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REGULATION OF GMO CROPS AND FOODS

KENYA CASE STUDY

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TABLE OF CONTENTS

I. INTRODUCTION **1**

II. THE AGRICULTURE SECTOR AND THE POTENTIAL ROLE OF GMOS IN KENYA **2**

Export Products and Markets **4**

A. Risks and Benefits of GMO Crops/Foods in Kenya **5**
1. Risks 5
2. Benefits 6

III. KEY ACTORS AND SOCIAL ATTITUDES **6**

A. Government GMO Regulatory and Management Authorities **7**
1. National Environment Management Authority (NEMA) 7
2. The Kenya Plant Health Inspectorate Service (KEPHIS) 7
3. Department of Veterinary Services (DVS) 7
4. The Kenya Bureau of Standards (KEBS) 7
5. National Council for Science and Technology (NCST) and National Biosafety Committee (NBC) 8

B. Institutions and others Involved in Biotechnology R & D **8**

C. Players outside Government & Technology Developers **9**
1. NGOs 9
2. Farmer Groups 9
3. Scientists' Lobbies and Networks 10
4. The Media 10
5. International Initiatives 10

D. Key GMO Policy Disputes in Kenya **11**
1. GMO or no GMO? 12
2. Access and property issues 13
3. Institutional home for biotechnology and biosafety policy 13

IV. STATUS OF GMO CROP RESEARCH & DEVELOPMENT IN KENYA **14**

A. Target crops **14**
1. Maize 14
2. Sweet Potato 16
3. Cotton 16
4. Cassava 16

V. NATIONAL REGULATION OF GMOS **17**

A. Laws and Regulations **17**

1. Proposed GMO Bill 18
2 Environmental Impact Assessment 19
3 Liability 19
4 Public Participation 20
5 Regulatory Capacity 20

VI. INTERNATIONAL AND REGIONAL DIMENSIONS OF KENYA'S GMOS LAWS AND POLICIES **21**

A. International Law **21**

B. Other International Influences and Issues **21**

1. Presence of international actors in Nairobi 21
2. Funding 22
3. Export Markets 22
4. US-EU Dispute 23

C. Regional Developments **23**

VII. ANALYSIS OF KENYA'S APPROACH TO GMOS AND CONCLUSIONS **23**

A. Summary of Kenya's approach **23**

B. Key Conclusions **24**

VIII. APPENDICES **25**

A. Table 1: Domestic exports by value Kshs.'000 - Principal commodities, 1994-2002 **25**

B. Table 2: Domestic Exports - Principal Commodities by Quantity (tonnes) 1994-2002 **26**

C. Table 3: Domestic Exports -Principal commodities as percentage of total value 1994-2002 **27**

D. Table 4: Export Statistics for flowers - Volume (2000-2003) **28**

ABBREVIATIONS

AATF	-	African Agricultural Technology Foundation
BecA	-	Biosciences eastern and central Africa
BTA	-	Biotechnology Trust Africa
CBD	-	Convention on Biological Diversity
CGA	-	Cereal Growers Association
CIMMYT	-	International Maize and Wheat Improvement Centre
CIN	-	Consumer Information Network
CIP	-	International Potato Centre
CRF	-	Coffee Research Foundation
DVS	-	Department of Veterinary Services
EA	-	Environment Assessment
EIA	-	Environment Impact Assessment
EMCA	-	Environment Management and Coordination Act
GMOs	-	Genetically Modified Organisms
GM	-	Genetic Modification
ICIPE	-	International Centre for Research on Insect Physiology and Ecology
ICRAF	-	World Agro forestry Centre
ILRI	-	International livestock Research Institute,
IPP	-	Intellectual Property Protection
IPR	-	Institute of Primate Research
IRMA	-	Insect Resistant Maize for Africa
ISAAA	-	International Service for the Acquisition of Agribiotech Applications
KARI	-	Kenya Agricultural Research Institute
KEBS	-	Kenya Bureau of Standards
KEFRI	-	Kenya Forestry Research Institute
KEMFRI	-	Kenya Marine and Fisheries Research Institute
KENFAP	-	Kenya Federation of Agricultural Producers
KEPHIS	-	Kenya Plant Health Inspectorate Service
KFA	-	Kenya Farmers Association
KIOF	-	Kenya Institute of Organic Farming
KIPI	-	Kenya Industrial Property Institute
NBC	-	National Biosafety Committee
NCST	-	National Council for Science and Technology
NEMA	-	National Environment Management Authority
NMK	-	National Museums of Kenya
TRF	-	Tea Research Foundation

I. INTRODUCTION

Three introductory points: first, Kenya's economy is heavily dependent on agriculture with nearly three quarters of Kenyans making their living from farming, producing both for local consumption and for export (See tables 1, 2 & 3 in the appendices below). Secondly, Kenya's population is high in proportion to its arable area and it is continuing to grow challenging the internal self-sufficiency paradigm that is at the core of Kenya's agricultural policy. Thirdly, most investments in biotechnology in Kenya have been in the field of agriculture.

The debate on agricultural biotechnology in many African countries oscillates between two extreme views. On the one hand are the diehard proponents of biotechnology who are impatient to have the technology adopted at all costs and present it as the magic bullet and panacea to the multitude of problems facing African countries. On the other hand are the anti-biotechnology groups who front concerns for human health and environmental wholesomeness as reasons to stop the technology. The public as consumers and the policy makers are somewhat bewildered as the debate continues over their heads. The debate has international dimensions as the proponents are quick to point to the successes of the technology in the United States of America while the opponents look to Europe and the crises that have been witnessed there which have undermined public confidence in the regulatory systems.

The need for African countries to develop appropriate biosafety and food safety regulations, and trade, and intellectual property protection (IPP) issues have led to great interactions between national legal systems and international regimes governing these issues. These are nuanced by international debates on biotechnology particularly the EU-US "cold war" with countries feeling compelled to take sides as a consequence of bilateral (often trade-related) relations with either the EU countries or USA.[1] In Kenya biotechnology development is taking place within the context of policies governing agriculture, health, trade and environment. The laws and policies in these areas have been undergoing change to respond to international treaties that Kenya has signed and ratified. Given that Kenya has used conventional science for a long time, for instance in the area of agriculture, the concern is how to streamline existing regulatory structures to make informed choices for national development imperatives. Any changes in the agricultural policies and practices in Kenya must take into account a number of factors. First, the preferences of consumers in the traditional markets for Kenyan agricultural products need to be factored in these changes to ensure continued access to markets. Second, neighbouring countries that are centers of origin of particular crops such as Ethiopia have expressed concerns that Kenya's approach to GMOs might impact on the landraces for these crops within their countries. However founded or unfounded such fears might be, it is critical that Kenya adverts to them in light of Ethiopia's very strong anti-GM voice in the continent and globally. Third and finally, Kenya is the African country with the greatest concentration of organizations working on GMOs and is the furthest along the line of experimentation with GMOs. Neighbouring countries look up to Kenya to lead the way in developing clear frameworks for GMO development and commercialization. These considerations call for a co-ordinated and well-thought approach by sectors in Kenya that can potentially apply biotechnology.

The emerging GMO environmental, health and safety regulatory system in Kenya includes a combination of policy, legal, administrative and technical instruments set in place to address safety for the environment and human health in the context of genetic modification. It includes a proposed policy on biotechnology and biosafety, a draft GMO bill and regulations and guidelines for hands on work on genetic modification. These instruments include risk assessment and management procedures, mechanisms for monitoring and inspection and a system to provide information to stakeholders about the national biosafety framework and for public participation.

It is the regulatory framework that illustrates the normative principles guiding the investment in genetic modification in Kenya. These include the precautionary principle, environmental sustainability, poverty alleviation, assurance of food security and economic development. It is worth noting at the outset that the application of genetic modification in Kenya is in the infancy stage. There has not been any commercialization of GM products and current activities are in the laboratory and field trial stages. The approach to the technology is consequently based on conjectures and opinions from other countries rather than actual local experiences.

This paper is divided into six parts. Following the introduction and summary, part II looks at the agriculture sector in Kenya, generally highlighting the primacy of agricultural production and the potential role of GMOs in Kenya's

1 Personal communication with officials from the National Councils for Science and Technology in Uganda and Kenya explaining the request by their governments for advise on whether to join the US in the EU-US dispute at the World Trade Organization (March 2005).

agriculture. Part III analyses the key actors and social attitudes while Part IV looks at the status of GMO crop research in Kenya. Part V examines the national regulation of GMOs while Part VI looks at the international dimensions of Kenya's GMO policies and laws. Part VII concludes the discussion raising key emerging issues in Kenya's approach to GMOs.

II. THE AGRICULTURE SECTOR AND THE POTENTIAL ROLE OF GMOS IN KENYA

Agriculture, both subsistence and cash crops, is an important sector in Kenya's economy. It contributes 26 per cent of GDP and generates 60 per cent of total foreign exchange earnings. Agriculture provides 70 per cent of Kenya's employment. Consequently, agriculture creates jobs and provides incomes. As such, it has, and is expected to have for many years to come, an important and direct relationship with development efforts to eliminate poverty and food insecurity. Furthermore, agriculture in Kenya provides 70 per cent of the raw materials for agro-based industries, which in turn account for 70 per cent of all the industries in the country. Agricultural production can therefore stimulate growth in other sectors. With an estimated growth multiplier of 1.6, compared to 1.23 in non-agriculture[2] it is likely to also maintain a strong indirect effect on Kenya's overall economic development. Indeed industrial growth has remained minimal in Kenya with the main drivers in economic policy being agriculture and wildlife based tourism.

Most agricultural production in Kenya is accounted for by rural people, mainly smallholder farmers. Approximately 23.1 million (or 80 per cent) of the estimated 28.7 million Kenyans live in rural areas and rely on smallholder agricultural (crop and livestock) production, often at subsistence level.[3] Women as a social category contribute approximately 70 per cent of labour in the agriculture sector. Kenya's economic performance has been dismal in recent years resulting in lower per capita income and reduced income at individual levels. The rural people have become poorer as agricultural production has declined. The causes of rural poverty in Kenya however, lie in broad and complex development problems such as unrelenting stop-gap macroeconomic policies due as a result of the slow pace of structural reform, weak governance in public services, rising unemployment, environmental crises including depletion of soil and water resources, and of course, social and economic devastation due to HIV/AIDS.[4]

The main food crops in Kenya are maize, wheat, beans, peas and potatoes. Maize is a principal staple food of Kenya, averaging over 80 percent of total cereals (rice, wheat, millet and sorghum). The popularity of maize can also be derived from the proportion of the Kenyan agricultural land devoted to its production. It is grown in 90 per cent of all Kenyan farms. Maize is a strategic food security crop and poor yields of it almost inevitable result in food shortage and famine in the Kenya. It is also a major income generation product and accounts for about 25 per cent of agricultural employment.[5] The main problems affecting the production of maize in Kenya include harsh climatic conditions, scarcity of good agricultural land for expansion and a high incidence of pests and diseases. The area under maize cultivation has stabilised at around 1.4 million hectares. The potential for expansion is limited because of the high population pressure. The average maize yield is about 2 tonnes per hectare, but potential exists for increasing the yield to over 6 tonnes per hectare through increased use of improved seeds (this projection does not relate to GM seeds), fertilisers and good crop management.[6] Major diseases include maize streak virus, the stem borer and the grain borer. They account for heavy on-farm and post harvest losses.

Most agricultural products are consumed unprocessed and not bought in bulk but in small quantities in local open markets or from homes. Market days (usually twice a week) are a major event in many parts of Kenya and it is on those days that people stock up for the next few days. This is a consequence of both economics as well as storage

2 Nyangito, H. and J. Okello. (1998). Kenya's Agricultural Policy and Sector Performance 1964 to 1996. IPAR Occasional Paper.
3 Republic of Kenya, 2000.
4 *See* H. Odame et. al, 'Globalisation and the International Governance of Modern Biotechnology in Kenya: Implications for Food Security', IDS Working Paper 199, Biotechnology Policy Series 20, Brighton, United Kingdom, IDS (September 2003).
5 S. Pearson et. al. 1995. Agricultural Policy in Kenya. Applications of the Policy Analysis Matrix. Cornell University Press.
6 GOK 1997. National Development Plan for the Period 1997 to 2001. Government Press.

facilities at the household level. It is within this context that one must examine the issue of labelling for GMOs. There is largely no culture of labelling other than identifying the different products generically. It is high unlikely, given the literacy and poverty levels in Kenya, that labelling would influence consumer choices.

In terms of economics, consumers buy as much food as they can afford and normally for immediate consumption. It is not unusual for a vendor to unpack products that are sold in large quantities and repackage these for sale to customers who can only afford much smaller quantities than the ones in which the product ordinarily comes.[7] Storage facilities for food are neither appropriate for bulk storage. The storage for grains in most parts is either in the space that people inhabit or in granaries specially built for the purpose. The latter are in most cases make-shift structures that are not appropriate for prolonged storage of grain.[8] This means that most Kenyans cannot store large quantities of buffer stock and use the harvest from a good yield to help them deal with the bad yield year. The National Cereals Board, which has silos for grain storage, is not able to accommodate the farmers' excess harvest. Besides, the prices it offers for the produce are not competitive and this makes most farmers unwilling to sell their grain to the Board.

As far as domestic marketing is concerned, most agricultural products are consumed in the neighborhood of their production because of the poor road and transport infrastructure between different parts of the country (the exception to this rule are the major urban centers, where products come from farther away). It is therefore not uncommon to have food rotting in one part of the country whose production surpasses the local demand and has no storage facilities while there is famine in another area not too far away. The issue of increased production using GM technologies must therefore be viewed within this purview. The draft policy and strategy look at the interface of technology within Kenya's agricultural context but these documents are incapable of addressing the generally poor infrastructure that is key to the successful application of GM food crops to deal with food insecurity and alleviate poverty. Even with low production levels using conventional methods, storage issues abound at household levels and there have been cases of *aflatoxin* poisoning due to poor storage of grain. However, the current world agenda for GM crop development seems to be more focused on developing pest and drought resistance and not on the development of in-bred preservatives to extend shelf-life of products. This agenda is therefore not necessarily going to help Kenya in developing the GM crops it needs most.

The discussion of agriculture in the context of food security is incomplete without reference to the link between culture and food in Kenya. Different communities have different perceptions of what comprises food and that perception is critical to effective interventions in making food accessible and affordable. Some food crops such as sweet potatoes are associated with famine and will only be consumed in instances when there is no other food available. Further, different communities eat different foods as part of their culture and will be very reluctant to eat other types of food. These factors have not been considered in the development of GM crops in Kenya. A telling example is the focus on GM sweet potato which is considered by many communities a famine crop. Another salient point is the practice of saving seed from the harvest for planting the next season. While farmers increasingly buy hybrid seeds from seed vendors for sowing, there is no distinction between seed for planting and seed for food in many parts of Kenya. The implications of this are that GM seeds brought in as food or feed may end up on farmers' fields. The likelihood of this happening is significant given that Kenya suffers from chronic food shortages and receives food aid from diverse sources.

The growth of agricultural production in Kenya has declined gradually since the mid 1980s and more rapidly in the past five years. It declined from 4.6 per cent in 1960 to less than 1 per cent in the 1990s. Further, the sector's contribution to GNP dropped from 35 per cent to 28 per cent during the same period.[9] The poor performance of the agricultural sector has been attributed to inappropriate policies particularly controls on agricultural production and marketing[10], inappropriate land tenure arrangements, market failure[11], increased need for and cost of agricultural

7 Personal interview with a vendor in a village shop in Murang'a District who repackages cooking fat and maize meal into denominations as small as a tablespoon and 200 millligrammes to cater for the needs of his clientele.

