Proceedings of a SADC Regional Workshop on

"Public Awareness, Education and Participation in Biosafety and the Environment"

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ACRONYMS

AC	-	Advisory Committee
AIA	-	Advance Informed Agreement
BCH	-	Biosafety Clearing House
BD	-	Bio Diversity
BTZ	-	Biotechnology Trust of Zimbabwe
CBD	-	Convention on Biological Diversity
CPB	-	Cartagena Protocol on Biosafety
EU	-	European Union
GE	-	Genetic Engineering
GEF	-	Global Environmental Facility
GMO	-	Genetically Modified Organisms
GM	-	Genetic Modification
GURT	-	Genetic Use Restriction Technology
IPR	-	Intellectual Property Rights
NABA	-	Namibian Biotechnology Alliance
NBF	-	National Biosafety Framework
NEPAD	-	New Partnership for Africa's Development
RAEIN	-	Regional African Environmental Initiatives
RA	-	Risk Assessment
RBS	-	Regional Biodiversity Strategies
SA	-	South Africa
S&T	-	Science and Technology
SADC	-	Southern African Development Cooperation
US	-	United States
UNEP	-	United Nations Environmental Programme
WTO	-	World Trade Organisation

Executive Summary

Southern Africa is engaged in a fierce debate over the prospects and challenges of modern biotechnologies. Can modern biotechnologies such as genetic modification be deployed in a safe and responsible manner? Can poor farmers who till marginal soils in very harsh environments benefit from adopting new technologies emanating from life sciences and biotechnology? What policy and legal frameworks should be put in place to manage biotechnology? Should Southern Africa embrace modern biotechnology and Genetically Modified (GM) foods? Are these foods safe to humanity and the environment? What are the socio-economic effects of adopting a pro-biotech stance? These are difficult questions that require careful exercise of the mind before coming to conclusions. It was against this background that the Regional Agricultural and Environment Initiatives Network (RAEIN) Africa organised a three day workshop for the SADC to create a conducive environment for legislators, regulators, scientists, civil society and the media to deliberate on the divergent views on biotechnology with a view to help countries make sound decisions on GMOs.

The workshop brought together legislators, regulators, scientists, civil society and the media. These groups exchanged views on their roles, challenges and concerns over genetic modification and GM products. This was a very useful experience as the different groups realised the degree of mistrust that had crept in between them due to lack of communication. Even though the different parties where claiming to represent farmers and consumers, it however emerged that their failure to communicate was no good to the farmers and consumers they so claimed to represent. They recognised that their failure to engage in constructive dialogue had indeed contributed to the protracted and often highly emotive debates that characterise the region.

The regulators saw their role as that of ensuring safety in the practice of science. The legislators felt that their role was to put in place laws that allow science to proceed without undue detrimental effects on humanity and the environment. Scientists saw their role as that of providing solutions to men's economic, social and environmental challenges. They felt that they are critical to the advancement of the human race. Civil society classified themselves as a shield to society, a voice of the voiceless. The role of the media seemed to overlap with that of civil society. However the media saw itself as the informer.

As the workshop came to an end, the groups realised the need to come together and serve the people. They agreed to work together and bury their differences that had divided society. They called upon RAEIN – Africa to organise more meetings of this nature.

A few important lessons where learnt. Whereas modern biotechnology is regarded as high science, it can indeed be simplified to allow ordinary citizens to scrutinise it and decide on its future. Scientists are often frustrated when society asks them to explain what they are doing and why they are doing it. This is often misunderstood to be gross interference. Regulators are often very secretive and defensive when the general public wants to know the status of regulatory frameworks and processes. They are known to dodge the media. However the media is often avoided because of mistrust. Civil society is often viewed as a peeping Tom, too curious and often too vocal. This

report therefore attempts to capture the hot and yet constructive dialogue and the final recommendations made by the participants.

1. INTRODUCTORY REMARKS

1.1 Introduction

In her introductory remarks the Regional Director for RAEIN-Africa Mrs Doreen Shumba-Mnyulwa highlighted the issues pertaining to biotechnology and biosafety as discussion points in the SADC region. She further explained that the organization RAEIN-Africa works in the whole SADC region even though only the group "A" countries are participating in the current activities. She further stated the purpose of the workshop as to facilitate the development and implementation of effective biosafety frameworks in the countries of the region. The workshop would also endeavour to promote understanding of the importance of such frameworks. She further noted that only few SADC countries are currently at the implementing phase of their biosafety frameworks. The question therefore is why this is not a priority in the region? Also amongst points for discussions are the potential impact of biotechnology on the environment, the implications of Article 23 of the Protocol (Public Awareness and Participation) and to discussed the provisions of Articles 27 (Liability and Redress), emphasizing the role that each stakeholders plays in the implementation of these articles.

1.2 Objectives

The objectives of the workshop were:

- To get scientists, media and civil organisations to interact and share their understanding of issues concerning modern biotechnology, biosafety and sustainable use of biodiversity
- To impart knowledge on modern biotechnology and raise awareness on why biosafety frameworks are a must for SADC
- To raise awareness on the need for effective participation by civil and media organisations in decision making on biotechnology, biosafety and the environment
- To discuss the potential impact of biotechnology on the environment - (Will the introduction of modern biotechnology support or undermine the 2010 biodiversity targets?)
- To discuss Article 27 of the Cartagena Protocol on Biosafety and the potential role of each of the stakeholder grouping represented in ensuring effective public participation in decision making processes
- To create awareness and raise interest of media personnel to report on modern biotechnology, biosafety and the environment responsibly

1.3 Workshop Expectations

- Development of clear guidelines on how to involve stakeholders in biosafety and environmental decision making
- A clear understanding of biosafety and environment issues
- Empowerment to effectively communicate biosafety and environment issues
- Clear guidelines on how to report accurately on issues of biosafety
- To receive a balanced view of the pros and cons of biotechnology in a regional context
- To share experiences on public awareness
- To see science made simple and clear
- To form networks with other partners and to understand the regional stance on biosafety
- To see this workshop as an extension of dialogue in the region
- To get guidance on the implementation of article 23 of the Cartagena Protocol
- To see that there are biosafety policies and GMO regulations in the SADC region
- To see a more objective and emotion-free debate on biotechnology and biosafety in the region.

2 OFFICIAL OPENING

2.1 Remarks by the Chairperson of RAEIN-Africa - Mr Andrew Mushita

Mr Mushita started by welcoming all the participants to the workshop. He explained that RAEIN-Africa is a Southern African regional organization formed almost four years ago with the objectives of promoting user-friendly agricultural and

environmental technologies and advancement of policies that ensure safe and sustainable use of such technologies. Its partners are government ministries, development oriented NGO's and farmer organizations.

He also explained that the current Biosafety and Environmental Programme under RAEIN-Africa focuses on four major areas which are: generation of stakeholder awareness; development of relevant research data for adoption of relevant technologies; development of legal and technical capacities to ensure effective development and implementation of biosafety systems; and lastly the provision of technical assistance to facilitate the adoption of effective national biosafety policies and legislation in the SADC region.

He then highlighted that public awareness issues are a high priority for RAEIN-Africa. Hence seven out of the eight group A SADC countries had received funding under this project component from RAEIN-Africa and are already implementing public awareness activities such as drafting awareness materials for specific stakeholders and information dissemination to all relevant stakeholders.

Several countries had also received funding under the research support project whose main objective is to sponsor creative, innovative, high quality coordinated research. The data generated under these research activities will address needs and add value to the national programmes on biotechnology, biosafety and the environment. Two major studies currently underway are on gene flow and GMO spread in the SADC region.

Lastly he informed the participants that a study had been commissioned to examine how RAEIN-Africa can compliment on-going capacity building efforts on biosafety and the environment in the region. He then concluded by emphasising the essence of having all the participants at this workshop and expressed his desire that this platform would address all their needs in the area of public awareness creation while fostering important mutual partnerships.

2.2 Official opening address by the chairman of the Parliamentary Committee on Agriculture and the Environment of the Government of Botswana - Hon Mokalake .

Hon Mokalake welcomed all the delegates to Botswana and expressed his and his government's appreciation of RAEIN-Africa for holding the workshop of this magnitude in Botswana. He then acknowledged that biotechnology is widely used these days and that advances in the technology had raised some safety concerns and hence the essence of biosafety. Hon Mokalake also said that this further underlines the importance of deliberations on genetic engineering and biosafety as pertaining to the environment and human and animal health. He shared with the participants Botswana's recent experiences in the area of public consultation on biosafety and was of the view that the workshop would serve as a reinforcement of issues discussed in the consultations.

He then underlined the fact that the field of biosafety requires people of diverse knowledge backgrounds to enhance further understanding of the issues since GMO's have not yet withstood the test of time. He warned against hasty decisions to accept and distribute GM foods without proper risk analysis in the spirit of averting starvation without due regard to the possible detrimental irreversible consequences down the line.

He also recognized the important role that the media plays in informing the public about these issues. He hoped that the workshop would empower the media participants to appreciate biosafety issues and report them in a balanced manner. He also underscored the need for civil society organizations to engage the public in transparent discussions on the prospects and challenges of biotechnology.

Hon Mokalake wished all the participants fruitful deliberations and a successful workshop. He reiterated his appreciation of the Regional Agricultural and Environment Initiative Network Africa (RAEIN-Africa) for its partnership with the department of Agricultural Research on addressing important issues of biosafety at sub-regional level. On this note he declared the workshop officially open.

2.3 Vote of thanks by the Permanent Secretary for the Ministry of Agriculture of the Government of Botswana, Mr Mathias Chakalisa.

Mr Chakalisa expressed his gratitude for being invited to participate at the official opening of the workshop. He highlighted the critical role played by all stakeholders in food production, emphasising that in Africa all citizens are involved in food production in one-way or another. He then noted that the contribution of agricultural production to GDP is going down due to several factors. Therefore the development of new ways of producing better and safe food is very important. He further observed that people's choices are primarily driven by the cost of food and not necessarily safety. In this regard the general public rely on scientists to advice on the safety of food

3 SUMMARY OF PRESENTATIONS & DISCUSSIONS

3.1 Defining biotechnology and genetic engineering. What are LMOs/GMOs? How are they produced and what is the status of Biotechnology in Africa?

By Dr Dahlia Garwe, Tobacco Research Board, Dgarwe@kutsaga.co.zw

The present started by giving a simplified definition of biotechnology. She pointed out that the technology is not new as it has been in use for many decades. She however highlighted that some novel aspects of biotechnology such as genetic engineering that results in Genetically Modified Organisms (GMOs) had aroused a lot of public interest and scrutiny. She then took the participants through the genetic engineering process.

Her paper also covered in brief the status of biotechnology in Africa and the whole world. She pointed out that the USA, Canada and Argentina are the global front-runners, while Africa lags behind in all categories including research, application, regulations/policies and even public awareness. In Africa only one country has commercialized GMO's while nine are conducting field trails. Twenty African countries are engaged in GMO research and development while only 24 have institutional and human capacity to conduct such research and development. In total, 27 African countries have ratified the Cartagena Protocol on Biosafety.

Her paper also gave a snap short of the benefits and potential risks of using the technology. Some of the benefits of modern biotechnology in crop production she noted include: enhanced taste and quality, reduced maturation time, increased nutrient uptake and use, increased yield, stress tolerance, improved disease resistance and pest resistance. Animal improvements ranged from increased disease resistance, feed efficiency, better yields of meat, eggs and milk etc. This she believed would ensure food security. Some of the potential challenges and concerns she noted include safety to human and animal health, environmental sustainability, ethical issues, Intellectual Property Rights, the monopolisation of food by a few multinational companies and the current disagreements on the labelling of GM foods.

Dr Garwe underscored the need to regulate the technology to ensure its sustainable use. Resisting the technology, the presenter noted, will not be in the best interest of present and future generations. She therefore challenged regulators to develop and implement effective biosafety frameworks that take into account local realities. She concluded by stating that collaboration and networking are essential to enhance research and policy capacities. Genetic engineering offers dramatic promises for meeting some of the challenges of the 21-century however like any other new technology it has some known and unknown risk, she noted. It is therefore crucial to promote the safe and responsible use of the technology.

Questions and discussions

Participant: Does cloning fall under genetic engineering or biotechnology application?

Presenter: Cloning refers to the mass production of cell contents, cells, organs or the whole organism hence molecular cloning falls under genetic engineering however some people prefer cloning not be included under GE especially stem cell research which really does not involve alteration of genetic material but rather transfer of such material wholly. (*The facilitator then added that most countries if not all regulate cloning under separate regulatory regimes than the Cartagena Protocol biosafety regime).*

Participant: For how long have GMOs been under commercialization in GMO producing countries?
Presenter: The first GM crop was commercialized in 1996. Hence GMOs have been in production for almost a decade. In addition it was explained that commercialization takes time as extensive safety test have to be done first before approval.

Participant: Do the enzymes used in the production of GMOs not produce toxins that are harmful to human?
Presenter: The presenter pointed out that current regulatory practices ensure that GMOs are screened against toxic compounds before commercial release. She hinted that in the event of any toxic or allergenic substances being detected in the GM product, such product will not be approved for commercial release.

Participant: How can one create interest from the general public of this higly technical subject in a way that people can relate to it and how do you simplify this information for ordinary readers?
Presenter: The presenter acknowledged that it is a very difficult challenge and not an easy task. However it helps to know the audience and to try to simplify according to their levels of understanding. One way of doing this is using the analogy of letters and books in reference to DNA and genes. *One scientist added that the analogy of bricks as building blocks for different structures could also be used. Genes can also be explained as being the same building blocks that can build so many different organisms.*

3.2 Agricultural biotechnology: What is there for the third world?

By Prof. Diran Makinde, AfricaBio, makinde@mweb.co.za

Prof. Makinde started his presentation by giving statistics on the farming situation in Africa. He said 60 - 80% of Africans live on farming. However the majority of them farm on less than 3 acres. He further said that 30 - 50% of GDP in most African nations is from agriculture and that land and labour are the farmer's major inputs. However farms are undercapitalized, markets inefficient and individual farmers face huge environmental, pest and logistical challenges. He then gave maize yield estimates around the world as follows: South Africa 1.2MT/ha, Indonesia 3.8MT/ha and USA & Europe 8MT/ha -15MT/ha. He lamented at the dismally low productivity levels in smallholder farming and how this eventually leads to food insecurity. The transformation of African Agriculture through technological interventions such as modern biotechnology according to Prof. Makinde is the ultimate solution to Africa's food insecurity paradox. However, the improvement of such aspects as provision of

inputs, rural infrastructure, market access, farmer training and proactively reforming policy and regulatory frameworks are critical elements of empowering farmers to get out of the vicious poverty cycle that is characteristic of smallholder life in the region.

He then briefly distinguished between traditional and modern plant biotechnology, acknowledging that there are benefits of using gene transfer technology. However, he also underscored the need to exercise caution in the deployment of the technology as any new technology comes with new opportunities and novel challenges. He pointed out the rational for risk analysis done on GMOs as part of the regulatory process. He then gave an overview of environmental, food and feed safety, economic and social concerns some people have with modern biotechnology. He also alluded to the fact that most of the concerns highlighted by the media are an extension of the anti-science, anti-globalization movement that originated in Europe primarily in opposition to US commodity exports seen as an economic threat to local agriculture. Throughout this outcry safety issues were used to capture public support and fulfill WTO boycott requirements.

Prof Makinde then outlined the status of GM foods in the world. He pointed out that over 3 billion people have eaten approved GM food for at least the last 6 years and yet there are no reports of people falling ill after eating the food. He gave the following crops as some of the approved GMOs: tomato, soya, cotton, maize, canola, chicory, potatoes, flax, rice, pawpaw and squash. He placed emphasis that there are no human or animal genes in any approved GM food crops and that the year 2005 marked the 10th anniversary of GM commercialisation with 400 million ha planted by 8.5 mil farmers in 21 countries.
On this note he shared with the participants the results of the Bt white maize and small-scale farmer demonstration trials, which where aimed at ensuring that the small-scale farmers have the opportunity to evaluate *Bt* white maize for themselves, while fostering science-based discussions on biotechnology in the SADC region. These trails also served as a demonstration of the technology to farmers, scientists, decision-makers and policy makers.
He conclude his paper by saying that the key responsibility of AfricaBio is to ensure that society has enough knowledge and foresight and that they will continue to confirm safety before products are introduced into the environment and food supply.

Questions and Answers

Participant: Are there possibilities of establishing GM- free zones in Africa?
Presenter: The establishment of GM-free zones is a major challenge in Africa given the high degree of out-crossing, the well established system of traditional seed exchange, the porous nature of our borders and the lack of distinction between seed and grain for food and feed.

Participant: There is a general lack of resources for research in Africa. How then does one balance the interests of the African researchers and those of the donors that provide the funds?
Presenter: Only SA contributes 0.72% of GDP to research while most African countries contribute little or nothing. Governments in African therefore need to allocate money to their own biotechnology research. Certain conditions are normally attached to research grants, so African countries need to go into strategic partnerships

to neutralize these conditions. However provision of financial support to local scientists by their governments is a must for autonomy.

Participant: The issue of bio-piracy is serious in Africa, but how does one take these multinationals to court?
Presenter: The issue of biopiracy is serious and again African governments need to wake up and establish and enforce intellectual property laws so that their own scientists can start patenting to benefit from African resources.

3.3 Developing country concerns on the use of GMO's

By Ms Charmaine Treherne, National Coordinator for SA Freeze Alliance on Genetic Engineering (SAFeAGE) safeage@mweb.co.za

Ms Treherne commenced her talk with the experience and concerns of the South African people citing the Makathini Flat cotton farmers experience with Bt cotton as an example. She shared with the participants that the whole seemingly glamorous story of these farmers is a twisted one. According to her only four of the hand picked farmers had success growing the BT cotton. This result has been used ever since as representative of the whole region's success with BT cotton.

However the Biowatch's five-year studies in Makathini, she said, yielded opposite results. It concluded that industry's practices lead to high dependencies and that the benefits are short-lived. The adoption of GM technologies also leads to more pesticide usage due to higher incurrence of secondary insects, she said. She pointed out that a land Bank Official also revealed that the debt figure for the whole area is now totalling US$ 3 million. She further emphasised that the *BT* cotton has failed the Makathini farmers and hence will fail the farmers throughout Africa.

She continued with her talk by quoting some of the comments and concerns the South Africa general public had about this technology. Few examples;

- Farmer R.N.Martinglia, BlesbergFarm, Lidgeton, KzN: "I see no need for these products. If these products were any good (that is profitable), there would not be the need to subsidize farmers."
- Phadima Community Development Association "We are not told the negative impacts of GMOs on our health, environment, economy and farming systems."
- Farmer B.A.Manukuza, Mseleni/SbhayiReserve: "We had tried about 7 hectares of Bt cotton but with no success (poor production, no harvest), not suitable."

Ms Treherne then took the participants through a number of issues of global concern pertaining to GMO's which ranged from contamination, people and animal health risks, socio-economic risks of debt and dependency, threat to food sovereignty and security, monopolisation of the seed supply, environmental risks, legislation favouring profit before precaution, lack of traceability, lack of identity preservation and segregation, leading to lack of labelling, lack of accountability, liability and redress and lastly the fact that big businesses make millions from poor farmers through patent infringement.

In conclusion she said that the developing countries' concerns regarding the use of GMOs are Debt, Dependency, Dicey Economics, Industry-biased legislation and Loss of food security. She then urged developing countries to treat GM technology very cautiously and probe the origins of the 'research', whether it is industry-funded or not. She advised that they should address these concerns in the legal frameworks and adopt useful framework based on the African Union's Model Law on Biosafety.

Questions and Answers

Participant: There is a bombardment of science and politics hence how do we marry the two. We are talking more politics than science.
Presenter: The presenter said that she is not a scientist hence she sought her information from credible scientific sources like published journals and experts advice.

Comments from the participants:

People are more afraid of the technology that goes into the food chain but every technology comes with risk.

Madam facilitator informed the participants that some years back while she was still at BTZ they took some smallholder farmers on a field trip to Makathini to learn from these farmers' experience with Bt cotton. This was necessitated by the farmer's desire to also benefit from the *Bt* technology since it sounded so good for them. After talking to the Makathini farmers the farmers eventually concluded that there was no need for *BT* for them. As they have learnt of the problems with secondary pest increase with the introduction of *BT* for example.

3.4 GMO's – the ethical and social considerations. What are they for developing countries?

By Mr T.A Mushita, Community Development Trust, nancy@commutech.co.zw

Mr Mushita introduced his paper by highlighting arguments that the central problems in technological ethics can be understood as problems of anticipating and managing the unintended consequences of technical change. He further argued that ethics weigh in on whether people must be informed and give consent before they can become bearers of risk and how the balance between risks and benefits are evaluated. He further maintained that some approaches to technological risk analysis are measured and characterized by wholly scientific principles, where ethics is only considered when it is time to compare risk and benefits of different technological options. However it is now generally accepted that value judgements are implicit in such evaluation of risk. The objective now is to find an approach of how to derive and integrate statistical and subjective probabilities to ensure that all phases of risk assessment involve consideration of ethical issues.

His consideration of social equity revolved around the fact that biotechnology can be neutral, pro-rich or poor depending on the stage of its development and management,

area of application and socio economic climate in which it operates. Biotechnology techniques are high cost and require highly trained personnel, aspects of which are generally lacking in the developing world. This implies that much of this type of research takes place in the private sector implying that the research priorities are driven by market related factors rather than those of the public sector which are people centred.

Biotechnology is also feared to lead towards accelerated agricultural industrialization that might not be inclusive of smaller and less developed countries. In his consideration for ethical and legal aspects he stated that while recognising the potential of biotechnology the genetic manipulation of crop and livestock using genes from unrelated organisms and the potential biosafety considerations on human health raised ethical issues. One such ethical issue is the patenting of life forms. Most developing countries do not allow this while some see this as a necessary mechanism to stimulate technology development. Developing countries also see this as inadequate in protecting rights of the local communities as patenting also imply to patenting widely used traditional knowledge. On this note he told the participants that the only way is to assess the implications of different international rules regulating the development and use of biotechnology and to develop appropriate and workable domestic legal frameworks on biotechnology issues to safeguard themselves against these practices.

It is also very important to understand that mastering the GM technology and its potential environment and health impacts is not enough. This must also include questions like by whom, for whom and with what consequences this technology is developed. The challenge in addressing socio economic issues is therefore the fact that the scope of the biosafety protocol is limited to the transboundary movement of Biotech products. Therefore there are some opinions that this instrument is insufficient as it compromises dealing with the issues of introduction into the environment, which might have socio economic concerns.

He further summarized the limits of the green revolution saying that 800 million people which is 17% of the world population are undernourished while 200 million children under the age of five are underweight. Three hundred million people in Africa are hungry while another 200 million are undernourished. However he concluded that GMO's have been grown for less than a decade and that there are still scientific uncertainties.

Questions and Answers

Participant: Why is there always this reference to unintentional consequences when intentions are known?

Presenter: The presenter commended that they are referred to as such since there might still be unknowns even when research has been done. Scientist means well that's why the risk evaluation and management are done as precautionary measures.

Participant: It seems that market and profitability are the main driving factors, are they not advanced at the expense of all other issue?

Presenter: It appears most of the key drivers of the technology are multinational corporations with a profit motive. As to whether other equally important issues are addressed also is highly debatable.

Participant: Patenting of genes, is it ethical or unethical?

Presenter: This is a highly debatable issue. The patenting of genes found in nature is surely not in line with the provisions of existing patenting laws. How can one claim to have invented genes that are already in existence?

Participant: Is it unethical to use the poor as an argument to say we produce food for them? I believe the world produces enough food, the question therefore is one of distribution. Can the poor really afford GM food?

Presenter: On this question the presenter shortly commented that unless we are in the driving seat could we solve our own problems as Africans.

3.5 Conservation and sustainable use of biodiversity (*An introduction to International Conventions and Treaties on conservation and sustainable use of biodiversity)*

By Dr. Enos Shumba, SADC Biodiversity Support Programme, enos.shumba@iucn.org

Dr Shumba started by explaining the contextual framework of biodiversity and conservation issues in the SADC region as follows; the environment is the foundation of socio-economic development in SADC and that the health of inhabitants depends directly on environmental goods & services and hence the sector can reduce unemployment. He then told the participants that the SADC Member States have signed a number of Multilateral Environmental Agreements (MEAs) including the Convention on Biological Diversity (CBD) whose pillars are the conservation of biodiversity, the sustainable use of its components and the equitable sharing of benefits arising from the use of biodiversity.

Dr Shumba defined biodiversity (BD) as referring to the variation in the life support systems at various levels and that it contributes to human well being. On this note he acknowledged that biodiversity is the main driver of SADC economies. The SADC region is rich in transboundary genetic resources with associated local knowledge on genetic resources. This calls for regionally harmonized strategies, a need which has already been addressed by SADC through the formulation of the Regional Biodiversity Strategy (RBS). The thrust of the RBS is commercialisation & value addition and this has implications on biosafety and hence calls for regional policies on this subject also.

In conclusion, he cautioned the participants that the cases of bio-piracy in the region are increasing and that this highlights the need for national regulatory frameworks on Access and Benefit Sharing. Also of concern is that SADC has no policy on GMOs. In this regard the key challenges are genetic contamination through gene flow,

potential impact of Gene Use Restriction Technologies (GURTs) on smallholder agriculture and slow progress in developing regulations on access to genetic resources.

