for possible GMO content are not completely reliable. Several researchers have pointed out the potential health risks of consuming GMOs. These include toxic and allergenic reactions among others. Besides the health risks posed by GMOs on consumers there are other adverse side effects which affect consumers' food security status though indirectly. The impacts on food security manifest through loss of germ-plasm, displacement of exports, negative impact on the labour market and environmental impacts among others.

Proponents of the GM technology have promised that GMOs will help feed millions in a hungry world yet an analysis of the challenges reveals that consumers face a greater disadvantage due to direct and indirect risks introduced by GMOs in the food system. Most argue that GMOs present the opportunities for reducing food insecurity in developing countries yet the data to support this argument is not convincing and is largely unavailable. The most important challenge for the future of GMOs is to present the facts regarding their safety to human health. A second challenge is to ensure research on crops that are relevant to the poor African consumers. A study by De Grassi in 2003 assessed current evidence on the sufficiency of GM crops (cotton, sweet potatoes and maize) in alleviating poverty. The results have indicated that the GM crops are inappropriate for poverty alleviation in Sub-Saharan Africa. Within this context, consumer focused

⁵ Cohen, J. (2005). Poorer Nations Turn to Publicly Developed GM Crops. *Nature Biotechnology* 23 (1): 27-33. In Frandsen, L *et. al.* (2005). Integrating Socio-economic considerations into Biosafety Decisions: The role of Public Participation. World Resources Institute, Washington D.C.

research budgets are needed yet in reality the greater proportion of the budgets on GMOs research focus on improving crop traits that bring about a profit potential. A third challenge is creating sufficient value of food aid interventions to consumers. It appears that the demand from consumers is driven by those companies who want to maximize their profits, therefore the responsible authorities should strive to ensure that food which is safe for consumption is supplied and that it conforms to what consumers are demanding.

Some global trade policies mandate patenting of agricultural resources and this has led to bio-piracy (privatization through patents and IPRs). This allows multinational companies to lay claim to seed and plants that African farmers have developed and used for many generations. African consumers' food security and livelihoods are threatened thereof as farmers are denied access or are required to pay a fee for the patented seeds. In addition major development risks are posed as farmers in the long term are likely to incur costs of using the untested GMO technologies.

3.2 Policies and Regulatory Frameworks/Mechanisms

Mechanisms for traceability and monitoring of GMOs after release are imperative in order to adequately protect consumers. The major threat is posed especially due to the absence of regulatory mechanisms for GMO interventions. Poorly regulated commercialization of biotechnology especially GMOs pose threats to human health and the environment. Controlling the movement of GMOs has also proven to be a challenging task and available evidence has shown that even with regulations in place, contamination is likely to happen. Several cases of contamination have been cited in Mexico, China, Brazil, Thailand, Europe, India, Canada, Japan among others (see Appendix 1). Given such scenarios, there is no doubt that there are several unrecorded cases of contamination worldwide. Due to lack of capacities in many African countries to safeguard against illegal introduction of GMOs consumers are therefore left at risk. For most African countries there are no biosafety regulatory frameworks in place for the regulation of GMOs. Where frameworks are in place like South Africa it has been reported that the

regulatory system is not capable of assessing the health impacts of GMOs introduced into the food chain.

One major criticism put forward by GMO opponents is that the system of monitoring is flawed due to the fact that African countries have to rely on the assessment of risk of GMOs done by the biotechnology companies themselves. The safety assumptions when assessing the risk of GMOs are based on scientifically flawed concepts such as Substantial Equivalence⁶ which leads necessarily to seriously flawed procedures and protocols for assessing health risks as reported by some analysts. Ideally effective regulatory frameworks should regulate the introduction of GMOs based on risk assessment on a case by case basis and be able to sieve out hazardous GMOs. There is a general lack of capacity for testing and evaluation in most developing countries hence there is need for regulations that provide for properly controlled, long-term studies on the safety of GMOs before their release. Despite efforts by GMO opponents to safeguard consumer rights, GMO proponents continue to take advantage of ineffective biosafety regulatory frameworks and release GMOs into Africa. Some consumer watchdogs such as GM Watch have reported of GM trials being carried out in secret in some countries.