8 There have been reports in the newspapers on aflatoxin poisoning killing people who ate grains that were inappropriately stored.

9 Republic of Kenya (2000) Rural Poverty Eradication Strategy Paper.

10 H. Nyangito & J. Okello. (1998). Kenya's Agricultural Policy and Sector Performance 1964 to 1996. IPAR Occasional Paper.

11 Robert H. Bates, Beyond the Miracle of the Market : The Political Economy of Agrarian Development in Kenya, Canada, Cambridge University Press (1989).

inputs such as fertilisers, pesticides and seeds[12] and unfavourable climatic conditions. While Kenya's agricultural policy aims at internal self-sufficiency, maintaining adequate levels of strategic food reserves and generating additional supplies for the export market, the country has increasingly relied on food imports and food aid to satisfy local demand. This has been occasioned by drought and increases in human population that are not matched by increases in agricultural production.

In recent years, the production of major food crops, such as maize, rice, wheat and sorghum dropped significantly. This has resulted in more public expenditure on food imports. Maize production declined from 2.2 m. metric tons (from here abbreviated as MT (24 m. bags).[13] in 1996 to 1.98 million MT (22 million bags) in 2000, forcing the government to import 360,000 MT (4 m. bags) at Sh4.7 billion. In the same period, 636,000 MT (7.1 million bags) of wheat were imported at Sh7 billion. Wheat is the second most important crop after maize, but its production levels fall far below that of its consumption. Kenya produces 270,000 MT (3 million bags) against the national demand of 540,000 MT (6 million bags) per year.[14]

The production decline is not limited to major cereals but also traditional food crops such as sorghum, millet, beans, cowpeas, pigeon peas and grams. Sorghum, which is drought resistant and performs well on a range of poor soils with low rainfall, is particularly adaptable to agro-ecological zones of Kenya whose two thirds land area comprises of arid and semi-arid land. Sorghum production declined from 175,000 ha with an output of 108,000 MT (1.2 m. bags) in 1994 to 123,184 ha with an output of 90,000 MT (1 m. bags) in 1999. The production of pulses (including beans, cowpeas, pigeon peas and grams) is also on a downward trend in terms of area and output. For instance, bean production in 1993 was 405,000 MT (4.5 million bags) from an area of 628,000 ha. But it declined to 135,000 MT (1.5 m. bags) from an area of 647,000 ha in 1997. In part, the decline in the production of pulses is attributed to adverse weather conditions.[15] Only cassava experienced a drastic production decline due to increased incidence of pest infestation.

The production of roots and tubers such as potatoes and sweet potatoes has gradually increased in the past decade. This may be the result of increased acreage for these crops and the search for alternative food sources as the production of cereals has declined. Also, horticultural production (including floriculture) has shown growth.[16]

Food crop research is a driving force behind agriculture as it provides the requisite technologies in the form of genetically improved food crop varieties and associated agronomic practices required to reap maximum genetic potential of those varieties. Over the years, research has been done on increasing crop yield vertically (increase in crop productivity) and horizontally (increase in land area by expanding production into semi-arid lands) using conventional methods. The main aim of food crop research in Kenya is the need to contribute to the achievement of food security, reduction of poverty and increased incomes for rural people. Genetic engineering has potential in this regard and it is not surprising that current experimentation with genetic engineering been aimed at the development of improved varieties with resistance/tolerance to pests, diseases, moisture and fertility stress and the development and dissemination of superior crop management technical packages. Expectations from genetic engineering include high yielding, environmentally stable varieties of food crops, fortified with genes for nutritional factors and resistance/ tolerance to biotic and abiotic stresses, higher and more profitable on-farm crop productivity and longer shelf life.

Export Products and Markets

The main agricultural export product from Kenya are tea, coffee, pyrethrum, sisal and horticultural products (fruits and vegetables). Markets for Kenyan agricultural products are Europe and other African countries. Europe imports a substantial amount of Kenya's horticultural products and flowers.

Development of the flower sector is more recent than the fruit and vegetable one and has registered tremendous growth over the last few years as can be seen from the tables below. Kenya is now the leading supplier to the Dutch

12 Institute of Economic Affairs and Society for International Development (2001). Kenya at the Crossroads: Scenarios For Our Future, Nairobi, Kenya and Rome, Italy.
13 One metric tonne (or 1MT) is equivalent to 1000 kilograms (or 1000kg). The calculation is based on a 90-kg bag).
14 MOARD, Kenya Food Situation Reports 1990-2000.
15 *Ibid*.
16 See table 4 in the annexes on the growth in horticultural production which is driven principally by ready export markets in Europe.

Auctions ahead of Columbia and Israel. The industry has attracted FDI to the extent that over 70% of the production is now controlled by foreign investors mainly Dutch, Israel and British. There are approximately 40 of such farms. 90% of the flowers are grown in high tech green houses and shade net covers, requiring large sums of money to put up, while about 10% are grown by small scale growers in open fields specializing in summer flowers only.

A. Risks and Benefits of GMO Crops/Foods in Kenya

1. Risks

The main risks with regard to GM technologies in Kenya can be characterised as socio-economic, socio-ethical, health related, and environmental.

With regard to the socio-economic impacts, there are risks of the impacts on GM technologies on the livelihoods of local communities of farmers. The introduction of new varieties may make these communities more dependent on external inputs for their agricultural activities making them more vulnerable and unable devise strategies to deal with emerging problems. While this risk is not germane to and can arise with the introduction of hybrids, it has been accorded a lot of attention in the discussions on GMO.

Socio-ethical risks are related to the right to choice and privacy in instances where access to genetic information can lead to violation of an individual's rights and issues of control over the technology and its products. In cases where genetic engineering involves the sourcing of gene material from some animals that are considered unacceptable in some religious communities, then there are fears that acceptability will be an issue.

There are also concerns that inserted genes may be transferred to wild populations and wild relatives of the GMOs or become weeds difficult to control, possibly in contexts other than their normal agricultural environment. An inserted gene may "escape" from a crop if it is transferred to another crop or to another wild related crop and the plant containing it persists after the crop on the agricultural land, in field verges, ditches or waste dumps. Studies from Europe are instructive in this regard. For instance, the British GM Science Review report noted that while gene flow can occur from GM crops to sexually compatible wild relatives and to agricultural weeds, there are gaps in our understanding of the potential consequences of gene flow and the effect of particular traits on the fitness of the weed or wild relatives.[17]

Other concerns relate to the development of resistance to toxins by pests, harm to non-target species, escape to wild relatives leading to genetic pollution and creation of 'super weeds', invasion of natural ecosystems by such super weeds and impacts on ecosystem functions and biodiversity.[18] It has been argued that the evidence of actual or potential harm to the environment is not enough to justify a moratorium on research, field trials and controlled release of genetically modified products into the environment.[19] The possibility of this happening, it has been proposed, is minimal and on the overall the benefits of genetically modified products such as the reduced conversion of habitat to croplands, far outweigh the potential minimal risks.[20] The British GM Science review Report however pointed out that genetic modification has the potential to alter levels of plant toxins or create novel compounds toxic to wildlife and that genetically modified plants can produce toxins that impact on non-target wildlife since toxins are rarely species-specific.[21]

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17 *See* GM Science Review Report First report, An Open review of the science relevant to GM crops and food based on interests and concerns of the public, Prepared by the UK GM Science Review Panel (July 2003).Available at http://www.gmsciencedebate.org.uk/report/default.htm at p.19. *See also* L. G. Firbant et al, *The Implications of spring-sown genetically modified herbicide tolerant crops for farmland biodiversity: A commentary on the Farm Scale Evaluations of Spring Sown Crops*,(2003) available at http://www.defra.gov.uk/environment/gm/fse/index.htm.

18 Indur M. Goklany, *Applying the Precautionary Principle to Genetically Modified Crops*, Centre for the Study of American Business, Policy Study No. 157, 2000.

19 *See* Nuffield Council on Bioethics, "The Use of Genetically Modified Crops in Developing Countries", A Follow-up Paper to the 1999 Report 'Genetically Modified Crops; The Ethical & Social Issues' 2003 (Draft on file with the author).

20 *Ibid*.

21 *See* GM Science Review Report, *supra note* 17 at p.14.

As a mega diverse country, there are concerns in Kenya about the potential impact of GM technologies on biological diversity. Due to the phenomenon of cross-pollination, there is fear that other non-GM plant materials may get "contaminated". Moreover, GMOs grown in open fields can breed with wild relatives thus contaminating the genetic diversity. Existing species then suffer as a result of being exposed to new pathogens or simply by being replaced by the alien species. In this way cross-fertilisation can result in the loss of indigenous species in the ecosystem.

2. Benefits

The importance of biotechnology is highlighted in Articles 8(g), 16 and 19 of the Convention on Biological Diversity (CBD).[22] The three objectives of the Convention are conservation, sustainable utilization and benefit-sharing. These objectives have implications for the application of biotechnology. So far, biotechnology has made the most impact in the areas of agriculture, healthcare, industry and environment. While acknowledging that biotechnology by itself "cannot resolve all the fundamental problems of environment and development", Agenda 21 points to the significant contribution the technology can make "in enabling development of, for example, better healthcare, enhanced food security through sustainable development processes for transforming raw materials, support for sustainable methods of afforestation and reforestation, and detoxification of hazardous waste".[23] Along these lines, the chapter lists opportunities for a global partnership between biodiversity rich countries which lack experience and investments necessary to exploit resources for economic development with industrialized countries with technological know-how. Emphasis is laid on conditions to guarantee successful and environmentally safe application of biotechnology in agriculture, environment and human health through international cooperative mechanisms.[24] Kenya can certainly benefit from these.

The potential benefits of GM include a cleaner environment due to the creation of bacteria that biodegrade environmental pollutants, and higher yields (and therewith increased food production) as a result of plants that grow more rapidly, that flourish under saline and dry conditions, use less fertilizers and resist pests, organisms that control insect pests and diseases. Some of the biotechnology products developed through various processes could lead to further development in industrialization.

Farmers in Kenya can benefit from GMOs through increased choice and flexibility in crop and cropping systems; increased profitability through improved yields; produce quality and tolerance to stress factors and new value added crops offering new market opportunities. Moreover, a reduction in manual labour demands is especially significant for rural communities of mainly female, small non-mechanized farmers who are confronted with reduced rural manpower availability due to the fact that productive populations move from the rural to the urban areas. GMOs can assist the government to meeting social and welfare objectives, reduce poverty, strengthen rural economies and increase international trade competitiveness. Moreover, GMOs can increase productivity of existing farmed land, reduce pressure to farm marginal land and fragile ecosystems and support farming systems such as integrated pest management, which in turn can improve agricultural sustainability. To the consumers, GMOs can potentially ensure food availability even in the face of adverse weather conditions, offer lower costs of production helping to control the net costs of foods and increase food security for rural and urban poor who represent the majority of the Kenyan population.

III. KEY ACTORS AND SOCIAL ATTITUDES

The range of institutions involved in biotechnology research and development and advocacy is broad and can be grouped in four categories: public institutions, international agricultural research centres, private institutions and non-governmental organizations.

22 Convention on Biological Diversity, Rio de Janeiro, 5 June 1992, *reprinted in* 31 I.L.M. 818 (1992).
23 Nicholas A. Robinson, ed., Agenda 21: Earth's Action Plan, Annotated, IUCN Environmental Policy & Law Paper No. 27, Oceania Publications, Inc., London, Rome, 1993 Chapter 16.
24 *Id.* p. 273.

A. Government GMO Regulatory and Management Authorities

1. National Environment Management Authority (NEMA)

Established under the Environment Management and Coordination Act, 2000, the National Environment Management Authority (NEMA) is the principal Government institution responsible for the implementation of all policies relating to the environment. It coordinates all environmental activities undertaken by various government departments and bodies. It is also mandated to undertake programmes that enhance environmental education and public awareness about the need for sound environmental management.[25] The Authority is responsible for environmental impact assessments of development projects. Biotechnology projects are among those that require environmental impact assessments under the Environment Management and Coordination Act and thus NEMA is the body to oversee the assessments and issue permits for GMO development.[26] While considerable efforts have been made to enhance the capacity of NEMA through human resource deployment, the capacity to implement biosafety regulations is yet to be well developed. NEMA has concentrated on developing general environmental regulation competence.

2. The Kenya Plant Health Inspectorate Service (KEPHIS)

KEPHIS is a Parastatal agency under the Ministry of Agriculture that is mandated to regulate and facilitate all plant materials coming into the country or produced locally. They are responsible for implementing phytosanitary and quarantine measures. They are also mandated to implement the national policy on the introduction and use of GM plant species. It is also responsible for regulating imports of GM seeds. KEPHIS' capacity to regulate has been brought under scrutiny with European countries ignoring phytosanitary certification given by the institution and insisting on other certifications being issued at the point of entry to the EU.

Recently, the Food and Agriculture Organization (FAO) adopted the International Standards for Phytosanitary Measures dealing with Pest risk Analysis for Quarantine Pests including analysis of environmental risks and GMOs.[27] KEPHIS is supposed to implement this standard but it lacks capacity to detect GMOs at the ports of entry when it comes to foodstuffs including grains.

3. Department of Veterinary Services (DVS)

The Department of Veterinary Services performs regulatory services with respect to livestock. It also has no capacity to monitor GMOs coming into the country.

4. The Kenya Bureau of Standards (KEBS)

KEBS is the institution charged with the responsibility for developing standards, including food safety standards. The institution has developed standards pertaining to various products. KEBS is responsible for regulating GMO foods. However, KEBS has not developed any code of practice with regards to the manufacturing of GMO/ products of modern biotechnology. Consequently, no standards have been made available to institutions for quality or for guidance on how to deal with emergency preparedness or risk issues. Kenya's standards for biotechnology are based on international standards, in particular those created by the Codex Alimentarius Commission (CAC) and under the Cartagena Protocol on Biosafety (Kenya is a member of the CAC and the Biosafety Protocol). Kenya is in the process of putting in place measures to address modern biotechnology and modern biotechnology products. The capacity to develop standards and to enforce their adherence is necessary for sustainability and for creation of the confidence on the modern biotechnology products. At the moment the capacity is low and it is necessary for the country to enhance this capacity.

25 The objectives of NEMA include among others to coordinating the various environmental management activities being undertaken by the lead agencies and promote the integration of environmental considerations into development policies and plans and to undertake, in cooperation with other lead agencies, programmes intended to enhance environmental education and public awareness about the need for sound environmental management as well as for enlisting public support and encouraging the efforts made by other entities in that regard.

26 Schedule II of EMCA.

27 ISPM No. 11, 2004.

5. National Council for Science and Technology (NCST) and National Biosafety Committee (NBC)

The National Council for Science and Technology (NCST) of Kenya which is established under the Science and Technology Act chapter 250 of the Laws of Kenya and is within the Ministry of Education, Science and Technology was designated by the Government to lead the implementation of biosafety measures in the country. It hosts the National Biosafety Committee (NBC) which is a body constituted under the Science and Technology Act. It comprises of representatives of twenty-one (21) bodies ranging from Government Ministries such as the Ministry of Environment, Regulatory Agencies, Research Institutes, Government Departments, Universities and NGO's. The role of the NBC is to draw up policies and procedures for safe handling of biotechnology as well as scrutinizing applications for the introduction of GMOs in the country.