Questions and Answers

Participant: There is a concern that SADC regional biosafety strategies have already engulfed GMO's when the whole world is up in arms against them. Even the EU consumers rejected them. So what part is the African model law then going to play in the SADC regional strategy?

Presenter: The presenter answered that the reference to science is in transforming biodiversity into wealth using science hence this need for science might call for genetic engineering as a science and not necessarily the introduction of GMO's. In the pharmaceutical industry the science is unavoidable.
Comments from the participants: *Biotechnology is not only applied in plants but also in medicine hence the products are with us whether we like it or not.*

Participant: Biopircy, are there figures to justify the concerns?
Presenter: Out of the 50 cases of biopiracy in Africa 25 are from Southern Africa.

Participant: Why is our biodiversity being exploited by outsiders and not locally?
Presenter: Because we are not investing in biotechnology research and development. Outsiders are coming to take advantage of our rich biological resources.

3.6 The Cartagena Protocol on Biosafety – from negotiations to implementation (Contentious issues during negotiations and implications for developing countries)

By Mr. Abisai Mafa, Biosafety Board of Zimbabwe, mafa@biosafetyzim.ac.zw

In the introduction of his paper Mr. Mafa underlined that, for development to be sustainable it must be underpinned by three pillars and these are: Economic, Social and Environmental pillars. New and cutting edge technologies such as biotechnology can be instruments for sustainable development. However, biotechnology is a double-edged sword, which presents both opportunities and threats. Hence there is a need for a regulatory system as a basis for sound decision-making and this justifies the essence of the Cartagena Protocol on Biosafety and the subsequent domestic biosafety regulatory regime.

Mr Mafa then gave a brief summary of the negotiation process stating that in 1972 world leaders gathered in Stockholm, Sweden. The business was to find ways and means of reversing the damage man's economic activities where unleashing on mother earth. In June 1992, the United Nations convened its Conference on Environment and Development in Rio de Janeiro, 20 years after its meeting in Stockholm. The objective was to take stock of progress made after Stockholm and chart a more sustainable path to development. This gathering gave rise to the

Convention on Biological Diversity whose objectives are the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of benefits arising out of use of biological resources.

Article 8(g) of the Convention he pointed out, gives the mandate to each Party to as far as possible and as appropriate establish and maintain means to regulate or control the risks associated with the use and release of LMOs**.** While Article 19.3 gave Parties the obligation to consider the need for and the modalities of a protocol setting out appropriate procedures in the field of the safe dealings with LMOs. On this note he gave a brief history of the meetings that have resulted in the development of the status on the Cartagena Protocol to date.

He summarized the key provisions of this instrument as being; (a)the Precautionary Principle, (b) the scope, which states that the Protocol shall apply to the transboundary movement, transit, handling and use of all LMOs that may have adverse effects on the conservation and sustainable use of biodiversity, taking also into account risks to human health, (c) application of the Advance Informed Agreement Procedure (AIA), (d) the decision procedure, (e) risk assessment and risk management (Articles 15&16), (f) handling, transport, packaging and identification (Article 18), the Biosafety Clearing House (Article 20), public awareness and participation (Article 23) and Socio-economic considerations (Article 26).

In his concluding remarks he urged developing countries to be proactive rather than reactive. He also highlighted the essence of public awareness and education in preceding effective participation in the decision-making and the urgent need for regional cooperation to ensure effective implementation of the Protocol.

Questions and Answers

Participant: The CPB is for two things, trade and environmental protection not really health. While article 26 on socio-economic considerations is there, it is a very weak provision. Most of the SADC countries are struggling with development of legislation on GMOs while GMO consignments are being transported by road and there is illegal planting. When then are the socio-economic considerations going to be part and parcel of decision making?

Presenter: Lack of an appropriate legal framework should not be misconstrued as a passport for releasing GMOs into the environment without the approval of the national government. Even though many countries in the region do not have legally binding instruments on GMOs they still require that all GMOs be subjected to risk assessment before import. However limited capacity to carry out risk assessment and the pressure to move food quickly to emergency areas militates against the provision of thorough risk analysis.

Participant: The language of the Protocol on labelling of putting “Contains” or “May contain”. How realistic and enforceable is it. Are we not going to end up with everything being given the label “may contain” thereby defeating the whole purpose of labelling?

Presenter: This is a compromise reached in Brazil this year after the negotiations had stalled. The provision of course has serious shortcoming and is prone to abuse, but it is at least better than not labelling. It is up to countries to use their domestic

legislation to ensure that proper declarations are made. Regional cooperation is also needed.

3.7 Liability and redress issues in the Cartagena Protocol on Biosafety- Implications for developing countries

By Mrs. Nancy Kgengwenyane. nancy@irbm.co.bw

Mrs Kgengwenyane shared with the participants that Liability and redress is a provision of the Biosafety protocol under Article 27 which requests the Parties to adopt a process for elaborating international rules and procedures on liability for damages caused by LMOs/GMOs in a transboundary context.

She briefly highlighted the key issues of the negotiations under the liability and redress regime. She said that developing countries called for a legally binding international civil regime and the scope of the liability regime should be inclusive of damage resulting from the transboundary movement, transit, handling, and use of all living modified organisms and their products, also damage caused by intentional, unintentional and illegal transboundary movements. Lastly it must be inclusive of areas within the limits of national jurisdiction or control of Parties as well as in areas beyond any national jurisdiction.

Damage can be of environmental, human and animal health, and socio-economic nature. Further more the developing countries called for a strict liability regime while causation should be based on cumulative undesirable effects resulting from an LMO, multiple LMOs or multiple incidents that cause damage. The question however remains on the issue of channelling liability, should it be inclusive of the whole chain from exporter to supplier including currier etc? Should it then be joint or severally liability or vicarious liability? She then touched on the issues of insurances and other financial guarantees and that any affected person or interested public has the right to bring claims in the event of damage. She also informed the participants that the developing country participants at that meeting also called for a strong mechanism under the liability and redress regime for dealing with non-compliance, dispute settlement and settlement of claims and a mandatory monitoring and reporting of damage incidents.

In conclusion she said that Parties importing from non-Parties and Parties exporting to non-Parties should ensure that, in respect of liability and redress, such transboundary movement do not result in a lower level of protection as provided for under the liability and redress regime of the Protocol.

Questions and Answers

Participant: Who should be made liable for damage resulting from an LMO?
Presenter: Every legal person in the GMO production and marketing chain could be held liable. Ideally the legal framework should leave it to the affected to decide who to sue. However causation has to be established first.

Participant: Apportioning of liability, does it take into account the extent to which each person played a part in causing the damage?
Presenter: Yes, it does.

Participant: Can you please explain vicarious liability?
Presenter: In vicarious liability each part in the production or distribution chain is liable whether they did something wrong or not. As long as you are part of the system you will be accused of having contributed to the damage and hence you are liable.

Participant: Does the Protocol have measures that guard against bio piracy or bioterrorism? What about modified anthrax?
Presenter: Biopiracy is not covered under the Cartagena Protocol on Biosafety, the reason being that the Protocol focuses primarily on the environmental implications of applying biotechnology to add value to biological resources. However your concerns on biopiracy are very valid. Countries should develop and implement laws to curb biopiracy. *Bioterrorism is only covered to the extent that the living organisms used in the bioterrorism are genetically modified. However the Biological and Toxin Weapons Convention addresses issues of bioterrorism.*

3.8 Regulating biotechnology in the SADC and other developing countries: A choice or a must?

By Dr Martha Kandawa-Schulz, Namibian Biotechnology Alliance, University of Namibia, kschulz@unam.na

Dr Kandawa-Schulz informed the participants that the National Biosafety Frameworks can have several main components and she outlined them as follows;
Biosafety Policy, this can either be a stand alone or part of existing policies in the related area. Regulatory system can consist of national legislation with regulations and guidelines on risk assessment and risk management/administrative procedures or amendments on existing regulatory instrument with additional biosafety legislation.
She shared with the participants that an administrative system to handle requests is also needed and can consist of the following, institutional structures which can be a ministry or any institution housing the biosafety unit, institutional biosafety committees, national biosafety committees/council/board which in some instances have an advisory role and in some decision making, Biosafety Officer and a registrar.
A system for enforcement and monitoring compliance is another important component of any NBF while, public awareness and hence participation in the biosafety system is also essential. This she said can be done through availing all biosafety information to the public and also establishing systems for public inputs in the decision making process.

Dr Kandawa-Schulz then touched briefly on the scope of the Cartagena protocol and it's implications on the provisions of domestic regulatory systems. The Cartagena Protocol on Biosafety binds countries, which have ratified and those who intend to ratify to draft their NBFs in line with CPB. The CPB only covers living modified organisms whereas many NBFs cover GMOs. She informed the participants that the LMOs that are covered under the CPB are those intended for intentional introduction into the environment (e.g. seed for planting), those intended for direct use as food,

feed or for processing (e.g. genetically modified maize for human consumption) and those meant for contained use (e.g. for laboratory use). These are processed through advanced informed agreement. The AIA applies to first intentional transboundary movement of LMOs for intentional introduction into the environment of the Party of import. The notification by exporters to importing party is required and the importing party is to adhere to the acknowledgement procedures. The country of import has to have made the decision within 270 days according to CPB.

In summary she said that 10 SADC countries have ratified the CPB while only three have legally binding regulatory systems namely: South Africa, Zimbabwe and Malawi. Most of the remaining countries have biosafety policies in place and others are at advanced stages of drafting such legislation.

Questions and Answers

Participant: There are discussions at SADC level on transboundary movements of GMOs, however we tend to leave important issues to national frameworks that does not exist. How far is SADC from having a legally binding regional regime?
Presenter: SADC does not have a regional Biosafety framework in place. However a SADC advisory committee was established a few years ago as a result of the challenges with food aid imports. However the committee is non-functional due to a number of reasons among them lack of resources and link to national Biosafety systems. Issues of transit are really a cause for concern, and need to be taken care of both at regional and national levels. Many SADC countries' NBF's are drafts that cannot be implemented. There is also no consensus in SADC on GMO's and hence no common instrument.

At this point the facilitator shared with the participants that the SADC Member States are the process of establishing a science and technology desk within its Secretariat. The desk will also deal with biotechnology and biosafety, issues. It will also be feasible to come up with a SADC Protocol on Science and Technology with provisions for biotechnology and Biosafety or a separate protocol on biotechnology and biosafety. Things are happening at SADC level in this regard albeit at a very low pace; maybe RAEIN-Africa should establish links with the SADC and develop a common strategy on these issues.

Participant: Liability and redress, BCH on the regional level, Where are we as SADC on the development of frameworks for liability and redress, and a regional Biosafety clearing house?
Presenter: The presenter agreed that a liability and redress regime is very essential e.g. SA is growing GMO's and does not segregate yet many SADC countries import from SA. This concern should be taken up at the policy level of SADC.

Participant: How effective are the public information and awareness campaigns, websites and brochures mentioned given the low literacy rates and poor Internet connections reminiscent of SADC?
Presenter: Yes these are challenges that limit effective public participation some local languages do not have science words and inhibits translation of awareness material. Namibia has translated some of their awareness material.

Participant: How is SADC handling the disposal of LMO's containers like medical bottles?
Presenter: Disposal is a very important aspect of biosafety; however in SADC we are not clear of how to dispose products or by-products of the technology.
The facilitator then said that this issue should be addressed in detail in administrative arrangements at the domestic level. Incineration is very expansive therefore there is a need to form linkages to develop common solutions to the disposal bio wastes

Comments from the participants: One participant said that the EU policy on GM-free meat is pure hypocrisy, since they themselves are feeding their beef with GM-soya. The presenter highlighted that Namibia's position is not as an EU policy on GMOs *per se,* but rather an attempt by the country to protect her niche markets.

3.9 What does risk assessment and management entail in the implementation of the biosafety protocol?

By Dr Lewanika Mbikusita, National Institute for Scientific and Industrial Research, Zambia, mmlewanika@nisir.org.zm

Dr Mbikusita commenced by outlining the objective of the CPB as to contribute to ensuring an adequate level of protection in the field of the safe transfer, handling and use of LMOs resulting from modern biotechnology that may have adverse effects on the conservation and sustainable use of biological diversity, taking also into account risks to human health, and specifically focusing on transboundary movements.

He then informed the participants that Article 15 deals specifically with risk assessments and prescribed the terms and conditions of risk assessments to be carried out under the CPB. He outlined the elements of risk assessments. He said the first is the objective, which he said is to identify and evaluate the potential risks, a tool for competent authorities to make informed decisions regarding the introduction of LMO's. He then described the general principles of RA as being systematic and either qualitative or quantitative.

RA should be carried out in a scientifically sound and transparent manner and must be carried out on a case-by-case basis, he said. Most importantly, he said, lack of scientific knowledge or scientific consensus should not necessarily be interpreted as indicating a particular level of risk, an absence of risk, or an acceptable risk.

Dr Lewanika said that the commonly followed methodology includes the identification of any novel genotypic and phenotypic characteristics associated with the LMO that may have adverse effects followed by an evaluation of the likelihood of these adverse effects being realized, taking into account the level and kind of exposure of the likely potential receiving environment to the LMO and, an evaluation of the consequences should these adverse effects be realized. Estimation needs to be done of the overall risk posed by the living modified organism based on the evaluation of the likelihood and consequences of the identified adverse effects being

realized. Lastly a recommendation as to whether or not the risks are acceptable or manageable needs to be done.

At this point he said that risk assessments uses terminologies that can often be used in different ways or mean different things to different people. These are terms like hazards, risk, risk treatment etc. He then concluded by saying that expert judgement is key to the risk assessment and management process and that there is a need to closely describe the basis for each conclusion.

Questions and Answers

Participant: Is there provision to avoid abusing of confidential information?
Presenter: The issue of confidentiality is mainly based on IPR and is meant for protection against competitors. Receiving countries therefore have to guarantee confidentiality. Such confidentiality is however jointly agreed on by the applicant and the competent authority. If there is no agreement on such the country can refuse considering such application.

Comment from participants: SA Biowatch sued the SA government because they refused to give information from the applicant on the basis that such information was confidential. Time constraints in the system were used as loopholes and when the applicant got involved Biowatch lost the case.

Participant: There is provision for taking into account socio-economic considerations in the Protocol when making decisions on LMOs. What about political factors?
Presenter: Political considerations are unavoidable especially if the final decision rests with the politicians. *However political considerations of a socio-economic nature may be taken into account as provided for under Article 26 without violating the country's obligations under other international agreements.*

Participant: Is it true that under the Namibian law risk assessments done in SA will automatically apply and hence the decisions?
Response: A Namibian participant responded that although it was a suggestion during some consultation meetings from industry it had not been considered wise by most stakeholders therefore the draft Namibian law calls for in-country independent risk assessments and decision making.

Participant: Risk assessment is a capacity issue however is it wise to out source risk assessment reports to make country decisions?
Presenter: Capacity constraints should not limit countries from carrying out their own risk assessments. On SADC level there can be a regional approach that also has limitations like trust limitations.

3.10 Potential Role of Civic Organisations and the Media in the implementation of Article 23 of the Cartagena Protocol on Biosafety

By Rodger Mpande, mpander@ecoweb.co.zw

Mr Mpande commenced his talk by giving the objectives of the Cartagena Protocol on Biosafety. He further informed participants that Article 23 of the protocol urges Parties to promote and facilitate public awareness and education. He pointed out that public participation should be recognized as a process by which human beings and societies can reach their fullest potential. Education is critical for promoting sustainable development and improving the capacity of people to address environment and development issues. Both formal and non-formal education is indispensable to change people's attitudes so that they can have the capacity to assess and address their sustainable development needs, he said.

The issues of genetic modification have become topical around the world in the last decade with the emergence of two distinct camps. One camp is advocating for the need to urgently adopt this new technology as it has potential to resolve problems of hunger, disease and environmental degradation. On the other side of the debate are those that strongly believe genetic engineering will in fact worsen the problem of food security, introduce new diseases to humans and the environment. The inappropriateness of technology might stem from its being deployed in a context quite different to that for which it was designed, he said. Thus appropriate choice of technology ought to be treated as a cardinal principle of human affairs and not just a matter worthy of attention by specialists and enthusiasts, Mr. Mpande alerted.

He then outlined the current challenges faced by civic groups and the media in creating public awareness and education. These issues can only be debated based on credible scientific information that all relevant stakeholders accept as valid. A key problem in the debate over biotechnology, he said, is the existence of false information and misrepresentations. In the absence of accurate information that helps stakeholders reach decisions, conflicting claims arise, making the process of decision making very difficult to achieve.

The key issues of concern seems to be understanding the science and its possible risks and risk management, while political dimension of the technology as it relates to issues of intellectual property rights and social and economic implications including trade are also relevant. Mr Mpande said that at the international level the main focus of the debate is around the establishment of a system that would ensure appropriate documentation of GMOs, risk assessment and management, and issues of liability and redress.

He said that the question is whether the technology improves the welfare of the farmer and consumer, whether the economy will prosper as a result of the technology, and whether the technology threatens current economic establishments. Mr Mpande said that at the sub regional level (SADC), the debate revolving around issues of GMO technology is very critical as the region continues to consolidate its regional

integration strategy whilst drawing towards a free trade zone. The most worrying issue about the sub region as its relates to GMOs and biosafety is that the South African government supports genetic modification in agriculture and uses its own infrastructure and resources to encourage positive public attitudes about crop genetic engineering, he said. South Africa's permissive regulatory system and its technologically advanced agricultural system makes the country an ideal gateway into the region for the spread of GM crops, Mr Mpande pointed out. This needs to be taken up as an awareness creation issue in the region.

If developing countries are to make the best possible informed choices on the technological change, the imbalance of voices and influences needs to be rectified and their own choices needs to drive decision-making, said Mr Mpande.
The Cartegena Protocol serves as a good guide on what should be done to minimize adverse impacts of introducing GMOs in the country. It is thus important for stakeholders to understand fully and correctly the contents of the biosafety Protocol before embarking on any public awareness programmes he concluded.

Questions and answers

Participant: The bombardment of African scientists is not fair. Are you telling us that we should stop the research work as African scientists when the whole world is heavily investing in this? Why should we not take the good things from this in capacitating ourselves for our own benefit and choose which science is good for us?

Presenter: The presenter responded that it was just his view about African scientists but not GE as such. However the money that goes in the GE is amazing while there are pressing issues in Africa, he said. He noted that even the EU with its moratorium has enormous GE research in the field. The point, he said is whether Africa can afford to put a lot of money into GE research when it has more pressing issues to attend to. He questioned the cost effectiveness of such an approach.

3.11 Biosafety Clearing House Mechanism, a means for enhancing public participation

By Ms IL Geingos, Directorate of Research, Science and Technology, Ministry o f Education, Namibia, igeingos@mec.gov.na

Ms Geingos informed the participants that the Biosafety Clearing House (BCH) is an information exchange mechanism, which was established under article 20 of Cartagena Protocol on Biosafety and also as part of the "Clearing House Mechanism" of the Convention on Biological Diversity. The clearing House Mechanism under the convention was established to make sure that all governments have information and technologies relevant for their Biosafety work.

The purpose of the BCH is threefold she said. These are to facilitate sharing of all relevant information pertaining to LMO's amongst both parties and even non-parties. To assists parties in the fulfillment of their obligations and to serve as a one-stop

resource for getting all relevant contact information to enhance the establishment of human and technological networks on Biosafety throughout the world.

The protocol calls on all Parties and governments to ensure that required information is availed to the Central portal of the BCH in a timely and appropriate manner. The participation in the BCH is open to all governments and even credible NGO's dealing with issues of capacity building, she said. Governments, she said, have to designate a national focal point for the registering of national information on the BCH. All registered information is however validated at national level before it is posted on the central portal of the BCH.

The BCH, she said, is a web based Information site and can be accessed by everybody with an Internet connection. Such information can be beneficial to all including regulators, industry, civil society etc. The minimum required information as prescribed by the Cartagena Protocol is found on the BCH. This includes: national laws and regulations including agreements, national contacts, decisions and declarations on LMO's, risk assessments summaries, capacity building activities, roster of experts and links to national and other relevant websites.

In conclusion she stated that effective public participation in the decision making process is only possible if the public is informed by reliable information sources and only if such information sources are availed and known to the people, the BCH is one such credible source of information. Even if the required information is not on the BHC website, the website has links to all relevant biosafety sites.

Questions and Answers

Participant: Is the information on the BCH reliable?
Presenters: The BCH contains information of a regulatory nature predominantly. All Parties and institutions submitting such information are obliged to ensure accuracy and correctness of the information. Each country therefore has a validation process in place to ensure that information submitted to the portal is a true reflection of what obtains on the ground. The secretariat also does not just publish information unless it is from the designated national focal point.

Participant: Are there enabling funds to assist African states to participate in the BCH mechanism?
Presenters: Global UNEP/GEF BCH funding can be accessed by Parties to the Protocol. This is usually up to a maximum of US$50 000 per developing country Party.

Participant: What is a public and how is public participation possible?
Presenters: Every individual citizen who is affected by law, decision or activity is a public. Governments have to ensure democracy by putting in place mechanisms to ensure public participation in any decision-making process on issues that affect people. This will be explained in more detail under the presentation on public participation.

Comments from participants: SA experiences are that the GMO Act was drafted without public participation and there was civil society outcry but nothing was done

in this regard. Civil society participation is also limited by funds and hence SA is in contravention of its own constitution in this regard. There was a heated debate on what constitutes an LMO. Participants agreed to stick to the language of the Protocol and the definitions as the definition an LMO had been a subject of controversy during the negotiation of the Protocol.

3.12 Public awareness and participation – An in-depth analysis of the provisions of Article 23 of the Cartagena Protocol on Biosafety.

By Mr. Abisai Mafa, Biosafety Board of Zimbabwe, amafa@biosafetyzim.ac.zw

The presenter started by highlighting the international provisions for public participation as given by Article 23 of the Cartagena Protocol on Biosafety and principle 10 of the Rio Declaration on Environment and Development that environmental issues are best handled with the participation of all concerned citizens. Lastly the Parties to the Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters (Aarhus Convention) in 2002 adopted Guidelines on Access to Information, Public Participation and Access to Justice with respect to Genetically Modified Organisms.

On this note he gave definitions of various terms on the subject. He defined public Participation as a process of encouraging all interested and affected parties to contribute to solving social problems, setting priorities, designing strategies, increasing ownership and taking on responsibilities for action. Public awareness was defined as a series of actions taken to provide information to the public on what is going on. He defined public education as an investment in people to empower then to analyze and synthesis information to make their own judgments about situations and events. While the public was defined as all who have a stake in the issue at hand or those who are going to be affected by an action whether positive or negative and even be those who are going to have an influence on an action.

Mr. Mafa highlighted the essence of public participation on the note that developmental issues are best handled through the effective participation of all citizens and that people should be given the right to choose what is best for them, which he said is a constitutional provision in many countries. He also noted that the need to consult the public is substantiated by the fact that at the end it is the public that will determine whether a technology is adopted regardless of its utility value or scientific merits.

In his concluding remarks he said that the public can only effectively participate if they have been empowered through education, hence the need to progress from awareness to education.

Questions and Answers

Participant: What is the difference between public awareness, education and participation? What comes first? And who is to be trusted, regulators or scientists?

How do we build credibility in those who promote public awareness in the SADC region?

Presenter: Public awareness is predominantly providing information whereas public education deals more with equipping people with skills and capacity to make their own judgments and decisions. Effective public participation occurs when the public articulate issues and decide and influence decisions. The preconditions for effective participation are awareness and education. Trust is earned. The level of trust for regulators and scientists vary from country to country depending on past experiences. In countries where regulators or scientists have displayed some dishonest the level of public confidence in them is low. For example there is high trust for regulators in the US than in Europe. The later being a result of past experiences with mad cow and foot and mouth diseases. In the SADC trust in scientists is low as they are thought to be influenced by the West. The question is, how practical is public consultation? To what extent should the public be consulted? Experience has shown that the more you consult the more you delay making a decision and the more costly it becomes.

Comments from the participants: For scientists to ensure meaningful public participation and acceptance they must change their ways. They must focus on more adaptive research, simplify their jargon and write to inform and not to impress. There is need for more platforms to be created in the region where scientists, civil society and the media can dialogue in an attempt to understand each other.

One participant commented that scientists seem to find it so difficult to embark on participatory methodologies. The perception they have is why talk to farmers when we already know what they want/need. This has proved to be wrong. Participants also felt that civil organizations and the media should not act as people's mouth pieces. Rather than speak for communities, these entities should build capacity for people to make their own independent decisions on issues that affect them.

Participant: Funding and resources are limiting in terms of awareness creation. Sometimes communities do not have transport but incases they do they need incentives like a meal, which again has financial implications. What can be done to ensure that resources are there for engaging the public?

Presenter: The presenter acknowledged that resources are a big challenge however we need to be innovative in the midst of all these challenges. The question therefore is how to take the subject of biosafety to the village with limited funding?

3.13 How to enhance participation and communication of biosafety and environment issues.

By Mr. R. Rramolai.

Mr R Rramolai commenced his talk by giving various definitions of communications as follows: It a fundamental element of social behaviour that deals with the transmission of messages between the sender and the receiver using any one of the five senses, it is the exchange of ideas, opinions either through the spoken or written word, it is the successful transmission of information through a common system of symbols or signals: written word, speech or signals for example e-mail, telephones

and fax etc. All these definitions he said have got an element that communication is a two way process with the purpose primarily to inform, influence and express feelings.