In the absence of national regulatory frameworks on biosafety, countries can use the Cartagena Protocol of the Convention on Biodiversity and the African Union Model Law. The Cartagena Protocol is a legally binding treaty contributing to ensuring an adequate level of protection in the field, safe transfer, handling and use of GMOs. The Protocol requires parties to put in place necessary institutional, policy and legal frameworks to enable the parties to fulfill their obligations under the Protocol. The Protocol, which came into force in the last quarter of 2003, is the first international agreement to deal with the transboundary shipment of GMOs. It gives countries the right to withhold imports of GMOs that they believe carry environmental or health risks. The Protocol contains a

⁶ “Initially, it was thought that if a genetically modified food was "substantially equivalent" to its traditional counterpart, a risk assessment would not be necessary. The test compared attributes such as protein, carbohydrate and fatty acid levels between the novel food and its traditional counterpart. However, there were no clear and universal guidelines stipulating what to test and how similar the items in question should be” (http://en.wikipedia.org/wiki/Substantial_equivalence).

strong reference to the “precautionary principle” which holds that when a technology may cause suspected harm, scientific uncertainty should not be used by the exporting country as the basis to prevent the importing country to take precautionary action. The Protocol in this regard gives parties the right to take import restrictive actions and gives the minimum standards on biosafety. Whilst the Protocol is not a comprehensive biosafety regime, African countries can take advantage of the fact that the Protocol allows for more protective measures to be taken if a country feels it is compelled to do so for its protection.

The African Union (AU) Model Law on safety in biotechnology was put in place by AU to facilitate African countries to legislate effectively and set some guidelines and standards. A strength of the AU Model Law is that it provides for Advance Informed Agreement (AIA) procedure requiring a country to be notified prior to the transboundary movement of GMOs in its territory. Regionally the African Model Law on Biosafety has been encouraged for Southern African nations in adopting a common strategy on GMOs and it gives opportunities for Governments in Africa to introduce national biosafety regulations.

United States Agency for International Development (USAID) and the United Nations Environment Programme/Global Environmental Facility (UNEP-GEF) are quoted as the most active players spearheading biosafety capacity building programmes in Africa. Some countries have developed draft biosafety frameworks under UNEP/GEF and these include: Kenya, Lesotho, Swaziland and Tanzania.

3.3 Anti-GM Initiatives

GM promoters are continually trying to influence biosafety policy development by African nations. A central question amongst many interest groups is whether the intent of biotech companies is to help or to invest with the expectation of yielding profits. On the other hand consumer interest groups and other green groups have been making efforts to safeguard the rights of consumers on GMOs issues. An examination of the biosafety legislation of some African countries by consumer representatives on GMO issues have

left no doubt in their minds that most of the biosafety regimes are meant to serve as a rubber stamp for the approval of GMOs, serving only the interests of the biotech industry. GMO opponents have continually been campaigning and advocating for biosafety. The spread of GMOs is of major concern to consumers and Consumers International (CI) has played a major part in campaigning. CI's advocacy initiatives have included anti-GMO message to G8, support for labeling among others (see Appendix 2) on the issue of GMOs with some results. Other interest groups like Greenpeace International, together with farmers' organizations and community representatives have exerted their efforts towards influencing international regulations governing GMOs by calling on delegates to the Biosafety Protocol meeting to urgently introduce strict liability regulations to make companies accountable for the contamination and damage caused by their GE products.

Several consumer representatives and interest groups have also accused some development agencies of pushing GM crops under the guise of biosafety capacity building. In different settings, several groups representing farmer, consumer, environmental and development organizations from African countries continue protesting against the pressure exerted over decisions to impose GM food aid on African consumers. A recent example of the experience with the controversy over GM food aid was in Angola and Sudan in 2004. Both Angola and Sudan had imposed restrictions on GM food aid. Sudan wanted the food aid to be certified GM free whilst Angola would accept on condition that the grain first milled. USAID and WFP criticized both decisions and exerted pressure on the countries to remove restrictions and in the end both countries had to concede. More than 60 groups representing farmer, consumer, environmental and development organizations from 15 African countries sent an open letter of protest to the World Food Programme (WFP) in 2004 protesting against the pressure exerted by the WFP and USAID.