Officials of the NBC have insisted that their role is to facilitate all the concerned while still ensuring safety and sustainability of the biotechnology / GMO systems. Their main concern is the lack of capacity of the country at the moment to implement GM technologies.

B. Institutions and others Involved in Biotechnology R & D

At present GM R & D is mainly carried out by public institutions. These include public universities such as the University of Nairobi and Jomo Kenyatta University of Agriculture and Technology; and national agriculture research institutes such as Kenya Agricultural Research Institute (KARI); Institute of Primate Research; National Museums of Kenya (NMK); Coffee Research Foundation; Tea Research Foundation; Kenya Forestry Research Institute (KEFRI); Kenya Marine and Fisheries Research Institute (KEMFRI). Public universities and public research institutions depend on capitations from the government for their research agenda. Staff in the institutions are public servants. The funds received cover both staff salaries and research investment. Over the years, funding for these institutions for research generally has been decreasing. It is difficult to approximate how much within the general research budget is set aside for GMO research.

International research centres include the Future Harvest Centres (ILRI), CIMMYT, ICIPE, the World Agroforestry Centre (ICRAF), CIP and ISAAA. Private institutions include Oserian Flower Company and non-governmental organisations include Biotechnology Trust Africa and the Africa Biotechnology Stakeholders Forum. The Biotechnology Trust Africa (BTA)[28], a non-profit organization with vast experience in implementing participatory biotechnology programmes, potentially impacting on GM R&D. BTA is registered in Kenya, however its scope is regional. Its mission is to improve the livelihood of the people of Africa, with special focus on the resource poor, through the application of biotechnology in agricultural production, health services, industry and encouraging sustainable environmental practices in Africa, using the interactive bottom-up approach where the needs of farmers at the grassroots determine the research agenda. The organisation has been traditionally funded by the Dutch Government through the Ministry of International Cooperation and Development (DGIS). However, with changing priorities of the Dutch, the organization has had to look for new sources of funding. BTA emphasizes collaboration, networking and information exchange with a clear focus on the needs and priorities of the end-users. BTA exclusively deals with biotechnology research, development and policy and is therefore a key stakeholder in participatory biotechnology aimed at addressing the needs of farmers in Kenya. So far, its work has been on traditional biotechnology such as tissue culture. It is yet to engage in GM R&D.

It is important to point out that most of these institutions are only potential actors in GM R&D and have not invested there yet. However, while these institutions do not directly influence the GMO policy as institutions, individuals involved in research in them participate in forums discussing policy directions.

There are no multinational corporations investing in GM R & D. To this extent, the market niche for GM products has not been curved out and this may explain why the Kenya Seed Company has not been bought by a multinational seed companies, like in many other developing countries. Local seed companies are yet to become a critical voice in the GM debate. The entry by actors such as Syngenta and Monsanto has been through joint research with the Kenya Agricultural Research Institute. The investment is mainly through training of scientists. This research has not gone beyond the field trial stage.

28 For more information, please, visit: http://www.biotechafrica.or.ke.

C. Players outside Government & Technology Developers

1. NGOs

a) International NGOs

International non-governmental organizations such as ActionAid, Oxfam GB and Greenpeace have been quite vocal on the impact of biotechnology on small-scale farmers in Kenya. ActionAid officers in Kenya have argued that genetic modification will not impact significantly on food security for poor farmers whose food security problems are traceable to problems that are much broader. For instance, poor farmers who have only limited land to grow crops on are unlikely to benefit from GM technologies. They also argue that intellectual property rights will hinder farmers from accessing genetic modification technologies and constrain their freedom to save seeds.[29] Oxfam GB has raised the same issues.

b) Local NGOs

Very few local NGOs have come out on the issue of genetic modification and when they do, it is to warn against adoption of GMOs on account of threats to the environment and the fear of monopolisation of major food crops by multinational corporations. Pelum-Kenya is one local NGO that is of the view that the government should tighten its regulations on the release of GMOs and had reservations about the commissioning of a greenhouse at the Kenya Agricultural Research Institute[30] and about continued GMO experimentation. They see the government's approach to GMOs in Kenya as casual and bent on legitimising the quick flow of GMOs and GM products into the country. The Consumer Information Network (CIN)[31], an NGO working to empower consumers, has expressed the view that GM foods are a time bomb which the majority of Kenyans are not aware of and the regulatory authorities are incapable of dealing with. They have insisted that the government's reluctance to formulate policies and laws to govern GMOs was part of a conspiracy to shield the public from the real implications of GM products.[32]

2. Farmer Groups

a) Kenya Institute of Organic Farming (KIOF)

The Kenya Institute of Organic Farming (KIOF) is opposed to GM. It is of the view that GM is only geared towards generating economic gains through the control of the seed business and will not contribute to food security. They believe that GMOs will cause environmental and human health challenges and recommend that contained trials should be conducted for a minimum of ten (10) years before testing of G products on human beings.[33]

b) Kenya Federation of Agricultural Producers (KENFAP), Cereal Growers Association (CGA) and the Kenya Farmers Association

The Kenya Federation of Agricultural Producers (KENFAP) has taken the position that lack of information has hindered the development of the debate. As a result, they felt that no release of GMO's should be undertaken before all the fears associated with them were addressed. They expressed fear that the multinational corporations involved in the promotion of GM technologies are only interested in monopolizing seed business. They recommended that conventional technologies that are already in existence be more optimally used before the country takes up GM.[34]

Both KENFAP and the Cereal Growers Association (CGA) have categorically stated that farmers are always ready to adopt a technology that is beneficial to them. They however would like that more research is done into GM to make it acceptable to all and to enlarge their range of their options without compromising human health and the environment.[35] Dearth of information is a big handicap to acceptance of the technology as it creates suspicion.

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29 *See* Jason Oyugi, "Reject Genetically Modified Hunger", East African Standard, Friday February 6, 2004. Jason is parliamentary Liaison Officer of ActionAid Kenya.
30 For more information, see http://www.kari.org/.
31 For more information, see http://www.consumersupdate.org/about.php.
32 *See* East African Standard February 2, 2004.
33 African Centre for Technology Studies, Rabesa Initiative: Stakeholders Analysis On Modern Biotechnology & Biosafety On Trade & Food Security in Kenya (on file with the author, 2004).
34 *Ibid*.
35 *Ibid*.

c) Fresh Produce Exporters Association of Kenya (FPEAK)

FPEAK takes a position similar to those of KENFAP and CGA. Their concerns should be seen in the context of the fact that over 80% of their exports go to the European Union which is perceived to be anti-GM. FPEAK is concerned that even though GMOs have not been introduced in the commodities they deal with, Kenya's official pro-GM stance will impact on their access to European markets.[36] They are concerned that a legal structure on biotechnology and biosafety be in place before GM is introduced. This should be accompanied by an analysis of the commodities that should be included in GM trials to avoid business risks especially where exports to the European Union are concerned.

3. Scientists' Lobbies and Networks

a) Africa Biotechnology Stakeholders Forum

Africa Biotechnology Stakeholders Forum (ABSF) is another key actor outside of government.[37] It is a non-profit, apolitical association seeking to facilitate communication, improve public understanding, support policy development and create capacity for information generation and dissemination on biotechnology and related issues. It is a pro-GM lobby and seeks to enhance collaboration on biotechnology activities in Africa and globally. Based in Nairobi, it has developed offices in other African countries mainly in Eastern Africa and is poised to expand to other parts of Africa. The funding for ABSF comes from donors such as USAID.

b) BIO-EARN

At the sub-regional level, the East African Regional Programme and Research Network for Biotechnology, biosafety, and biotechnology policy development (BIO-EARN) aims to build national capacities in biotechnology and biosafety in related policies in Kenya, Uganda, Tanzania and Ethiopia.[38] It is funded by the Swedish International Development Agency and has assisted in the training of human resources in biotechnology and the development of laboratories in participating institutions which include national research institutes and public universities.

c) Association for Strengthening Agricultural Research in East & Central Africa

The Association for Strengthening Agricultural Research in East & Central Africa (ASARECA) based in Entebbe has a biotechnology programme. The primary focus of this Programme is to complement sub-regional and country efforts to develop and commercialize agricultural biotechnology products. It covers the following countries: Burundi, DR Congo, Ethiopia, Eritrea, Kenya, Madagascar, Rwanda, Sudan, Tanzania and Uganda. Recognizing the need to harness available capacities for risk assessment and management, ASARECA is working on harmonization of administrative risk assessment and management procedures in the region. This programme is mainly funded by USAID.

4. The Media

The views on GM are aired in diverse fora and the media has played a critical role in bringing these views to the people. A scan through the newspapers available in Nairobi and their contents from 2002 to 2004 indicates that there are many pronouncements made by diverse actors at diverse fora. It is noteworthy that the readership of the Nairobi press also has access to information on GM from other parts of the world especially Europe (See Appendix 2)

5. International Initiatives

a) African Agricultural Technology Foundation

In June 2004 the African Agricultural Technology Foundation (AATF) was launched in Nairobi.[39] The mandate of the Foundation is to enable African small holder farmers to access technology in order to improve their productivity, improve food security and fight poverty. It will act as an intermediary "honest-broker" between technology providers and farmers.[40] It will negotiate licence agreements on behalf of the farmers to enable them use relevant proprietary

36 *Ibid*.
37 For more information, see: http://www.absfafrica.org.
38 For more information, see: www.bio-earn.org.
39 For more information, see: http://www.aftechfound.org.
40 *See* "Foundation Aims at helping Farmers Access Technology", Sunday Nation June 6, 2004 p. 17.

technology without paying royalties. The areas in which AATF intends to focus are striga control, insect resistance in maize, improving nutritional quality and improving the productivity of cowpeas, bananas and plantain.[41] The work will be done, when it eventually commences, by partner institutions in different countries not by AATF. AATF is funded by the Rockefeller Foundation the United Kingdom Department for International Development (DFID) and USAID.

b) Biosciences Eastern and Central Africa (BecA)

Biosciences eastern and central Africa (BecA) is an initiative endorsed by the Steering Committee of the New Partnership for Africa's Development (NEPAD) to support eastern and central African countries in developing and applying bioscience research and expertise to produce technologies that help poor farmers secure their assets, improve their productivity and income and increase their market opportunities.[42] It provides a focal point for the African scientific community to support the activities of national, regional, and international agencies as they address agriculturally related problems of the highest priority for alleviating poverty and promoting development. BecA will consist of a hub based on the campus of the International Livestock Research Institute (ILRI) in Nairobi, Kenya and a network of laboratories distributed throughout eastern and central Africa for the conduct of research on priority issues affecting Africa's development. It is envisaged that the facility will provide a world class biosciences research centre, open to all African agriculture/livestock research communities at individual and institutional levels, and will help build capacity in African bioscience expertise. Funding to start up BeCA has been obtained from the Canadian International Development Agency (CIDA). While BecA is yet to start work on GMOs, it is however clear from its mandate that it will eventually start working on GMOs. An environmental impact assessment as well as a strategic environmental assessment is currently ongoing as required by the Environmental Management and Coordination Act of 2000.

In the course of the assessment, some conflicts on GMO have come to the fore.[43] These include conflicts between GE proponents and people who are of the view that the eastern and central African countries' agriculture problems can be resolved through conventional technologies. There are also likely to be conflicts between different holders of intellectual property rights with regard to dealings with the intellectual property rights (IPRs). More specifically the issue of whether the work of the facility will be for profit or for public domain use.

D. Key GMO Policy Disputes in Kenya

Up to this moment, there is no official Kenyan policy document addressing the issue of GMOs. There are only draft guidelines and policies. There is however reference in national development plans to the role that new technologies can play in addressing food security problems and in spurring economic growth.[44]

Within the context of the UNEP-GEF project however, a draft for a comprehensive policy on biotechnology and biosafety was developed in 2003 but it has not been adopted. The main objective of the draft policy is to provide a framework for safe development and application of biotechnology. Other objectives of this draft policy are:

- To provide a framework for safe development and application of biotechnology in the country.
- To list priorities for a national plan of action in areas such as research and training in biotechnology, processing of biotechnology products, regulatory requirements in biosafety and intellectual property rights.
- To provide the basic conditions for securing adequate safety in the development, application and utilization of genetically modified organisms (resulting from recombinant DNA technology) in various industrial processes, including manufacturing, agriculture, food, environment, health and research.
- To ensure that information on biotechnology is disseminated to the public and to industry, on the safe use of biotechnology.

41 *Ibid*.
42 For more information, see: http://www.biosciencesafrica.org.
43 PharmEng Technology Inc., 'Strategic Environmental Assessment Report for Biosciences eastern and central Africa' (March 2005) On file with the author who was part of the assessment team.
44 *See e.g.*,Republic of Kenya, *Kenya Economic Recovery Strategy for Wealth and Employment Creation 2003-2007* (2003).

- To update the laws in matters relating to biotechnological advances and to keep the laws in conformity with our international obligations and commitments.
- To provide for the establishment of a mechanism that ensures the proper coordination of scientific and technological activities to meet economic and social needs of the country.
- To provide resources for investment to ensure effective implementation of the policy and subsequent strategies and programmes.
- To ensure that Kenya becomes self-reliant in the development and production of biotechnology-derived products and service critical to our national economy.
- To ensure that Kenyans have access to and benefit from safe, ethical and profitable uses of biotechnology-based products and services.[45]

Overall, the policy recognises the importance of biotechnology in national development. It addresses both traditional and GM technologies and has general statements on risk assessment and management, capacity building, funding and institutional arrangements for biotechnology R&D. It is important to point out that the policy does not specifically address GMOs. It deals with it in the general context of biotechnology development.[46] The policy was drafted by the National Council for Science and Technology and is still going through the government processes. Given the time that has lapsed since the draft was generated, it is difficult to predict when the policy will be finalised. It is however clear that GMO experiments have not been hindered by the absence of an official policy document. Indeed the slow pace of adoption of the policy by the government may be indicative of the ambivalence with which GM is viewed in Kenya's policy circles. This ambivalence is discernible from conflicts regarding GMO highlighted below.

1. GMO or no GMO?

The issue as to whether or not Kenya should invest in GM technologies remains contentious. While the head of state and some scientists are of the view that Kenya should use GE technologies to deal with problems in agricultural production, there is still no consensus that this is the way to go. Some members of Parliament and the Assistant Minister for Environment have been cautious on GMOs arguing that they are merely a way of inviting in foreign agribusiness multinationals, and cannot really solve the food insecurity problems or alleviate poverty. For instance, while the draft GMO law (discussed further below) is expected to go to parliament, at the same time there is before Parliament a private member's bill seeking to ban the introduction of genetic engineering in Kenya.[47]

The ambivalence of Kenya's policy and law makers on biotechnology is indicative of diverse pressures bearing on them to take some stands with regard to GMOs. The Kenyan Minister for Agriculture has for instance been quoted in the press giving contradictory messages on GMOs. On the one hand, he has indicated that Kenya is poised to enter the genetic modification revolution and has prepared a policy and law to guide it along that path. On the other hand he has been quoted discussing with the Italian Minister for Agriculture the possibility of Kenya exporting GMO-free agricultural products to Italy.[48]

Local NGOs have also raised concerns with regard to the way in which GM has been introduced into the country arguing that it has come in even before a regulatory regime has been institutionalised. They argue that the introduction of GM utilising draft rules and regulations is procedurally irregular and that consultations should have been held and the requisite laws and laws promulgated before any GM work was started.[49] There are also scientists who are of the view that Kenya has not utilised conventional technologies optimally. They argue that before a decision is made on whether to invest in GM technologies or not, a determination should be made on the causes of non-use or non-effectiveness of the conventional technologies. Failure to do this will negatively impact on the effectiveness of GM technologies because the operational context will be largely the same.