Communication can be classified as intrapersonal, interpersonal, mass communication and extra personal communication. He said the methods of communication can be through radio, television, news papers, World Wide Web, teleconference, and electronic mail. However he said there are certain barriers in communication, which might render the communication ineffective. It can be Physical barriers, physiological barriers and psychological barriers while perceptual barriers relate to one's worldview, experience and differences in values that are brought about by several factors like age.

He said that there are four major hindrances to communication which are language barrier which might be due to educational background of both the sender and the receivers, use of specialized language, words having more than one meaning, some words may be used incorrectly, illogical presentation or use of wrong grammar. Interpersonal barriers are related to differences and personal characteristics of the sender and the receiver of the message; age, status, role and cultural differences could hinder communication.

Personality traits such as prejudice and insincerity, insecure, defensive personalities are not good communicators. Then there is a situational timing barrier, which deals with the time, and place where communication takes place. In our societies we are bombarded by so much information that we do not have enough time to process everything. If we are under great stress we may be incapable of processing information. The place where communication takes place may hinder it if it lacks privacy, is hostile or is uncomfortable. The amount of noise in the environment also affects the reception of information negatively. Lastly he said is the procedural, organizational or structural barriers that deal with how and through what structure a message goes from the sender to the recipients. The message may have to pass through many people before it reaches the recipients and this may result in distortions along the long route. Parts of the message may be ignored, omitted, or simply misunderstood.

He then suggested three primary ways of overcoming the communication barriers as follows: improving perception, which involves putting yourself in another person's place and avoiding focusing on your own experiences and background. Improving the physical process by ensuring that you encode the message clearly either by selecting words or gestures carefully, using an appropriate channel to send the message; paying attention to the feedback you get from the receiver so that you could be sure that you were understood. Improving relationships is another way of rendering effective communication. This can be done by building trust between yourself and the audience. Lastly speaking ethically carries power and therefore the sender has to understand that he/she has to bear ethical responsibilities. When communication power is abused the results can be tragic. So, you must ensure that your goal is ethically sound. This can be achieved by knowing your subject matter, being honest in what you say, using sound evidence and using good and valid reasoning.

He concluded his paper by giving hints as to how to ensure effective communication. These were: identify your audience, identify your subject matter, choose the

appropriate channel and choose the appropriate language code. He also posed the following questions to the participants:

1. Is intra communication normal?
2. What barrier is it when you cannot communicate with the rural people because there is no communication means?
3. Should we involve communities from the start when we plan research that has bearing on them?
4. The blind is left out from communication for example condoms are not in brail so how do we communicate with them on biosafety? How do we incorporate the need for disable people?
5. Women are not consulted and are often left behind. They are not allowed to speak without consulting their husbands. Even woman scientists are not forthcoming to speak; can men please allow women to speak their minds?
6. Scientists or those who create awareness are not familiar with journalistic ethics. Scientists also seem to be stingy with information sometimes because of their ethics. Institutional procedures to get just simple information are cumbersome and this delays the printing of daily papers. Journalists need to know the clear channels of public relations in universities or other institutions to make the process easy. Yet this process has time delays, which are a concern for journalists. It is evident that every institution has protocols, accountability to be observed and some countries even have cumbersome access legislation with long time limits. How then do we assist journalists to overcome the barriers in terms of getting timely information? Media is selective in their priority setting in terms of publications. Biosafety and environment issues are not on their priority list.
7. Reference was made to the previous day's pubic debate as to why the public was not well represented as the debate was widely circulated? Maybe the public's lack of interest is because they are not informed, so who is to blame? Maybe it is the way in which the advert was presented; maybe it needed a sensational heading. It could therefore be the packaging of the message that we send out. Maybe it needed to be made simple and personal and also the timing of the advert. Did the advert communicate to its intended audiences?

4 WAY FORWARD

Civil society inputs:

1. Establish better communication links with all concerned stakeholders by using various communication methods.
2. Establish better information exchange mechanisms
3. Create discussion forums between all relevant stakeholders
4. Awareness workshops for targeted audiences be it parliamentarians, media, scientist etc.

Scientist's inputs:

1. The media must start to include good things about modern biotechnology in their reporting e.g. insulin for diabetic patients.
2. Media must consult with the relevant experts on the subjects before publications.

3. Media must also create opportunities for feature programmes from field scientists to deliver accurate information.
4. Create a multi-stakeholder forum for interaction on this issue at local and regional levels.

Regulators inputs:

1. Urged civil society, scientists and the media to convey simplified, factually balanced information to the public and do away with polarized and emotional debates, which only confuse the general public.
2. There is an urgent need to sensitize parliamentarians through local and sub regional workshops and even individual meetings, especially those serving on standing committees for biosafety issues.
3. Regional and local networks to encourage dialogue while clarifying confusing information and hence creating better understanding.

Media inputs:

1. Scientists should adopt science made friendly approach and provide user-friendly information. They should also be open and transparent.
2. Grassroots consultation is necessary before research.
3. In the event of breakthrough locally scientists should inform the local media first, instead of the local media hearing from the international/global media first.
4. Scientists should engage in research that is of relevance to the local people addressing African needs, problems and conditions.
5. Legislators should increase networking with the media who're better placed to reach the majority of people.
6. Civil society noises and complaints should continue where necessary because that makes news.

ANNEX1: PAPERS PRESENTED

WELCOME REMARKS TO THE "PUBLIC AWARENESS, EDUCATION AND PARTICIPATION IN BIOSAFETY AND THE ENVIRONMENT" - FOR CIVIL ORGANISATION AND MEDIA ORGANISATIONS IN SADC

By A. T. Mushita, Chairperson of RAEIN-Africa

I would like to start by welcoming you all to this important workshop on "Public awareness, education and participation in Biosafety and the Environment" organised by RAEIN-Africa in collaboration with the Ministry of Agriculture, Department of Agricultural Research in Botswana.

RAEIN-Africa is a southern African regional organization formed in June 2002 with the objective of facilitating access by communities to user friendly agricultural and

environmental technologies and the development of policies or mechanisms that guarantee safe and sustainable use of such technologies. The formation of RAEIN-Africa was endorsed by stakeholders in Biotechnology and Biosafety who participated in a "Southern and Eastern African consultative initiative on Biotechnology and Biosafety" in 2001.

RAEIN-Africa is a network with partners from Government ministries, development oriented NGOs and Farmer organisations in the SADC. The current Biosafety and the Environment Programme being implemented by RAEIN-Africa has four major components. These are:

- Generation of stakeholders awareness to influence decision making on biosafety and environment system
- Development of Research Data to support adoption of appropriate technologies in the region
- Development of legal and technical capacity for effective development and implementation of biosafety system
- Provision of technical backup to enhance the development of National biosafety policies and Legislation in the region.

Public awareness

Public education and awareness is a priority for RAEIN-Africa. To date seven countries out of the eight, Group "A" countries are already implementing awareness activities. (Group "A" Countries are those that are set to benefit from all RAEIN-Africa initiated activities and these are: Botswana, Malawi, Mozambique, Swaziland, Namibia, Lesotho, Zambia and Zimbabwe. Whilst Group "B" is constituted by the rest of the other SADC countries and these will benefit only from Capacity Building initiatives)

The Public awareness activities in the countries whose work plans have been approved vary. The following are some of the activities planned for by the various countries:

- Identification of information gaps per specific stakeholder groups
- Preparation of awareness materials for specific stakeholder groups (drafting and/or collation)
- Information dissemination to, policy makers, legal personnel, extension staff, schools, media and politicians. Methods to be used include workshops, debates, school competitions)

Data Generation

The research program's main objective is to sponsor creative, innovative, high quality coordinated research that addresses needs and adds value to the national programs on biotechnology, biosafety and environment issues. The projects therefore addresses needs as identified and planned for by RAEIN-Africa.

Three research grants were awarded under the Biosafety and Environment Programme (BEP). Following the planning meeting held in Zambia in March 2005 projects under the following themes were funded:

Gene flow studies are contributing to the debate on whether there can be co-existence between conventionally-bred local crop varieties and GMOs as well as provide information on the diversity and distribution of plant, animal and microbial resources in the region.

The scope of the projects is to develop procedures for identifying and determining the spread of biological resources in the region (though the major bias is on plant genetic resources). The methodologies of the study were developed in close liaison with existing genetic resources conservation institutions; e.g. national and regional gene banks.

The Spread of GMOs ***study is intended to determine the extent of use of GMOs food as planting material, in the region. These could be distributed through formal and informal marketing channels or food aid. The scope of this research is to determine the spread of products of genetic engineering in the region; be they products produced in the region or introduced into the region from elsewhere. This activity will cover products intended for use in agriculture and food aid, with the possibility of finding their way into the agricultural production cycle and other sectors, and the interface between these and the environment.***

Capacity Building

Based on the needs as identified by the needs assessment exercise I referred to earlier A study aimed at examining how RAEIN-Africa can compliment on-going efforts in capacity building with specific reference to elements of policy, legislation and regulation as well as critical accompanying factors, for the success of the implementation of biosafety regimes at national and regional levels. The study sought to identify and outline an approach for capacity development in all spheres important to the design, maintenance and sustenance of a transparent biosafety policy and related legal framework for the region.

Among the many recommendations the study gave RAEIN-Africa prioritized capacity building themes they would be pursuing in 2006:

- Negotiation skills training – for Negotiators to the COP-MOP/3 to which ladies and gentlemen you are the first beneficiaries to,
- The Interface between the provisions of the CBD and the Cartagena Protocol on Biosafety
- Biotechnology and Biosafety an interface between science and law for Environmental lawyers and Biotechnology Scientists
- How to communicate science and law – awareness of legal issues pertaining to biotechnology and biosafety,
- Participation in decision making for media personnel and civil organisations
- Roles of different regulators under the law, legal issues pertaining to decision-making on imports, knowledge of biosafety law requirements for National Biosafety Committees.

You will therefore appreciate that your participation in this workshop means a lot for RAEIN-Africa we hope that by addressing your needs as our partners we will

continue to enjoy a mutual partnership. RAEIN-Africa is eager to collaborate with other players in environment, agriculture and policy issues.
We are aware that this technology is still young and needs the contribution of all concerned stakeholders hence the need for collaboration, participation and collective contribution in our capacity building processes.
I wish you fruitful deliberations, open discussions and informative analysis that will enhance public awareness, create deeper knowledge and understanding of biotechnology, Biosafety, and the environment in the SADC region.

Thank You,

OFFICIAL OPENING ADDRESS

By the Chairman of the Parliamentary Committee on Agriculture and the Environment Honourable, Mathias Chakalisa

Madam Facilitator
Invited guests
Distinguished Delegates
Ladies and Gentlemen

It is my honour to have been asked in my capacity as a chairman of a parliamentary select committee on agriculture and environment to officially open this training workshop on "Public Awareness, Education and Participation in Biosafety and the Environment" for civil organization and media organizations in SADC region.

For those who are from other SADC countries I am also pleased to welcome you to Botswana and I hope that within your busy schedule or programme you will find time to visit some interesting sites in and around Gaborone. The theme of this workshop centres on the use of both the media and civil organizations in disseminating and scrutinizing information regarding relationships between biotechnology and consumers as well as the environment. Civil organizations have a direct link to communities because they work closely with them as their fortunes or foretell likely misfortunes. The media also plays an important role in informing communities at large on all important national issues that may affect their lives negatively or otherwise. It is therefore pleasing to me to be part of this workshop which will be discussing important and yet controversial issues of safety in the use of Genetically Modified Organisms (GMOs) – Biosafety.

Madam Chairperson

This workshop came at an opportune time since Botswana recently held a stakeholder's consultative workshop on drafting of the National Biosafety Framework. It is therefore my hope that issues of interest that we discussed during that workshop are still fresh in most people's minds. This is particularly important since I am informed that tomorrow there will also be public debate on similar issues.

I understand that his workshop is attended by participants from SADC countries such as Zambia, Zimbabwe, Namibia, Lesotho, Swaziland and South Africa. My hope is that this diverse group of people will bring about desirable exchange of ideas and views to enrich the debate tomorrow in further understanding the issues on biosafety and the environment.

Nobody can for certain quantify the loss of Neanderthals when during the evolution of Homo sapiens different flora and fauna species were tested for suitability as food and still with our present state of development we cannot for certain say whether our genetic modifications will be friendly to both animal life (including humans) and the environment, hence the need to approach this area of development with outmost caution. As we work under pressure to provide food to millions in the world, we are likely to fall into the trap of distributing products that have not gone through the test of time especially in Africa only to face irreversible consequences down the line.As indicated earlier, the media has an important role, to inform the public about these issues. It is my believe that by the end of the week, media participants attending this workshop will appreciate that issues and report them in a neutral way. Civil organizations should also discuss the issues with the public in a non biased way.

Madam Chairperson, Ladies and Gentlemen

I would like to take this opportunity to wish you a fruitful deliberations and a successful workshop and to that the Regional Agricultural and Environment Initiative Network Africa (RAEIN-Africa) for its partnership with the department of Agricultural Research on addressing important issues of Biosafety at sub-regional level. My heartfelt thanks also goes to all those who made this workshop possible. Lastly but not last, I would also like to thank all delegates present, for having spared valuable time to attend this important workshop.

I now declare the workshop officially open and wish you a successful deliberation.

Thank you

PULA! PULA! PULA!

Biotechnology and Genetic Engineering

By Dr Dahlia Garwe, Tobacco Research Board, Box 1909, Harare, Zimbabwe, Dgarwe@kutsaga.co.zw

Good morning ladies and gentlemen. I would like to start by thanking the organizers of this workshop for inviting me to present this paper. As you will be aware, biotechnology and genetic engineering have recently become controversial topics. The purpose of this paper is to define the terms and hopefully by the end of the presentation, you will be in a better position to understand the science behind the terms.

Structure of the Paper

- Ø What is biotechnology?
- Ø Brief history of biotechnology
- Ø Genetic engineering – the processes, the products (in summary)
- Ø Applications
- Ø Status of biotechnology globally, Africa, SADC
- Ø Genetic engineering – the issues
- Ø Conclusions

Biotechnology definition

Biotechnology can be defined as "any technique that uses living organisms or substances from those organisms, to make or modify a product, to improve plants or animals or to develop microorganisms for specific purposes" Clearly then, biotechnology is not a new science. A cursory examination will show that biotechnology has been use for thousands and thousands of years. It began as an empirical practice with minimum scientific inputs. Examples of this would be the use of yeast for brewing and baking. This first generation of biotechnology as its sometimes referred to was followed the period between the second world wars during which, there were significant developments in fermentation biology, the production of antibiotics especially penicillin and also various vitamins and enzymes. Another notable achievement during this period, also known as the second generation of biotechnology, was the development of hybrid maize varieties which considerably contributed to the Green Revolution.

There were dramatic changes in the area of biotechnology that were ushered in by the deciphering of the deoxyribonucleic acid (DNA) structure by Watson and Crick in 1953. This, in fact, was the birth of modern biotechnology and all controversy that has subsequently arisen is directly due to the fact that man was now capable of altering the very code of life. But before there can be a real understanding of modern biotechnology one has to look at the structure of DNA in some detail. DNA is a long thread-like complex macromolecule that stores genetic information and can be found within the cell. Most organisms are made up of cells which can be defined as the fundamental unit of structure and function. Within the cell is the nucleus from which emanates the instructions that guide the life processes of that cell. But what structures within the nucleus actually issue the instructions? Within the eukaryotic cell are distinct X-shaped structures known as the chromosomes. These chromosomes are composed of DNA and protein. The chromosomes bear the basic units of heredity, the genes. It is the genes that are passed on from generation to generation, that determine the characteristics of cells and act as the units of control in the day-to-day activities of living cells. Let us examine more closely the genes.

Genes are made up of DNA, which in turn in turn is made up of building blocks known as nucleotides, which themselves are composed of a five-carbon sugar bonded to a phosphate

group and a nitrogenous base. DNA is double helix in which the two strands are anti-parallel. The sugar-phosphate backbone is on the outside of the helix, and the base on the inside. The backbone can be thought of as the sides of a ladder with the bases in the middle forming the rungs of the ladder.

There are four kinds of nucleotides that differ from one another in their nitrogenous bases. These bases are adenine, cytosine, thymine and guanine. These in fact can be referred to as the alphabet of life. It is the way these bases are arranged that determines, for example, whether the organism is going to be a little ant busily building a home, or whether an individual is going to be tall or short. These four bases are present in all forms of life and can be likened to our 26-letter alphabet. Letters can be arranged in such a way as make up words that makes sense or something that is nonsense. Words can then be strung together to make a sentence and each sentence starts with a capital letter and ends with a full-stop. In much the same way, the four-letter alphabet of life is strung together to make words and sentences that eventually make a whole book – the organism. Genes can be likened to sentences with a start – the capital letter in that sentence is equivalent to the promoter regions in the gene which is where transcription begins; a middle which are the words strung together; and an end – the full-stop in the sentence referred to as the terminator region. It is important to appreciate that all life forms are made up of these four bases or letters (except some viruses). That therefore, means that taking a gene from a pig, for example, and placing it in, say, maize is really the equivalent of cutting a sentence from one book and pasting it in another book. It does not make the maize a pig in much the same way that the second book remains the same and keeps its title and meaning even if there is an extra sentence inserted. It also important to appreciate that it is possible to move genes around in all life forms because the code of life is the same. For example, genes can be moved from an animal into a plant, from a plant into a microorganism, from a microorganism to an animal or any other combination.

Genes are eventually translated into proteins, which might have structural functions or are responsible for some kind of action. So even simple scratching of your head because you can't understand this presentation is a result of instructions emanating from your genes! The colour of your hair, the shape of your eyes, the size of an anaconda, the stripes of a zebra and even the reach of a giraffe, all these characteristics are encoded in the genes.

GMO or LMO

Now let us consider terms that we frequently come across, GMOs and LMOs.

A Genetically Modified Organism (GMO) is a living organism, e.g. a plant, in which the genetic material (DNA) has been altered in a way that does not occur naturally by mating or natural recombination. Alteration is brought about by means of recombinant DNA technology. An LMO is any living organism that possesses a novel combination of genetic material obtained through the use of modern biotechnology (e.g fresh fruit, seed). The distinction is in the "living" as opposed to being a product of an organism that was once alive.

Genetic Modification

Genetic modification can be achieved through **conventional breeding** as has been done since time immemorial. For example, a farmer coming across an early maturing variety of maize may have desired it to be also high-yielding. Crossing those two varieties would have resulted in maize with a combination of the characteristics resulting from the mix of the genes of the parent plants. Simple observation of the progeny would have resulted in the farmer selecting the maize plants showing the highest expression of the two desired characteristics.

Another method used to bring about genetic modification is the use of **chemical or radiation mutagenesis**. This involves using radioactive isotopes or chemicals to induce the DNA structure to alter so that bases are lost or gained or rearranged. This is completely random and the organism exhibiting a new desired characteristic is selected. Plant breeders have used this method extensively by to create new varieties of various crops.

The most controversial technique for obtaining new genotypes is of course, **Recombinant DNA technology** or **genetic engineering/modification.** This procedure is used to alter or move the genetic material (genes) of living cells. It is the artificial manipulation, modification and recombination of DNA or other nucleic acid molecules through the use molecular biology tools in order to modify an organism or population of organisms. Thus genetic engineering allows the transfer of specific and well-characterized traits from one organism to another. In plant molecular biology, this process is called plant transformation and the resultant plants are known as transgenics.

Genetic engineering methods

There are a number of techniques available for the introduction of foreign genes into organisms, especially plants. Plasmids and viruses, which have the natural ability to insert their genes into the genome of a host organism, can be used as vehicles for the transfer of foreign genes. The DNA of the plasmids, which are circular pieces of DNA found mostly in bacteria or viruses, can be cut with special enzymes known as restriction enzymes which cut DNA in a very precise and reproducible manner, and have foreign genes inserted into them. These foreign genes are subsequently inserted into the host organism along with genes from the plasmid or virus.

A method commonly used for plant transformation is to make use of the bacterium Agrobacterium *tumefaciens*. The gene is first inserted into the Ti plasmid of the soil bacterium, and then plants are infected with the bacterium. *A. tumefaciens* inserts the Ti plasmid into the plant cells' chromosomal DNA and causes a "crown gall" tumour. These tumour cells can be cultured in the laboratory and whole new plants grown from them by micropropagation. Every cell of these plants contains the foreign gene.

Another technique is microinjection which results in the direct injection of foreign DNA into a nucleus. That DNA becomes incorporated into the host genome. This technique is extensively used in the in vitro fertilization.

High voltage electricity can also be used to introduce foreign DNA into a host cell in a technique known as electroporation. The electricity punctures self-repairing holes in the host cell through which DNA can get through. Some of this DNA eventually is incorporated into the host cell’s chromosomes.

One of the most widely used methods for genetic engineering is particle bombardment or biolistics where foreign DNA is coated onto microprojectiles usually gold or tungsten. A gene gun, which works in a similar fashion to a shotgun, is used to “shoot” the microprojectiles into the cells to be transformed. The actual Biolistic Gene Gun looks nothing like a real gun and there are several models available on the market. In the example illustrated in the presentation, callus tissue, which is essentially a mass of undifferentiated cells, is bombarded with a gene that confers herbicide tolerance. The callus tissue is grown on a medium that contains the herbicide in question. All cells that have received and incorporated the herbicide tolerance gene survive on the medium whereas untransformed cells will die.

Areas of modern biotechnology application

The areas of where modern biotechnology can be applied can be divided into three broad categories and these are listed below.

1. Gene Products

Using genetically modified organisms (e.g microbes) to produce chemicals, usually for medical or industrial applications. For example, many medicines are now made by GMOs. Insulin used to be extracted from the pancreas of animals but now large quantities of the hormone are produced by bacteria with the insulin gene spliced into their genetic material.

2. New Phenotypes

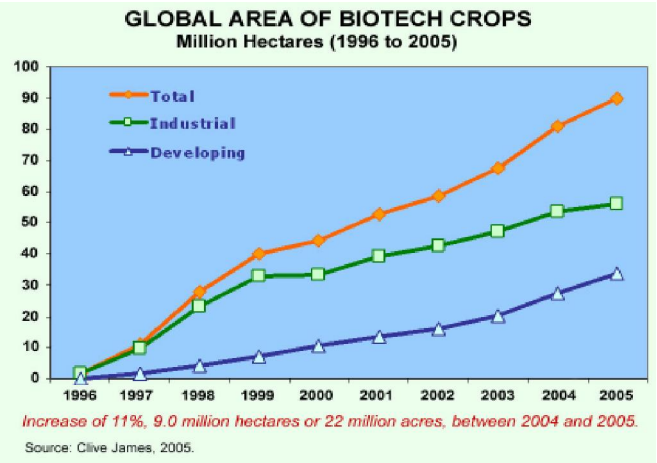
Using gene technology to alter the characteristics, usually of farm animals or crops (e.g. herbicide resistance, fast growing fish). Bt maize is grown in significant amounts in the United States and other countries and has been engineered to produce the Bt insecticide, which only affects certain types of pests - mainly caterpillars of the Lepidoptera (butterflies and moths). The gene for the Bt toxin comes from the soil bacterium *Bacillus thuringiensis*. The Bt protein initially exists as a **protoxin** which means it must be activated before it has any effect. The crystal protein is highly insoluble in normal conditions, so it is entirely safe to humans, higher animals and most insects. However, it is solubilised in conditions of high pH (above about pH 9.5) such as the conditions commonly found in the mid-gut of lepidopteran larvae. For this reason, Bt is a highly specific insecticidal agent.

Gene Therapy

Gene therapy involves the use of various techniques to fix a disease-causing mutant gene in an animal or a human (e.g cystic fibrosis). One technique uses a modified virus that no longer contains the harmful, disease-causing viral components. Instead, it has the healthy version of the gene that inserts into the organism's cells and nuclei. Whilst promising results have been obtained with this kind of therapy, the whole field is still in its infancy and to date, no real successes have been recorded.

Status of Biotechnology at Global and Regional Level

Now let us turn to the status of biotechnology at global and regional level. Please note that this is biotechnology in its broader sense, not just genetic engineering. The front-runners in all aspects of biotechnology are the USA, Canada and Argentina. Africa lags behind in all categories including research, application, regulations and policies and in the area of public awareness. In Africa, South Africa, Egypt, Kenya, Zimbabwe, Uganda, Nigeria and Mauritius are the leading countries in the area of biotechnology research particularly genetic engineering. In the rest of the countries biotechnology is still in its infancy. Figure ** shows the global area of biotech crops at a global area. From 1996, which was the year of the first commercial planting to 2005, the area of land under GM crops has grown from 0 to 90 million hectares. The most commonly grown crops are soyabean, maize, cotton and canola.



The African Biosafety Stakeholders Forum reports that in Africa, the following situation obtains:

- 1 country (South Africa) has commercial plantings of GMOs

- 9 countries (Burkina Faso; Egypt; Kenya; Morocco; Senegal; South Africa; Tanzania; Zambia; Zimbabwe) have reported field trials of GMOs
- 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
- 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 have ratified the Cartagena Protocol on Biosafety to date

The most widely used biotechnology applications include tissue culture, fermentation technology, marker-assisted selection and biological nitrogen fixation.