4. International Trade Related Issues of the GMO Debate

Africa is at the centre of global agricultural comparative advantage and the GMO disputes have far reaching trade implications on the African continent. The topic of international trade policy in GMOs is of importance when dealing with the trans-

boundary movement of GMOs. Given that different countries adopt different approaches to the regulation of GMOs, it leaves much debate on the content of imports and exports of food and agricultural commodities. GMO proponents in various quarters have argued that attitudes towards the risks posed by GMOs affect trade flows, especially for developing countries as they try to further their development agendas by taking advantage of trade in agricultural products. However, this type of argument is one sided as there really is no evidence that the trade in GMOs is sustainable especially considering the many feared and unknown effects on the environment, biodiversity and consumers' health which could be detrimental to the same development agenda.

The interactions between specific instruments of the WTO and other international treaties have added challenges to the already hot debate on GMOs. The matrix in Table 2 has been designed to show the trade implications of a selected set of international regulations that govern the use of GMOs. The complexities of the regulations are such that there are many overlaps and contradictions of the various instruments, thus providing leeway and opportunities for GMO proponents and biotech companies to release GMOs whose safety both to human health and the environment has not been proved. The global international trade rules shows that the rules are focused on promoting free trade. The issues on treatment of GMOs based on the set of international regulations shown in Table 2 illustrate that the trade in GMOs is highly influenced by the international agreements governing trade. The WTO promotes free trade and because of how several disputes involving GMOs are likely to receive a positive response in promoting trade. GMO opponents have accused the WTO of being driven by genetic engineering companies. In this scenario, the US has been accused of attempting to use the WTO as a tool to force feed the world GE food.

Table 2: International Trade Agreements: Implications for GMOs

International Trade Regulations	Issue on Treatment of GMOs	Trade Implications
SPS and TBT Agreement of the	<ul style="list-style-type: none"> • SPS Agreement's preference for scientific evidence, states that a 	<ul style="list-style-type: none"> • SPS and TBT restrict the extent to which trade

WTO	<p>country has to justify by appropriate risk assessments when restricting trade.</p> <ul style="list-style-type: none"> • SPS Agreement’s “precautionary principle” when dealing with scientific uncertainties 	<p>measures can be used against GMOs.</p>
TRIPS	<ul style="list-style-type: none"> • Sets minimum standards for the protection of IPRs 	<ul style="list-style-type: none"> • Encourages the patent holder to exclude others from making, using or selling the invention
Cartagena Protocol	<ul style="list-style-type: none"> • Objective of governing the trans-boundary movement of living modified organisms resulting from modern biotechnology • Applies to GMOs intended for food, feed or processing • Sets that “may contain” GMOs label is adequate for products for direct use as food or feed. No labeling is mandated for processed foods. 	<ul style="list-style-type: none"> • Allows each country to decide whether under what conditions it will accept imports of GM products for release into the environment. • Provides loopholes for shipment of GMOs under the pretext that they are for contained use, yet the GMOs may find their way into the environment

The WTO agreements are in conflict with the rights to restrict trade in GMOs. The WTO has also been viewed as threatening the Biosafety Protocol. Under the WTO, moratoria on GMOs can be challenged on the basis that they are used as trade barriers. There are questions as to whether basing trade on the provision of scientific evidence could protect consumers. In addition, GMO opponents view international treaties as often skewed in favour of corporate interests rather those of producers and consumers. It has also been observed that there are various ambiguities in the articles legislating for GMOs and that in the end most of the actions undertaken would need resolution.

The Trade Related Intellectual Property Rights Agreement (TRIPS) of the WTO is criticized for encouraging patenting though there are options within the Agreement to

protect farmers' traditional practices. Market dominance in agriculture by a few companies in biotechnology research possibly could lead to loss of farmers' access to plant material. The farmers end up paying for patented crop varieties bred from genetic material originating farmers' own fields. Restrictive patents on genes negatively affect food security of farmers whose livelihoods depend on planting seeds saved from previous harvests. The transfer of patented technologies therefore does not help to reduce poverty in developing countries. Many developing countries have weak negotiating positions in reaching agreements on IPRs. Due to this fact, the US has been accused of imposing IPR systems on developing countries as a condition for bilateral aid and trade. IPRs have contributed to excluding poor African farmers from accessing control over resources needed to sustain their livelihoods.