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45 NCST. 2003. Draft Biotechnology and Biosafety Policy (on file with the author, 2003).
46 Republic of Kenya, Draft Biotechnology & Biosafety Policy (on file with the author, 2003).
47 Hon Nakitare Private Members' bill barring introduction of GM into Kenya (2004).
48 *See* Konchora Guracha, "Kirwa Okays Use of GM Foods to Boost Farming", *East African Standard*, Tuesday April 6, 2004; *Cf.* "Kenya to Export GMO-Free Agricultural Products to Italy", Http://www.embassyofkenya.it/content-20.html; *See also* Kirwa Cautions on Genetically Modified Foods, Daily Nation, Thursday, June 17, 2004.
49 *See* Konchora Guracha, 'Farmers Oppose Genetically Modified Foods Bill' The east African Standard, 21st December 2004. *See also* Benson Kathuri, 'GM foods: Kenya inherits a new baggage of Prejudices', Financial Standard, July 6 2004.

There is on the overall, very little discussion on genetic engineering outside the scientific and relevant policy bodies. The groups of farmers and NGOs raising issues with regard to GM are very few. This is surprising given that the main argument made for the adoption of GM technologies is to increase food production and thus alleviate food insecurity and poverty. One would expect the GM policy discussions to be taken to the villages but these occur mainly in the capital city in Nairobi and in exotic resorts which are not easily accessible to the farmers.

2. Access and property issues

Another key conflict over GM technologies relates to ownership and accessibility to local farmers.

Access to GM plant and animal materials is a function of diverse factors such as geopolitical or political economic locus of the person seeking access, ownership and control of the materials, the different normative regimes influencing ownership, control an access and the procedural rights on access to justice and public participation. The grant of property rights to land, for instance, has implications for access to plant and animal materials found on that land. Similarly, the grant of intellectual property rights to innovations has implications for access to those innovations. The owner has legal protection against unwarranted encroachment by non-owners. The latter have to negotiate with the rights' holder to access the resources. If ownership and control rights are given to the innovator of a biotechnology product, the issue of access for the person who nurtured the raw material must be addressed. This raises the issue of the fair and equitable sharing of benefits arising from the innovations with the aim of protecting the rights of all actors.

Following the adoption of the TRIPS Agreement and its progressive implementation in developing countries, debates concerning the contribution of IPRs to economic and social development have become much more pronounced. This is due to a number of converging factors. Firstly, the TRIPS Agreement commits developing countries to significantly raise their standards of intellectual property rights protection even though it is generally accepted that this will at best have some positive results in the long term for most countries. Secondly, the TRIPS Agreement makes few concessions for the smaller, economically weaker countries, including the least developed countries. This limited differentiation has led to major controversies such as the controversy concerning access to drugs in countries severely affected by HIV/AIDS. Thirdly, in the context of increasing appropriation of knowledge through intellectual property rights which has characterised developed countries over the past couple of decades, there are renewed debates over the 'appropriate' level of intellectual property protection for social and economic development.

With respect to TRIPS, the Industrial Property Act No. 3 of 2001 aligns Kenya's industrial property law to TRIPS' provisions. Under the provisions of the Act, biotechnology innovations are patentable. This fact only becomes important when considered together with the perception that IPP restricts access to seed by farmers. Provision for biotechnology patents is seen as advantaging foreign biotechnology firms and putting resource poor farmers at their mercy.

In a North-South context, concerns over the appropriate scope of intellectual property protection include the whole gamut of issues debated in developed countries and a host of other issues. Among a number of initiatives that have been taken in recent years to address some of the IPR-related problems in developing countries, the 2002 report of the Commission on Intellectual Property Rights stands out.[50] It provided a largely balanced account of the pros and cons of intellectual property protection in developing countries and found that there were a number of significant problems in the existing system. These issues are likely to be raised within the Kenyan context.

3. Institutional home for biotechnology and biosafety policy

While the National Council for Science and Technology remains the focal point for biotechnology and biosafety policy, there are divergent views on whether this is the best option. The Council is within the Ministry of Education, Science and Technology. Its main function is regulation of research activities by granting research permits. Actors in the Ministries of Agriculture, Health, Environment and Planning have all expressed views on the need to have the biotechnology policy placed within their respective ministries. The Ministry of Environment and Natural Resources has made a strong case for making the biosafety function part of its mandate and has the provisions of the framework environmental law, EMCA, as its basis for this argument. Indeed the National Environment

50 Commission on Intellectual Property Rights, *Integrating Intellectual Property Rights and Development Policy* (London: CIPR, 2002)

Management Authority (NEMA) under the ministry is mandated under the EMCA to deal with biosafety. The problem arises when action on biotechnology or biosafety is required and different government agencies adopt a wait and see attitude since they do not feel fully competent to deal with the issue at hand.

IV. STATUS OF GMO CROP RESEARCH & DEVELOPMENT IN KENYA

While the Kenyan government has a policy of increasing agricultural production and key government functionaries[51] have made pronouncements on the usefulness of new technologies in this quest, there is no clear agenda for strategic investment in GM for agricultural production enhancement. This is despite the fact that Kenya's public research institutes have been involved in agricultural research for a long time focusing mainly on improvement of yields through conventional breeding techniques. It is noteworthy for instance that substantial progress was made in the achievement of high large grain yields in the 1960s when hybrid maize was developed in Kenya and it is now difficult to produce hybrids that out-yield the current ones by a big margin.[52] The accumulated research experience provides a good ground for the introduction of GM technologies to deal with pests and droughts and enhance the shelf life of products. The national research agenda, while focusing on increasing and stabilising yields of hybrids and reducing input prices, is yet to internalise GM technologies as a key component. The research is mainly carried out by public institutions, the national agricultural research institutions.

A. Target crops

Most of the agricultural biotechnology R&D activities focus on improving the yield potential of cereals and some of the export crops such as coffee and pyrethrum (See the tables in the annexes for details). As pointed out above, Kenya is not yet using GM technologies on a wide-scale. While Kenyan public agricultural research institutions have done considerable tissue culture work, not much genetic modification of crops has been done. There are a few crops being worked on in the laboratory and field but none have been commercialised. The crops being worked on are maize (field trials), sweet potato (field trials concluded in failure and work has to start afresh), cotton (field trials) and cassava (field trials). Work on maize is so far the most advanced even though work on the transgenic sweet potato had started much earlier.

1. Maize

The main thrust of agricultural research on maize in Kenya has traditionally focused on breeding for higher yields. Not much attention has been given to breeding for pest and disease tolerance and consequently, small-scale farmers have been affected substantially as they plant improved maize varieties under very poor pest and disease management conditions. They end up not benefiting from the yield potential of such varieties.[53] Stem borers pose one of the most serious threats to the production of maize in Kenya, with losses estimated to be about 15 per cent of the harvest.[54] Climatic factors such as drought combine with the virus to aggravate production loss. On the other hand, in years of surplus production, post-harvest losses are high mainly due to poor and limited storage facilities. The above problems have continued to intensify as most subsistence farmers are poor and cannot afford to buy pesticides to curb the menace posed by the borers.[55]

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51 *See* The People Daily, Thursday June 24, 2004, Hon. Mwai Kibaki, Kenya's President said that increased incidents of drought and diseases demanded the employment of modern methods of farming to increase yields. He was speaking during the commissioning of the Kenya Agricultural Research Institute's Greenhouse Complex. He categorically said that Kenya had resolved to apply modern biotechnology in line with existing biosafety framework national statutes and international obligations.

52 H. Odame et al, *supra* note 4.

53 H. Odame et al, *supra* note 4.

54 H. De Groote. 2000. Using Biotechnology to Develop New Insect Resistant Maize Varieties for Kenyan Farmers. An Overview of the KARI/CIMMYT Insect Resistant Maize for Africa (IRMA) Project.

55 H. Odame et al, *supra* note 4.

a) The Insect Resistant Maize for Africa (IRMA)

It is within the above context that the Insect Resistant Maize for Africa project started in 1999 and is jointly implemented by KARI and the International Maize and Wheat Improvement Centre (CIMMYT) with funding from the Syngenta Foundation for Sustainable Agriculture. The overall objective of the project is to increase maize production and enhance food security through the development and deployment of insect resistant maize that is adapted to various agro-ecological zones in Kenya. It is expected that a new maize variety will be developed with Bt. genes that are harmful to local populations of stem borers. Other objectives of the project include developing procedures for diffusing the technology to farmers and the assessment of the socio-economic impacts of the new maize variety in Kenyan agricultural systems.[56] Bt maize is viewed as having high potential for closing the wide and increasing food deficit gap in Kenya. To ensure that Bt. maize is affordable and it benefits the resource-poor farmers, the technology will encapsulate in open pollinated seed varieties; unlike hybrid varieties, farmers will be able to recycle the seeds on the farm without significant drop in production. Cross-pollination between farms with Bt. maize and adjacent ones with local varieties will be possible. In such situations, farmers will be able to maximise benefits of the technology at no extra cost but at the same time this brings the risk of contamination of non-GM crops, an issue that the Kenya Institute of Organic Farmers has raised.[57]

The implementation of the project started with the identification of Bt. genes active against Kenyan stem borers followed by the development of transgenic maize with suitable gene construct; identification of target germplasm for transformation and for backcrossing to source germplasm and the evaluation of biosafety conditions in greenhouses and field trials. In furtherance of the objectives of the project, maize leaves with Bt. toxins were imported into Kenya from Mexico and these underwent trials at various KARI research stations. The next phase of the project comprised the construction of a level-2 biosafety greenhouse and an open quarantine facility at the KARI Biotechnology Centre in Nairobi. Mock trials have began and been inspected by the Kenya Plant Health Inspectorate Service (KEPHIS). This paved way for importation from Mexico in May 2004, of Bt. cotton seeds with a gene that is resistant against the stem borer. The next step will be green house trials and open quarantine field trials of Bt. maize. Stakeholder meetings have been held at each stage from the conceptualisation of the project to the current stage of development. These meetings have been held as a goodwill gesture to get broad ownership of the project, not because of any legal requirement. They have included farmers, policymakers, scientists, consumers and regulators and have been more of information dissemination sessions on the progress of the work. Given the diversity of the stakeholders, the sessions are tailored to get the participants to understand the processes that have been followed in the project. Scientific expertise is not required of the participants.

The meetings provide a useful platform for exchange of information and ideas from a cross-section of stakeholders. For instance, difficulties in breeding of Bt. varieties that are effective against stem borers have been discussed as well as the possibility of the borers developing resistance in the long run. Mechanisms for addressing or countering these have been discussed and incorporated into the project. These include the development of resistance management strategies such as development of Bt. maize varieties carrying multiple forms of resistance.[58] Issues relating to ecological and environmental impacts of Bt. Maize have also been addressed such as the impact that Bt. maize may have on non-target organisms, potential gene flow from the transgenic maize to other cultivated and/or wild species and the possibility for the development of super weeds. Researchers in the project, responding to these concerns have argued that the risk to the environment, especially of gene flow to other species, is inconsequential in Kenya because maize is not native to Africa and there are no wild relatives that would readily cross with maize but gene flow to landraces will be addressed during impact assessment studies.[59] Field trials for the Bt. Maize under this project began in May 2005.[60]

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56 IRMA Updates 2000. Insect Resistant Maize for Africa.
57 IRMA Updates 2000. Insect Resistant Maize for Africa.
58 De Groote, *supra* note 54.
59 *Ibid*.
60 *See* The African Executive, 08-15 June, 2005 noting that Kenya planted genetically modified (GM) maize in open fields. The feature continued to explain that the seeds that are modified to resist insect pests called stem borers were planted first in a series of confined field trials at the Kenya Agricultural Research Institute (KARI) station in Kiboko on 27 May 2005. The KARI director Romano Kiome was quoted as hailing the move as an example of using science to address the needs of the people. He pointed out that the amount of maize Kenya loses to stem borers each year — about 400,000 tonnes — is nearly the same amount that the country imports annually. The article continued to point out that if successful, the GM plants will be interbred with Kenyan maize lines to produce varieties adapted to local growing conditions.

2. *Sweet Potato*

Sweet potato is mainly grown by poor resource farmers and is cultivated on about 75,000 hectares spread over various agro-ecological zones in Kenya.[61] The ability of sweet potato to adapt to a wide range of growing conditions, in both fertile and marginal areas, makes it a versatile crop for Kenya's farming systems.[62] The production of the crop has declined over the years owing to diseases and inadequate quantities of clean planting materials, pests and the sweet potato virus disease SPFVM. Kenya's average sweet potato yield stands at 6 metric tonnes per hectare, less than half the world's average of 14 metric tonnes per hectare.[63] Yield losses from the sweet potato virus can be as high as 80 per cent.[64] Conventional approaches to breeding varieties resistant to Sweet Potato Feathery Mottle Virus (SPFVM) have not been effective in combating the disease and thus recourse was had to biotechnology. The process of developing GM varieties of sweet potato started almost nine years ago when Monsanto developed a coat protein responsible for virus resistance, and donated it to KARI, royalty free, to use in its sweet potato improvement programme. The objective of the project was to develop transformed Kenyan sweet potato varieties with resistance to SPFMV at Monsanto and to transfer these to Kenya.[65] However, all efforts so far made to develop a virus resistant sweet potato variety have failed and scientists have had to go back to the drawing board.

3. *Cotton*

Cotton production in Kenya has declined over the years due to yields being affected by bollworm, necessitating the search for varieties that will be resistant to bollworm. Work on Bt. Cotton is at a very early stage and Bt. cotton seeds with a gene of resistance against the bollworm were imported for trials from South Africa in late May 2004. This was after the plant regulatory authority, the Kenya Plant Health Inspectorate Service (KEPHIS) granted KARI a permit to introduce the seeds. The trials will be done at KARI fibre research station in Mwea Tabere whose biosafety facilities have been inspected and approved by KEPHIS on behalf of the National Biosafety Committee.

4. *Cassava*

Genetically modified cassava has also been approved by the National Biosafety Committee and KEPHIS for laboratory trials in Kenya. The variety being worked on has a gene that is resistant to the cassava mosaic virus. Trials will be done in KARI Kakamega within the aegis of Agricultural Biotechnology Support Programme (ABSP II) supported by USAID. The programme is based at Cornell University and technical support for the project will be provided by scientists working for Danforth Center in St. Louis.

Table 1: Transgenic Agricultural Research in Kenya

Transgenic Crop	Desired trait	Institutions Involved	Status
B*t* Maize	Insect Resistance	**KARI/CIMMYT** Financed by Syngenta	Field Trials
B*t Cotton*	Insect Resistance	**KARI/MONSANTO**	Contained Trials
Transgenic Sweet Potato	Viral Resistance	**KARI/MONSANTO/ DANFORTH CENTRE (USA)**	Contained Trials
GM Cassava	Cassava Mosaic Virus	**KARI/DANFORTH CENTRE (USA)**	Contained Trials
Rinderpest Vaccine	Disease Control	**KARI**	Contained Trials

Source: Adopted from Bolo 2004 with updates from the author

61 M. Qaim. The Economic Effects of Genetically Modified Orphan Commodities: Projections for Sweet potato in Kenya. ISAAA Briefs No.13. ISAAA: Ithaca, NY and ZEF:Bonn.
62 S. Gibbons. 2000. Linkages Newsletter Fourth Quarter Feature Article. Transgenic sweet potato research collaboration: A case study of ABSP involvement in Kenya.
63 N. Mungai. 2000. Transgenic Sweet Potato Could End Famine. Environment News Service.
64 KARI 2000 KARI. 2000. KARI/Monsanto Virus Resistant Sweet potato Project. " For Alleviation of Hunger and Poverty".
65 *Ibid*.