Genetic Engineering – the Issues

Although we now have the knowledge and ability to transfer genes from one organism to another resulting in life forms with desirable characteristics, there may also be many yet to be discovered problems associated with the technique. Not enough time has elapsed to allow scientists to study or search for long-term effects of GMOs. However, the benefits of modern biotechnology include:

- Crops with enhanced taste & quality, reduced maturation time, increased nutrients, increased yield, stress tolerance and improved disease and pest resistance among others
- Animals with increased resistance, feed efficiency, better yields of meat, eggs and milk, improved health and diagnostic methods.

All this leads to increased food security. However, there is flip side to this coin and no technology in the history of mankind has stirred as much debate and controversy as genetic modification.

Controversies include:

- Safety - people are concerned about the potential impact on human health especially with respect to the introduction of allergens and antibiotic resistance genes.
- Potential environmental impact - there are concerns that the introduction of GMOs will lead to loss of biodiversity, the advent of “superweeds” and genetic drift
- Ethics – other concerns center on ethics, Objections have been raised to what is viewed as tampering with nature, scientists trying to play God. There also objections to eating animal genes in plants and vice versa which mostly arise from a lack of understanding of the science behind genetic engineering.
- Access and Intellectual Property - There are also issues of access to the new technology or the products of the technology, intellectual property rights and biopiracy. Fears of domination of world food production by multinational have also been raised.
- Labelling has also been a controversial issue. Should GM food be labeled? Should every single foreign gene in the material be listed? Should the quantities of each

transformation event be listed etc.? To date these questions have not been answered fully.

Looking all these issues, it is clear that there is some misunderstanding of the science by the general public. However, if any real progress is to be made towards acceptance of GM, the concerns raised have to be addressed. It is important to invest in research and policy development that will in turn, increase implementation capacity. Collaborations and networking amongst the countries leading in the GM field and those still lagging behind is crucial for growth and development. Genetic engineering or genetic modification offers dramatic promise for meeting some areas of greatest challenge for the 21st century. However, it is important to realize that biotechnology will not solve all the problems. It is merely a tool, which can be utilized to bring about some positive change. Additionally, like all new technologies – modern biotechnology carries with it some risks, both known and unknown. Therefore, I would urge for the safe and responsible use of the technology.
Thank you.

DEVELOPING COUNRIES' CONCERNS ON THE USE OF GMO'S:DEBT, DEPENDENCY AND DICEY ECONOMICS

By Charmaine Treherne, national coordinator, S.A. Freeze Alliance on Genetic Engineering, S.A.

When I was first asked to do this paper I wondered how I could possibly get all of the concerns of all of the developing countries into a 20-minute paper! After some careful thought, I decided that I was really only able to speak from my own experience and share some of the voices of the people directly affected by GMOs. I have taken the title of my talk from a report on Bt Cotton and the Makhathini Farmers in rural Kwa Zulu Natal (KzN). The title of the report is, in my experience, a succinct encapsulation of the concerns of the developing countries to the use of GMOs: Debt, Dependency and Dicey Economics.

So, firstly I will share some of the report findings on the Makhathini Flats experiment with Bt Cotton, then I will share some of the concerns made by civil society at a public hearing on the GMO Act Amendment Bill which happened in January this year. The GMO Act was drafted in 1994 when our new Government was in transition. Much influence was brought to bear on the writing of this Act, by Industry. Now, seven years down the line, repercussions of it are being felt far and wide in terms of people being exposed to GMOs without adequate legislative protection. At this hearing, a whole range of organisations and individuals including farmers, church groups, NGO's, and even grain producers gave input as to their concerns with GMOs in South Africa. The quotes in this presentation are extracts from these inputs. The following extract from Jeffrey Smith's excellent book, *Seeds of Deception* may well apply to the South African Government:

"At a biotech industry conference in January 1999, a representative from Arthur Anderson Consulting group explained how his company had helped Monsanto create a plan to control the world's food supply." First, they asked Monsanto what their ideal future looked like in fifteen to twenty years. Monsanto executives described a world with 100 percent of all commercial seeds genetically modified and patented.

Anderson Consulting then worked backward from that goal, and developed the strategy and tactics to achieve. They presented Monsanto with the steps and procedures needed to obtain a place of industry dominance in a world in which natural seeds were virtually extinct.

Integral to the plan was Monsanto's influence in government, whose role was to promote the technology worldwide and to help get the foods into the marketplace quickly, before resistance could get in the way. A biotech consultant later said, "The hope of the industry is that over time, the market is so flooded that there's nothing you can do about it. You just sort of surrender."[1]

After this input, I will touch in on one or two major global concerns with GMOs which could and in some instances are, being repeated in developing countries. I will then conclude.

Debt, Dependency and Dicey Economics: Bt Cotton and Makhathini

Since 1997 farmer have been growing Bt cotton reportedly with high success; in 198 a study was done stating a 20% increase in yield; but the truth is that in 1998 four farmers were hand-picked, Bt cotton planted on their fields, and the results used ever since by Industry. This case is therefore not representative of the whole region. In 2005 Biowatch put out a report of a five year study they had done in Makhathini. Researcher, Elfrieda Pshorn-Strauss article on this report refers. Some of their findings were:

- High levels of support leading to high dependency; (R269 million inputs from the Land Bank in 2002, plus support from Provincial Government's green revolution).

- Clever advertising by Monsanto: ("*The muti is in the seed"*) entices farmers to buy Bt but fails to reveal information regarding the dangers and threat;

- Benefits are short-lived. There was an initial reduction in insecticide used, but longer term results revealed more pesticides had to be used due to a higher incidence of secondary insects;

- Debt trap. GM seed being twice as expensive as regular seed and not being able to save seed from year to year due to contracts signed with the supplier, it required higher input costs by way of credit;

- Farmers bought GE seeds with little or no understanding of their contracts. Some are illiterate. Although Monsanto spends billions of dollars to promote this case, they are not bothered to ensure that the most basic information is conveyed to peasant farmers about their products.

- Community access to resources in the region came under threat. Thousands of people depend for their livelihood on the water cycle of the Makhathini floodplains, fed by the Pongola River. Since the Jozini Dam has been built, the

[1] Stuart Laidlaw, "Starlink Fallout Could Cost Billions," The Toronto Star, January 9, 2001.

water is released annually to imitate this natural cycle and ensure that the cycles of nature and farming can continue as before. Because of the introduction of the input from outside agencies such as Monsanto, the Bt cotton farmers have become a strong enough lobby group to lobby for the premature release of water from the Jozini Dam to suit their needs. This however, has an impact on the rest of the community growing food crops and other crops on the floodplain as the premature flooding destroys their crops and thus food security. The timing also does not correspond with the natural flooding time of the floodplain and will have an impact on the breeding cycle of the fish, affecting another food source and so starting a cycle of scarcity.

- Some farmers said their poor cotton harvests negatively affected their status in the community, which had an impact on their family members and affected their standing in the community.

- The report found that only 4 farmers out of 36 made a profit.

- In 2004 a Land Bank official said that the debt figure for the whole area totalled just over US$3 million, averaging about $1,3 thousand per farmer;

- Around 80% of farmers have defaulted on their loans.

The conclusions of the Report: Bt cotton has failed Makhathini farmers. And from this it is clear that Bt cotton and many other GM crops will fail the majority of farmers throughout Africa. In Africa farmers should be able to make choices that empower them and provide them with opportunities that will ensure food security and sustainable livelihoods, not dependency and debt.

CONCERNS RE GMOS MADE TO SOUTH AFRICAN PARLIAMENT - FEBRUARY 2006

1. Farmer R.N. Martinglia, Blesberg Farm, Lidgeton, KzN: "I see no need for these products. If these products were any good (that is profitable), there would not be the need to subsidize farmers."

2. Bizana Community and Legal Advice Centre "These seeds, they pollute our own traditional grains which make life difficult for organics [small scale and subsistence] farmers. We do not ant our small scale farmers in five years time committing suicide because they are unable to pay the debts of the suppliers like farmers in India."

3. Elands kraal Belimi Irrigation Scheme. "Big seed and chemical companies charge lots of money for there products like seed, pesticide and fertilizers, but when we go to the market to sell our products, we have to be satisfied with low prices for cotton. We are caught in a trap and Government is not protecting us. We are also concerned about GMO seeds contaminating our local varieties and who will be held responsible for it?"

4. Phadima Community Development Association "We are not told the negative impacts of GMOs on our health, environment, economy and farming systems."

5. Kwangwanase Farmers Union, KzN".. it is critical to monitor the ongoing of GMOs. The best way they have to label the GMO. In order to be clear to every one. Nor matter, it is hard to avoid the GMO because of cross-pollination that occurs on it, potentially it may affect our seeds."

6. Farmer B.A.Manukuza, Mseleni/Sbhayi Reserve. "We had tried about 7ha of Bt cotton but no success (poor production, no harvest), not suitable."

7. Wildlife and Environment Society of SouthAfrica (WESSA)"It is our view that the GMO Act favours industry and does not adequately protect communities, food security or the environment."

8. The Surplus People's Project: "The introduction of the GMO Amendment Bill… has the potential to undermine current efforts of land and agrarian reform."

9. GRAIN SouthAfrica: GRAIN SA's members are probably the biggest commercial users of GM technology in South Africa, and therefore have a major concern regarding the issue of who should be liable in the case of damage caused by activities related to a GMO. Our contention is that the owner/ licence holder of the GMO should be liable, certainly not the user."

10. **Organics South Africa** "The use of GMOs is not allowed in organic agriculture anywhere in the world, and contamination of our crops in SA, or even the perceived risk thereof, would immediately close all export opportunities, existing or potential."

TAMPERING WITH THE BASIC CONSTRUCRS OF LIFE? What the faith groups have to say:

- South African Council of Churches: "We in the faith communities are not opposed to scientific advances…. But we believe the precautionary principle should be applied. Especially when we don't know the full consequences of our actions."

- South African Faith Communities 'Environmental NGO(SAFCEI). Bishop Geoff Davies said: "I find it verging on the criminal that GMO food is not required to be labelled. The public has a right to know what we are eating. We call for a moratorium on the further use of GMO seeds and crops."

- South African Catholic Bishops Conference: "According to the precautionary principle it is important to take a more cautions approach to GMOs. The absence of proof of harm does not mean that harm does not exist."

WHAT THE WORLD RELIGIOUS LEADERS HAVE TO SAY:

World Council of Churches:
"We believe that the people of the world have the right to produce their own food and control the resources belonging to their livelihoods, including biodiversity. It is

therefore the right and responsibility of governments to support the livelihoods of small scale farmers in the South and in the North. It is their right to refuse the demands of agri-businesses that seek to control every aspect of the cycle of life."

The Pope:
"Pope Benedict XVI delivered a blistering attack on the mores of modern society. Particular condemnation is reserved for scientific advances in the field of genetic manipulation. Warning against the move to '"modify the very grammar of life as planned and willed by God', the Pope will lead prayers against 'insane, risky and dangerous' ventures in attempting 'to take God's place without being God' (See Annexure II)

The Alliance for Bio-Integrity - a USA Farmers Group:
" The false claims and faulty procedures of the biotechnicians not only affront genuine science, they affront religion as well." (See Annexure III)

REPUTED SCIENTISTS WHO COME OUT AGAINST GMOs LOSE THEIR JOBS

Arpad Pusztai worked for the Rowett Institute in Scotland." When testing GM potatoes he found that rats which were fed GM potatoes suffered damage to heir immune systems. Their white blood cells responded much more sluggishly than those fed a non-GM diet, leaving them more vulnerable to infection and disease. Organs related to the immune system, the thymus and spleen, showed some damage as well. Compared to rats fed non-GM, some of the GM rats had smaller, less developed brains, livers and testicles. Other rats had enlarged tissues, including the pancreas and intestines. Some showed partial atrophy of the liver. What's more, significant structural changes and a proliferation of cells in the stomach and intestines of GM-fed rats may have signaled an increased potential for cancer." [2] When he revealed his findings he was fired.

Ignacio Chapela of UC Berkeley published an article in the journal 'Nature' about the uncontrolled contamination of irreplaceable native Mexican corn varieties by GE corn. He was subsequently denied tenure due to pressure from Monsanto at the University (the UC Berkeley tenure review panel had previously voted almost unanimously to approve his tenure). This issue is in both the environmental and media categories, since this type of silencing of academics limits the research results that the public has access to.

GLOBAL CONCERNS:

Farmer Suicides in India: As debts increase and become unpayable, farmers are compelled to sell kidneys or even commit suicide. More than 25,000 peasants in India have taken their lives since 1997 when the practice of seed saving was transformed under globalisation pressures, and multinational seed corporations started to take

[2] *Seeds of Deception*, Jeffrey Smith, page 12.

control of the seed supply. Seed saving gives life. Seed monopolies rob farmers of life."[3].

Monsanto Sues Farmers: Monsanto has an annual budget of $10 million and a staff of 75 devoted solely to investigating and prosecuting farmers. In 2004, total recorded judgements granted to Monsanto for lawsuits on farmers amounted to $15,253,602.82 Farmers have paid a mean of $412,259.54 for cases with recorded judgements. That is $2.5 thousand per farmer. (See Annexure VII)

Biased Media Coverage: "The United Nations Food and Agricultural Organisation (FAO) has upset a broad coalition of consumers, farmers, environment groups, peasant organisations and social movements by producing a report overtly biased towards promoting the interests of multinational corporations like Monsanto and Syngenta. The report omits to mention that Monsanto control over 90% of total world area sown to transgenic seeds." (See Annexure IV)

SUMMARY OF GLOBAL CONCERNS:

- Contamination
- People and animal health risks
- Socio-economic risks of debt and dependency
- Threat to food sovereignity and security
- Monopolisation of the seed supply
- Environmental risks
- Legislation favouring profit before precaution
- Lack of traceability, identity preservation and segregation, leading to
- Lack of labelling
- Lack of accountability, liability and redress
- Big business making millions from poor farmers through patent infringement - accidental.

CONCLUSION:

In conclusion then, we say that the developing countries' concerns regarding the use of GMOs are Debt, Dependency, Dicey Economics, Industry-biased legislation and Loss of food security. We urge those developing countries to think very carefully before adopting GMO's. To tread very cautiously and probe the origins of the 'research', whether it is industry-funded or not. Particular caution should be applied when designing legal frameworks and a useful framework to adopt is the African Union's Model Law on Biosafety.

Always when considering something new, it is good to ask the question: WHO STANDS TO GAIN?

Lastly, in reference to Dr Gawa's excellent and informative presentation earlier where she jokingly pointed out that all life is created from the same four DNA building blocks, it's just a case of how it is put together - I say that it's time we all break for lunch now, and guess what's on the menu? Roast teenagers!!

[3] Vandana Shiva, India, 2004

Thank you.

Reference page hand-outs:
a) Info on GM crops: An Overview for Newcomers to the Subject of Genetic Engineering (Annexure V)

b) Why GM Crops are Inherently Unsafe - Jeffrey Smith, seedsofdeception.com (Annexure VI)

ANNEXURE I

Bt Cotton and Small-scale Farmers in Makhathini –A Story of Debt, Dependency and Dicey Economics
By Elfrieda Pschorn-Strauss, GRAIN, South Africa

INTRODUCTION

South Africa is the only country in Africa growing GM crops commercially. To our knowledge, it is the first place in the world where small-scale farmers have been introduced to GM crops. On 26 March 2002 the Indian government approved the growing of GE cotton and this will most likely lead to more small-scale farmers growing *Bt* cotton. In China farmers are also now growing *Bt* cotton.

The lack of food security in Africa is being played off against the success of *Bt* cotton farmers in Makhathini and is being used to put pressure on countries such as Uganda, Zambia, Zimbabwe to adopt GM crops. Much has been written about the benefits and risks of GM crops. It is widely agreed that a mere technology cannot be the solution to food security. In spite of this it is still the main argument that the agrochemical companies and the US are using to promote the technology.

Monsanto and the US use the case of *Bt*. cotton in Makhathini in the following ways:

> To push the moral argument that by being cautious about GE crops, European consumers are depriving Africans of this new opportunity to feed themselves. To this end, one of the farmers was taken to the UK to promote their experience in Makhathini.
>
> The US trade representative, Robert Zoellick, had a 'chance' meeting with a farmer (TJ Buthelezi) to hear of the success of *Bt*. cotton with small-scale farmers.
>
> Farmers and journalists from African countries, such as Uganda, Zambia, Zimbabwe are taken to visit Mr Buthelezi's fields and hear his success story.
>
> The US is taking the EU to the World Trade Organisation, saying that the EU's labeling restrictions on GE form an illegal trade barrier, and contribute to hunger by discouraging Africans from importing and growing GE. When Zoellick made this announcement earlier this year, Mr Buthelezi was standing next to him to 'prove his point.'
>
> USAID has taken Zambian and SADC policy makers and scientist on a tour of Makhathini to persuade them to soften their stance on GM food aid.
>
> The results from Makhathini is widely published, even though these are highly questionable and even researchers that have found positive results, acknowledge that the situation still has to unfold for the full impact to be realised.

4.1.1.1 MAKHATHINI IN CONTEXT
4.1.1.2 Geography and Environment

The region has six interlocking ecological zones that run from north to south parallel to the coastline. At the foot of the Lebombo mountain range, lying to the east is the Pongola Zone, which encompasses the floodplain and extensive pan system of the Pongola River. As it meanders towards the sea, it has given birth to a series of oxbow lakes and pans that are teeming with fish and bird life. Each year the spreading waters of the Pongola River replenish these pans as it floods its banks after the summer rains. The floodplain tract is about 70km long and between half and one km wide. It plays a major role in the economic life of the people of the region. The alluvial soils have considerable agricultural

potential. In general it is on these rich alluvial soils that the small-scale farmers undertake cotton production.

The ecology of the Pongola floodplain is finely tuned but is being increasingly disturbed, by the damming of the Pongola River at Jozini, and the increasing population and agricultural pressure on the floodplain.

The Pongolapoort Dam was constructed in the 1960s for the growing of sugar cane under irrigation on the Makhathini Flats and with the construction of the dam the natural flood cyclce has been disturbed. It is now necessary to artificially flood the system to ensure the fish spawning and plant growth continues as naturally as possible. The advantages of a major late summer release are threefold. Firstly fish spawn in summer and they need flooding in order to stimulate spawning; this will ensure a steady supply of fish in the winter and following early summer months. Secondly the pans will be filled and this will sustain them and so prevent them from drying out during the winter months. At the same time regular flooding will improve the quality of grasses and grazing throughout the whole year. Thirdly, annual summer floods will allow the people to plan their cropping strategies better and so avoid crop destruction through flooding.

4.2 The release of water from the Pongolapoort (Jozini) dam

The Ubombo Farmers Association, who are the farmers planting the most Bt cotton in the area, is a very strong organized group. They need the water from the Pongolapoort Dam to be released a few weeks earlier than the agreed time in order to start planting the cotton early. According to Mr Buthelezi the maturation period for Bollgard is on average two to four weeks shorter than that of other hybrid cottons in that area and provided that the flooding occurs earlier in the year, they can plant earlier and have more than one harvest period, increasing their yield substantially.

The normal flooding period had been established over the years through Department of Water Affairs and Forestry (DWAF) in consultation with the Floodplain farmers in order to best suit their normal subsistence crops, mainly maize and beans. The Ubombo Farmers Association has lobbied DWAF for the earlier release of the water during 2000 and has been successful. People have raised the early release of water as an issue, as those farmers who are planting vegetables on the floodplains loose their crops on a regular basis.

Socio-political - land

The main owner of the Makhathini Floodplains is the State. This land is held in trust by the Minister of Land Affairs and is thus directly under the control of the DLA. There is still no security of land tenure for the inhabitants of the Floodplains, although it is the policy of the DLA to return all State land to the inhabitants of the area. On the Makhathini there has been no consensus as to whether this should be in the manner of free hold land (land owned by private landowners) or whether it should become communal land (land under the jurisdiction of local tribal authorities), which in the case of KwaZulu-Natal means the land is returned to the Ingonyama (King) Trust.

The lack of security of tenure is regarded as one of the main constraints to the development of viable commercial agricultural enterprises. The threat of removal and insecurity of land tenure severely affected agriculture production in the area. This is still evident today in that very few farmers would plant any permanent crop, such as sugar cane.

90% of the farmers involved in cultivation in the Ingwavuma and Ubombo districts, are deficit farmers. This means that they do not produce enough for their own household food requirements. The 10% farmers producing surplus products are primarily found along the Pongola River floodplain.

BT COTTON IN MAKHATHINI

Cotton has been produced for over 15 years in the Ingwavuma/Ubombo region. The reasons why farmers continue to grow it are two-fold: 1.) It is a resilient crop that can withstand the harsh climate experienced in the region, and 2.) the farmers are assured of a market for this cash crop. It is important to note that the harsh climate of the region precludes the cultivation of most crops under dry land conditions. Cotton is one crop that can be cultivated under these harsh conditions. In initial years cotton production was done exclusively by dry land farmers on approximately 3ha land units.

Many people working on the floodplain believe that cotton growing is inappropriate with the flood plain management system due to its growing season, the amount of pesticides used, and because it is a very important and sensitive ecosystem.

Planting of Bt. cotton on the Makhathini Plains started in 1997 when it was introduced by Monsanto and Delta Pine with the support of the Department of Agriculture and the Landbank. Four Makhathini

farmers participated in the first trials and soon farmers were purchasing and planting the seeds. During the 1997/8-planting season the Bt. cotton plant, sold as Bollgard, was introduced to the small-scale farmers of the Makhathini area. This crop was attractive to the farmers because they were told that it would reduce the amount of insecticide spraying needed. At the same time the Department of Agriculture's Makhathini Research Station started planting trials of Bollgard to establish the yield potential. This was done under the auspices of the Agriculture Research Commission (ARC). Generally new cultivars are planted in trials for at least two to three years and must show that it has proven itself before it is released to be planted by farmers.

The total size of plots that the farmers have access to, varies from 2ha to 30 ha. None of the farmers interviewed kept any record of purchases, yields, or amounts of insecticides sprayed. It can be safely assumed that hardly any small-scale farmer on the Makhathini keeps farming records or financial spending records. Much of their financial lay-out for seeds, fertilizer, insecticides or herbicides, ploughing and agricultural tools is done through Vunisa, where records are kept for those farmers who are receiving loans from Vunisa or the Land Bank. These records are confidential and not available.

Monsanto has donated US$10 000 to the Ubombo Farmers Association for the purchase of planters for the 2001. T.J. Buthelezi, who has rented out some of his hectares of land to Delta Pine and Monsanto for the planting of *Bt.* cotton field trials, chairs this farmers association. The message being sent out to farmers is that should you use Bollgard, you will be rewarded in multiple ways: better yields and funding to purchase farming equipment.

Each farmer purchasing Bollgard seed must sign a Monsanto Technology Agreement before they can receive the seed. The grower agrees to the following:

- To use the seed for planting a commercial crop for only one season
- To plant a refuge as part of the insect resistance management strategy
- To not supply any seed containing Bollgard to any third party
- To not use or provide seed containing Bollgard to anyone for crop breeding, research or seed production
- To not ratoon any Bollgard cotton
- To allow Monsanto agents to inspect the grower's fields in order to ensure that the correct refuge areas have been planted.

It is clear that the farmers do not understand what they are signing. During a survey in 2001, only one of twelve farmers planting Bollgard had been thoroughly informed of the contents of the contract signed. Only five farmers of the twelve farmers planting Bollgard were aware of the need to plant refuges. Of these only three were planting refuges.

Insecticide spraying brings challenges to communities such as those living on the Makhathini Floodplains. They can only afford the cheapest insecticide, which is often the most poisonous and from the older varieties on the market. Often they are unable to read instructions and although many farmers know how to apply the insecticide, it is not clear whether they train their labourers thoroughly. Water for dilution of the insecticide is taken from the same source as that used for collection of water for human and household consumption, resulting in the potential pollution of drinking water.

ANALYSIS AND CONCLUSION

South Africa is under the spotlight as the first country in the world in which small-scale farmers are planting genetically modified crops. Since 1997, farmers in the Makhathini floodplains of northern Kwa-Zulu Natal have been growing Bt cotton, reportedly with high levels of success and adoption. This is now Monsanto's flagship project and no time has been lost in generating propaganda to convince the rest of the world of the alleged benefits of genetic engineering for small farmers and food security. But this project might also be Monsanto's Trojan horse, in the words of one researcher. There are many reasons why it would be a fundamental mistake for the rest of Africa to accept the apparent success of this project as a reason for adopting other GE crops. The circumstances under which Bt cotton was introduced cannot easily be replicated.

High level of support to farmers leading to high dependency.
The success of the Makhathini farmers has only been possible with high levels of support and infrastructure which is makes for exceptional circumstances compared to the vast majority of African farming conditions. Combined efforts of the South African Department of Agriculture, Monsanto,

Vunisa (a private company) and the Land Bank (a government bank) have guaranteed farmers easy access to markets for their crops and credit to purchase inputs. Farmers have thus become highly dependent on outside actors - and highly vulnerable to the vagaries of the private sector.

Because cotton is a cash crop, farmers get loans to buy inputs. When they harvest, the input cost is immediately deducted from their payout. There are now two ginneries on the Flats, so they do not have a problem with transport or markets. While many farmers farm dryland cotton, the most successful *Bt* cotton farmers farm either on the floodplain or is part of the irrigation scheme. The companies owning the technology and selling seed provide extension services and support to the farmers.