The International Treaty on Plant Genetic Resources for Food and Agriculture recognizes the contribution of farmers to the conservation and use of plant genetic resources over time and for future generations and deals with the loss of agricultural biodiversity. Whilst the treaty gives legal force to the conservation of the world's agricultural seeds, it is ambiguous on the issue of patents on seeds.

The Codex Alimentarius Commission provides mechanisms that can help strengthen regulatory developments in African countries. It is the international body charged with the development of food standards and its standards are recognized by the World Trade Organization's as being consistent with the WTO's Agreement on Sanitary and Phytosanitary Standards (SPS Agreement). Three documents relating to biotechnology were adopted by the Commission in 2003. These are the Principles for the risk analysis of foods derived from modern biotechnology; Guideline for the conduct of food safety assessment of foods derived from recombinant-DNA plants; and Guideline for the conduct of food safety assessment of foods produced using recombinant-DNA microorganisms. The inclusion of safety assessment requirements for foods produced with GM micro-organisms, including a relatively weak annex setting out standards for the assessment of possible allergic reactions, are key parts of these documents from a consumer perspective, produced by the Codex Task Force (ICTSD, 2005).

5. Environmental Impacts of GMO Interventions and Consequences for African Consumers

Since the formulation of the Convention on Biodiversity, African countries are still struggling with issues of bio-safety. In fact the mapping of biodiversity in Africa is still to be done. This is happening in a situation when experimentation of biotechnology developed mostly in climatic and ecological conditions of the United States and Europe is being tried in Africa. There are a few African people trained in biotechnology. It is countries that had developed a sound base for conventional breeding such as Kenya, South Africa, Egypt and Zimbabwe, that have been on the forefront in the debates on biotechnology and the forms of multi-lateral agreements required. In general African countries have had to deal with GMO issues when confronted by the reality of food insecurity in the midst of availability of GMO type of food from the United States of America.

The evidence submitted from various researches conducted show that GMOs have hardly created the perceived benefits for farmers especially in Africa. The greatest risk lies in the new technology interacting with African indigenous varieties and this will affect food security. African smallholder farmers base their agriculture on the natural climate and ecology. The cropping regime is based on mostly dry-land farming with little irrigation. GM crops that are being developed and promoted in Africa are not oriented to the needs of African farmers as some require supplementary irrigation. In Kenya, the GM sweet potatoes utilized more resources that would not be ideal for smallholder farmers. Moreover, the research carried out did not involve women who mostly grow sweet potatoes. The technology developed in Kenya was mostly concerned with developing higher yields of sweet potatoes but did not address issues such as value addition, markets (if any), utilization, etc.

The environmental and socio-economic impacts of use of transgenic animals is a controversial issue. Socially and culturally, Africans exist in a value system that respects products as provided by the Creator. African beliefs and myths cannot accept cloning or

by-products thereof. This would affect the social and cultural lives of African people. The use of GMOs in beef, dairy and poultry industry that utilize cotton or soyabean cake have serious ramifications on African industries in the European Union markets. The emergence of new viral diseases in Europe such as bird flu, mad cow disease have given consumers grounds to fear the potential effects of gene manipulation in the livestock industry.

5.1 Africa's biodiversity

Africans depend on the continent's renewable natural resources for food, shelter, medicines, fuel, and as a means of income generation. Natural systems provide ecological services such as water supply and soil fertility, as well as sacred sites that are used for cultural and religious purposes. However, the environment is threatened by natural and anthropogenic hazards. When the natural environment is damaged, it can have effects on the welfare of humans. Ecosystem integrity depends on biodiversity, ecosystem function and resilience, all of which are such interrelated variables, that factors which affect just one of these can have far-reaching consequences. Women would be most affected as they are the gatherers of wild foods, thatch grass for shelter, wood for fuel and through generations of indigenous knowledge, know the plants that provide the necessary medicines to treat ailments in their families.

Environmental degradation through the activities of human beings has been a significant driving force. International concern has grown about human impacts on the atmosphere, land and water resources, the bioaccumulation of toxic substances, species loss and the degradation of ecosystems.⁷ There is now a realization that countries need to take action about the loss of biodiversity. The United Nations Conference of Environment and Development in Rio de Janeiro in 1992, set the foundation for a direct international response to ecosystems decline.