V. NATIONAL REGULATION OF GMOS

A. Laws and Regulations

Currently, the draft *Regulations and Guidelines for Biosafety in Biotechnology for Kenya,*[66] issued in 1998 by the National Council on Science and Biotechnology, comprise the main instrument for regulating GMOs in Kenya. These regulations are based on the precautionary principle, prior informed consent or advance informed agreement, public participation and consultation, access to information (without prejudice to the protection of confidential information), access to justice (through compliance, liability, and compensation systems), and enforcement procedures and sanctions. They require that the release of GMOs be preceded by the approval of the National Biosafety Committee (NBC). Membership to the NBC includes representatives of relevant institutions and line ministries such as KEPHIS, NEMA, DVS, Attorney-General's chambers. The NBC advises on all relevant emerging legal issues. The chairman is from the Ministry of agriculture. The relevant regulatory authorities must undertake risk assessments before making the decision to approve or deny approval of the import. In order to do so they should be provided with enabling information such as description of the GMOs and its intended uses in Kenya. For crops, KEPHIS is the relevant authority and it advises the NBC on whether or not to allow imports and what to do after the assessment. The guidelines provide that it is an offence to import GMOs without prior approval of the NBC. Penalties for offences under the biosafety regulations were left to be made by the Minister. To do this the Minister requires the powers to be conferred upon him by an Act of Parliament. To date, this has not been done although there are some prescribed penalties in draft form under the proposed National Biosafety Bill.[67]

The regulations require that the release of GMOs be preceded by the approval of the National Biosafety Committee (NBC). The main aim of the regulations is to enhance the effectiveness in the use of new products and ensure safety to human health and the environment.[68] The function of the NBC is to review and ascertain the suitability of both physical and biological containment and control procedures appropriate to the level of assessed risk involved in relevant research, development and application activities.

The regulations require institutions carrying out work on genetic modification to establish Institutional Biosafety committees. These institutional committees are required to advise their respective institutions in drawing up proposals that take cognizance of applicable biosafety measures and advise their institutions on activities that should be brought to the attention of the NBC. The applicant is expected to make an application in the prescribed form detailing all information on the proposed work and send the form to the NCST as the secretariat of the NBC. The NBC should acknowledge receipt within 30 days and verify the information for completeness using a checklist whereupon it may request for additional information from the applicant within 60 days. Deliberation must be within 90 days and communication of the decision to approve or deny approval communicated within 210 days.

So far all applications received have research institutions and private companies from developed countries collaborating with Kenyan institutions (especially KARI). Upon review of an application, the NBC sometimes recommends conditions under which proposed work should be conducted. The construction of the Level-2 laboratory and a greenhouse complex at KARI was, for instance, a requirement for work on Bt. Maize in the IRMA project. Significantly, applicants must make separate applications to the NBC to work on GM in containment conditions, release into the environment and commercialisation. In practice the NBC in Kenya applies relatively high standards in screening GMOs and is slow in approving imports of GMOs and related products.[69] This may explain why so far there is no commercialisation of GMOs in Kenya. The process is not open to public scrutiny and the author was not able to get the written accounts of the decision-making processes. The way in which the regulations have been

66 NCST. 1998. Regulations and Guidelines for Biosafety in Biotechnology for Kenya, (National Council for Science and Technology (NCST).

67 It seems that the proposed penalties may not achieve the desired goals as they are relatively lenient. For example, a person who imports GMOs without the AIA of the country of import may only be liable to a fine not exceeding fifty thousand shillings. (See: Clause 15 of the NCST, 1999, UNEP/GEF, Pilot Biosafety Enabling Activity Project: Kenya Biosafety Framework .. In such circumstances one may find it convenient to commit the offence and pay the fine.

68 NCST No. 41. 2003. Regulations and Guidelines for Biosafety in Biotechnology for Kenya.

69 R.L. Paarlberg, 'Governing the GM crop revolution: Policy choices for developing countries', Food, Agriculture, and the Environment Discussion Paper 33, (International Food Policy Research Institute, , December 2000).

applied has given rise to a lot of suspicion and the perception that GMOs are being brought in through the back door. The fact that the guidelines have not been made available in the governments Official Gazette and that their legal status is unclear has not helped to popularise the regulations and the institution implementing them.[70]

In 1999, NCST proposed a National Biosafety Act in order to give statutory power to the 1998 Regulations and Guidelines. The Act, which was never adopted, was designed to implement the proposed Kenya Legal framework on biosafety.[71] This was an attempt to anchor the Regulations and Guidelines to the Environment Management and Coordination Act 1999.The failure of this legislative initiative to mature into a binding law has left the Draft regulations and Guidelines as the blueprint for decision-making on GMO work by the NBC.

1. Proposed GMO Bill

As discussed above, Kenya is in the implementation phase of the UNEP-GEF Project and is expected to develop a national biosafety framework which comprises a combination of policy, legal, administrative and technical instruments set in place to address safety for the environment and human health in the context of modern biotechnology. The broad elements of the framework include: -

- Policy on biosafety;
- Legal/regulatory system;
- Administrative system to handle requests for permits which includes risk assessment procedures to help in decision-making;
- Mechanism for monitoring and inspection;
- System to provide information to stakeholders about National Biosafety Frameworks and for Public participation.

Within the implementation phase of the UNEP-GEF project another attempt at coming up with a binding law has been made. Thus in 2003, a draft GMO bill was generated as part of the national biosafety framework alongside the policy discussed above. This draft is yet to go through Parliament. Legislators discussing it in February 2005 requested that a legal team be tasked to look through it and refine it further. The legal team comprising lawyers from NEMA, the Attorney-General's chambers, private practice and the academy discussed the draft and made changes. The author has authoritative information that the revised draft will be taken to Cabinet in the month of June 2005.

The draft bill seeks to bring Kenya's law in line with the Cartagena Protocol on Biosafety which it has both signed and ratified. Its objectives are to ensure an adequate level of protection in the field of safe transfer, handling and use of genetically modified organisms resulting from modern biotechnology that may have an adverse effect on the environment and to establish a transparent and predictable process to review and make decisions on such genetically modified organisms and related activities.[72] It deals with applications for contained use, field trials, exportation and importation and placement on the market. It is not clear where food aid which Kenya gets from Europe, America and Canada would fall in these categories especially in light of the fact that GMOs intended for use as food, feed and for processing are exempt from the advance informed agreement procedures in the Cartagena Protocol.

The draft bill also establishes a National Biosafety Authority to administer the Act.[73] The membership of the Authority comprises of representatives of the National Environment Management Authority, Kenya Bureau of Standards, and National Council for Science and Technology, the Department of Veterinary Services, Kenya Plant Health inspectorate Service, Ministries of Finance and Science and Technology among others.[74]

The draft bill contains no provisions on labeling. This may be because there is no commercialisation of GMOs yet.

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70 Personal communication with Maurice Odhiambo Makoloo, Secretay to the Public Complaints Commission, EMCA & Director Institute for Law and Environmental Governance (ILEG) (February 2005).
71 The legislation is yet to be passed by Parliament into law.
72 *See* Draft Biosafety Bill, September 2003 (On file with the author). § 4.
73 *Ibid.* § 5.
74 *Ibid.*

2 Environmental Impact Assessment

In 2000, Kenya adopted the Environmental Management and Coordination Act (EMCA) which requires environmental import assessments for specified projects. The EMCA is administered by NEMA. Under the EMCA, environment impact assessments (EIAs) are required to be undertaken for biotechnology projects, including the introduction and testing of genetically modified organisms. An environmental impact assessment falls within the responsibility of the project proponent and has to be paid by him or her but must be conducted by experts authorized by National Environment Management Authority (NEMA) in accordance with regulations and guidelines issued by NEMA.

To promote public involvement, the act requires that the general public, including potentially project-affected persons, be notified of the intention to carry out an EIA. The notices must contain a summary of the project, the location in which the project is to be carried out, and the place at which the EIA report may be inspected.[75] The act grants all persons the right to participate in the EIA process.[76] The time limit within which public comments may be submitted should not exceed 60 days. To afford reasonable opportunity for comments to be submitted, the time limit may be extended.[77]

Section 53 of the Act provides a legal basis for promulgating biosafety regulations.[78] It is unlikely that the regulations will be under this Act as ministries such as agriculture and health do not see the Act as appropriately representing their interests. Be that as it may, it is critical that the EIA procedures are synchronised with the NBC permit processes especially with regard to public participation.

3 Liability

The country's position on liability for damages caused by GMOs has not been consistent. The position taken depends largely on the key actors in the framing of the provisions. For instance, the proposed Kenya Legal Framework for safety in Biotechnology in 1999 adopted the African Model Law on Biosafety[79] provisions on liability and redress, including strict liability, provisions for costs of reinstatement, rehabilitation or clean-up and preventive measures incurred. This was influenced by the environmental lawyers in the group. The more recent initiative, the draft GMO bill which was generated by a group comprising more scientists than lawyers, provides that "liability and redress for any damage that occurs, as a result of activities subject to this Act, shall be addressed by applicable laws".[80]

The three torts that are relevant to liability and redress for biotechnology are negligence, nuisance and the rule in *Rylands Vs Fletcher*.[81] Given that these laws predate biotechnology activities and may not cover all kinds of

75 *Id.* at§ 59.
76 *Id.* at §§58(7) and 59.
77 *Id.*at § 60.
78 *Id.* at § 53(1). The Authority shall, in consultation with the relevant lead agencies, issue guidelines and prescribe measures for the sustainable management and utilization of genetic resources of Kenya for the benefit of the people of Kenya. (2)Without prejudice to the general effect of subsection (1), the guidelines issued or measures prescribed under that subsection shall specify -(a) appropriate arrangements for access to genetic resources of Kenya by non-citizens of Kenya including the issue of licences and fees to be paid for that access;(b)measures for regulating the import or export of germplasm;(c)the sharing of benefits derived from genetic resources of Kenya;(d) biosafety measures necessary to regulate biotechnology;(e) measures necessary to regulate the development, access to and transfer of biotechnology; and(f)any other matter that the Authority considers necessary for the better management of the genetic resources of Kenya.
79 http://www.africabio.com/policies/MODEL%20LAW%20ON%20BIOSAFETY_ff.htm.
80 *See* Draft Biosafety Bill, September 2003, § 42 (On file with the author).
81 Negligence protects interests in physical and mental health, reputation, property interests, economic relationships and public rights. To establish negligence, there has to be in existence of what in law "a duty of care situation", namely, a situation in which the law attached liability to carelessness; secondly, there has to be breach of the duty of care by the defendant, that is, failure to measure up to the standard set by the law; a causal connection between the defendant's careless conduct and the complained of damage; and damage that is foreseeable and not remote. It has been noted that the concept of negligence presents a difficulty in enforcing liability and redress for biotechnology activities because of the *locus standi* requirements and the time limits. The rule in Rylands Vs Fletcher applies to anything brought on land in the course of its non-natural use that is likely to do mischief on escape. Damage and escape need not be reasonably foreseeable. Nuisance on its part comprises an act or omission, which is an interference with, disturbance of or annoyance of a person in enjoyment or exercise of a right belonging to him as a member of the public, his ownership/occupation or enjoyment of his land, easement or profit or other use connected with land. *See* Migai Akech, *Common Law Approach to Liability & Redress and its Application to East African Countries*, Paper presented at the International Environmental Law Research Centre Workshop held on 22-26 September 2003, Mombasa. Available at www.ielrc.org.

damage likely to arise from biotechnology activities, the issue of their efficacy has been raised and the need to work out a suitable liability and redress system for GMO intimated.[82]

4 Public Participation

Public participation in environmental decision-making has been accepted as a guiding tenet in environmental law in Kenya and the concern for procedural rights including participation of the public is now part of Kenya's environmental law. This has followed from Principle 10 of the Rio Declaration on Environment and Development.[83] The states parties to the declaration also commit themselves to grant the right of access to information held by public authorities to each individual citizen, the opportunity to participate in decision-making processes, and effective access to judicial and administrative proceedings, including redress and remedy. Increasingly, these rights have been adopted in emerging international treaties on the environment such as the Convention on Biological Diversity[84] and its Cartagena Protocol[85] and also in domestic legislation. As a party to the Protocol, Kenya has been concerned to ensure that this provision is implemented in domestic law. The draft GMO bill provides that one of the duties of the proposed implementing authority under the bill is to promote public awareness and education concerning activities under the Act [bill?].[86] However, there are no provisions in the bill establishing a right to public participation.

While it is generally accepted that the public should participate in decision-making on imports of GMOs and substantive law on environment provides for this right, the modalities of actualising this remain a big challenge in Kenya. The major challenges include access to information where the information is technical and is presented in English while most Kenyans cannot read English.[87] Another challenge is lack of access to documents due to distance from the capital where the NBC is situated. Furthermore, even where distances are not the problem, the culture in government (which is the location of NBC and NCST) is to limit public access to information by designating it as confidential. The constrained democratic space in Kenya has greatly impacted public participation and with the opening up of space, one hopes that information will be more readily available. It is encouraging to note that the media has become more vocal on all issues and the appendix indicates that there is vibrancy in reporting on GMOs. However, it is worth noting that the opportunities for public participation in GMO regulatory decision-making remain very constrained. The view of the decision makers is that decision making should be based on scientific facts and not saddled with broader issues that public participation might open up. As intimated above, the author could not readily and easily access the documents detailing the decisions of the NBC.

5 Regulatory Capacity

The regulatory capacity of most of the institutions including the NCST is very low. Some of the members of the NBC are drawn from bodies that carry out GMO work such as KARI. This raises issues of a potential conflict of interest where an application is made by an institution represented on the NBC. Since the deliberations of the NBC are not made public, it is difficult to determine how the likelihood of a conflict of interest is handled in the decision-making process. Further, though Kenya has trained a big number of regulators, few of them remain in government owing to the low remuneration. Related to this is the fact that the infrastructure for regulation has not been modified to accommodate GMOs. It is apt to say that there is no regulatory capacity in KEPHIS to regulate GMO even though capacity building is taking place. Moreover, the regulatory authorities are not well synchronised.

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82 *See* Patricia Kameri-Mbote, 'Towards a Liability and Redress System under the Cartagena Protocol on Biosafety: A Review of the Kenya National Legal System', *East African Law Journal*, (2004).

83 United Nations Conference on Environment and Development, *Rio Declaration on Environment and Development*, Rio de Janeiro, Brazil, 1992 stating that 'environmental issues are best handled with the participation of all concerned citizens, at the relevant level. At the national level, each individual shall have appropriate access to information concerning the environment that is held by public authorities, including information on hazardous materials and activities in their communities, and the opportunity to participate in decision making processes. States shall facilitate and encourage public awareness and participation by making information widely available. Effective access to judicial and administrative proceedings, including redress and remedy, shall be provided'.

84 United Nations Conference on Environment and Development: Convention on Biological Diversity - Done at Rio de Janeiro, June 5, 1992, *reprinted in* 31 I.L.M. 818 (1992) [hereinafter the Biodiversity Convention].

85 Cartagena Protocol on Biosafety to the Convention on Biological Diversity, 2000. Montreal.

86 § 7 c.