Unequal access.

The marketing hype around Makhathini fails to reveal that it is not the most marginalized producers that are benefiting from Bt cotton, but rather the larger cotton producers that have access to land and - most importantly - to credit to enable purchase of the very costly Bt cotton seeds. The Landbank provides credit, Vunisa assess farmers and screen them. Credit worthiness plays a major role in the adoption of *Bt* cotton. The average loan recovery is 40 - 60%.

Researchers from Reading University confirm that there is a potential that socio-economic problems could develop between farmers who can afford to take up the technology and those who cannot and so widen the poverty gap within the community. In selecting farmers, Vunisa targeted larger producers, the group that is more prone to take risks. Cotton farming forms only a small part of the local economy and the Bt cotton growers form less than 5% of the local population.

Debt trap.

Those farmers able to access credit are locked in a debt-cycle. This has to be seen in the context of cotton being a cash crop in Makhathini for the past 20 years. Farmers have been dependent on inputs from government and companies before the arrival of Bt cotton. The new seed is at least twice as expensive at non-GE seed, leading to higher debt than would otherwise be the case. The Land Bank provides loans to cotton farmers because they get cash in hand as soon as they deliver to the ginneries. In other words there is a ready market for their cotton. This puts the farmers in a very precarious position and a failed crop will mean that they will not be able to buy seed the next season. During the 2002 - 2003 season, the area experienced a drought and it was reported that many farmers have lost their entire crop, GE or non-GE. The difference being that those who planted GE crops had higher input costs and subsequent debt that they now have to pay off.

Moreover, since South Africa has liberalised its cotton market, farmers have become increasingly vulnerable to price fluctuations determined by the US markets. Reductions in cotton prices will be devastating for small farmers already operating under marginal conditions and during the recent Doha round of WTO negotiations, the dilemma of African cotton farmers was high on the agenda.

During the recent cotton season, South African farmers have planted less cotton due to weak world prices and several ginneries did not operate at all. This led to big job losses in the industry.

Short-lived benefits.

Reduced insecticide use is seen as one of the advantages of Bt cotton at Makhathini, and initially farmers have said that they use less insecticides. However, it seems that spraying for bollworms has continued even among farmers that have adopted the technology. While Bt cotton may have initial management benefits, experiences from around the world suggest these to be short-lived. No variety can remain resistant to all pests and diseases and in the province of Mpumalanga, commercial farmers planting Bt cotton are already returning to normal spraying patterns because of outbreaks of secondary insects such as aphids, leafhoppers and stinkbugs. There have also been cases of farmers losing their entire crop because they did not spray. Commercial farmers in South Africa can take this risk, but for small-scale farmers, the loss of one harvest can be catastrophic.

Monsanto has already applied for a permit for the commercial release of Bollgard II, which contains two Bt genes. The reason for putting Bollgard II on the market is because insect resistance develops and Bt cotton with the "stacked" Bt genes is now needed to be effective. This has come six years after Bt cotton has been released in South Africa and five years after Makhathini farmers started converting to Bt cotton.

Farmers are planting GE cotton without information.

Farmers planting Bt cotton do so with no understanding of the technology, or of their obligations under the licensing contracts they sign with Monsanto. Biowatch research has revealed that farmers understand their contracts to mean that in the case of a crop failure, the seed will be replaced. They are

not aware that they should plant a refuge, that the insects will develop resistance over time, or that during some seasons they will have to spray for unexpected insect outbreaks. Although Monsanto is happy to spend millions of dollars in promoting this case and 'educating' the global public, it is not at all bothered to ensure that the most basic information of all is conveyed to its peasant clients. Even the Provincial agricultural officers in the district had no idea that GE crops are being planted or even what it is.

Community Access to Resources under Threat.
Thousands of people depend for their livelihood on the water cycle of the Makhathini floodplains, fed by the Pongola River. Since the Jozini Dam has been built, the water is released annually to imitate this natural cycle and ensure that the cycles of nature and farming can continue as before. Because of the introduction of the input from outside agencies such as Monsanto, the Bt cotton farmers have become a strong enough lobby group to lobby for the premature release of water from the Jozini Dam to suit their needs. This however, has an impact on the rest of the community growing food crops and other crops on the floodplain as the premature flooding destroys their crops and thus food security. The timing also does not correspond with the natural flooding time of the floodplain and will have an impact on the breeding cycle of the fish, affecting another food source and so starting a cycle of scarcity.

Current Research Data raises more questions than answers.
The first data coming out of Makhathini in 1998 and widely quoted by Monsanto and some prominent SA scientists actively promoting GE crops, were stating that there was a 20% increase in yield, and sometimes in a more enthusiastic mood, figures of up to 30% have been quoted. The truth is that in 1998, four farmers were handpicked, Bt cotton was planted on their fields and their results have been used ever since. It has not been taken into account that the farmers probably used inferior seeds before and that any improved variety, Bt or not, would have given an increase in yield. The next year Monsanto spent R1million on a failed socio-economic study, the main reason being given that the researchers did not take into account that small scale farmers do not keep written records. Subsequently several researchers have published results, seemingly based on those records. Overall, the data presented by different researcher and the industry varies enormously making it difficult to come to any clear conclusion.

Farmers in Makhathini have been fairly positive about *Bt* Cotton, but the benefits may have been overrated by many in their eagerness to sell the product. Clearly the situation still needs time to unfold and a proper socio-economic and environmental study still needs to be done that takes into account the real cost of growing cotton and GM cotton. There has not been a single environmental impact study done on GM crops in South African and Makhathini is no exception and this is a cause for much concern.

Reduced choice is tied integrally to increased dependency and once a farmer decides to plant GE crops, it becomes very difficult to rethink this choice. As is the case elsewhere, farmers in South Africa buying GE cotton have to sign growers' contracts obliging them amongst other things to use the seed for only one season; to plant a refuge as part of an insect-resistance management strategy; not to supply any seed containing Bt cotton to any third party; and to exclusively use the company's chemicals. Many farmers in the US have been forced by Monsanto to destroy their crops for not complying with this agreement and several court cases are pending. This is alarming, especially for small-scale farmers, who traditionally save and exchange seed and, as the case at Makhathini illustrates, are unlikely to be able to read contracts, let alone understand their contents.

*** This analysis is a result of three years of monitoring and research on Bt Cotton in South Africa and internationally. It included interviews with small- scale farmers in Makhathini, commercial Bt cotton farmers, the industry and other roleplayers.**

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Sunday Times, 14 April 2003

ANNEXURE II

Good Friday - Pope condemns "genetic manipulation" (14/4/2006)

"The Pope will deliver a blistering attack on the 'satanic' mores of modern society today, warning against an 'inane apologia of evil' that is in danger of destroying humanity.... Particular condemnation is reserved for scientific advances in the field of genetic manipulation. Warning against the move to 'modify the very grammar of life as planned and willed by God', the Pope will lead prayers against 'insane, risky and dangerous' ventures in attempting 'to take God's place without being God'." ---

Pope condemns geneticists 'who play at being God'
By Ruth Gledhill, Religion Correspondent
The Times, April 14, 2006 http://www.timesonline.co.uk/article/0,,3-2134140,00.html

Pope Benedict XVI will deliver a blistering attack on the mores of modern society

THE Pope will deliver a blistering attack on the "satanic" mores of modern society today, warning against an "inane apologia of evil" that is in danger of destroying humanity.

In a series of Good Friday meditations that he will lead in Rome, the Pope will say that society is in the grip of a kind of "anti-Genesis" described as "a diabolical pride aimed at eliminating the family". He will pray for society to be cleansed of the "filth" that surrounds it and be restored to purity, freed from "decadent narcissism".

Particular condemnation is reserved for scientific advances in the field of genetic manipulation. Warning against the move to "modify the very grammar of life as planned and willed by God", the Pope will lead prayers against "insane, risky and dangerous" ventures in attempting "to take God's place without being God".

The Pope has not actually composed the prayers for the traditional Way of the Cross, but is certain to have given his blessing to the Good Friday meditations at the Colosseum.

Their author is Archbishop Angelo Comastri, Vicar General at Vatican City. The tone of the meditations is striking in its contrast to the contemporary fashion for feel-good religion.

While some will regard their emphasis on sin and the dark side of human nature as retrograde, others will welcome them as a sign of the strong and conservative leadership that Pope Benedict XVI was elected to provide. All Roman Catholic churches and many others, including Anglican churches in the Anglo-Catholic tradition, celebrate a liturgy around the Stations of the Cross on Good Friday.

The 14 stations begin with Jesus's condemnation to death, take Christians through meditations of the "Way of the Cross" and the Crucifixion and end with the laying of Jesus's body in the tomb. The Pope wrote the meditations himself for last year's Way of the Cross in Rome. But today's Catholic prayers, published in Italian this week and

in English on the Zenit website yesterday, go further than most in their thorough denunciation of contemporary culture.

At the Third Station of the Cross, where Jesus falls for the first time, Archbishop Comastri has written: "Lord, we have lost our sense of sin. Today a slick campaign of propaganda is spreading an inane apologia of evil, a senseless cult of Satan, a mindless desire for transgression, a dishonest and frivolous freedom, exalting impulsiveness, immorality and selfishness as if they were new heights of sophistication."

At the Fourth Station, where Jesus is helped by Simon the Cyrene to carry the cross, Pope Benedict and his followers will pray: "Lord Jesus, our affluence is making us less human, our entertainment has become a drug, a source of alienation, and our society's incessant, tedious message is an invitation to die of selfishness."

One of the strongest meditations warns against the attack on the family. "Today we seem to be witnessing a kind of anti-Genesis, a counter-plan, a diabolical pride aimed at eliminating the family."

There is a moving meditation for the Eighth Station, where Jesus meets the women of Jerusalem, describing the "River of tears shed by mothers, mothers of the crucified, mothers of murderers, mothers of drug addicts, mothers of terrorists, mothers of rapists, mothers of psychopaths, but mothers all the same".

The Pope will also confront the question of evil in the world in a meditation that asks: "Where is Jesus in the agony of our own time, in the division of our world into belts of prosperity and belts of poverty . . . in one room they are concerned about obesity, in the other, they are begging for charity?"

Ruth Gledhill weblog http://timescolumns.typepad.com/gledhill

Annexure III

ALLIANCE FOR BI0-INTEGRITY

Preserving the Safety of Our Food, the Health of Our Environment, and the Harmony of Our Relationship with Nature

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Genetic Engineering: An Affront to Religious Principles

The false claims and faulty procedures of the biotechnicians not only affront genuine science, they affront religion as well.

From a religious perspective:
(a) By insisting that forced, piecemeal gene-splicing is substantially equivalent to sexual reproduction, and by attempting to trivialize the multiple barriers against cross-species gene flow, bioengineers denigrate the presence of purpose in nature.

(b) By sundering these barriers without sound safeguards, they display irreverence toward the Creator and an irresponsible attitude toward the creation.

Accordingly, an increasing number of people oppose the genetic restructuring of our food as a trespass on the realm of God and a disruption of the divine plan.

PLAINTIFFS WITH RELIGIOUS OBJECTIONS TO GENE-ALTERED FOODS

There are seventeen plaintiffs who object to consuming genetically engineered foods on the basis of religious principle. Many of them are listed below.

Christian Clergy

1. The Rev. Dr. Colin B. Gracey, (Episcopalian) head of the Religious Life Office at Northeastern University in Boston and University Chaplain.

2. The Rev. Dr. Donald B. Conroy, (Roman Catholic) President of the North American Coalition on Religion and Ecology, Washington, D.C.

3. The Rev. Dr. Margaret Mitchell, (Baptist) The Olivet Health & Education Institute, Cleveland, OH.

4. The Rev. Paul C. Kucynda, Pastor of Holy Spirit Orthodox Church, Wayne, NJ.

5. The Rev. Samuel Kedala, Pastor of Holy Spirit Orthodox Church, Wantage, NJ.

6. The Rev. Dr. John Reigstad, pastor of the Evangelical American Lutheran Church (ELCA), Jesup, Iowa; Lecturer in Religion at Wartburg College, Waverly, Iowa.

7. The Rev. Dr. DeWitt Williams, director of the Health Ministries (North American division) of the Seventh-day Adventist Church.

Jewish

8. Rabbi Harold S. White, (Reform) Director of Jewish Chaplancy and Lecturer in Theology, Georgetown University, Washington, D.C.

9. Rabbi Alan Green, (Conservative) Beth Israel Synagogue, Winnipeg (a U.S. citizen).

10. Rabbi Jossi Serebryanski, (Orthodox) A kosher supervisor for O.K. Labs, Brooklyn, NY.

Buddhist

11. Dr. Ron Epstein, Chancellor of the Americas Dharma Realm Buddhist University; Research Professor, Institute for World Religions, Berkeley, CA.

Hindu

12. Gayatri Pariwar-Yugnirman, a Hindu religious organization in the Chicago metropolitan area with a membership of approximately 1,000.

WHY THE VENTURE TO GENETICALLY ENGINEER OUR FOOD OFFENDS SCIENCE, RELIGION, AND THE BILL OF RIGHTS

A Summary Overview

- **Unprecedented Risks / Dubious Benefits**
- **Flawed Foundational Assumptions**
- Deliberate Thwarting of Consumer Choice and Religious Freedom

Redesigning Nature. Within recent years, the biotechnology industry has launched a massive enterprise to genetically restructure our food supply. Hundreds of genetically altered plants and animals are being developed in laboratories, and many varieties of such foods are on grocery shelves. It's estimated that 60 to 70% of packaged foods already contain ingredients from bio-engineered organisms. In most cases, biotechnicians circumvent natural cross-breeding barriers by forcibly splicing a gene from one species into organisms of a distant, dissimilar species to endow them with a trait they do not normally possess -- with the result that grains, fruits and vegetables are being implanted with genes from viruses, bacteria, animals, and even humans. If the process continues as planned, the genetic blueprints of a majority of the world's edible plants and animals will be permanently reconfigured.

Why Is It Happening? Bioengineers say they can enhance the quantity and quality of the world's food while reducing dependence on pesticides. They claim their venture is in tune with nature, scientifically sound and virtually risk-free.

Is It a Wise Thing To Do? Counsels of Caution. A growing number of distinguished scientists and respected public interest organizations (such as Consumers Union, the Environmental Defense Fund and the Union of Concerned Scientists) dispute these claims. They say that genetic engineering is being irresponsibly oversold and warn it poses unprecedented threats to the health of both consumers and the environment. As the following paragraphs explain, these warnings are well-grounded.

1. Unsound Science: Relying on a Flawed Assumption.

The Fallacy of Equating Gene-Splicing With Traditional Breeding. The claims about the safety of the bioengineering enterprise have not been confirmed through standard scientific tests. Rather, they rest on an unfounded assumption -- the assumption that genetic engineering is substantially the same as traditional breeding. As many experts point out, careful consideration of the facts reveals that this assumption is scientifically unsound.

Traditional breeding is based on sexual reproduction between like organisms. The transferred genes are similar to genes in the cell they join. They are conveyed in complete groups and in a fixed sequence that harmonizes with the sequence of genes in the partner cell. In contrast, bioengineers isolate a gene from one type of organism and splice it haphazardly into the DNA of a dissimilar species, disrupting its natural sequence. Further, because the transplanted gene is foreign to its new surroundings, it cannot function without a big artificial boost. And because this unnatural boosting is continual, it causes the transplanted gene to act independently of the host organism's intricate control system, unlike any of the native genes. Consequently, not only does the foreign gene produce substances that have never been in that species before -- it produces them in an essentially unregulated manner.

Accordingly, molecular biologist Liebe Cavalieri, a Professor at the State University of New York, says it's "simplistic, if not downright simple-minded" to claim that genetic engineering is substantially the same as traditional breeding -- and that doing so borders on "sham."

Recognizing How Radical Genetic Engineering Really Is. Scientists who have objectively evaluated genetic engineering recognize not only that it radically differs from traditional breeding but that it is the most radical technology ever devised. Nobel laureate biologist George Wald termed it "the biggest break in nature that has occurred in human history." Biochemist Erwin Chargaff points to its potential irreversibility as "awesome," and he and several other eminent scientists warn it is a greater threat than nuclear technology.

2. Unprecedented Risks. Due to its deep differences with traditional breeding, genetic engineering entails unprecedented risks to both the consumer and the environment.

New Risks to Our Food (a) Because the foreign genes enter the host DNA haphazardly and disrupt the region into which they wedge, they can broadly and adversely alter cellular function. (b) The powerful boosters (called "promoters") artificially attached to the foreign genes operate independently of the host's intricate control mechanisms. They can therefore induce erratic expression of neighboring

genes as well as other imbalances. (c) The transplanted genes' unregulated production of foreign substances can upset complex biochemical feedback loops.

Each of these three types of disruption can cause the generation of toxins and carcinogens -- or other harmful effects -- in unpredictable ways, and the minimal testing currently performed cannot adequately screen for the numerous potential problems. In addition, the foreign proteins can cause serious allergic reactions.

Therefore, gene-spliced foods present abnormal risk. Professor Philip Regal of the University of Minnesota, a renowned plant biologist, says it is "scientifically justified" to be concerned about their safety -- and warns that some could be "quite dangerous."

Risks of Irreversible Harm To the Biosphere. Organisms with radically restructured DNA pose major threats to the world's eco-system. (a) Through cross-pollination, they can pass their novel traits to wild relatives and create superweeds. (b) The pieces of viruses engineered into many plants could recombine with other viruses to create superviruses -- and dangerous new diseases. (c) Plants engineered to produce their own pesticide can kill beneficial species as well as pests. These and the many other environmental risks are especially problematic because their effects are to a substantial extent irreversible. Once gene-altered organisms are released, it is difficult to recall or control them. They continue to propagate, migrate, and cross-breed with similar species.

3. Entrenching Unsustainable Agriculture. Although proponents claim genetic engineering will reduce unsustainable practices, in reality it causes greater dependence on them. For instance, the majority of bioengineered crops are designed to tolerate high doses of herbicides, which encourages increased use of these toxic chemicals. Even plants engineered to produce their own pesticide may well prove a net loss to sustainable agriculture. Their wide-scale use induces the development of pests resistant to them, which not only hastens their own ineffectiveness, but can destroy one of the main tools of natural, earth-friendly pest management.

4. An Affront to Religious Principles. The false claims and faulty procedures of the biotechnicians not only affront genuine science, they affront religion as well. From a religious perspective: (a) By insisting that forced, piecemeal gene-splicing is substantially equivalent to sexual reproduction, and by attempting to trivialize the multiple barriers against cross-species gene flow, bioengineers denigrate the presence of purpose in nature. (b) By sundering these barriers without sound safeguards, they display irreverence toward the Creator and an irresponsible attitude toward the creation. Especially arrogant is their presumption that human intelligence can restructure the intricate genetic programs that guide the growth and function of living organisms with greater competence -- and with less precautionary procedure -- than when amending a man-made computer code. Accordingly, an increasing number of people oppose the genetic restructuring of our food as a brazen trespass on the realm of God and a disruption of the divine plan.

5. An Official Policy to Underinform -- and even Misinform -- the Public. Because manufacturers fear consumers will reject gene-tampered foods, they strongly resist labeling them. They are supported in their stand by the regulatory agencies of the U.S.

government, which have a stated policy to promote bioengineered products. Thus, although federal law mandates that all material facts about food be disclosed, the Food and Drug Administration (FDA) staunchly refuses to require identification of foods implanted with genes from foreign species and the foreign substances they synthesize. Moreover, in order to justify its lax policy and to gain public acceptance of bioengineering, FDA officials systematically misrepresent it. They claim it is a seamless extension of natural, time-tested practices instead of acknowledging it as an artificial and radical departure; they assert it is more precise than traditional techniques when on balance it is far less precise; they treat its safety as an established fact when in reality it is an open question -- and in several respects doubtful.

By permitting the fact of foreign gene implantation to be hidden, not only does the FDA ignore clear demands of both the law and consumers, it thwarts the right of citizens to make an informed choice about their foods. Moreover, it also inhibits the free exercise of religion, since millions of people object to eating some or all genetically altered foods on the basis of religious principle.

6. Inadequate Safety Testing. Besides asserting that the radical alteration of an organism's genetic structure is too insignificant to label, the FDA further claims it is too minor to monitor (based on the fallacious assumption that genetic engineering is substantially equivalent to traditional breeding). Accordingly, although genetically engineered foods present a range of unprecedented risks, the FDA exempts them from the standard testing required of new food additives -- in what appears a stark violation of federal law. As a result, numerous varieties of bioengineered foods are being widely marketed even though their safety has not been confirmed through reliable procedures and remains subject to reasonable doubt.

7. Eminent Scientists and Religious Leaders Take the FDA to Court. Many well-credentialed scientists have deplored this FDA policy as unsound and irresponsible. Further, in order to emphasize the pressing need for the policy's revision, nine such scientists have taken the unprecedented step of becoming plaintiffs in the lawsuit our organization has filed against the FDA. The suit demands that the agency bring its policy back in line with sound science and U.S. law by requiring comprehensive safety testing and labeling of all genetically engineered foods.

Underscoring the fact that labeling is required not only to uphold the basic right of consumer choice but religious freedom as well, seventeen religious leaders have also joined as plaintiffs. They represent a wide variety of faiths and include seven Christian clerics (spanning Roman Catholicism, the Eastern Orthodox Church, and Protestant denominations from Episcopalian to Baptist); three rabbis (orthodox, conservative and reform); a Hindu religious organization; and a prominent Buddhist. They believe that the wholesale sundering of the species boundaries is an irreverent disruption of the integrity of God's creation, and they wish to separate themselves from it as a matter of religious principle. They therefore feel obliged to avoid all genetically engineered foods, and they allege that the FDA's refusal to institute labeling unlawfully restricts their free exercise of religion.

Other documents on our website more fully discuss the points in this overview and explain why every individual has reasonable grounds to reject gene-tampered foods and oppose the enterprise that is producing them out of concern for both personal safety and environmental protection. They also explain why all religious individuals have additional reasons to do so in order to uphold the integrity of God's creation -- and the integrity of humanity's relationship with God.

Annexure IV

ISIS Press Release 26/11/04

Feeding the World or the Corporations?

Food agencies are feeding corporate greed while an estimated 880 million people in the world go hungry.
Sam Burcher reports

Sources for this report are available in the ISIS member's site http://www.i-sis.org.uk/full/FTWOCGFull.php. Full details here http://www.i-sis.org.uk/membership.php

FAO report condemned, GM food aid rejected

The United Nations Food and Agricultural Organisation (FAO) has upset a broad coalition of consumers, farmers, environment groups, peasant organisations and social movements by producing a report overtly biased towards promoting the interests of multinational corporations like Monsanto and Syngenta. The report omits to mention that Monsanto control over 90% of total world area sown to transgenic seeds.

The FAO report, Agricultural biotechnology: meeting the needs of the poor? states that GMOs could be key to solving world hunger, and pushes for more funding. The report was denounced by 650 worldwide civil society organisations in an open letter to the Director of the FAO in Rome. The letter, signed by 800 individuals from more than 80 countries, demanded structural changes in access to land, food and political power, to be combined with support for sustainable technologies in farmer-led research. It was also rejected by five international NGOs at a Hunger, Food Aid and GMOs meeting at Maputo, Mozambique in July 2004.

Via Campesina, an organisation representing the interests of peasant-farmers worldwide said that promoting a technological solution to the problem of hunger in the form of GM crops is "a slap in the face for those who defend food sovereignty." The development of industrial agriculture has already caused millions of rural people to be displaced from their lands and condemned them to lives of misery. GM crops, the latest offering in industrial agriculture, will only intensify that trend.

Consumers International Regional Office for Africa, União Nacional de Camponeses (UNAC) Mozambique (Via Campesina), Environmental Rights Action (Friends of the Earth Nigeria), the Oakland Institute and the Third World Network (TWN) said that the FAO's report has betrayed rural people and consumers by recommending GMOs.

Their consensus is that the donation of GM food developed from untested and unreliable technologies can only complicate hunger issues. It is unacceptable at least until the safety of GM food and feed has been proven beyond any reasonable doubt.

ISIS was the first to call for GM-free food aid in 2002 on grounds that the malnourished with compromised immune systems would be especially susceptible to the potential hazards of GM food ("GM-free food aid!" www.i-sis.org.uk/GM-freefoodaid.php).

Consumers International (CI), which has 250 member organisations in 115 countries worldwide, became concerned about GM food aid in 2000 when a shipment of US GM maize arrived in Africa without any labelling or any indication as to the nature of the cargo. A petition was immediately sent to the then Clinton Administration and the UN, requesting that food donations be positively and explicitly labelled so recipient countries could give informed consent to donations after having been made aware of their contents.

The petition served to attract marginalized groups of farmers, NGOs and environmentalists who together decided that GM food aid raised the broader issue of the denial of fundamental consumer rights.

In May 2004, 65 groups representing farmer, consumer, environmental and development organisations from 15 African countries sent an open letter to the World Food Programme (WFP), protesting against the pressure exerted on Sudan and Angola over their respective decisions to impose restrictions on GM food aid. They demanded that the WFP and USAID (US Agency for International Development) immediately desist from misleading the governments of Angola and Sudan with a scenario of no choice, and from forcing them to accept GM food aid. The called on the WFP to respect the decisions of recipients of food aid, and to actively seek alternative food - or cash donations to purchase food - available at the local and regional level.