⁷ Global Scenario Group, 2002. Great transition: the promise and lure of the times ahead, Global Scenario Group and Stockholm Environment Institute, Boston.

The valuation of bio-diversity to the national economy and to local communities in Africa is an important activity. Many African, especially women directly or indirectly benefit from biodiversity and therefore governments usually intervene to ensure the sustainability of ecosystems. It is increasingly recognised that Africa's biodiversity includes agricultural crops and wild plants. There are also significant wild animals that thrive on harsh and unstable climates. There are thus concerns at the policy level on the acceptability of GMO in plants and animal populations given the concerns about their impact on biodiversity, essential natural processes and ecosystem integrity.

The effects of GMOs on natural plants through cross-pollination are unknown in the African context. However, there are specific manifestations and patterns that have been noted in developed countries, where biotechnology has advanced. Table 3 outlines the problems of GMOs that have been noted in various studies. The impact of GMOs is at the ecosystem level, where issues of gene escape from crops to plants have been noted. The competition with wild plants is a one effect that has been noted. Rissler and Mellon, (1993) found that rice engineered in more saline soils to become more salt tolerant could be transferred to its wild relatives through cross pollination, impart salt tolerance to the wild plants, which could invade the remaining marshes and displace the native plants together with all the other organisms, such as birds and insects that were depending on them.⁸

Table 3 Problems, Manifestation and Impact of GMOs

Problem	Manifestation	Impact
1. Gene escape	Interactions might occur at gene, cell, plant and ecosystem level.	<ul style="list-style-type: none"> • Herbicide-resistance genes in weeds • Recalling transgenes or foreign DNA sequences, whose safety is still subject to scientific debate, will not be feasible.
2. Genes can mutate with harmful effect	Uncontrollable genetic changes	<ul style="list-style-type: none"> • Potential destabilization of an organism, through mutations, • Uncertainty over gene stabilisation gene in the organism over generations
3. Effect on	"Sleeper" genes accidentally	A "promoter" gene inserted to switch gene on

⁸ Rissler, J. and Mellon, M. 1993. Perils Amidst the Promise. Ecological risks of transgenic crops in a global market.

	silent genes	switched on could affect the silent genes	could silence the productive genes
4.	Interaction with wild and native populations	Competition or breeding with wild species	<ul style="list-style-type: none"> • Threat to crop biodiversity especially centres of origin or centres of genetic diversity of that crop • Substitution of traditional farmers' varieties and wild relatives that have been bred, or evolved, to cope with local stresses
5.	Impact on birds, insects and soil biota	Potential risks to non-target and useful species, such as birds, insects and microorganisms	<ul style="list-style-type: none"> • Development of resistance in insect populations exposed to the GMO crops
6.	Pathogen resistance	Resistance to pharmaceutical they are supposed to be used against	<ul style="list-style-type: none"> • Stronger pharmaceuticals (often more hazardous and expensive) required to treat ailments versus less hazardous drugs
7.	Transfer of allergenic genes	To other species,	<ul style="list-style-type: none"> • Dangerous reactions in people with allergies • Human placental cells are very sensitive to round up, even at concentrations lower than those in agricultural use • Miscarriages and premature births
8.	Mixing of GMO products in the food chain	Accidental use of GMOs of intended for animals in food	Unknown impact
9.	Transfer of antibiotic resistance	Markers for indicating successful gene transfer	Marker genes" confer resistance to antibiotics.

Sources: adapted from Persley and MacIntyre, (2001), Relyea, (2005), Hirsch, and Sussman (1999), and Rissler, and Mellon, (1993)⁹

The Guardian (United Kingdom) reported that scientists in the United States of America had identified 15 weed species that show a resistance to herbicide commonly used on

⁹ Persley, G J and L R MacIntyre, (eds) 2001. Agricultural Biotechnology: Country Case Studies - A Decade of Development, CABI; Hirsch, Rebecca E. and Michael R. Sussman, 1999. "Improving nutrient capture from soil by the genetic manipulation of crop plants", Tibtech; Relyea, R. 2005. The Impact of Insecticides and herbicides on the Biodiversity and Productivity of Aquatic Communities. Journal of ecological applications. www.eurekalert.org/pub_releases/2005-04/uopm-rh1040105.php; Rissler, J. and Mellon, M. (1993). Perils Amidst the Promise. Ecological risks of transgenic crops in a global market.

