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Towards a Regional Approach to Biotechnology and Biosafety for Southern African Countries (RABSAC)

FOOD AID AND COMMERCIAL IMPORTS OF GM COMMODITIES: THE CASE OF MALAWI

by

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LIST OF ACRONYMS

ADMARC: Agricultural Marketing and Development Corporation Africa

ACMV: Cassava Mosaic Virus

Bt:*Bacillus thuringiensis*

CAMA: Consumers' Association of Malawi

DNA: deoxyribonucleic acid

GMO: Genetically Modified Organisms

IFDC: International Fertilizer Development Centre

IRR**:** Internal Rates of Return

MBA: Malawi Biosafety Act

NRCM: National Research Council of Malawi

OPC**:** Office of the President and Cabinet

PBS: Program for Biosafety Systems

RABESA: Regional Approach to Biotechnology Policy in Southern Africa

RABSAC: Regional Approach to Biosafety for Southern African Countries

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EXECUTIVE SUMMARY

The purpose of this paper is to estimate how the impact that different import policies toward GM commodities might have on food security in Malawi and the SADC region in general. If the government decides not to import GM commodities, either on commercial terms or as food aid during an emergency, will it jeopardize the country's access to needed food supplies? The paper heavily draws on secondary data and in-depth interviews from a limited number of public/private sector stakeholders. Findings of the Phase I OF THE Regional Approach to Biotechnology Policy in Southern Africa (RABESA) stakeholders' consultations on GM crops have also been instrumental in drawing conclusions on critical issues addressed in the paper.

The great drought of 1992 in Southern African countries including Malawi, necessitated a large influx of foreign produce, especially yellow maize from the USA and South America. It is well documented that by the late 1990s, a significant and growing proportion of U.S. food aid included GM maize (either as whole grain or flour) or GM soy extract (which is used to make "blended foods" that Congress mandates be given). It is also known that WFP has been distributing GM food aid in southern Africa and Malawi since the mid-1990s. How ever, there has been no documented evidence of toxic side effects to human, animals and the environment of consuming GM maize in Malawi as well as other countries in the Southern African Region. It is therefore interesting to note that that concerns of SADC member states about the risk to consuming GM only surfaced a decade later.

Anxiety and fear especially among members of the civil society of unknown consequences of consuming the product appear to have been heightened by inadequate information of the likely effects of transgenic products to human and animal health. At regional level, lack of information about the extent to which maize and food aid imports destined for food insecure nations in Southern Africa in the 1990s and 2000s contained GM material serves as a warning that without developing national and regional policy, legislation and regulatory frameworks, food security programmes and technological development in agriculture in the SADC region, with the exception of South Africa, would be externally driven. However, the paper observes that regulating imports of GM maize will not completely prevent entry of the product into Malawi considering the porosity of the border with neighbouring countries and the attractiveness of informal cross border trade.

The thrust of Government Policy in Malawi is to reorient the country's development paradigm from a consumption based economy to a production based one, as such science and technology, especially

biotechnology are perceived as critical elements towards the attainment of this economic transformation. In line with this paradigm shift plus the objective of ensuring household and national food security, it is Government's imperative that all forms of technology including GM should be explored to assist farmers in improving their productivity. In this regard, Malawi has drafted a policy which is geared towards promoting commercialisation of biotechnology and international trade in biotechnology products. The policy also aims at promoting free enterprise and international collaboration in biotechnology industry so that public agencies and private enterprises can become involved in research and development (R&D) and commercialisation of new biotechnology products and services. Strategies to promote these aims and objectives as stated in the draft Biotechnology Policy are as follows:

a. Starting the national biotechnology development programme and acquiring the necessary items of equipment and expertise with the view to building capacity and achieving self-reliance;
b. Establishing appropriate linkages between the biotechnology programme and Science and Technology coordinating institution to facilitate a strong, locally based bio-informatics system;
c. Establishing small and medium-scale biotechnology industries to engage in domestic bio-resource and biotechnological entrepreneurship development through:
    - Purchase of patent or trademark
    - Open market purchase of technology
    - Technical assistance and collaboration
d. Setting up standards, specifications, guidelines and codes of practice according to international practice for biotechnology production and processing, including the handling of food aid.