Corporate propaganda misleading the public

Polls conducted in Europe have firmly rejected GM crops across the board except on the issue of feeding Third World hunger. Some 55% of people believe that GM can solve Third World hunger, mainly because they were misled by corporate propaganda. Many African nations reject handouts or dependence on corporate owned seeds. Instead, they want self-sufficient sustainable agricultural production methods to enable them to feed themselves. (See Public Say No to GMO's SiS 19, 2003 http://www.i-sis.org.uk/isisnews/sis19.php)

Africa fights for self-sufficiency against GM crops

In 2002 Zambia, under intense pressure from the UN, nevertheless refused GM food aid (see "Africa unites against GM to opt for self-sufficiency" (ISiS 16 http://www.i-sis.org.uk/isisnews/sis16.php) and went on to double their own maize yield and successfully fed themselves and neighbouring countries for the following year. The African country of Benin has placed a moratorium on the import and cultivation of GMOs.

As consumer demand for genetic engineering shrinks and more countries adopt biosafety laws and labelling regulations, so the volume of surplus GM crops increases. Rejected by Europe, GM giants Monsanto and Syngenta have turned their attention to Asia, and in particular, Africa, to profit from dumping GM food as aid, and to support agricultural research and 'biosafety' initiatives designed to facilitate acceptance of their untested products. The US based aid agency USAID, which funds the African Agricultural Technology Foundation, is in turn funded by Monsanto, Syngenta and the Rockerfeller Foundation. USAID clearly states its intention to "integrate biotechnology into local food systems and spread technology throughout regions in Africa."

The huge sums invested in the biotech industry supposed to alleviate world hunger have failed to deliver thus far. The USAID-funded Consultative Group for International Agricultural Research (CGIAR) has recently received $100 million towards its "Harvest Plus Plan" to produce "second generation" GM crops - maize, cassava and sweet potato in Africa. But there is already evidence that organic farmers are achieving record yields with their crops in Africa without the need for GM varieties (see "Greening Ethiopia" series, SiS 23 http://www.i-sis.org.uk/isisnews/sis23.php).

At the World Food Summit in 2002, the FAO engaged with the NGO Forum on Food Sovereignty to make a commitment to strengthen the principle production by rural people. But they have clearly reneged on their commitment in saying that hunger can be solved by genetic engineering.

With this change of mind, the FAO now appears to be open to supporting terminator technology (sterile seed lines), which would be another radical departure from their stance only four years ago. And this has called their independence and integrity into question. This effective support of corporate bio-piracy is responsible for threatening the collective work of farmers over countless millennia in creating new breeds of agricultural crops.

Ten years of GM failures

The first decade of commercial GM crops have failed even the biotech companies. Promises have been broken and benefits from GM have not materialised. GM crops have been put into place in many countries mainly because of concerns over health and transgenic contamination. Citizen opposition in Europe has ensured that GM products are kept off the shelf and consumer and retailer rejection has forced Monsanto to delay commercialisation of GM wheat planned for 2004. The biotech vision of predominant GM monocultures will fuel mounting over the ecological impacts of industrial agriculture. Fortunately, there are many sustainable low input alternatives that are safe and more cost effective. (See The Case for a GM-Free Sustainable World, ISP Report.
http://www.indsp.org/A%20GM-Free%20Sustainable%20World.pdf

How civil society can safeguard their civil rights

Aside from the UN Guidelines for Consumer Protection, Consumers International has

identified four crucial tools that civil society can use to safeguard their civil rights:

The African Model Law on Safety in Biotechnology, which provides for clear labelling on GM foods and advocates participation in decision making to protect Africa's biodiversity, environment and health from risks associated with GM. The Model Law's provisions are also very comprehensive and provide for strict regulation, taking into account the importance of Africa as a centre of origin and diversity of many food crops.

The Cartagena Protocol on Biosafety, which puts into operation the Precautionary Principle. It also establishes the principle of prior informed consent with regard to the import of GMOs and preserves the right of a country to reject applications for the import of GMOs. So far only 27 African countries have ratified this protocol and more must be persuaded to do so.

The Food Aid Convention Articles iii, viii and xiii, which state that GM food aid should only be accepted after recipient countries have discarded alternatives and non-GM food aid as non-options.

The Rio Declaration, in which Principle 15 endorses the Precautionary Approach to be applied by States where scientific certainty of safety is lacking.

Steps must be taken to improve citizens' rights to redress, so that farmers are adequately compensated for damages and losses incurred when GM crops fail in harvest, or GM seeds and pollen contaminate local crop varieties. CI also supports consumer education rights whereby critical information on the development of biotechnology is accessible and wholly in the public domain. It cautions against measures that destroy existing healthy food production systems, exclude the majority of small-scale farmers (1 in 6 people in developing countries are food producers) and reduce the diversity of food bases for the future.

Historically, hunger is a political problem that requires political will to create stable markets for small food producers and to encourage land use by rural families. This would enable the production of larger amounts of quality foodstuffs in rural areas through investing in truly sustainable alternatives such as agroecology and biodiversity management (see "Corporate hijack of sustainable agriculture", ISIS report 17 Nov 2004)
http://www.i-sis.org.uk/CHSA.php.

This article can be found on the I-SIS website at http://www.i-sis.org.uk/FTWOCG.php

Annexure V

AN OVERVIEW FOR NEWCOMERS TO THE SUBJECT OF GENETIC ENGINEERING:

http://panna.igc.org/resources/geTutorial.html
(note important article by Prof David Schubert below)

* US Foodborne Illenesses Up Two To Ten Fold:
http://www.i-sis.org/FoodborneIllnesses.php

* 50 HARMFUL EFFECTS OF GM FOODS: http://www.cqs.com/50harm.htm

* GM Bt-spliced food damages the intestines of laboratory rats says study: http://purefood.org/gefood/iliumstudy.cfm

* GM foods can enhance AIDS and Hepatitus say scientist:
http://members.tripod.com/~ngin/050302b.htm

* Insurance companies in Australia and UK deem GM crops and foods too dangerous to insure, see: http://members.tripod.com/~ngin/170302a.htm

* The European Union has just voted for even stricter GM food labelling laws, see: http://ngin.tripod.com/050602c.htm

* GENETIC ENGINEERING AND ITS DANGERS, compiled by Dr Ron Epstein
http://online.sfsu.edu/%7Erone/GEessays/gedanger.htm#Technical

* "Unraveling the DNA Myth: The Spurious Foundation of Genetic Engineering", by Dr. Barry Commoner:
http://www.mindfully.org/GE/GE4/DNA-Myth-CommonerFeb02.htm

* The Promise of Plant Biotechnology - The Threat of GMO's, by Prof. Patrick Browne:
http://www.geocities.com/RainForest/6783/GMO-release_Premature.html

* To distinguish between genetic modification and biotechnology visit:
http://www.btinternet.com/~nlpwessex/Documents/GMdebatesolution.htm

GM GENES FOUND IN HUMAN GUT
http://www.guardian.co.uk/gmdebate/Story/0,2763,756666,00.html

EVALUATING THE RISKS ASSOCIATED WITH USING GMO'S IN HUMAN FOOD
http://www.foodstandards.gov.uk/science/sciencetopics/gmfoods
/gm_reports (use complete URL)

GM DNA IN HUMAN GUT UNDERESTIMATED
http://www.i-sis.org.uk/hgthumangut.php

GERMANY - GM DNA PASSES INTO MEAT AND MILK

http://www.lifescience.de/news/article/05564/index.html).

WARNING SIGNS, Potential Health Risks of Genetically Engineered Organisms in Animal Feed, Greenpeace International, November 2000
http://www.greenpeace.org/~geneng/reports/gmo/gmo022.htm
U.S. Agriculture Has Not Been Sustainable For Decades
http://www.psrast.org/sustbiotech.htm

Genetically Engineered Crops: Lower yields /Reduced profits/More pesticides http://members.tripod.com/~ngin/151201b.htm

Sustainable Agriculture, Research and Education, visit:
http://www.psrast.org/sustfarmlinks.htm

SAFE FOOD COALITION (South Africa) in association with the Natural Law Party, taynton@cdrive.co.za

THE RISKS OF GM FOOD By Prof David Schubert
July 2002

As a cell biologist I am very much discouraged by the content of the ongoing debate about introducing genetically modified (GM) plants into the marketplace. While the voiced concerns usually center around irrational emotional arguments on the one hand, and the erroneous concept that genetic engineering is just like plant breeding on the other, I believe that the three issues which should be of most concern on the basis of established science receive little or no discussion.

These are:

1. that introducing the same gene into 2 different types of cells can produce two very distinct protein molecules;
2. the recent observations that the introduction of any gene, be it from a different or the same species, always significantly changes overall gene expression and therefore the phenotype of the recipient cell; and 3. the possibility that enzymatic pathways introduced to synthesize small molecules such as vitamins can interact with endogenous pathways to produce novel molecules.

The potential consequence of all of these perturbations could be the production of bio-molecules that are either toxic or carcinogenic, and there is no _a priori_ way of predicting the outcome.

I will give a few examples and then argue why GM food is not a safe alternative.

In addition to their primary sequence of amino acids, the structure and biological activity of proteins can be modified by the addition of molecules such as phosphate, sulfate, sugars or lipids. The nature of these secondary modifications is totally dependent upon the cell type in which they are expressed. For example, if a protein involved in the cause of Alzheimer's disease, the beta amyloid precursor protein, is expressed in liver cells it contains covalently-attached chondroitin sulfate carbohydrate, while the identical gene expressed in brain nerve cells contains a much

simpler sugar. This is because each cell type expresses a unique repertoire of enzymes capable of modifying proteins after they are synthesized. Once modified, the biological activity of the molecule may be changed. In the case of the beta-amyloid precursor protein, the adhesive properties of the cells are changed, but there is, at our current state of knowledge, no way of knowing the biological effects of these modifications.

The second concern is the potential for inducing the synthesis of poisonous or toxic compounds following the introduction of a foreign gene. These observations are clearly at odds with the individuals who imply that everything is fine because they are simply introducing one gene. In fact, the introduction of a single gene invariably alters the gene expression pattern of the whole cell and each cell of the individual or plant responds differently. One recently published example is the transfection of a receptor gene into human cells. In this case, the gene was a closely related isoform of an endogenously expressed gene. The pattern of gene expression was monitored using gene chip technology, and the mRNA levels of 5% of the genes was significantly up-regulated or down-regulated. Similarly, the simple introduction of a bacterial enzyme used for growth selection of transfected cells changes the expression of 3% of the genes. While these types of unpredicted changes in gene expression are very real, they have not received much attention outside the community of the DNA chip users.

Furthermore, they are not unexpected. The maintenance of a specific cell phenotype is a very precise balancing act of gene regulation, and any perturbation is going to change the overall patterns of gene expression.

The problem, like that of secondary modifications, is that there is currently no way to predict the resultant changes in protein synthesis.

Third, the introduction of genes for a new enzymatic pathway into plants could lead to the synthesis of totally novel or unexpected products via the interaction with endogenous pathways. Some of the products could be toxic. For example, retinoic acid (vitamin A) and derivatives of retinoic acid are used in many signaling events that control mammalian development. Since these compounds are soluble and work at ultra low concentrations, a GM plant making vitamin A may also produce retinoic acid derivatives which act as agonists or antagonists in these pathways, resulting in abnormal embryonic development.

Given the fact that genetically modified plants are going to make proteins in different amounts and perhaps totally new proteins than their parental species, what are the potential outcomes? A worst case scenario could be that an introduced bacterial toxin is modified to make it toxic to humans. Direct toxicity may be rapidly detected once the product enters the marketplace, but carcinogenic activity or toxicity caused by interaction with other foods would take decades to detect, if ever. The same outcomes would be predicted for the production of toxins or carcinogens via indirect changes in gene expression.

Finally, if the above problems are real, what can be done to address these concerns? The issue of secondary modification could be addressed by continual monitoring of the introduced gene product by mass spectroscopy.

The problem is that some secondary modifications, like phosphorylation or sulfation can be lost during purification. However, the best, and to me the only reasonable solution, is to require all genetically engineered plant products for human consumption be tested for toxicity and carcinogenicity before they are marketed. These safety criteria are required for many chemicals and all drugs, and the magnitude of harm caused by a widely consumed toxic food would be much greater than that ofany single drug.

Professor David Schubert
Cellular Neurobiology Lab, The Salk Institute for Biological Studies, P.O. Box 85800, San Diego, CA 92186-5800,USA Phone: (001) (858) 453-4100http://www.cqs.com/50harm.htm

Annexure VI

Why GM Foods are Inherently Unsafe
Jeffrey Smith - Seedsofdeception.com

Assumption	**Actual Status**	**Quote**
Inserted genes will produce a single protein.	Inserted foreign genes might create multiple proteins, with unpredictable consequences.	“The fact that one gene can give rise to multiple proteins . . . destroys the theoretical foundation of a multibillion-dollar industry, the genetic engineering of food crops.” Dr. Barry Commoner, senior scientist at the Center for the Biology of Natural Systems at Queens College
The proteins created by inserted genes will act exactly the same way in a new organism.	Foreign proteins may be folded improperly or become attached to other molecules, which could change their properties. Likewise, gene expression may be affected by the genetic disposition of a host organism, or even the environment.	Dr. Peter Wills of Auckland University warns, “an incorrectly folded form of an ordinary cellular protein can under certain circumstances . . . [duplicate itself] and give rise to infectious neurological disease.” Professor David Schubert of The Salk Institute for Biological Studies, says the effect that a particular protein has on a plant or animal “can be modified by the addition of molecules such as phosphate, sulfate, sugars, or lipids.”
Inserting foreign genes is precise and non-disruptive.	The process of inserting foreign genes can damage the structure and function of the host’s DNA, switch genes on or off, create never-before-seen genetic sequences, and render the genome unstable.	The BBC’s Tomorrow’s World Magazine says: “Genetic engineering is generally a hit and miss affair. The genes may be inserted the wrong way round or multiple copies may be scattered throughout a plant’s genome. They may be inserted inside other genes—destroying their activity or massively increasing it. More worryingly, a plant’s genetic make-up may become unstable. . . . Rogue toxins may be produced or existing ones amplified massively. Such problems may only arise hundreds of generations after the crops are originally modified.”
Foreing genes will not transfer to bacteria in the digestive system. Use of antibiotic resistant genes are therefore safe.	Foreign genes jumped to human gut bacteria in just one meal of a GM soy burger and soy milkshake.	"British scientific researchers have demonstrated for the first time that genetically modified DNA material from crops is finding its way into human gut bacteria, raising potentially serious health questions." The Guardian In 1992, Murray Lumpkin, M.D., then director the FDA’s Division of Anti-infective Drug Products, warned: “IT WOULD BE A SERIOUS HEALTH HAZARD TO INTRODUCE A GENE THAT CODES FOR ANTIBIOTIC RESISTANCE INTO THE NORMAL FLORA OF THE GENERAL POPULATION.”
The promoter that keeps foreign genes switched on, only influences that one gene.	The promoter may turn on native genes “over long distances” up and down the strand of DNA—even genes on a different chromosome. This can create a flood of proteins with unpredictable consequences. Some scientists theorize that the promoter might even switch on dormant viruses that are deposited along the DNA.	“When inserted into another organism as part of a 'genetic construct,' it [the promoter] may also change the gene expression patterns in the recipient chromosome(s) over long distances up- and downstream from the insertion site.” Dr. Michael Hansen, Consumers Union, publishers of Consumer Reports And in their paper, “Cauliflower Mosaic Viral Promoter—A Recipe for Disaster,” Drs. Ho, Ryan, and Cummins warn, “Horizontal transfer of the CaMV promoter .

		. . has the potential to reactivate dormant viruses or [create] new viruses in all species to which it is transferred."
The promoter is stable.	Studies indicate that the promoter may create a "hotspot" in the DNA, whereby the whole DNA section, or chromosome, can become unstable. This can cause breaks in the strand or exchanges of genes with other chromosomes.	According to Geneticist Dr. Joe Cummins, a promoter can have "the same impact as a heavy dose of gamma radiation."
The promoter only works with plant organisms.	Research indicates that the promoter can influence animal genes. Some scientists believe it can transfer to internal organs and accelerate cell growth, possibly leading to cancer.	Dr. Stanley Ewen, one of Scotland's leading experts in tissue diseases, says, "It is possible GM DNA could affect stomach and colonic lining by causing a growth factor effect with the unproven possibility of hastening cancer formation in those organs."
Nutritional properties are unaffected by genetic modification.	Significant differences in nutritional content between GM crops and their natural counterparts have been observed.	"Roundup Ready beans were significantly lower in protein and the amino acid phenylalanine. More disturbing were [increased] levels of the allergen trypsin inhibitor in toasted Roundup Ready meal. . . . Lectins in Roundup Ready beans almost doubled the levels in controls. What might be the result of consuming foods with high levels of trypsin inhibitor and lectin? Well, maybe slower and lower growth, say scientists." Medical writer Barbara Keeler, on data that hasd been omitted from Monsanto's published study.
Genes and their expression will act in isolation, not impacting other metabolic processes.	Insertion of foreign genes and their new proteins may create complex, unpredictable interactions, not well understood. Similarly, inserting two or more foreign genes into the same plant may also cause interactions that have not been studied.	University of Georgia's Dr. Sharad Phatak says, "When you insert a foreign gene, you are changing the whole metabolic process. . . Each change is going to have an effect on other pathways. Will any one gene kick off a whole slew of changes? We don't know for sure." Stanford's Dr. Charles Yanofsky says, "Genetic engineering results in the formation of higher than normal concentrations of certain enzymes and products; these could provide the basis for the synthesis of higher levels of toxic substances." Commenting on the genetically modified supplement L-tryptophan produced by Showa Denko, which killed about 100 people and caused 5-10,000 to fall sick, Yanofsky, one of the world's leading authorities on tryptophan biosynthesis, says, "If Showa Denko engineered the bacterium to overproduce tryptophan [which they did], then there are many unknowns that would be associated with its overproduction."
There is no risk from breathing pollen from GM crops	If GM genes can transfer to gut bacteria or internal organs, then inhalation of pollen may cause unpredicted health problems.	"Experts on the Government's Advisory Committee on Novel Foods and Processes have issued a warning about plants being grown in the U.S. and parts of Europe which contain a gene resistant to antibiotics. They are concerned that, if workers breathe in dust as the crops are processed, the resistance could be transferred to bacteria in their throats. Around one in five people are carriers of the meningitis bacteria, even though they are not affected by the disease. Microbiologist Dr. John Heritage, a member of the committee, has written to American authorities to express his worries. 'It's a huge concern to me,' he said. 'While the risk is small, the consequences of an untreatable, life-threatening infection spreading within the population are enormous.'" Daily Mail (UK)
The chances of GM crops being allergenic are minimal.	After GM soy was introduced into the UK, soy allergies skyrocketed 50%. Current GM corn would not pass tests recommended by international Codex standards for potential allergenicity. It took the FDA 9 months to develop an allergy test for StarLink corn; It was so poorly designed, however, that the EPA's Scientific Advisory Panel rejected its results.	The FDA's 1992 policy states, "At this time, FDA is unaware of any practical method to predict or assess the potential for new proteins in food to induce allergenicity and requests comments on this issue." FDA scientist Dr. Carl Johnson wrote, "Are we asking the crop developer to prove that food from his crop is non-allergenic? This seems like an impossible task." According to FDA microbiologist Dr. Louis Pribyl, "the only definitive test for allergies is human consumption by affected peoples, which can have ethical considerations." According to a 1999 Washington Post article, there is still "no widely accepted way to predict a new food's potential to cause an allergy. The FDA is now five years behind in its promise to develop guidelines for doing so." The same remains true today.

ANNEXURE VII
MONSANTO SUES FARMERS
The Institute of Science in Society Science Society Sustainability http://www.i-sis.org.uk

General Enquiries sam@i-sis.org.uk Website/Mailing List press-release@i-sis.org.uk ISIS Director m.w.ho@i-sis.org.uk
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The Center for Food Safety just released a report detailing Monsanto's lawsuits against American farmers. For a copy of the report, click www.centerforfoodsafety.org/Monsantovsusfarmersreport.cfm

Monsanto Assault on U.S. Farmers Detailed in New Report FOR IMMEDIATE RELEASE January 13, 2005 Contact: Craig Culp, (202) 547-9359, or (301) 509-0925 (mobile)

First-of-its-Kind Analysis Reveals Thousands of Monsanto Investigations, Nearly 100 Lawsuits and Numerous Bankruptcies

Toll-Free Hotline Established for Farmers Facing Lawsuits or Threats from Monsanto to Get Guidance and Referrals

WASHINGTON - The Center for Food Safety released today an extensive review of Monsanto's use and abuse of U.S. patent law to control the usage of staple crop seeds by U.S. farmers. The Center (CFS) launched its investigation to determine the extent to which American farmers have been impacted by litigation arising from the use of patented genetically engineered crops. Monsanto vs. U.S. Farmers details the results of this research, discusses the ramifications for the future of farming in the U.S. and outlines policy options for ending the persecution of America's farmers.

"These lawsuits and settlements are nothing less than corporate extortion of American farmers," said Andrew Kimbrell executive Director of CFS. "Monsanto is polluting American farms with its genetically engineered crops, not properly informing farmers about these altered seeds, and then profiting from its own irresponsibility and negligence by suing innocent farmers. We are committed to stopping this corporate persecution of our farmers in its tracks."

The report finds that, in general, Monsanto's efforts to prosecute farmers can be divided into three stages: investigations of farmers; out-of-court settlements; and litigation against farmers Monsanto believes are in breach

of contract or engaged in patent infringement. CFS notes in the report that, to date, Monsanto has filed 90 lawsuits against American farmers in 25 states that involve 147 farmers and 39 small businesses or farm companies. Monsanto has set aside an annual budget of $10 million dollars and a staff of 75 devoted solely to investigating and prosecuting farmers.

"Monsanto would like nothing more than to be the sole source for staple crop seeds in this country and around the world," said Joseph Mendelson, CFS legal director. "And it will aggressively overturn centuries-old farming practices and drive its own clients out of business through lawsuits to achieve this goal."

The largest recorded judgment CFS has found thus far in favor of Monsanto as a result of a farmer lawsuit is $3,052,800.00. Total recorded judgments granted to Monsanto for lawsuits amount to $15,253,602.82. Farmers have paid a mean of $412,259.54 for cases with recorded judgments. Many farmers have to pay additional court and attorney fees and are sometimes even forced to pay the costs Monsanto incurs while investigating them. "Monsanto is taking advantage of farmers with their marketing and their threats and lawsuits," said Rodney Nelson, a North Dakota farmer sued by Monsanto. "It's hard enough to farm as it is. You don't need a big seed supplier trying to trip you up and chase you down with lawyers."

Farmers even have been sued after their fields were contaminated by pollen or seed from a previous year's crop has sprouted, or "volunteered," in fields planted with non-genetically engineered varieties the following year; and when they never signed Monsanto's Technology Agreement but still planted the patented crop seed. In all of these cases, because of the way patent law has been applied, farmers are technically liable. It does not appear to matter if the use was unwitting or if a contract was never signed.

Various policy options supported by CFS include passing local and state-wide bans or moratoriums on plantings of genetically engineered crops; amending the Patent Act so that genetically engineered plants will no longer be patentable subject matter and so that seed saving is not considered patent infringement; and legislating to prevent farmers from being liable for patent infringement through biological pollution.

CFS has established a toll-free hotline for farmers facing lawsuits or threats from Monsanto to get guidance and

referrals: 1-888-FARMHLP.

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"GMOs: THE ETHICAL AND SOCIAL CONSIDERATION—WHAT ARE THEY FOR DEVELOPING COUNTRIES"

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INTRODUCTION

The 20th century was a time of unsurpassed technological progress, but it was also a time in which humanity learned that technological changes bring unintended ethical, social and environmental consequences. Hans Jonas is generally credited with first recognizing the need for a systematic method of anticipating and evaluating technology (Jonas 1984). According to Thompson, Jonas argued that technological ethics must integrate science-based attempts to understand the systematic and temporally distant effect by technology with ethical concepts attuned to the fact that,

many of the people who will be affected by technology will not be known, to those who plan and execute a technological practice.
Today the central problems in technological ethics can be understood as problems of anticipating and managing the unintended consequences of technical change. In this regard risk analysis is one of the main social responses. Risk analysis is often characterized as a multi-stage process comprising;

- Ø Risk identification
- Ø Risk measurement
- Ø Risk evaluation and
- Ø Risk management

The last two components of analysis have always been understood to incorporate value judgments. From the standpoint of management, ethics weighs in on whether people must be informed and their consent obtained before they can become bearers of risk, and on how trade-offs between risk and benefit are to be evaluated. On the other hand some approaches to technological risk analysis, the stage of risk identification and risk measurement are characterized as wholly objective. On this model, ethics comes in only when it is time to compare their risks and benefits of different technological options, or to accept or reject a technological practice based on its predicted risk (Rowe, 1977, Lewis, 1990). However it is now generally, recognized that value judgments are implicit in an attempt to identify or decide which consequences are relevant, or to determine which of the myriad of actual possible courses of action should be selected as the options that will be subjected to modelling and analysis. Furthermore, it is recognized that measurement of risk requires value judgments about how to treat uncertainties in data modelling, and how to derive and integrate statistical and subjective probabilities. In this regard it is possible to see all phases of risk analysis as involving ethical issues.