87 N. Rukuba-Ngaiza et al., *Public Involvement in Environmental Decision-making in Asia and East Africa: Law and Practice* (The Legal Vice Presidency, The International Bank for Reconstruction and Development/The World Bank, Washington DC, 2003)

There is for instance no reason why Kenya should not work towards establishing one regulatory authority for agriculture to include both plants and livestock. It is also noteworthy that NEMA has no capacity to deal with GMOs even though as part of their mandate, they are expected to deal with environment impact assessments for biotechnology activities.

VI. INTERNATIONAL AND REGIONAL DIMENSIONS OF KENYA'S GMOS LAWS AND POLICIES

A. International Law

Kenya is a member of many international organisations and has ratified a number of instruments that have implications for GMO research including the WTO Agreements the Convention on Biological Diversity (CBD) and the Biosafety Protocol. For instance, membership to the World Trade Organization implies that Kenya has to put in place mechanisms in its national law to domesticate provisions of agreements such as the Agreement on Trade Related aspects of Intellectual Property Rights (TRIPS) and the Agreement on Sanitary and Phytosanitary measures (SPS Agreement).

The CBD provides the framework for the development of biotechnology in a manner consistent with conservation and sustainable use of biological resources. It recognises the need to ensure equitable allocation of ownership rights and intellectual property rights to biotechnology by explicitly spelling out the rights of states to their natural resources and the rights to intellectual property rights for products of biotechnology. It is noteworthy that while it stresses the need for recognition of intellectual property rights, Article 16 of the Convention provides that such rights should support the objectives of the Convention and not run counter thereto. The internationalisation of intellectual property rights within the purview of the World Trade Organization's Agreement on Trade Related Aspects of Intellectual Property Rights (TRIPS) raises the need to align the provisions of the Biodiversity Convention with the requirements of TRIPS. There is also need to consider the implications of the Food and Agriculture Organization's International Treaty on Plant Genetic Resources for Food and Agriculture, which provides for Farmers' Rights, a genus of intellectual property rights. Given that Kenya is a member of the International Convention for the Protection of New Varieties of Plants (UPOV Convention), this should inform policy directions in biotechnology research and development.

The above mentioned Industrial Property Act No. 3 of 2001 implements TRIPS in Kenyan law. The draft GMO bill described above, is designed to implement the Biosafety Protocol. The uncertainty in the Protocol regarding certain issues such as liability and redress and labelling has implications for actions at the domestic level. For instance, the Kenya Bureau of Standards depends on internationally set standards and GMO products are not going to be an exception. This is not a situation germane to Kenya. It is the same in most African countries where dearth of biotechnology capacity makes them heavily reliant on international trends especially where there is assistance to adopt these. In such circumstances, laws on GMOs are predicated on international rules rather than on national development imperatives.

There are also other requirements under the Food and Agriculture Organization such as Codex and the Pest Risk Analysis under the international Plant Protection Convention. These have implications for national regulatory bodies' activities.

B. Other International Influences and Issues

1. Presence of international actors in Nairobi

Because Kenya is one of the countries in the region that has a national biosafety system that is working, many international institutions prefer to work in Kenya. The existence in Kenya of many international and regional

bodies intending to work, or working on, GM has influenced the laws and policies. The applications by KARI and CIMMYT to work on Bt maize has, for instance influenced the development of the regulations and guidelines as NBC has had occasion to think through aspects of these regulations that could work better. The establishment of BecA at ILRI in Nairobi, the presence of AATF and the work of CIMMYT has all spurred developments in policy and law. For instance, the environmental impact assessment and strategic environmental assessment carried out by ILRI for BeCA has contributed to both shaping the way in which such assessments are carried out as well as building the capacity of NEMA officials on assessments for GM related developments. It is also noteworthy that these assessments have factored in public participation and engaged local communities in the locality where the facility will be located in debates on GMOs. The IRMA project has also assisted in the development of the Regulations and Guidelines as it has gone furthest along the line of applying GM technologies. It has enabled the NBC to learn by doing and spurred discussions on the import of specific aspects of the Regulations and Guidelines.

Given the close interactions of countries in the region through regional bodies and regional economic institutions such as the East African Community, ASARECA and the Common Market for Eastern and Southern Africa (COMESA), it is likely that the presence of these actors and the emerging framework will impact on the development of the frameworks in the other countries in the region.

2. Funding

Another external influence on Kenya's approach to GMO is international funders of GMO R&D and the development of Biosafety regulation in Kenya. The UNEP-GEF project, for example, has impacted significantly on the development of Kenya's biosafety system and the current framework used in practice mirrors the template of that project. The question often asked is whether Kenya would have invested in an elaborate national biosafety framework without the resources from UNEP-GEF. If the past is anything to go by, such an investment would have competed with other pressing national problems. Indeed the seed for a national biotechnology policy was planted as early as 1990 when the National Advisory Committee on Biotechnology Advances and Their Applications (NACBAA) identified national priorities for biotechnology on the basis of comparative advantages and the ability to implement traditional methods of production in small-scale agriculture, rapid access to new germplasm, reduction in the high cost of agricultural inputs and access to cheaper and more environmentally friendly alternatives. The development of the policy has however only been accomplished in the last couple of years. UNEP-GEF has therefore played a strategic role in assisting Kenya work on her policy, law and regulations and guidelines. The investment of further resources by other donors such as USAID's Programme on Biosafety Systems in the development of functional biosafety systems should add value to the work already done with UNEP-GEF resources rather than replicate the same processes.[88]

In so far as funding for the promotion of bio*technology* activities is concerned, most of the biotechnology work is funded by bilateral donors such as USAID and CIDA and this is likely to influence the focus of the work. As noted above the work on the transgenic sweet potato and on cassava is being financed by USAID. Private foundations such as the Rockefeller Foundation and Norvatis have also funded GMO work.

3. Export Markets

The fact that Kenya's main market for agricultural goods is Europe is likely to impact on the national policy on GMOs. The players in the horticultural sector such as the Ministry of Agriculture, The Horticulture Development Authority and Fresh Produce Exporters Association of Kenya view the Sanitary and Phytosanitary Standards set out by the European Union as a barrier to their exports. There is also the EUREPGAP, which is an initiative by the main supermarket chains in Europe (the main buyers of Kenya's fresh produce) whose aim is to get products that are safe, environmentally friendly, and socially acceptable and of high quality. The guidelines are stipulated in the document called the EUREPGAP Protocol for Fresh Fruits and Vegetables and were to be complied with by all suppliers to these European Supermarket chain by December 2004. Among other requirements, suppliers (fresh produce exporters) are expected to sample and analyse the soil, water and the plant material. This calls for a third party certification and verification all of which increases the cost of production. When Kenya commercialises GM products, these guidelines will be applicable as they affect all fresh products. The low level of GM application in

88 The Program for Biosafety Systems (PBS) is one such investment that can catapult the national biosafety system to higher levels of performance by institutionalising monitoring, evaluation and inspection systems.

Kenya implies that the link between export markets and GM is still very low. However there are discussions and studies being carried out to show what the adoption of GM would mean for Kenya's markets. This discussion has however to be seen within the broader debates on limited access to markets as a consequence of requirements under international trade agreements (mainly WTO) and economic partnership agreements such as the Cotonou agreement.[89]

4. US-EU Dispute

There were reports of Kenya's intention to join the US-EU dispute before the Dispute Settlement Body of the World Trade Organization about GMOs on the side of the US. Pro-GM scientists were arguing that the moratorium by the EU would negatively impact on farmers' access to GM seeds and propagative material and thus negatively impact on agriculture in Kenya. As discussed above, groups in Kenya concerned with securing their EU export market remain pensive that adoption of GMO friendly laws and policies will negatively impact on their access to markets. This underscores the different discourses current in Kenya on GMOs. The low level of GM application in Kenya however, makes that these discourses are still mostly theoretical.

C. Regional Developments

Many of the countries in the region are developing their own laws and policies on GMOs and are at different stages of development. ASARECA has an initiative to harmonise these policies. It is widely accepted that harmonisation of administrative regulations and guidelines will be easier than convincing other African countries to copy regulations and guidelines from another country because they will see it as an assault on their sovereignty to have a policy developed in another country.[90] It is however clear that the developments in Kenya's policy on GM will be an important point of reference both in terms of best practice and hurdles to avoid. The international organisations and foundations based in Kenya have a regional focus and their familiarity with the Kenyan policies may contribute to its acceptance in countries participating in regional GM research through such institutions.

VII. ANALYSIS OF KENYA'S APPROACH TO GMOS AND CONCLUSIONS

A. Summary of Kenya's approach

Kenya has entered the fray of genetic modification and is working towards developing products and eventually marketing them. This is a logical investment in light of the fact that its viability as an agricultural country is threatened by limited arable land, increasing population and reduced production owing to unfavourable climatic conditions and pests and diseases.

Much progress has been made in the development of a GMO regulatory framework. There are however a number of issues that require finalisation to ensure safe and beneficial investment in genetic modification. These include synergising the regulatory framework and finalising the draft documents through the promulgation of the Biosafety and Biotechnology Policy and making the GMO Bill and the Regulations and Guidelines legally binding. Given that some GMO trials have been approved, there is a critical need to put substantive policy, legal and regulations and guidelines instruments in place to replace the existing draft policies and guidelines. To institutionalize these regulations, there is need for improved regulatory capacity.

89 *See* Benson Kathuri, 'GM foods: Kenya inherits a new baggage of Prejudices', *Financial Standard*, July 6 2004.
90 Patricia Kameri-Mbote, 'Final Report of a Workshop on Biotechnology Policies', Organized by the Association for Agricultural Research in Eastern & Central Africa (ASARECA) May 26-28, 2003.

The maintenance of, and operation under, draft laws makes some constituencies suspicious that there are underhand dealings. If these are not passed by parliament eventually, the investment in building capacity for regulation may go to waste and GM technologies may be discredited for having been carried out outside the purview of law. Considering the emphasis on public participation and awareness spelled out in the Cartagena Protocol and the draft Kenyan law and policy, it is critical that the public is brought on board the discussions pertaining to GMO crops. The country also needs to anchor GM to national development policies. This can be done through the national development plans and poverty alleviation and agriculture development strategies.[91]

B. Key Conclusions

A number of conclusions can be made on the status of GMO research in Kenya. *First,* GMO research in Kenya is still at an infancy stage with most activities taking place in laboratories. There are indications that commercialization is the ultimate aim. This is informed by anticipated benefits that are seen as capable of contributing to the agriculture sector in Kenya. *Second*, there are concerns about the risks associated with GM technologies. These concerns have not been discussed openly by all actors and it is therefore not possible to mobilise groups around the concerns. The absence of public awareness and the skewed nature of the debate makes the risk issue a possible rallying point for anti-GM lobbies. *Third* and related to the second is that there are already many structural problems in the agriculture sector which impact on access to agricultural resources likely to impact on efficacy of GMOs. There are people arguing that GMOs are not necessary until we have made full use of the potential of conventional technologies. *Fourth,* the perception of IPP as limiting the access of farmers to technology and the related discussions on genetic use restriction technologies will impact on the development of GMO research in Kenya. *Fifth,* while a lot of efforts are going to the development of regulatory capacity, the capacity to regulate GMO is still limited. The presence of many regulatory bodies with unsynchronised mandates is likely to complicate GMO research and also presents an opportunity for conflict. *Sixth,* while official reports and trends indicate a permissive approach to GMO, there are still lingering doubts that need to be settled. It is interesting for instance that a Member of Parliament has proposed a private member's bill seeking to prohibit GMO research while at the same time there is a draft biotechnology law waiting to go to parliament. *Seventh,* international influences are likely to impact on Kenya's approach to GM as it seeks to situate itself in the international market place. The preponderance of international organisations carrying out research in Nairobi will continue to impact on GM research in Kenya and the region. Similarly, international NGOs are likely to continue to be more vocal on GM issues unless public awareness is raised to enable more local actors to engage in the debate. *Eighth,* public participation in the GM debate is limited and needs to be raised to secure investments in GM in Kenya and the region. *Ninth* and finally, the fact that Kenya's main market is Europe will play an increasingly significant role in the discussions on GM technologies.

91 For example the *Kenya Economic Recovery Strategy for Wealth and Employment Creation 2003-2007*,can be used to develop a specific agenda on the role of GM in this plan.

VIII. APPENDICES

A. Table 1: Domestic exports by value Kshs.'000 - Principal commodities, 1994-2002

Table 1: Domestic exports by value Kshs.'000 - Principal commodities, 1994-2002

Commodity	1994	1995	1996	1997	1998	1999	2000	2001	2002
Maize unmilled	16,980	1,810,720	2000280	55585	129648	357240	33485	17820	1693300
Meal & Flour of wheat	14,000	1,260,280	1,028880	837,713	970,858	423,360	200,639	155,448	32,155
Fish and preparations	1,906,180	1,688,880	3,293,220	3,075,603	2,290,988	2,267,020	2,952,960	3,858,338	4,204,748
Pineapples, tinned	1,694,460	2,478,460	3,851,600	2,620,486	2,778,209	2,656,660	2,540,157	3,017 738	3,721,538
Beans, Peas & Lentils	32,840	101,700	7,920	2,707,049	513,660	44,00	7,809,350	106,619	460,050
Coffee not Roasted	13,057,940	14,442,640	16,856,034	16,856,034	12,875,040	11978,280	11,707,099	7,460,388	6,540,768
Tea	16,881,380	17,989,460	22,704,560	24,125,910	32,970,659	32,787,680	35,095,298	34,485,101	34,376,418
Cotton, raw	-	76,840	-	6,458	2,605	4,500	38,977	1,106	82,558
Timber (rough or simply worked)	46,860	29,940	38,200	66,914	12.691	10,680	4,635	9,206	4,545
Sisal Fibre 7 tow	66,400	588,280	814,260	723,089	688,753	637,500	603,308	728,979	792,147
Pyrethrum Flowers	11,280	11,840	8,680	-	-	-	-	-	23,110
Textile Yarns, Fabrics, made up-textiles	1,580,380	1,772,740	2,007,020	2,077,261	1,530,991	736,960	1,986,708	1,915,380	1,963,421
Cement	1,633,120	1,617,400	2,544,300	2,289,335	1,443,206	1,248,780	1,355,092	1,031,429	1,478,811

Source: Central Bureau of Statistics

B. Table 2: Domestic Exports - Principal Commodities by Quantity (tonnes) 1994-2002

Table 2: Domestic Exports - Principal Commodities by Quantity (tonnes) 1994-2002

Commodity	1994	1995	1996	1997	1998	1999	2000	2001	2002
Maize unmilled	1,685	154,291	221,478	2,637	9,126	40,520	488	420	158,753
Potatoes	238	108	66	366	86	497	257	52	196
Fish and preparations	18447	15466	18769	17,438	14,332	15951	168552	18536	18252
Pineapples, tinned	67,752	74,963	91,985	71,031	79,348	51626	56,212	67,006	77,527
Beans, Peas & Lentils	1,195	4,652	266	220	25,115	20	44,081	4,204	17,577
Coffee not Roasted	79,616	88,494	116,731	70,066	51,578	71,581	86,982	62,159	48,210
Tea	174,926	217,937	262,146	199,244	263,771	260,177	217,282	270,470	272,707
Cotton, raw	-	962	-	81	87	54	147	9	1,183
Timber (rough or simply worked)	87	35	456	420	99	108	55	143	21
Sisal Fibre & tow	25,354	21,207	21,672	19,154	17,630	16830	16,753	17,857	19,482
Pyrethrum Flowers	120	120	300	-	-	-	-	450	279
Oil seeds, oil nuts & Kernels	1,066	1,699	4100	3,445	1,447	1,634	1,117	2,373	2590
Cement 000 tones	596	501	662	690	417	284	301	233	292
Animal & vegetable oils & fats	27,177	33,987	30,794	40,120	40,751	31,651	23,056	343	261