GMO crops.¹⁰ Such a development could cause serious environmental problems unless strategies are designed to deal with such arising issues. Glyphosate a commonly used herbicide was developed to control weeds. A key concern from scientists and anti-biotechnology activists is that these could allow the mutation of new super herbicide resistance to weeds in future.

5.2 Indigenous knowledge and intellectual property rights

One of the devastating impacts of GMOs is the reality that farmers in Africa, the majority who are women will not save seeds for planting the next season. The interference with saving of seeds could have far reaching cultural connotations as seeds have more cultural value attached to them in some cultures in Africa. The harvest of viable seed is celebrated in communities not only as a sign of food security, but as also a sign of continuity of generations and fertility.

New technologies or practices that result in the disappearance of indigenous knowledge and varieties that are consistent with the resource base of smallholder farmers are not favoured. The fear of a major overhaul change in farming and livelihoods can be understood, especially given that the farmers would have to undo cumulative learning, loyalty and reliance on old varieties acquired over many generations and throw all that away in favour of new varieties they have no experience with. Once the traditional systems and varieties are lost, they are unlikely to be recovered.

GMO technologies are likely to undermine the rights of farmers to share the benefits arising out of indigenous knowledge. Whereas GMO research is often based on some prior knowledge usually provided by local farmers or local breeders, the patenting system typical of GMOs hardly recognises the sources of the material and knowledge they used in the research, hence the claim to invention. While environmental changes resulting from gene flow or biodiversity decline may not lower profits for cultivators of land, those

¹⁰ The Guardian (United Kingdom) August 18, 2005.

dependent on commons, pasture, forest resources etc. may be directly affected in terms of loss of livelihood source. It is important to remember that farmers in Africa evaluate a technology in terms of its contribution to the farming system as a whole, not to a single component of that system.¹¹

5.3 Unfair internationalization of seed markets

Biotechnology research is carried out predominantly by the private sector and there are concerns about market dominance in the agricultural sector by a few powerful companies.¹² This could have a negative impact on small-scale farmers all over the world. Farmers fear that they might even have to pay for crop varieties bred from genetic material that originally came from their own fields when they buy seeds from companies holding patents on specific genetic modification "events". Thus the key issue of intellectual property with respect to ownership of genetic resources has still to be dealt with. In this debate, it is farmers in Africa, particularly women who seem to be on the losing end given that they are at the bottom of technological innovation and adaptation.

5.4 Rights and protection of consumers and farmers

The question of consumer rights of access to information, participation in technological adaptations and option to say no has not been practiced in Africa as it has been in the developed countries. Technologies such as biotechnology, which may very well be revolutionary in future, are being undertaken and foisted on the African people without sufficient recognition of the need for the adaptation process to relate meaningfully with local practices, usage, language and people. The process of generating technical knowledge should be seen as a process, which empowers people, giving them a voice in society and a window to the wider world. Without incorporating indigenous knowledge

¹¹ Thus economic profitability alone is no guarantee of adoption of biotechnology, which means that cost benefit analysis is not a proper indicator of the suitability of a technology.

¹² Mohamed-Katerere J. C., 2003. Rights and risk: challenging biotechnology policy in Zimbabwe, IDS Working Paper 204, United Kingdom; Mushita, A., 2001, *An African View on Genetic Engineering*, http://talk2000.nl/docu/bmd_96.html.

systems, culture and language, science technology remains transfixed outside the people’s sphere of existence, and cannot be understood or sustained.

There is currently raging debate within the Southern African Development Community on the desirability of using GMOs as a basis for addressing the hunger crisis. However, most countries in Africa have a weak research and institutional base upon which to use GMOs in agriculture. The countries generally struggle in adhering to environmental impact assessments. The key problems are lack of knowledge, loss of staff, limited choices, and lack of resources. Governments in Africa have politicised the GMOs, and uses the technology as a basis for attacking large multinational corporations involved in GMOs as well as their governments. Citizens have not been given a chance to make choices. There is a need to ensure that there is adequate availability of information to allow consumers to make a choice. This information though, causes prices of consumer goods to rise. Consumers should be willing to pay for this information in their quest for choices. GMO companies would like not to pay citing that labeling may turn consumers away from their products. It is vital that every consumer be given an opportunity to make a choice based on adequate information.