SOCIAL EQUITY

Biotechnology, like any new technology, can be neutral, pro-rich or pro-poor, depending on the stage of its development and management, area of application and the socio-economic climate in which it operates. As regards research and generation of new techniques, biotechnological techniques are certainly high-cost and require highly trained personnel, a setting generally obtained in industrialized countries (FAO, 2000). Much of the research takes place in the private sector, which means that the marketability of the product and potential return on investment are crucial factors in deciding what research to undertake. Most of the new technologies, processes and products are, therefore, generally expected to be first available in industrialized countries and first applied to the commodities and priorities favoured by those countries (Hoffmeyer, 1995). Furthermore, research and development goals of the private sector may diverge from those of the public sector. The gap should be narrowed, keeping in mind the interest of the people, especially the poorer sector who constitute the majority in developing countries.

The adoption of biotechnology-derived products/techniques intended for common use should ordinarily be scale-neutral. However, the time lag in availability and adoption of new technologies between developed and developing countries is likely to reduce the competitiveness of agriculture in the poorer countries, and of the poorer sectors within a country, at least in the sort term, especially when more and more production

surpluses will be competing in fewer markets. This is taking place in a background where the share of industrialized countries in the World export of food products increased from about 45 percent in the early 1960s to about 68 percent in the early 1980s (FAO, 2000).

Another anticipated consequence of the application of biotechnology is acceleration in the trend towards further industrialization of agriculture, for which many of the smaller and less developed countries are not sufficiently prepared. This is a major challenge to developing countries, because, even though biotechnologically modified varieties, breeds and micro organisms may be used with equal success in small and large scale agriculture, economies of scale in marketing and processing and ability to take risks and to invest favour adoption first and foremost by larger producers (Fowler, 2000).

ETHICAL AND LEGAL ASPECTS

Notwithstanding the high potentials of biotechnology for development, the genetic manipulation of crops and livestock using genes from unrelated organisms and the possible implications for biosafety and human health have raised ethical issues (Shumba-Mnyulwa, Chikowore and Mugwagwa 2004). There is a global debate on the implications of patenting life forms a practice being advocated for and legitimized by developed countries. Developing countries argue that patenting of genes and the materials they contain, as the essence of life cannot be owned, as this is unethical. Ownership and control of biodiversity should be in the hands of farmers and communities because if they lose ownership of seeds and plants, companies will decide, what to produce, how to produce and the amount to be produced.

Most developing countries do not allow the patenting of plants, animals or their genetic component generally because of their importance in the food supply. Others, however, see the use of patents as one of the necessary mechanisms to stimulate technology development (Stokes, 1998). Developing countries believe that Western style IPRs are inadequate in protecting the rights of local and indigenous communities because there should be no patenting of life-forms at all, including traditional knowledge. Traditional knowledge and IPRs are incompatible systems because the former is for open access and collective rights, while the latter is for exclusive access and individual rights. Subjecting traditional rights to IPRs the “traditional” aspect of that knowledge system will be lost. The developing countries further consider that its unfair that genetic material which peasant and indigenous people have kept alive, cared for and protected for more than 10, 000 years could be property of corporate business.

Differences in perspectives on the usefulness and exploitation of biotechnology emanate from the level of agricultural and economic development, the level of research and technology capability, the form and mechanics of transfer of technology and the availability of appropriate regulations and the mode of their implementation Shumba-Mnyulwa, Chikowore and Mugwagwa 2004). Several technical and legal problems related to biosafety and patenting of living organisms and their genetic materials remain unresolved. The definition of protected subject matter as it applies to biological material is still evolving and is far from being fixed, and in many countries a policy debate on this matter is under way. Specific legal provisions in the

area of IPR for biological content are currently under consideration in various international fora such as the World Intellectual Property Organisation (WIPO), the World Trade Organisation's Trade Related Aspects of Intellectual Property Rights (TRIPs) and OECD. Specialized UN agencies and technical bodies, such as FAO and World Health Organization (WHO), are closely associated with, and involved in, such negotiations/debates to facilitate the formation of socio-economically scientifically and ethically balanced decisions (FAO, 2000).

The system, which is now emerging in some industrialized countries, is one that will grant strict intellectual property protection to a wide array of biotechnological products. Great pressure is being and will continue to be exerted by these countries in a number of for a in order to assure that such protection is observed worldwide, although, at the Uruguay Round of the GATT negotiations, industrialized countries formally agreed that they did not expect developing countries "to make contributions which are inconsistent with their individual development, financial and trade needs". The system proposed by industrialized countries is designed to serve individual inventors in a formal research setting and to "protect" the "inventions" originating from their own economic systems. These laws do not take into account informal research and innovations or the indigenous knowledge and products of differing cultures, which have provided and will continue to provide invaluable information and materials for further innovations worldwide (Shiva, 1995).

Member countries should carefully assess the implications of different rules regulating the development and use of biotechnology. Appropriate and workable legal frameworks on biotechnology-related matters should be formulated to ensure the balanced exploitation of new techniques and products. The FAO, based on its experience on issues such as the safe and efficient use of pesticides and harmonization of quarantine principles and procedures, is one of the intergovernmental bodies, such as WIPO and WHO, who are willing to assist Member Nations in formulating the necessary legal guidelines (FAO, 2000).

SOCIO ECONOMIC ISSUES

It is clear that mastering GM technology and its potential environmental and health impact is not enough. It is also necessary to understand the society into which the new GM products will be introduced. GM technology has raised a number of important issues, which relate to how this technology is developed, by whom, for whom and with what consequences (Shumba-Mnyulwa, Chikowore and Mugwagwa 2004).

Historically speaking, technologies have been as scrutinized, assessed and debated as GM technology, with the possible exception of immunization, pasteurization and nuclear technology. The critique is often focused on who is setting the R&D agenda and who is delivering the technology or products, rather than on the safety issues and the impact of the technology, *per se*. Socio-economic issues proved very controversial during the drawn out negotiations that resulted in the Cartagena Protocol on Biosafety.

The challenge is that the Cartagena Protocol specifically focuses on international trade and transboundary movements of such organisms and does not cover e.g. deliberate release of GMOs in one country (Torheim 2005). The Protocol is therefore

a compromise and insufficient regulatory framework as it does not cover "international introduction into the environment" to address situations where the exporter knows that some shipped modified grain, for instance will be planted within the importing country, but does not necessarily 'intend' this to happen. The Protocol says nothing about any regulatory oversight within a country.

LIMITS OF THE GREEN REVOLUTION

As is well researched and documented, the Green Revolution (use of high-yielding varieties in combination with in-organic fertilizers, pesticides and herbicides, and intensive irrigation) had a mixed impact on small-scale farmers in Asia and Latin America, with a majority managing to benefit, while a minority have become marginalized. Decades of continuous use of agro-chemicals and irrigation have led to serious and persistent environmental damage of soils and water bodies. The Green Revolution in the developing world has in many cases reached its limits, with examples of yields either levelling off or declining. It could well be that the currently experienced limits in yields are an outcome of restricted input-intensification (e.g. the application of fertilizers), rather than a result of the properties bred into the high yielding cultivars. In addition, while the Green Revolution increased the production of the main staple cereals (maize, rice and wheat) by several factors in Asia and Latin America, it was unable to establish itself in sub-Saharan Africa (for a variety of reasons), where agricultural productivity has remained very low.

The proponents of GM technology believe that it heralds a new "Double Green Revolution", arguing that the use of GM crops will dramatically revive the now stagnant levels of yield, while simultaneously having a beneficial impact on the environment because of the decrease in the use of pesticides and herbicides. This claim is hotly disputed by GM opponents. Socio-economic issues are in the forefront of the debate, together with environmental and health safety issues.

DIFFERENTIAL IMPACT OF TECHNOLOGICAL CHANGE ON FARMERS IN THE DEVELOPING WORLD

More than two-thirds of the population of Africa and Asia live in rural areas. The great majority of them are small farming households with land-access to between one and two hectares. A sizeable minority are landless people, who earn their living as agricultural wage labourers or farm on communal land governed by traditional leaders. Latin America presents a somewhat different picture, with more than half the population urbanized, and the southern cone dominated by immense individual landholdings, while the Andean region and Central America display a mix of large, medium and small landholdings, with the last category by farm the most common. As with the technological changes introduced over the last thirty years by the "Green Revolution", the medium and large scale farmers can be expected to face no difficulty in turning GM technology to their own advantage. But it is a moot question whether the same applies to small-scale and subsistence farmers.

Potential Impact on Rural Incomes and Livelihoods: Transnational GM Technology versus Developing Countries' Domestic R&D

One of the questions under close scrutiny is how GM technology is going to affect the incomes and livelihoods of small farmers and landless rural households, who are not only the majority population of the developing world but also its predominant suppliers of food and cash crops to domestic and export trade. The answer differs depending on the appropriateness, origin, ownership and control of the GM crops in question. On the one hand, there are half a dozen TNCs, which have so far put several lucrative GM crops on the global market (cotton, soya bean, maize, oil-seed rape/canola, sugar beet, tomato, potato and wheat) and are on their way to introducing some more in the near future (rice, mustard and tobacco).

On the other hand, there are public-sector research institutions in a few developing countries, which are in the process of innovating genetically modified versions of local varieties of subsistence and cash crops (GM local crops), that small farmers grow for their own use and the local market, which are vital not only for their daily subsistence income but also for basic consumption by the poor majority (e.g. local varieties of maize, rice, wheat, cooking banana, cassava, yam, potato, sweet potato, chickpea, tomato, papaya, cabbage, cauliflower, etc.). These will be crops, developed either by local seed companies or public breeding institutions registered under national plant variety protection (PVP) regimes, or community developed farmer varieties. The ownership and control of the improvements to the latter type of crops, and the rules of sharing the economic benefits resulting from them, will not be easy to establish, since PVP regimes in most cases fail to acknowledge established farmer varieties. However, plant genetic resource regulations may fill this gap.

The potential benefit of current commercial GM crops arises from the transgenes that either confer resistance to certain globally occurring plant pests and diseases, or immunity from certain chemical herbicides that wipe out all other vegetation in the areas sprayed. In the former case, potential monetary savings accrue to the farmer by obviating the need to use certain pest-specific pesticides and there is a net safety gain for workers by minimizing the use and exposure to toxic agrochemicals. In the latter case, the potential gain is from the yield rescued from the weeds. These broad spectrum herbicides were developed with the industrialized countries' commercial farmers in mind, for whom the decisive issue is the saving of labour costs prevalent in their high-wage economies.

The current commercial GM-crops are designed primarily with the high-income markets of the industrialized world in mind and may turn out not to be appropriate to the very different socio-economic contexts of rural Africa, Asia and Latin America. The potential risks faced by the rural communities in developing countries that may adopt the current commercial crops are related to the:

i) monopoly control that the TNCs developing country agents/subsidiaries/joint-ventures exercise on the price of the GM-seeds;
ii) need to buy GM-seeds for every new planting season to maintain high yield levels and fulfill farmer's agreements with the seed selling companies;
iii) dependency on new generation of GM-seeds or a reversion to old technology to address resistance that plant pests and diseases are likely to develop;
iv) profitability margins being squeezed between increasing seed prices and declining harvest selling prices, and

v) possible loss of existing robust crop varieties and technologies, thereby reducing the diversity, flexibly and resilience of farming systems, and increasing vulnerability to events that could lead to famine.

Most of the concerns are not unique to GM-crops. To some extent, they are the same as the concerns raised when hybrid seeds and elite cultivars were introduced some decades ago. One new component, however, is the stronger IPR protection accorded to GM-technologies and crops. Additional concerns have to do with the ongoing globalization and liberalization of markets, and the changes in agricultural systems and how this is impacting on rural societies. Turning these arguments around, it could be said that developing country farmers can benefit from improved commercial seeds, even if they cost more *provided* they are able to produce more and find a market for their products at *reasonably profitable prices*.

Turning now to the public-sector R&D institutions in developing countries, they have a greater possibility of responding seriously to *specific local* requirements than the TNCs with their globalised and globalising approach. National and provincial agricultural Universities and other GM-related R&D institutions are aware of the local farming and agronomic practices, the economic, infrastructural and social constraints facing the local farming community, seed producers and traders, and local consumer preferences. Were they do let this awareness determine their R&D work, they would avoid the risks associated with the monopoly and global approach of the TNCs, and be able to deliver benefits identified by the local people themselves.

Impact on agricultural practices: Seed saving, biodiversity and inputs into agriculture
For the sake of maximizing their profitability, medium-and large-scale farmers in some parts of the developing world have tended to concentrate on monoculture of certain varieties of staple cereals and industrial crops. Like their counterparts in the industrialized countries, they have become practitioners of industrialized agriculture, buying new seeds and agrochemicals from agribusiness companies every planting season. They have paid scant attention to preserving agricultural biodiversity.

The situation is quite different with regard to the small farmers. Tradition has taught them that in order to ensure their own food security, *within the severe limits set by semi-subsistence cultivation*, they have to preserve genetic diversity in the crops they cultivate, so that an epidemic caused by a pest or a disease or a climatic stress cannot wipe out their entire production. For this, as well as other economic, social and cultural reasons, small farmers have saved seeds from one harvest to the next to replant and exchange. Fortunately, while they may accept the cultivation of some GM crops, they are most unlikely to give up their seed saving and intercropping cultivation practices that ensure the conservation of genetic diversity on their plots. These practices find support in the International Treaty on Plant Genetic Resources for Food and Agriculture.

From the standpoint of the developing countries, a potential risk factor associated with commercial GM-technology is the attempt by some TNCs to incorporate the Gene Use Restriction Technology (GURT, or the so-called “terminator technology”) into their GM seeds. GURT systems make seeds sterile and therefore useless for replanting, obliging farmers to buy new seeds every planting season. The US Department of Agriculture and Pioneer (now part of DuPont) were the first public-

private partnership to announce work on GURT. But following an international outcry, they backtracked and agreed that GURT could compromise small-scale farming practices. However, a report emerged in mid-2003 indicating that the GURT option was being revived as it offers a viable mechanism to stem gene flow from GM crops. However, it would be safe to predict that TNCs will face tremendous opposition if they tried to impose GURT on developing countries. In fact, a number of developing country biosafety frameworks have stated that they will not approve GM technologies that could impact negatively on a farmer's right to save seed.

Even if the cultivation of some GM-crops becomes established and widespread among farmers in the developing world, the cultivators' present dependence on fertilizers, pesticides, and herbicides, and on pump-fed and canal irrigation, will not cease. What the GM technology allows them to do is to dispense with only those inputs that the transgenes make redundant. In other words, GM-technology is not a magic wand that does away with the current dependence on inputs. What it could lead to is some increase in monetary and safety benefits through savings on some chemical inputs, irrigation and increased shelf-life (for vegetables and fruits).

ROLE OF PUBLIC-SECTOR R&D INSTITUTIONS IN DEVELOPING COUNTRIES

Historically, necessary conditions for the successful dissemination and use of the public-sector R&D innovations was that the innovated technologies were transferred free of charge to the local and national entrepreneurs and companies, and were backed up by free and reasonably prompt technical advice. However, the resources required forgoing "from the lab to the market" are too heavy to be borne by the R&D institutions themselves and it may be time to consider another model that might include selling the innovations to the domestic pubic and private sector agricultural companies to recover the costs. Alternatively, the full costs will have to be met by the national governments (through, for instance, national research councils) and by foreign donors in the case of the poorest countries.

A review of the GM crops developed so far in developing country public research organizations shows that the major constraint to final release of the new, improved and tested varieties is the cost of the biosafety process. This cost now equals the cost of development and was not included in project budgets initiated 10 years ago.

There is always the risk of the public-sector R&D institutions not being able to deliver the innovations expected of them by government authorities, the farming community and other GM stakeholders. One indispensable element in any strategy designed to improve the institutions' ability to "deliver" is to develop their institutional capacity (functional-competence, resources and structure). The 'capacity issue' is covered not only with respect to R&D institutions, but also in relation to government entities and CSOs (including NGOs). Our brief examination there will include the capacity to conduct studies on socio-economic impact, as well as other agro-biotechnology issues.

CONCLUSION

There are issues that that need national, regional and global consideration in terms of both ethical and social consideration regarding the application of modern biotechnology. GMOs have been growing for less than a decade in a few countries and there are great scientific uncertainties regarding the safety of GMOs and their potential risks to the environment, health, food and animal safety. This calls for an approach that emphasizes the precautionary principle in regulating international trade in living modified organisms.

The other ethical concern is that most developing countries have no Biosafety regulations but are under pressure from GMO exporting countries to implement weak Biosafety regulations and to accept GMOs, e.g. through food aid.

This calls for the region to develop collective regional policies on food aid that address the array of potential risks in all facets of the technology.

THE CONSERVATION AND SUSTAINABLE USE OF BIODIVERSITY IN SOUTHERN AFRICA

By Enos Shumba, SADC Biodiversity Support Programme, enos.shumba@iucn.org

Contextual framework

There is increasing recognition of the following realities on the environment in Southern Africa (SADC, 2005):

- That the environment is the foundation for socio-economic well being and sustainable development;
- That the health of the Southern African Development Community (SADC) inhabitants depends directly on the essential goods and services (e.g. clean water, clean air and catchment areas) provided by the environment;
- That the environmental sector can significantly contribute to reducing unemployment through sustainable environment based industries (e.g. bio-gas production, waste management and eco-tourism);
- That sustainable use and management of environmental goods and services can significantly help in the fight against poverty and food insecurity, thus contributing to enhanced livelihood security; and,
- That there is a direct relationship between poverty and environmental management. Due to lack of alternative livelihood sources, poor people are exerting undue pressure on limited biological resources, leading to environmental degradation.

The central role played by environmental issues in the region's socio-economic development agenda coupled with their trans boundary nature has motivated SADC Member States to sign, and/or ratify and accede to a number of Multilateral Environmental Agreements (MEAs). They include the Convention on Biological Diversity (CBD); the United Nations (UN) Convention to Combat Desertification (UNCCD); the Ramsar Convention on Wetlands; the Cartagena Protocol on Biosafety; the Kyoto Protocol of the UN Framework Convention on Climate Change (UNFCCC); the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA); and the World Intellectual Property Organization (WIPO).

Table 1 shows the status of SADC Member States on these MEAs. With the exception of the CBD, the UNCCD and the WIPO that have been ratified by all countries, some States have yet to do so with the other international instruments.

This paper focuses on the Convention on Biological Diversity (CBD), whose three pillars are the conservation, sustainable use and equitable sharing of benefits from biodiversity. It highlights the current situation of biodiversity in the region and gives two examples of key challenges on the subject

Table 1: Status of SADC Member States regarding some Multilateral Environmental Agreements.

Country	CBD	Cartagena	ITPGRFA	Ramsar	UNCCD	Kyoto	WIPO
Angola	r	-	s	-	r	-	m
Botswana	r	r	-	r	r	a	m
Lesotho	r	a	-	a	r	r	m
Malawi	r	-	r	r	r	a	m
Mozambique	r	r	-	s	r	r	m
Namibia	r	-	s	r	r	a	m
S. Africa	r	a	-	r	r	a	m
Swaziland	r	-	s	-	r	-	m
Zambia	r	a	s	r	r	s	m
Zimbabwe	r	-	s	-	r	-	m
DRC	r	-	a	r	r	r	m
Mauritius	r	a	s	r	r	r	m
Tanzania	r	a	s	r	r	r	m

Key: r=ratified; s=signed; a=acceded; m=member

CURRENT BIODIVERSITY SITUATION IN THE REGION

Biodiversity can be defined as the variation between ecosystems and habitats; the variation between different species; and the genetic variation within individual species. It is a system of interactions between genes, species and ecosystems they form, influencing and influenced by ecological and evolutionary processes. The processes help to sustain biological systems and to ensure their productivity. Biodiversity forms the foundation of the vast array of eco-system products and services that contribute to human well being and drives the economies of SADC Member States. It is underpinned by the following realities:

- A very high incidence of genetic resources that transcend national borders established during colonial times. Without a coordinated regional approach, Member States risk being dragged into a “a race to the bottom” when competing for bio prospecting and biotrade investments; and,
- Several ethnic groups within and across State borders hold much of the traditional knowledge on genetic resources. This constitutes a potential source of ethnic conflict that the region can ill afford.

It is against the foregoing background that SADC has produced a Regional Biodiversity Strategy. The Strategy provides a road map for cooperation in biodiversity conservation and its sustainable use across Member States.

Although Southern Africa is endowed with biological resources of economic and significance, it has not been able to effectively transform this biological capital into goods and services that assist the region to achieve Millennium Development Goals (MDGs) 1 (on poverty eradication) and 7 (on environmental sustainability). It is against this background that one of the three strategic areas of the Regional Biodiversity Strategy is the enhancement of the region's economic and business base by adding value to and commercializing its biological resources; and broadening and diversifying its industrial and manufacturing base. This is in recognition of the fact that business creates wealth and wealth fights poverty. Economic diversification will be achieved by seeking and establishing "green markets" for value added products. The "Bio trade will be tackled within the context of existing regulations and agreements that govern international trade in biological products. This development will be linked to the certification and/or domestication of affected species to guard against the unsustainable harvesting and exploitation of the resource. The success of the commercialization drive will largely depend on successful training, research and development efforts in bio prospecting and value addition. However, the concept of value addition and commercialization might involve some genetic engineering (shuffling of genes from one organism to another) and thus brings into play issues of biosafety.

Cases of bio piracy are on the increase in the region. A number of plant and animal species have been patented by Multi National Corporations with very little to no benefits accruing to the region and its people. It is against this background that SADC, with its rich biological diversity, supported the need for a legally binding international instrument on Access and Benefit Sharing at the Conference of Parties (COP 8) of the Convention on Biological Diversity (CBD) held in March 2006 in Brazil. Such an instrument is intended to regulate access to genetic resources, their products and derivatives; protect the knowledge and practices of local and indigenous communities; and support national legislation. However, negotiations on the regime were very slow and disappointing and the text on it remains heavily bracketed. Although a process to move the international regime forward was agreed upon, the issue is unlikely to be resolved soon. It is against this background that SADC Member States have agreed to develop national regulatory frameworks on Access and Benefit Sharing that will be underpinned by a regional approach and/or mechanism.

There is now a high level of scientific certainty that human induced climate change will have severe negative impacts at the global level in the next few decades. In the case of Southern Africa, the effects are likely to include:

- More frequent and severe droughts;
- More frequent and severe flooding;
- Increased incidence of human and animal diseases as well as crop and pest and diseases; and,
- Increased water and food insecurity.

This will worsen the region's capacity to provide adequate food to its citizens. Consequently, the issue of international food aid, as it relates to biodiversity in the region is critical. SADC has no policy on dealing with Genetically Modified Organisms (GMOs) but it has developed guidelines on the subject. For example, during the 2002-3 droughts, the region imported some GMO maize to offset part of its food deficit of 3.3 million metric tonnes. While some Member States rejected the grain on grounds that they lacked a national policy framework to deal with GMOs, others received it and fed their hungry citizens. This lack of a coherent regional policy framework on GMO imports could have long term implications SADC's maize germplasm that could have been polluted by the imports. Furthermore SADC Member States were not adequately educated on the potential and adverse effects of GMO food on human health to enable them decide whether or not to consume the grain. Consequently, the need for national and regional policy frameworks and awareness strategies on GMOs cannot be over emphasized. It is therefore gratifying to note that some Member States have or are in the process of developing legislation on biosafety.

EXAMPLES OF KEY CHALLENGES ON THE REGION'S BIODIVERSITY

This section highlights cases of possible genetic contamination and bio piracy on the region's biodiversity.

Genetic Use Restriction Technologies

In many parts of the developing world, gene flow (including through cross pollination and seed dispersal via grain food aid) from genetically modified plants is causing unwarranted genetic contamination. In essence, genetic contamination is a new type of industrial pollution that involves living organisms and replicating organisms which cannot be controlled or replicated and can increase over time.

In response to genetic contamination, the biotechnology and seed industry is promoting Genetic Use Restriction Technologies (GURTs) or Terminator technology as a biosafety tool. It is argued that engineered sterility in the GURTs offers a built in safety feature in that if modified genes from a genetically modified terminator crop get transferred to related plants through cross pollination, the resultant seed would be sterile and hence contamination would not spread.

Over 60% of the population of Southern Africa is rural, is dependent on subsistence agriculture and relies on farm saved seed for planting. GURTs produce seeds that grow into sterile plants. They could therefore force the region's resource poor subsistence farmers to purchase new seeds every year. Such a development might increase food insecurity at the household, national and regional levels. It is against this background that SADC completely rejected a recommendation to research and study GURTs on a "case by case risk assessment basis" at COP 8 in Brazil. It was therefore gratifying that the Conference rejected this recommendation in favour of a defacto moratorium on GURTs.

Cases of bio piracy and the Hoodia Access and Benefit Sharing Agreement

Some slow progress is being made to reduce cases of bio piracy highlighted earlier through the regulation of access to the region's genetic resources by outside parties.

This is illustrated by the case of the Hoodia succulent, *Hoodia gorgonii*, a plant with appetite suppressant qualities. The San people's traditional knowledge on the Hoodia plant, freely conveyed to anthropologists and researchers many decades ago, provided the crucial lead that guided scientific tests towards the invention and eventual registration of an international family of patents on the treatment of obesity by the South African Council for Scientific and Industrial Research (CSIR) who later licensed Phytopharm in the United Kingdom to undertake further development and commercialization of the invention. In the absence of access and benefit sharing legislation, and as a result of international media exposure of the Hoodia case, CSIR and the South African San Council entered into negotiations to develop a Memorandum of Understanding, in recognition of the collective rights of the San as the owners of the indigenous knowledge on the use of the Hoodia. The Agreement entitles the San people to obtain a certain percentage of royalty payments received by CSIR. Though not perfect, it provides useful insights into the development of regulatory frameworks on Access and Benefit Sharing in the region.