Source: Central Bureau of Statistics

C. Table 3: Domestic Exports -Principal commodities as percentage of total value 1994-2002

Table 3: Domestic Exports -Principal commodities as percentage of total value 1994-2002

Commodity	1994	1995	1996	1197	1998	1999	2000	2001	2002
Coffee, not roasted	15.6	15.5	14.4	14.7	11.2	10.4	9.8	6.1	5.0
Tea	20.2	19.3	19.9	21.1	28.8	28.6	29.3	28.4	26.2
Petroleum products	6.1	4.7	6.2	9.0	8.5	7.9	7.9	10.2	3.0
Sisal Fibre & tow	0.8	0.6	0.7	0.6	0.6	0.6	0.5	0.6	0.6
Meat and meat preparations	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2
Pyrethrum extract and flowers	1.9	1.4	1.4	1.2	0.6	0.6	0.6	0.8	0.2
Hides skins and fur skins, undressed	0.3	0.3	0.2	0.3	0.1	0.3	0.4	0.5	0.3
Cement building	2.0	1.7	2.2	2.0	1.3	1.1	1.1	0.8	1.1
Wattle bark and extract	0.4	0.2	0.3	0.3	0.2	0.2	0.2	0.2	0.1
Sodium Carbonate	1.2	1.1	1.0	1.2	1.1	1.1	1.2	1.6	1.6
Pineapples, tinned	-	-	-	2.3	2.4	2.3	2.1	2.5	2.8
Cotton, raw	-	-	-	-	0.0	0.0	0.0	0.0	0.1
Woo, raw	-			-	0.0	0.0	0.1	0.1	0.1
Cashew nuts	-	-	-	-	0.1	0.5	0.2	0.3	0.4
Beans, Peas and lentils	-	-	-	2.4	0.4	0.0	6.5	0.1	0.1
Oil, seeds, oil nuts and oil kernels	0.1	0.2	-	0.3	0.0	0.1	0.0	0.1	0.1
Scrap metal	0.2	0.2	0.2	0.1	0.2	0.1	0.1	0.1	0.1
Butter and ghee	-	-	0.1	-	O.O	0.0	0.0	0.0	0.0
Maize, unmilled	-	1.9	1.8	-	0.1	0.3	0.0	0.0	1.3
Horticulture	10.0	11.4	12.0	12.0	8.2	15.4	17.7	16.3	1.3
Other	41.3	41.4	39.6	32.3	36.0	30.4	22.2	31.1	34.9
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Source: Central Bureau of Statistics

D. Table 4: Export Statistics for flowers - Volume (2000-2003)

Table 4: Export Statistics for flowers - Volume (2000-2003)

Year	Volume in (kgs)	% Change
2000	36 436 662	-
2001	41 396 011	13.6
2002	52 106 697	25.9
2003	60 982 885	17.0

Table 5: Export Statistics for Flowers- Value (2000-2003)

Year	Value (Kshs)	% Change
2000	8,350,538,129	-
2001	10,626,892,349	27.3
2002	14,792,301,822	39.2
2003	16,495,531,185	11.5

Source: Horticultural Crops Development Authority-Kenya

Table 6: Kenya's Exports to the European Market in 1998- 2002 (tons)

Product	1998	1999	2000	2001	2002
Green beans	15 550	21 346	23 521	21 675	21 760
Avocados	6 956	9 738	11 420	15 639	11 792
Mange tout Peas	5 135	7 761	6 998	3 900	4,197
Passion Fruit	375	598	671	652	787

Source: EUROSTAT, Collaboration: COLEACP (a non-profit inter-professional association with close to 100 member companies representing ACP producers/exporters and European Importers of fruits and vegetables, flowers and plants)

Could you, please, give a little more information about the source of the tables?

B. APPENDIX 2

Select Pronouncements on GMO in the Kenya Media from 2002-2004

DATE & SOURCE	WHAT WAS SAID AND BY WHO?	FORA
Daily Nation/TuesdayOctober 8, 2002	• UK NGO's Green peace and the development agency action aid accuse the US for dumping GM crops in Africa. They hit out at the US government over allegations that it is trying to force famine hit southern African countries to accept American GM crops. • The NGOs said these policies are in stark contrast with the policies adopted by other western nations (like the EU), which have mainly given countries such as Malawi and Zambia, money to buy food on the open market.	
Daily Nation October 31, 2002	• Zambia says it would not accept GM maize to alleviate severe food shortage facing 3 million of its people. • This is often tests it said its scientists conducted in the US, Europe and South Africa separated sufficient evidence to demonstrate their safety.	
East African Standard Friday August 16, 2002	• Mozambique in the midst of an acute hunger crisis accepted shipment of genetically modified food from the US.	
Daily Nation September 14, 2002	• Jean Ziegler UN Special investigator in the right to food questioned the safety of genetically modified food saying big corporations had more to gain than poor countries fighting starvation. • She said that humans are at risk if they consume GM foods over a period of time and downplaying the views, of WHO which says it's safe. • Farmers accepting GM seeds would be forced to continue buying them forever from big technology corporations' said Ziegler. There is absolutely no justification to produce GM food except the profit motive. • Ziegler is also a former socialist member of parliament. • Ziegler is also a former socialist member of parliament.	
East African Standard August 24, 2002	• James Moriss head of the UN Food Agency said there is no way that the World Food Program can provide the resources to feed starving people without using food that has some biotechnology content.	
People Daily Thursday June 24, 2004	• Kenyan President Mwai Kibaki said that increased incidents of drought and diseases demanded the employment of modern methods of farming to increase yields. • He said Kenya has resolved to apply modern biotechnology in line with existing biosafety framework national statutes and international obligations.	KARI while commissioning a Biosafety Greenhouse Complex
East African Standard June 1, 2002	• Commentary by Ng'an'ga Mbugu • The poor don't need GM Foods • He differs with an earlier outside by a Bill Carmichael who thinks different • He also notes that Tony Blair says he sees no evidence of health risks.	
Daily Nation September 30, 2002	• African Biotechnology Stakeholders Forum (ABSF) Director Dr. J. Wafula says the objectives of the forum are	

	• Improving public understanding of biotechnology issues through provision of balanced and accurate in for mention as well as the facilitation of research and development of appropriate policies.	
Daily Nation, Thursday September 12, 2003	• The first biotechnology sweet potato has been harvested while trials on B. T. Cotton may start as soon as the National Biosafety Committee approves. • Dr. Florence Wambugu the genetic sat behind the project said the second season of the GM sweet potato starts in October. • Ms. Cecilia Nzau secretary to the National Council for Science and Technology said her organization had ensured that stringent and biosafety regulations had been observed all along the project phase. She said she had personally inspected the destruction of the sweet potato by-products after the harvest in accordance with the laid down regulations. • The sweet potato is made resistant to the feathery mottle virus an aphid bone disease that can destroy up to 80% of any crop. • Bt cotton in resistant to Bollworm with increased cotton production. Kenya is set to benefit from AGOA. • Dr. Romano Kiome KARI Director said the cotton industry faces problems of quality seeds.	Speaking from her Utalii House office
East African June 17 – 23, 2002	• Godfrey Santogo of the CDO cotton development organization says improved genetically engineered seeds will raise income generated from cotton from 8 million USD to 9.7 million USD. • Monsanto, a US Company asked the Ugandan authorities for permission to introduce its GM variety in the country. • President Museveni has put before the cabinet a paper outlining the draft cotton development policy aiming at boosting Uganda's exports to the US under the AGOA, the concern is to loose the lucrative European markets for planting GM's • ISA Serunjogi national cotton breed recently said that Uganda should weigh its options before rushing to BT Monsanto cotton Ms. Jolly Sabune executive director CDO said Uganda would not be able to sell its cotton to the world markets consumers shun genetically modified products Prof. Joseph Mukibi director of the National Agricultural research organization says the variety (Monsanto BT) was high yielding and has strong past resistance.	
East African StandardSaturday June 1, 2002	• Cabinet ministers Nicholas Biwott and Maalim Mohammed called for the development of appropriate policies and legislation to foster the country's Biotechnological local capacity.	Consultative meeting organized by the biotechnology trust of Africa BTA at a Nairobi Hotel.
Daily Nation November 13, 2003	• According to S. K. Muigai Thika KARI director production for newly developed banana varieties dwarf convention Chinese Cavendish grand and gold finger is 38 per cent higher than conventional bananas like Kaplan. • Developed by KARI at Thika using technology known as tissue cultured banana; These varieties are now being planted in Maragua district • Other organizations involved include international service for the acquisition of Agribiotech applications ISAA a Nairobi based private lab genetic technologies LED the project is funded by Canada based International development research centre. • Prof. Ester Kahangi of JKUAT pioneered tissue cultured banana.	

	• Laban Kamonde is among 450 farmers under the umbrella highridge banana growers association now involved in the Maragua project.	
Daily Nation Tuesday November 11, 2003	• EU Commission spokesman Poijo Tomippinon said the Commission will ask for a vote at the meeting in December on the decision of approving a new type of genetically modified sweet corn that would end a five year ban on biotech products.	EU Commission meeting Zurich, Switzerland
Daily Nation June 23, 2000	• Researchers and Imperial College London another European Molecular biology laboratory in Heidelberg Germany by inserting a marker gene into the species of a mosquito that carries malaria. Dr. Andrea Cresenti of the Imperial College while talking to Reuters with what they have it is possible to construct a mosquito which is consistent with malaria.	
Daily Nation July 3, 2000	• A concerned Kabete farmer says the government should be in a position to check any introduction of foreign GMO'S in the country. This should be articulated through Legislation South Africa for example, passed a Law called the GMO Act in 1997. He adds that to thrive best GMO require the establishment of a good infrastructure. These may include roads, market availability, extension services and subsidise agricultural inputs.	
Daily Nation September 3, 2004	• Two new high yielding and drought resistant wheat varieties have been developed by Kenyan researchers. • Njoro BWI and Njoro BW2 are also resistant to some diseases. • Dr. Miriam Kinyua the director of the KARI breeding centre at Njoro said Njoro BW2 produces 35 bags of wheat per acre. • Varieties developed by KARI a few years back for high potential areas are still out performing the older varieties.	Speaking to the Nation by telephone before the start of a farmers field day organized by cereal growers association and KARI
Daily Nation Saturday September 4, 2004	• Assistant Minister Peter Kaindi said the national demand for wheat was 700 000 tonnes against the national production of 300 000 metric tonnes • He called for research on wheat varieties that were tolerant to the Russian aphid. • He commanded Kenya breweries, for collaborating with KARI on research to control the Russian Aphid Barley yellow Dwarf virus and the vectors that transmit it.	Former field day at National Plant breeding centre in Njoro.
EA Standard August 31, 2004	• (GMF) genetically modified Food could be cassava, maize, guavas or beans, cows, goats, sheep, rabbits • President Kibaki recently backed the use of controversial genetically modified organ ISMS to increase yields at KARI while commissioning a biosafety green house complex. The use of GM's is a controversial one, in the US is treated with hollowed publicity. • GM – run the risk of creating insect resistance contaminants of wild plants that are related to our domesticated crops and greater use of chemicals. • GM foods also risk less biodiversity and harmful mutations that can cure diseases especially because of difficulty in treating an epidemic caused by a mutant. • They may also produce toxic substances to humans, pets, or other species. • They may also alter the absence of nutrients in the environment and alternate the growth and development of species. They may also reduce our 1Q level and make us intellectual dwarfs or reduce our life expectancy in US experiments with GM foods, 37 people died and	Agricultural Survey 2004 Magazine

	1,800 others were permanently disabled after feeding on toxic Soya beans that were genetically modified. • In other cases cows eating GM foods showed increase fat content in their milk. • Bees that feed on pollen from genetically modified plants suffered from impaired sense of smell and had shorter lifespan.	
Daily Nation Tuesday August 31, 2004	• EU experts will debate next month whether to allow import of a genetically modified maize type, potentially its second approval after lifting its biotech both in May • The maize engineered by US biotech giant Monsanto to protect against the corn rootworm insect would be used in animal feed. But not for growing or human consumption. • According to the draft the MON 863 maize would be put to some uses as any other maize with exception of cultivation and uses in food. • The committee experts meet on September 20 • Other Monsanto maize GM products not yet allowed by the EU include a hybrid cross of Mon 863 and another monsoon type N.K. 603 which are still on hold • Deadlock at ministerial and committee levels has been the pattern for all commission attempts to win a new GMO approval to win a new GMO approval since 1998. • Said Gues Ritsema of environmental group friends and earth the deadlock has happened seven times in a row a lot of countries abstain and that does not count as a vote. It does not block anything but the commission do not like the fact hat they can't get support.	Business Week article
East African Standard August 30 1997	• The Kenya Seed Company according to its personnel and public relations manager Allan Ruto is developing a new maize seed variety which is highly resistant to 'struck' a common maize disease. The seed code named H.94 takes 3 months to mature. He also said the company had also developed a new sunflower seed which can yield 3 – 5 tonnes of oil per hectare. It's condemned 4898.	Speaking to the EA Standard in Mombasa
EA Standard March 17 2003	• African scientists have complained that EU humanitarian groups e.g. Oxfam, Christian Aid and Save the Children have frightened African governments with pressures to reject food aid containing GMOs	
East African Standard March 10, 2003	• East African Seed Company (EASC) has entered memorandum of understanding with KARI to breed and market seed varieties from South Africa. EASC agronomist Francis Ndungu said under the pace a new variety PANA 691 to be produced in the country will supplement the popular half seed produced by the company.	Kitale Hotel at the launch of the 691 variety
EA Standard March 10, 2003	• The adoption of biotechnology enhanced crops by farmers worldwide according to a report released recently by Dr Clive James, Chairman Founder member of the International service for acquisition of biotechnology says. • According to him the adoption rate of biotechnology worldwide is a strong vote of confidence in GM crops.	
Kenya Times November 27 2004	• Principal of Chepkoilel Campus Moi University, Professor Margaret Kamar has challenged scientists and agricultural researchers to improve seed technology for sustained food security speech was read on her behalf by Dr Linus Cheruiyot.	Workshop in Kakamega

Kenya Times Wednesday November 15, 2000	• Rural development minister Chris Obure said that though the Kenyan agricultural research system had developed appropriate technologies to adjust decline of agricultural production the desired result has not been achieved as farmers were slow in adopting new technologies due to poor information dissemination.	Seventh Biennial Scientific Conference held at KARI Headquarters in Nairobi
Daily NationSeptember 11, 2003	• Tissue culture banana a variety used in deserts has been initiated in rural Meru districts to develop sustainable and successful banana cultivation. • Charity Mariene a (Nolep) National agriculture and livestock extension programme says with tissue culture bananas they have an opportunity to develop more competitive and profitable banana industry. • Farmers in Kiriia focal area some 15 Km from Meru town formed a village group to promote the culture.	
Daily Nation October 31, 2003	• Magnate Bill Gates donation of $ 25 million for bio fortification is an effort to provide a life saving shot to the dying family of public sector international agriculture research institutes. • The consultative group on international agricultural research (GIAR) is now seriously fighting for its own survival ironically. • Its contemplating merging two of its premier institutes the international rice research institute at Los Banes in the Philippines and the international crop research centre for wheat and maize in Mexico City. • Bill Gates donation comes as a blessing in disguise. • Ever since the release of the rice crop varieties some 25 – 30 years ago. The international agricultural research have only been engaged in maintenance research.	Opinion Davinder Sharma
Daily Nation September 24, 2003	• Two new wheat varieties have been developed at the Nyuso Plant breeding centre in Nakuru District plant breeder Peter Njau said the two varieties would be ideal for marginal areas such as Naivasha Mweiga Laikipia and lower parts of Narok Town. • The two are DH4 and DH7.	
East African Standard June 14, 2003	• Environment committee for the European parliament voted to ban traces of genetically modified material in imported products unless exporters can guarantee 100 per cent purity. • Even if a country takes every precaution on the farm during storage and transport adventitious material may still appear says Jocelyn Webster executive director of Africa-Bio in South Africa. • Draft legislation on the labelling and traceability of GM food is to be debate by the European parliament in July 2003.	
Daily Nation April 28, 2004	• KARI has developed 17 new maize varieties but a Kitale researcher, Mr. David Legeo said KARI needed to do more research to ensure that the best seeds were made available to farmers. East Africa Seed Company Marketing Manager, Francis Ndungu said his organisation has started producing three of the varieties.	
Daily Nation May 18, 2004	• The European Union appears ready to approve a genetically engineered coin ending a six year moratorium on approvals for biotechnology crops that led to a bitter trade dispute with the United States. • A spokesman for the US trade representative said the approval of a single product does not affect the WTO challenge.	
East African Standard June 11, 2003	• Scientists' prediction of the end of the world – a genetically engineered pathogen is released, debris from an erupting super volcano blocks the sun or scientists on the biggest bio error of them all accidentally trigger a matter of squeezing "big bang."	