Table 1: Potential Environmental Impacts of GMOs and their Consequences for Consumers

Identified Issue	Potential Negative Impacts on Environment	Consequences for Consumers
<ul style="list-style-type: none"> • Mutation of genes once inserted into the organism 	<ul style="list-style-type: none"> • Organism could out-compete naturally occurring species • Possible reduction of yields 	<ul style="list-style-type: none"> • Food security risks • Unknown impacts on consumers health if new strains of viruses
<ul style="list-style-type: none"> • Interaction with wild and native population varieties 	<ul style="list-style-type: none"> • Modification of non-target crops. – posing a threat to crop biodiversity. GM crops could compete with and substitute traditional farmers 	<ul style="list-style-type: none"> • Health risks • Reduced choice of seed undermining food security

<ul style="list-style-type: none"> • Herbicide resistant genes going into weeds 	<ul style="list-style-type: none"> • More problematic weeds requiring much stronger chemical control 	<ul style="list-style-type: none"> • Adverse health impacts due to chemical pollution
<ul style="list-style-type: none"> • Widespread use of GM crops could lead to the development of resistance in insect population exposed to GM crops. 	<ul style="list-style-type: none"> • Worsen of crop attack by pests 	<ul style="list-style-type: none"> • Food insecurity as a result of reduced yields

Source: Compiled from the report by Matondi, Munyuki-Hungwe and Hafashimana (2005)

6. Available Options for Improving Food Security

Using two typical examples cited in literature of a Sweet Potato:

1. Conventional Breeding Techniques is still a relevant option –

Following some analyses shown in the study carried out by DeGrassi (2003). In Uganda, it is reported that conventional sweet potato breeding was used to develop a virus resistant variety in a few years, with yield gains of nearly 100% when contrasted with GM sweet potato research which had been going on for over ten years. The GM sweet potato is expected to increase production by 18%.

This example supports that conventional breeding techniques are still relevant and cost effective. The interesting observation that has been noted about this example is that the virus in question is cited as a classic example of a problem that cannot be solved through conventional breeding and the second argument used by GM proponents is that the time and money spent on developing GM varieties are less than for conventional varieties. Yet the results from conventional sweet potato breeding refute both arguments given for the justification of GM interventions.

2. Constant Selection and Exchange – Farmer breeding strategies

Monsanto in collaboration with Kenya Agricultural Research Institute (KARI) GM in 1991 began a research to develop GM sweet potato with resistance to sweet potato

feathery mottle virus. After 3 years of field trials KARI reported that the GM sweet potatoes were as vulnerable to the virus as the ordinary varieties.

Constant selection and exchange of varieties is an available alternative to increasing yields which is less costly and farmers have over the years developed a wide variety of sweet potato varieties with excellent disease resistance. The Biotechnology Trust of Zimbabwe have successfully used the approach of sweet potato micro-propagation in collaboration with farmer breeders.

3. Other available options to increase yield include:

- a return to low intensity farming – this would require land to be brought into production to compensate for the reduced yields that would result,
 - further intensification on the most productive areas of the land and
 - use of older biotechnologies whose safety has long been established over the years.
 - Commercialization of smallholder farmers to improve food security through improved credit, markets and inputs supply.
 - Agricultural diversification – increase production of other food security crops such as cassava, sorghum millets and sweet potatoes.
 - Improved access to water such as irrigation
4. **Other ecologically rational sustainable agriculture approaches** - such as integrated pest management, habitat management, or the push-pull system for maize stem borer control approaches can dramatically increase production in a sustainable way that does not use GE/GM technology.

8. Recommendations on Further Actions to Protect Consumers

The following additional actions are recommended as a way to further protect consumers:

1. Scientifically based lobbying and advocacy for comprehensive monitoring and regulation of GM trials in Africa and international trade of GMOs.