KEY ISSUES FOR THE INTERNATIONAL REGIME ON LIABILITY AND REDRESS FOR DEVELOPING COUNTRIES

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BACKGROUND

The mandate of this discussion within the framework of the Awareness workshop is primarily to articulate the status of article 27 of the Cartagena Protocol on Biosafety and to provide to Civil Society, Media and Legislators information on the key issues as well as to open for discussion the rationale and possible solutions to some of the challenges arising from these issues.
The objectives of the workshop are:

1. *To get scientists, media and civil organizations to interact and share understanding of issues concerning modern biotechnology, biosafety and sustainable use of biodiversity*. In the context of this objective, the legalities on what constitute damages require relevant technical scientific knowledge and use of that knowledge to determine damage; the occurrence, processes and extent of damage. Civil society organizations are important players in monitoring changes to the environment and biological diversity because quite often CSOs interact and work very closely with communities and different constituencies that are directly depended on biological resources and the environment. Furthermore, CSOs are an integral part of a democratic society and provide a crucial role of advocacy in the societies they function in.

2. *To impart knowledge on modern biotechnology and raise awareness on why biosafety frameworks are a must for SADC.* Environmental protection, conservation and sustainable use of biological resources and the use of biotechnology bring a combination of different disciplines together. A forum such as this workshop, provides an opportunity not only to meet at regional level, but to impart knowledge through sharing and thus rising awareness on the different roles that disciplines and actors play in monitoring the use of biotechnology, noting damage should it occur and finding and providing ways of mitigating the damage in order that all can benefit from the conservation and use of biological diversity.

3. *To raise awareness on the need fort effective participation by civil organization and media in decision making on biotechnology, biosafety and the environment.* The participation of CSOs including the media in decision-making on assessment of damage in order to compute redress measures begins at the time that the use and application of GMOs in their societies and constituencies is approved, based on the conditions of approval, on the information provided by the users, the risk assessment and management plan and the expected results of the GMO. It then becomes the mandate of CSOs to monitor these developments and to continue to provide the latest information to all involved so that potential damage is adequately addressed and all involved know what recourse to take.

4. *To discuss the potential impact of biotechnology on the environment - (will the introduction of modern biotechnology support or undermine the 2010 biodiversity target?*) This objective in the context of liability and redress is important, should there be an damage resulting form the use of GMOs, what type of measures will be taken to address that so that the 2010 Biodiversity Target becomes a reality? COSs including the media have a role to play by providing information on the options for elements of a robust effective liability and redress regime by going back to the societies and constituencies to provide information and solicit answers that they can use to lobby Governments in advocating for a just and feasible liability and redress regime.

5. *To discuss Article 27 of the Cartagena protocol on biosafety and the potential role of each of the stakeholder grouping represented in ensuring effective public participation in decision making processes.* In the same line of thinking as reflected in objectives 1, 2 and 3 of the Workshop above the role of CSOs including the media is relevant in lobbying the legislature for policy and legal frameworks that enable the opportunity for seeking redress on damage caused by the use of GMOs. CSOs including the media are the voices of societies and communities in policy and law making for the development of enabling frameworks that recognize the right of public participation in decision-making and the right to seek remedies for harm caused by GMOs.

6. *To create awareness and raise interest of media personnel to report on modern biotechnology, biosafety and the environment responsibly.* The media is a powerful tool in ensuring just and democratic processes in governance, the role of all forms of media in environmental and sustainable development fields is perhaps the most important because all livelihoods are directly depended on the environment and the availability of biological resources. The media should therefore be appropriately equipped with information on both the potential benefits of GMOs and the potential adverse impacts and the channels available for seeking recourse for remedies for those affected as well as the environment in order that the media reports responsible.

INTRODUCTION

The question of apportioning liability and responsibility for damages resulting from GMOs permeated the negotiations of the Cartagena Protocol on Biosafety (CPB) until the conclusion of the Protocol. Those who sought that the issue be included in the CPB argued that it is important to have the issue resolved since biotechnology developments are taking place already and continue to do so at an advanced rate. The camp that was generally against the inclusion of the liability and redress in the CPB were of the view that the liability for environmental harm is already addressed in other agreements and areas of law, that in any case it would be very difficult to implement such a regime. It was however agreed that the issues of liability and redress in the case of genetic engineering are indeed complex and could not be concluded within the time frame allocated for the negotiations and conclusion of the Protocol.

At the conclusion of the Protocol, it was agreed that a regime for liability and redress be elaborated on by the Parties. This agreement is contained in Article 27 of the CPB which stipulates that
…the 1st Meeting of the Parties shall adopt a process to elaborate "international rules and procedures in the field of liability and redress for damage resulting from transboundary movements of living modified organisms and shall endeavour to complete this process within four years." The rationale for this process is to set out uniform rules and procedures for handling the damage caused by LMOs/GMOs in a transboundary context, including mutual recognition of judgments.

Given that mandate under Article 27, the 1st Meeting of the Parties in Kuala Lumpur in February 2004, established an Open-ended Ad Hoc Working Group of Legal and Technical Experts on Liability and Redress and adopted the terms of reference for the Working Group, as well as an indicative work plan. The Working Group is supposed to meet 5 times to negotiate a liability and redress regime, and is scheduled to complete this work by 2007, in order for the following Meeting of the Parties to complete the process by adopting the liability and redress regime within the mandate of four years (2008).

The 1st meeting of the Working Group was held in May 2005 in Montreal. The meeting elaborated on the different options, approaches and issues, scenarios and possible elements.

The 1st meeting of the Working Group invited Parties, other governments, relevant international organizations and stakeholders to submit views, in particular with respect to approaches, options and issues in the annex to the report, preferably in the form of proposals for text, no later than 3 months before the 2nd meeting of the Working Group.

The 2nd meeting of the Working Group took place from 20-24 February 2006 in Montreal. Accordingly, the CBD Secretariat requested for views to be submitted no later than 1 November 2005.

In order to move the process forward, the Co-Chairs of the Working Group, with the assistance of the CBD Secretariat will synthesized the proposed text that was submitted, and produce a working draft for consideration by the 2nd meeting of the Working Group. It is expected that the working draft produced by the Co-Chairs will form the basis of the text that will be negotiated in the Working Group meetings. The issue of liability and redress for damage arising from GMOs under the Protocol is therefore on-going work.

The concerns regarding the allocation of liability for damage caused by GMOs in order to claim remedies to address the damage is based among other reasons on the clear acknowledgement by the international community that GMO have a potential to cause damage to biological diversity and the environment. This is reflected in Articles 8(g) and 19(3) of the Convention on Biological Diversity (CBD) 1992, and the entire Cartagena Protocol whose main objective is to minimize the potential risks caused by GMOs to biological diversity, socio-economics and human health. The fact of this acknowledgement indicates that the concerns over possible damage and the need to have a system for compensation are not misplaced especially in the developing countries where the majority of the people are directly dependent on the availability of biological diversity and whose countries are largely regarded as large markets for the GMO industry. Furthermore the need for an international regime is supported by the fact that there is no international law rules that are specific to GMOs, international rules are necessary due to the fact that the subject matter of GMOs is across boundaries, it is of international concern and therefore international law should apply.

CHOICE OF INSTRUMENT

This issue is of primary importance to developing countries. Developing countries should bear in mind that the type of instrument that is chosen to lay down the rules on liability and redress will determine the effectiveness in implementing and enforcing the rules. Guidelines, procedures and such other non-binding instruments are not the best option for an enforceable workable regime.

Some developing countries are advocating that the legally binding instrument should be a Liability and Redress Protocol to the Cartagena Protocol on Biosafety. This is the most sensible route to take. An international regime on civil liability enables the facilitation of transboundary litigation through the provision of unified procedures and a body of binding substantive norms on key issues thus ensuring that these issues receive mutual recognition and enforcement. Some aspects of state liability are necessary. In a civil liability regime, all legal entities, natural or juridical have an opportunity to lay claims for damage and seek redress.

Due to the fact that GMO movement, use and application is already ongoing, many developing countries advocate for interim measures to be put in place immediately, pending the development and entry into force of the liability and redress protocol. The interim measures, and the development of such measures must not prejudice or delay the development of the liability and redress protocol, the measures should be such that they can easily be integrated into the liability and redress protocol.

SCOPE

Developing countries should be aware of the area and extent of coverage of the liability and redress protocol because the scope of any instrument has to have limitations and anything that is not included in the scope cannot be submitted for hearing even if the damage is directly caused by the subject matter of the CPB. It is therefore advisable, that the scope of the liability and redress protocol should be in line with the scope, objectives and subject matter of regulation under the Cartagena Protocol on Biosafety. On that basis, the scope of the international liability and redress protocol should cover damage resulting from the transboundary movement, transit, handling, and use of all living modified organisms and their products. It should include intentional, unintentional and illegal transboundary movements. In other words the scope should cover damage caused by activities that have been approved, gone through a risk assessment and all the procedures as required under the CPB on

transboundary, transit, handling and use of LMOs in the transboundary context. The scope should also cover unintentional movements, these are accidental transboundary movements, and finally it should cover damage arising out of activities that are not sanctioned by law, that is those that are illegal.

The international liability and redress protocol should apply to damage caused in areas within the limits of national jurisdiction or control of Parties as well as in areas beyond any national jurisdiction.

The scope should cover all legal persons, that is, the natural and juridical persons as well as the State in the identification of a person responsible for damage, or identifying persons entitled to lay claims and receive damages.

DAMAGE

This key issue, requires consideration of possible damages, in other words it requires developing countries to reflect on classification of damage based on the nature, behaviour and properties of GMOs during use, handling, movement including transitory movement. There is need to further consider carefully what constitutes use of a GMO, handling and movement of a GMO and apply the different scenarios these activities arise and occur in order to ensure that the classification of damage does not exclude any damage that can possibly be caused by a GMO. The types of damage should include the following:

1. Damage to the environment includes:
    - loss or changes to biological diversity, this could include genetic erosion or genetic contamination
    - Impairment of soil quality, often soil quality is directly linked to agriculture and socio-economics as well as microorganisms, plant and animal biological diversity found in the wild.
    - Impairment of water quality – important for not only portable water but for marine and freshwater biodiversity.
    - Impairment of air quality directly linked general human health and survival of biological diversity.

2. Damage to human health includes:
    - Loss of life or personal injury – could include adverse reaction to GMOs, allergenicity and lack of available traditional medicine.
    - Loss of income – due to a variety of effects such as loss of GE free markets.
    - public health measures,
    - impairment of health

3. Socio-economic damage, especially in relation to indigenous people and local communities includes:
    - loss of income
    - impairment or loss of cultural, social and spiritual values
    - Impairment or loss of food security, food security is based on the diversity of biological resources so genetic erosion or displacement or loss of species are real problems on food security.
    - Loss of competitiveness due to displacement in the markets.

4. Traditional damage:
    - loss of life or personal injury
    - loss of or damage to property
    - economic loss

5. Cost of response measures including remediation and restoration

6. Cost of preventive measures

The burden of proving damage should be reversed.

STANDARD OF LIABILITY

Most of the developing countries are advocating for strict liability. Strict liability exists in civil law in all the Southern African countries and at international level, and represents liability for damage even if the damage is caused by no fault of the liable person. **Strict liability** is a legal doctrine that makes a person responsible for the damage and loss caused by their acts and omissions regardless of culpability (or fault in criminal law terms, which would normally be expressed through a *mens rea* requirement, that is the intention of causing harm. Strict liability is important in torts or delict (especially product liability, corporations law and criminal law).

Under the laws of torts/delicts the plaintiff needs only to prove that the tort happened and that the defendant was responsible. Neither good faith nor the facts that the defendant took all possible precautions as provided in the risk management plan are valid defenses.

Strict liability is sometimes called absolute liability to distinguish those situations where, although the plaintiff does not have to prove fault, the defendant can raise a defense of absence of fault.

The law imputes strict liability to situations it considers to be inherently dangerous. It discourages reckless behavior and needless loss by forcing potential defendants to take every possible precaution. It also has the effect of simplifying litigation and allowing the victim to become whole (compensated) more quickly.

The Cartagena Protocol has all these elements, it has a product (GMOs) which although is not expressed as being inherently dangerous is internationally acknowledged as having “potential adverse effects” on the environment, biological diversity, socio-economics and human health; the key actors are corporations and there is a criminal element in the event of breach of conditions or provision of false information.

It is for those reasons that strict liability should apply.

Liability may only be mitigated in the following cases:

1. Damage caused directly by an Act of God where such occurrences could not have been reasonably foreseen and are of an exceptional nature;
2. Damage caused directly by an unforeseeable act of war or civil unrest, unless this is instigated or initiated by the Party;
3. Damage caused wholly by the wrongful intentional act of a third party.

- This shall not apply where the damage results from any false, misleading or fraudulent claim or the suppression or omission of any material facts by the person under the obligation to provide such information.
- This shall not apply unless it can be shown that the person under the obligation to provide such information has ensured or has taken all reasonable steps to ensure that the third party has understood all material information.

CAUSATION

Cumulative effects resulting from an LMO, multiple LMOs or multiple incidents that cause damage should be taken into account.

The complexity of interaction of LMOs with the receiving environment and time scales involved should be taken into account, but causation cannot be avoided on the basis of these complexities, so long as the damage or any part of it can be related to that LMO. Legal causation is concerned not only with the question of who or what caused harm, but also with the *extent* of harm to be attributed to the defendant's act.

There should be a reversal of the burden of proof in establishing causation. If a basic causal link can be established between damage and an LMO, then the person or entity deemed liable has to prove that the damage was not caused by the LMO in question.

CHANNELLING OF LIABILITY

Any one or more of the following, including persons or entities acting on his, her or its behalf, should be held liable depending on the circumstances, including:

- the exporter
- the Party of export
- any person who holds the approval (licence) in the Party of export
- the developer
- the producer
- the importer
- the carrier
- the supplier

The circumstances should include intentional, unintentional and illegal transboundary movement, and should be in respect of damage caused by LMOs for introduction into the environment, LMOs for direct use for food or feed or for processing, LMOs for contained use, and LMOs in transit.

Where the primary liable person cannot be identified, the Party of export should be held liable.

NATURE AND TIME OF RELIEF

There should be provision for interim relief, both monetary (e.g. if damage is established but the nature and extent are still unknown) and non-monetary (e.g. injunction). When damage has occurred, there should be an immediate obligation for cessation of the activity that could cause further damage.

NATURE AND EXTENSION OF LIABILITY

This issue of key importance to developing countries, who quite often may not necessarily be the manufacturers of a GMO but may have a number of actors involved in the process, from the time of manufacture, shipment, handling, distribution, placing in the market of a GMO and introduction into the environment. Joint and several liabilities therefore are important for harm caused by a GMO in the context of developing countries. Joint and several liabilities involve two or more persons acting independently so as to cause the same damage to a plaintiff. Where two or more persons, acting independently of each other, have by their

separate acts brought about a single and specific injury to another person, the law holds them jointly and severally liable for the full loss. The law treats each person as the effective cause of the plaintiff's entire loss and therefore allows the plaintiff to seek full compensation from any of the defendants found liable.

A defendant who compensates a plaintiff has a right of contribution from the other parties who are liable. This right allows the court to make an order requiring each defendant who has caused or contributed to a plaintiff's loss to contribute to paying the judgment according to the extent of his or her responsibility for the loss. For example, where a plaintiff's loss is found to have been caused by the acts of three different defendants, joint and several liability holds each of the defendants 100% liable to the plaintiff and the plaintiff is entitled to seek full payment from any one of them. Among the defendants, however, responsibility may be apportioned, for example, 35% to Defendant 1 (D1), 40% to Defendant 2 (D2) and 25% to Defendant 3 (D3).

Although a right of contribution gives a defendant the opportunity to reduce his or her ultimate liability, it has no meaning when the responsible co-defendants are insolvent or unavailable. In these situations, a solvent defendant under a joint and several liability regime must bear the cost of another defendant's insolvency or unavailability. This also ties in with the concept of an establishment of an insurance legal fund under the liability and redress regime.

Another key issue in determination the nature and extent of liability for developing countries is that of the application of vicarious liability.

Vicarious liability is a legal concept that means that a party may be held responsible for injury or damage, when in reality they were not actively involved in the incident. Parties that may be charged with vicarious liability are generally in a supervisory role over the person or parties personally responsible for the injury/damage. The implications of vicarious liability are that the party charged is responsible for the actions of their subordinates.

The intent behind vicarious liability is that the proper party must be held responsible when harm is done. Manufacturers of GMOs, for instance, have a responsibility to ensure that their products do not cause harm to the environment, biological diversity, socio-economics and human health.

There should be provision for the lifting of the corporate veil in order to ascertain the principals. This is for situations including where companies may set up shell companies or claim that they are separate legal entities to avoid liability.

There should be a right of recourse among other wrong doers under the liability and redress protocol.

LIMITATION IN TIME

Limitation in time to bring a claim should run at least 10 years after the person or entity who has suffered the damage knows or ought to have known about the damage, and that it was caused by the LMO in question.

There should be no absolute time limit to bring a claim.

If there are multiple incidents which caused the damage, the limitation in time should run from the last incident.

If the incident takes place over a period of time, the limitation in time should run from the end of the incident.

Financial limit

There should be no upper financial limit.

INSURANCE AND OTHER FINANCIAL GUARANTEES

There should be a clear and mandatory obligation on Parties to ensure that insurance, bonds or other financial guarantees are established and maintained for amounts not less than a minimum limit. Proof of coverage should be provided before an activity takes place.

There should be a fund set up under the liability and redress protocol. The fund can be used to ensure redress in situations where redress was not fully obtainable including where:

- The liable person is bankrupt or ceases to exist
- A time limit has expired
- Financial securities of the primary liable person are not sufficient to cover liabilities
- The primary liable person escapes liability on the basis of a defence

STANDING/RIGHT TO BRING CLAIMS

The person who has suffered damage, the Party whose citizen has suffered damage, or any person or group of persons should be entitled to bring a claim in respect of

1. their own interest
2. the interests of a person/s who is unable to bring a claim
3. the interest of protecting the environment or biological diversity

SETTLEMENT OF DISPUTES, NON-COMPLIANCE

There should be strong mechanism(s) under the liability and redress protocol for dealing with non-compliance, dispute settlement and settlement of claims.

MONITORING

There should be mandatory monitoring and reporting of adverse incidents/impacts. Parties should report every case that may lead to liability. These cases should be posted on the BCH.

NON-PARTIES

Parties importing from non-Parties and Parties exporting to non-Parties should ensure that, in respect of liability and redress, such transboundary movement does not result in a lower level of protection as provided for under the liability and redress protocol.

WHAT IS COMMUNICATION?

By Rramaloi

Definitions of Communication include among others:

- A **fundamental element** of social behaviour that deals with the transmission of messages between the sender and the receiver using any one of the five senses.
- The **exchange of ideas**, opinions either through the spoken or written word.
- The **successful transmission** of information through a common system of symbols or signals: written word, speech or signals for example e-mail, telephones and fax.
- The **successful transmission** of information to the receiver so that he/she understands the message from the sender.
- A process of information exchange and ideas. It involves encoding transmitting and decoding messages. Different languages could be used in this process.
- "Communication in its broadest sense can be seen as the two-way process by which information is conveyed or transmitted from a communication source to a receiver who in turn reacts to this stimulus" van Schalkwyk (2005: 3).
- "Communication is a purposeful process of expressing, receiving and understanding messages containing factual information, ideas, feelings or needs by two or more persons by means of a set of common symbols" (2005:4).

THE PURPOSE OF COMMUNICATION

- **Three primary purposes**
  1. To inform
  2. To influence
  3. To express feelings

CLASSIFICATION OF COMMUNICATION

- **Intrapersonal communication;** takes place within person.
- **Interpersonal communication;** takes place between two or more individuals.
- **Mass communication;** involves mass communication media like the press, radio, television, telephones, satellite, computers, e-mail.
- **Extra personal communication;** takes place between human and animals or inanimate objects.

COMMUNICATION METHODS

- Radio
- Television
- News papers
- World Wide Web (internet)
- Tele conference
- Electronic mail

BARRIERS TO EFFECTIVE / COMMUNICATION BARRIERS

There are problems in the communication process; sometimes what we say may not be understood due to a number of reasons. Once we know the barriers that make our communication ineffective we can improve the way we communicate.

- **Physical barriers :** these are related to noise from a passing car, snow on television , etc
- **Physiological barriers:** bodily defects that could cause pain; poor eye sight, poor hearing ability, or any other physical discomfort.
- **Psychological barriers:** negative attitudes towards the sender of the message by the recipients because of boredom, fear, inferiority complex, etc
- **Perceptual barriers: related to one's world view , experience and differences in values that is brought about by differences in the following;**
    1. Age
    2. Background
    3. Education and skills
    4. Intelligence
    5. Interests and needs
    6. Occupation
    7. Personality and attitudes
    8. Nationality and race
    9. Religion
    10. Gender
    11. Differences in Language proficiency

COMMUNICATION BARRIERS

There are four types that hinder communication:

1. **Language barrier:** due to educational background of both the sender and the receivers, use of specialized language, words having more than one meaning, some words may be used incorrectly, illogical presentation or use of wrong grammar. Usage of an inappropriate language like using English instead of Setswana, Seherero. **Example HOODIA**
2. **Interpersonal barriers:** differences and personal characteristics of the sender and the receiver of the message; age, status, role and cultural differences could hinder communication. Personality traits such as prejudice and insincerity, insecure, defensive personalities are not good communicators. **For Example Hoodia species which is an appetite suppressant in the Kalahari desert is potentially highly valuable to attack obesity ,yet there is little information that is communicated to the BASARWA;BARRIER OF EDUCATION AND STATUS EXIST; HOW DO YOU DEAL SUCH A PROBLEM?**
3. **Situational-timing barriers:** This deal with the time and place communication takes place. In our societies we are bombarded by so much information that we do not have enough time to process everything. If we are under great stress we may be incapable of processing information. The place where communication takes place may hinder it if it lacks privacy, is hostile or is uncomfortable. The amount of noise in the environment also affects the reception of information negatively.

4. **Procedural barriers / organisational structure**: these deal with how and through what structure a message goes from the sender to the recipients. The message may have to pass through many people before it reaches the recipients and this may result in distortions along the long route. Parts of the message may be ignored, omitted, or simply misunderstood. **QUESTION: Who has to communicate scientific information/ biotechnology and biosafety issues to the ordinary people?**

HOW TO OVERCOME THE COMMUNICATION BARRIERS

Communication barriers can be overcome in three **(3) primary ways:**

1. **Improving perception:** it involves putting yourself in another person's place and avoiding focusing on your own experiences and background. Perceptions are influenced by age, status, personality cultural background and other feelings. Put your communication to the level of the other person so that he/she would be able to understand the message. Take time to examine your own perceptions and ensure that they are not based on false information or prejudices.
2. **Improving the physical process of communicating: Pay** particular attention to the elements of communication. As sender ensure that you encode the message clearly either by selecting words or gestures carefully, use an appropriate channel to send the message; pay attention to the feedback you get from the receiver so that you could be sure that you were understood.
3. **Improving relationships:** building trust between yourself and the audience. Trust, honesty, integrity and confidence are essential for good communication so fulfil whatever promises you have made.

- **Speaking ethically:** Communication carries power and therefore the sender has to understand that he/she has to bear ethical responsibilities. When communication power is abused the results can be tragic. So, you must ensure that your goal is ethically sound. If your goal is a good one you do not become ethical if you use questionable methods to achieve your goal. There are four basic guidelines for ethical methods in communicating: Know your subject matter, be honest in what you say, use sound evidence, and use good and valid reasoning. Example: **There are ethical dilemmas in the use of transgenic crops there are suspicions that although these crops could alleviate human hunger there are risks associated with health and environment and socio-economic concerns**; how do you argue for the use of such crops when there are so many different ethical perspectives (Robinson1999)?

EFFECTIVE COMMUNICATION IN CONTEXT

- **Identify your audience:**
- **Identify your subject matter:**
- **Choose the appropriate channel:**
- **Choose the appropriate language code:**

WRITING EFFECTIVE PRESS RELEASE

Guidelines for effective writing:

- **Know your audience;** you have to know the level of understanding your reader has, choose the words and phrases your readers will understand.

- **Know why you are writing:** what is your purpose; to convince, persuasion, confirming information, or making a complaint etc.
- **Know your subject matter:** You have to know more about your subject otherwise you will not be able to communicate effectively.
- **Present your ideas clearly:** be sure that your ideas flow logically from point to point.
- **Be precise:** Do not try to impress your readers with big terms and long sentences, say what you want as briefly as you can.
- **Stay focused on the topic:** having an outline will help you stay focused on your topic.
- **Use correct grammar:** if you are unsure consult handbooks or text books.
- **Use correct style:** different types of writing have specific styles/ formats, decide which one to use.
- **Proofread your writing:** read it out loud, or have someone read it out for you. Check whether what you have written can be understood by your readers. Also check for errors in grammar and spelling.

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