East African Standard June 10, 2003	• If Africa were free to adopt GM Technology not only could we feed more people and reduce starvation but we could increase incomes. • If Greenpeace really cared about people as it likes to portray why it would campaign against Gm technology in agriculture.	Article by Richard - Director of health advocacy group Africa fighting malaria
East African Standard February 11, 2003	• Plans to develop new maize seed in Kenya that is resistant to insect attacks may be finalise in the next five years. • The maize seed known as BT *Bacillus Thuringiensis* is expected to result in higher yields and better quality grain which will in turn ensure food security for Kenyans. • IRMA review team members said the project had been successfully completed and have embarked on phase 2 which involves taking the product to the farmers for trials.	
Daily Nation October 30, 2003	• Prof. E. M. Njoka an agronomist and a University lecturer said Africa should use biotechnology to avert food shortage health and security problems. • Maritim said scientists had the responsibility of advising governments on police relating to the use of biotechnology.	Symposium at Egerton University
East African Standard April 2, 2004	• The proportion of S. Africa's maize crops that is genetically modified will double this year and the next. • South Africa is one of the few countries in the world that produce GM white maize.	
East African Standard April 20, 2004	• European countries started enforcing the world's strictest rules on labelling, genetically modified foods.	
Daily Nation Thursday June 28, 2001	• Dr. Florence Wambugu in an interview with Fred Pearce of the New Scientist magazine says she fights for the credibility of the technology as a stakeholder. • D. Wambugu said that GM technology is better for Africa compared with other technologies. She cited the green revolution which she says was alien and Africa's farmers had to be educated in the use of fertilisers – transgenic crops get around that because the technology (to control insects for instance) is packaged in the seed. • She says GM food could almost literally weed out poverty.	Midweek Magazine
Daily Nation June 28, 2002	• A file picture, Ambassador Andrew Young a former US Envoy to the UN Dr Judy Chambers a scientist at Monsanto potato research programme and Romano Kiome director KARI with a sample of the fast genetically modified sweet potato in Nairobi	
Daily Nation February 25, 2003	• FAO said last week that biotechnology research is failing to help the poor and needs to focus on boasting food supplies. Koffi Annan UN Secretary General called for a green revolution and did not specifically mention the controversial question of genetically modified food.	
Daily Nation March 26 2004	• Rockefeller Foundation President Dr. Gordon Conway said that his organization is committed in supporting farmers in Bungoma District. • The foundation and KARI are developing a new maize variety for Bungoma district. • He was accompanied by Sacred Africa MD Eusebias Mukhwana when he paid a courtesy call on District Commissioner Joseph Irungu.	Speaking in Bungoma when he visited.
East African Standard May 14, 2004	• Two new cassava types Mygera and KSA 81 were introduced by KARI after the mosaic virus wiped out old varieties grown in Bungoma, Busia and Teso districts	

	according to Mr. Clement Buyesu the Bungoma district agriculture officer. • Buyesu said the new varieties were being bulked at Mabanga farmers training centre and selected private farms adding they could be obtained for planting at cost of Shs. 200.	
Daily Nation Tuesday February 11, 2003	• Dr. Christopher Gichabe of KARI during a visit by Agriculture Minister Kipruto Arap Kirwa said a pest resistant maize variety developed by the Institute would soon be released to farmers known as the insect-resistant maize of Africa (IRMA). The variety is undergoing last stages of testing and is expected to boost farmers' earnings by reducing storage losses due to pests and saving on pesticides.	Speaking at KARI
Sunday Standard May 30 2004	• The EU this week lifted a six year moratorium on GM maize surprising the protagonists in the "Food wars" • Anti GM campaigner Eric Gail of Greenpeace said the European Commission is supposed to represent the interests of European citizens and the environment but it has chosen in this case to defend US farmers and narrow agribusiness interests. • The Kenya Government policy bans all importation of GM products even though food aid distributor WFP admitted recently that relief maize to Kenya could be GM from one of their main US markets.	Brussels
Daily Nation June 2, 2004	• The Institute (KARI) has developed new superior wheat varieties resistant to the Russian wheat aphid. • The KARI Njoro Centre of plant breeding biotechnology programme was started in 1997 with the assistance of the government, International Atomic Energy Agency, Rockefeller Foundation and the National Council of Science and Technology. • Scientists at the Centre are also evaluating mutated Soya beans and other oil crops production of the new improved Soya beans and sunflower varieties is expected to increase following the opening of a processing mill for Bidco Oil Refineries in Nakuru town last month. • Bidco's chief executive Virral Shah said that his company would pay farmers Kshs 14 for a kilo of Soya beans delivered to its mills.	Information given to members of Parliament who visited the centre last week.
Daily Nation June 17, 2004	• Agriculture Minister Mr. Kipruto Arap Kirwa says while the solution to the problem of food security in Africa lay in embracing new technologies, lack of information about the risks of biotechnology to assist in making laws on environmental protection health and food safety.	During the official launch of the African Agricultural Technology Foundation
Sunday Standard May 30, 2004	• On Wednesday 100 members from environmental youth and civic organizations gathered at the US Embassy in Heerengracht Avenue and marched along Adderley Street to parliament where they handed their manifesto to Thoko Didira Minister of agriculture and morthinus Van Scholkwyk Minister of environmental affairs. • The protest was held to support a court case in the Pretoria High Court in which bio watch is taking on state regulatory agencies and Monsanto the company responsible for taking GM food into the South African market. • Elfrieda P Schorn-Strauss Project Manager at Bio watch said research has proven that it can be toxic and while your safety is at risk when you.	Streets of Pretoria, S.A.
Daily Nation June 25, 2004	• There are many compelling reasons Kenya should gene support to and join in the bandwagon of countries that have officially sanctioned GM foods.	Nation Editorial

	• Nevertheless, there are compelling reasons we have to be careful about them. • Locally the concern has been that if GM food viability is being seriously questioned in the west where they have facilities check the content and address the negative effects what would happen to us who cannot boast of any technological ability to monitor the dangers?	
Daily Nation June 25, 2004	• President Kibaki while opening a greenhouse for genetically modified GM maize at KARI said that his government is committed to the development of GM or any other technology that will increase agricultural output. • Many took this to mean tacit government support for GM foods. Nation spoke to the proponents of either side of the GM debate that has raged in the country for years. • Dr. Hans Herren ICIPE Director a Swiss who is a 1995 Laureate of the world food prize says he feels that while GM technology may be beneficial to Africa, it is not the panacea to food security that it has been touted to be leader of the habitat management programme at ICIPE Dr. Zayour said that both domestic and wild grasses can protect maize by attracting and trapping stableness. • Head of biotechnology and molecular biology programme sat ICIPE Dr. Ellie Osir urges caution in the introduction of GM technology in Africa. • Dr. Samuel Wakhusama director of the International Service for the acquisition of agri-biotech application says that the past GM technology was seen as being only beneficial to the agro-business giants such as Monsanto. This is because such global giants could protect their (IPR) intellectual property rights and the terminator genes designed to ensure that farmers could not replant them as seeds are not made to germinate.	Nation Research
Daily Nation June 28 2004	• A new high ad early yielding sugar cane type is to be introduced in Western Kenya. • Chairman of the West Kenya Out growers Company Ms Hailam Datisi said yesterday that his organisation had asked the Kenya Sugar Research Foundation for the seed cane. The variety is also said to be resistant to the Smut Viral disease	Firms annual general meeting at Malaba township Busia District
Daily Nation January 29, 2004	• Trials to develop a virus resistant sweet potato through biotechnology have failed. This is according to KARI biotechnology centre researchers. • The modified potato was launched in Kenya in 2001 by US special envoy Dr. Andrew Young.	
East African Standard June 24, 2004	• President Kibaki backed the use of the controversial genetically modified organisms' agricultural production. • The greenhouse was developed in collaboration with the international maize and wheat improved (CIMMYT).	Speaking at KARI after commissioning a biosafety greenhouse complex
East African Standard July 2, 2003	• Prof. Ochanda Chairman of the African Biotechnology stakeholders forum, a not for profit organization creating awareness on biotechnology in Africa, says there is a window of opportunity for local scientists and that the Kenya government must pay its researchers well If it wants them to be innovators.	Editorial
East African Standard July 2, 2003	• James Shikwati, director of the NGO Inter-region Economic network IREN said at a meeting that EU concerns that African farmers could become dependent on GM technology from the US are justified but insisted that such a situation was still better than a dependency in food aid.	A forum in Brussels organized by Tech Central Station a US - on line journal

	• The Ministry of Agriculture and the National Council of Science and Technology (NCST) are putting up modalities for the introduction and use of GMOs in the country.	
East African Standard June 16, 2004	• Dr. Ed Rege Director of biotechnology at the international research institute says the planned setting up of a bioscience research facility in Kenya for the eastern and central Africa region, heralds a radical departure from the continents Lukewarm embracing of scientific and technological developments. • The bioscience facility is being established as part of a NEPAD (New Partnership for African Development) network of centres of excellence will be a focal point for African scientists to address top priority areas of development on the continent.	Executives
East African Standard FS Tuesday March 9, 2004	• Countries across Asia, Africa, Europe and most of Latin America agreed pm tighter rules governing in Kuala Lumpur negotiators from nearly 90 countries struck a deal requiring detailed information on shipments of GM crops such as maize, cotton and Soya. • Ethiopian negotiator Tewolde Egziaber who led talks for many developing nations represented in the week long Malaysian meeting highlighted the liability deal as key. • He said genetic engineering was a technology developed by the private sector meaning that risk assessment and research by the authorities was all he more important. • Australia and the United States were among a two year regretting what was agreed under the United Nations Cartagena Biosafety Protocol saying it would be hard to put into practice.	Negotiations Kuala Lumpur Malaysia
Daily Nation February 6, 2004	• KEMRI through biotechnology has developed a new vaccine against the deadly rift valley fever.	
Sunday Standard May 30, 2004	• Every year Kenya loses Sh. 7.2 b ($ 90 million) to an insect that attacks maize stalks – the stalk borer insect resistant maize for Africa (IRMA) project uses biotechnology to develop varieties of the crop that are resistant to insects. • Already Sh. 10 million ($ 128 205.12) Biosafety Level II green house for genetically modified maize has been constructed at KARI. • Choices for developing countries should not mean accept GM food or starve.	
East African Standard September 6, 2003	• Former US President and Nobel peace prize Laureate Jimmy Carter said that GM crops could be of huge benefit to Africa and it was grievous that the idea had spread that such crops were dangerous. • In a speech in Tokyo Carter said that biotechnology offered the chance to produce crops that were almost immune to disease helping to meet the most basic human right of all food to eat. Carter who won the Nobel Peace Prize in 2003 won acclaim during four years as President from 1977 by brokering a peace deal between Egypt and Israel.	A speech in a Tokyo event sponsored by the privately funded NIPPON Foundation and the Sasakawa Africa Association an Africa-Linked NGO
Daily Nation July 31, 2003	• A new research says that Kenyans could already be consuming genetically modified organisms without knowing. Done early this month, it says the country has no capacity to deal with genetically altered foods. Lucy Mathenge the brain behind the study cites food aid from the USA and other GMO producing countries as probable sources.	
Daily Nation July 8, 2003	• A United Nations food body has set a blueprint to manage health risks from genetically modified foods and has agreed minimum cocoa content for chocolate products.	FAO Headquarters

	• The more than 120 member state codex. Alimentarius Alan Ronde adopted the guidelines by consensus at the food and agriculture organization headquarters. The regulations which need final approval of the E.U. member governments will require the food industry to segregate GMO from conventional crops and allow no more than 0.9 per cent accidental mixing of GMO in non-GMO shipment to EU. • Rendell said the codex had also adopted technical guidelines for scientific assessment of gene-modified plants and how to determine whether GM foods could trigger allergies in consumers.	
East African Standard February 2, 2004	• Analysts say that Kenya is sitting on a biosafety time bomb following proliferation of genetically modified foods. • Tragically millions of Kenyans are neither aware of this nor has the country formulated adequate policies and laws to regulate what would look like a GMO invasion. • Frankenstein products with the biggest threat being posed on agriculture human health and environment. • Samuel Ochieng the CEO Consumer Information network argued that the governments' reluctance to formulate policies and laws to govern GMOs was part of a conspiracy to shield the public from the future and the real implications of GM products.	Samuel Ochieng CEO consumer information network in an interview with the EA Standard
East African Standard February 2, 2004	• Three months ago the United Nations Biosafety protocol allowed countries under international law to ban food imports containing genetically modified organisms (GMOs) that they think is unsafe. • The USA however the biggest contributor of relief food to the world's biggest food agency the WFP has said that it will not guarantee that its food will not necessarily be genetically modified. • In Kenya a food technologist Sam Omondi says that the raging debate on GM foods in Kenya as indeed in the best of the world is one of the right or wrong. • Friends of earth director Liana Staples points out that the US government seems to be attempting to bulldoze other countries without regard to their rights to protect their people and the environment. • Kenya's own scientist and pioneer in the science of GM foods Dr. Florence Wambugu argues that GM foods are good for Africa because Africa's priority is good security and anything that will increase crop yields should be greatly encouraged.	East African Standard Big Issue
Daily Nation May 23, 2003	• With transatlantic relations still strained by the Iraq war President Bush yesterday opened a new front by accusing Europe of impending American efforts to combat famine and poverty in Africa and beyond. • He made clear other disputes including one over Europe's de facto ban on genetically modified food clouded US-European relations and said he would step up the pressure when he tours the continent beginning May 30 with stops in Poland, Russia and France. • George W Bush said "our European partners have blocked all new bio crops because of unscientific, unfounded fears • The US plan to sue the EU unless it quickly opens its market to GMO products. Biotech crops are engineered to repel predatory insects and better withstand weed killers. Critics say they could endanger human health and cause unforeseen damage to the environment.	