2. Lobbying for an urgent shift in international and national policies towards supporting consumer rights to food security and safe food.
3. Assessment of safeguards and loopholes provided by international regulation that bind the trade in GMOs.
4. Expanding/building capacity of farmers to employ sustainable agricultural agricultural technologies

9. Appendices

Appendix 1: Genetically engineered (GE) crops contaminate fields and food around the world

Greenpeace, farmers' organizations and community representatives called on delegates to the Biosafety Protocol meeting to urgently introduce strict liability regulations to make companies accountable for the contamination and damage caused by their GE products. As predicted by environmental, farming and social movements, GE seeds have, since their introduction in 1996, contaminated food crops and the environment right across the globe. Over 50 incidents of illegal or unapproved GE contamination have been documented in 25 countries on 5 continents, and those are only the recorded incidents.

Illegal and unapproved GE contamination of seeds and crops has been recorded in maize in Mexico, rice in China, soya in Brazil, papaya in Thailand, oilseed rape in Europe, cotton in India, canola in Canada, and now, in the latest example, GE canola in Japan. In Chile, where the World Seed Congress starts today, Greenpeace is calling attention to the latest case of illegal maize seed contamination, the first to be found in this country highly dependent on its export seed industry. "GMOs have been found growing in the fields of farmers who never asked for, nor ever wanted, GE anywhere near their fields. Yet instead of compensation the farmers have found themselves forced by sharp lawyers and intimidation to pay the GE seed companies -- for damage to the company's patent!" Greenpeace GE Campaigner Doreen Stabinsky said.

Potentially allergenic GE maize (Starlink) has contaminated food products on two continents and dangerous GE pharmaceutical crops have been discovered in silos of harvested crops in the USA. In the meantime, field trials or commercial growing of anything from pig vaccines to industrial plastics continues apace in the USA.

Source: Greenpeace International (2005)

Appendix 2: Recent Highlights of Anti-GM Campaigns by CI

Consumers International brings anti-GMO message to G8

Amadou Kanoute, Director of CI Regional Office for Africa, spoke at a conference on "Will 'debt relief and increased 'foreign aid' Make Poverty History in Africa?" in Scotland and attended the G8 in Gleneagles (7-8 July). Amadou also led the march at the 'Make Poverty History' rally (2 July) with cardinals and Bianca Jagger amongst others. At 'Make Poverty History' CI had a stand and campaigned for trade rules that will benefit Africa, and food security for Africa - not GMOs. CI also asked members of the public their opinion on GMOs.

African consumers need food security - not GMOs

In the lead up to the G8 meeting (6-8 July, 2005) Consumers International (CI) called for food security in Africa, not genetically modified (GM) food. Large biotechnology corporations, and some governments, are trying to promote GM crops as miracle solutions to world hunger and malnutrition. However, there is no evidence that GM crops will solve world.

Consumers campaign for Chief Biosafety Negotiator's visa

Dr Tewolde Egziabher, Chief Biosafety Negotiator and GM critic, was denied a visa by Canada to attend meetings on the Cartagena Biosafety Protocol in Montreal. Consumers International (CI) pressurised the Canadian government which eventually granted his visa.

Lobbying by CI members leads to new support for GM labelling

Many new countries supported moving forward with an international guideline on labelling of GM food, thanks to CI members and the CI delegation, at the Codex Committee on Food Labelling (CCFL) in Malaysia. 5 countries tried to derail discussions on GM labelling without success. Discussions will move to a working group this year.

Source: Consumers International Website (2005);

Appendix 3: GM Crops Insufficiency in Poverty Alleviation in Sub-Saharan Africa: Study Results

- *virus-resistant sweet potatoes are not demand driven, site specific, poverty focused, cost effective, or institutionally sustainable. The environmental sustainability of modified sweet potatoes is ambiguous, but not great.*
- *Bt cotton scores low on criteria of demand drive, site specificity, and institutional sustainability. It has ambiguous poverty focus and cost effectiveness. Environmental sustainability is currently moderate, but could potentially be moderate to strong.*
- *For Bt maize, the analysis shows low demand drive, cost-effectiveness, and institutional sustainability. It is too early to detect unambiguous site specificity or poverty focus. Environmental sustainability is currently low to moderate, but could potentially be raised.*

Source: DeGrassi (2003)

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