In support of Government's stance on transgenic technology, studies have demonstrated that introduction of GM maize and cottonseed would double farmers' gross margins per hectare as long as yield or price levels are increased. Furthermore, it has been shown that GM technology has the potential to increase return to investment among maize and cotton growers in Malawi especially considering the reduction is the cost of pesticide application in the latter. For example a 15% reduction in yield loss as a result of using GM technology would double farmers' gross margins in both bt-cotton and bt-maize (IFDC 2004). However, gains from the introduction of any form of agricultural technology crucially depend on the farmers' investment in appropriate agronomic and farming practices necessary for that technology to manifest its potential.

In conclusion the paper makes the following observations and recommendations:

i. Harmonization of Regional Policies on Biotechnology.
Regulating imports of GM maize will not completely prevent entry of the product into Malawi considering the porosity of the border with neighbouring countries and the attractiveness of informal cross border trade. Furthermore, lack of information about the extent to which maize and food aid imports destined for food insecure nations in Southern Africa in the 1990s and 2000s contained GM material serves as a warning that without developing national and regional policy, legislation and regulatory frameworks, food security programmes and technological development in agriculture in the SADC region, with the exception of South Africa, would be externally driven.

- ***It is therefore recommended that Governments in the SADC regional allocate resources to facilitate development of a Biotechnology Common Policy and Regulatory Framework (BCPRF) within the next two years.***

ii. Capacity Building
Considering that most countries in the SADC have unknowingly been importing and consuming GM maize due to lack of capacity to monitor transgenic commodities,

- ***Governments should allocate sufficient resources to build technical and human capacity through acquisition of appropriate GM testing equipment and knowledge and skills development of commodity inspectors.***

iii. Awareness Campaign
Although the policy stance on commercialisation of biotechnology and international trade in biotechnology products is positive, debate on the risks of consuming GM maize is likely to continue as evidenced by the position taken by CAMA after national consultations on the draft Biotechnology Policy.

- ***It is recommended that Government in collaboration with the private sector should mount awareness campaign to counter unfounded and negative publicity of transgenic commodities.***

iv. Biotech Information system
The uncertainty regarding health risks of GM food to humans and animals was orchestrated by lack of information and the absence of

policy options on how to handle the product in emergencies and normal situations.

- ***It is recommended that Government in collaboration with the private sector invest sufficiently in evidence based biotechnology information systems development through national research centres and policy analysis networks.***

v. Input Support and technical education

This implies that, improvement in income and food security through introduction of transgenic crops can only be achieved if the input constraint in terms of seed and fertilizer is addressed.

- ***It is recommended that Government continues implementing a market friendly input support programmes through subsidies with a clearly defined exit strategy within the next five years.***

- ***It is also recommended that Government in collaboration with the private sector should implement a coherent and coordinated demand driven farmer education programme to support the input support programme.***

1. INTRODUCTION

During the past two decades Malawi has increasingly relied on imports and food aid to compensate for recurring food production deficits. The country requires 2,173,600 - 2,654,080 mt of food in maize equivalents to feed an estimated 12 million people; but over the past two decades, food deficits have ranged between 400,000mt to 798,085 mt, the worst deficit being that of 1991/92 with a food deficit of approximately one million mt in maize equivalents. Since 1994, maize imports have risen above 200,000 mt (Figure 1) except in 1999 /00 and 2000/01, the period in which the country produced more than its requirements largely as a result of free input distribution by Government. Since 2001 food aid in form of cereals has trebled from around 50,000 mt to 150,000mt.

The use of imports and food aid to mitigate starvation in Malawi and neighbouring Southern African countries has been met with stiff resistance by policy makers, NGOs, and some groups of consumers due to the emergence and inclusion of genetically modified (GM) maize stock in the food aid and commercial import consignments. Fear of unknown risk to human and animal health and the likelihood of contaminating and eroding the maize genetic pool in the region triggered region-wide condemnation that the use of GM maize to offset food shortages was an unsuitable and unwelcome option. Among the SADC member states Zimbabwe was the first government to raise concern about GM whole kernel maize in June 2002 to the extent that President Robert Mugabe denounced a shipment of 10,000 metric tons of such maize at the July 2002 World Food Summit in Rome. That shipment was re-routed to Malawi while negotiations ensued with Zimbabwe over transport, packaging and milling. In late August, Zimbabwe agreed to accept the whole kernel maize but would only distribute it after milling and labeling. The uncertainty regarding health risks of GM food to humans and animals was orchestrated by lack of region-wide public awareness about the long term effects of introducing GM crops in the region due to insufficient information and the absence of policy options on how to handle the product in emergencies and normal situations.

In the wake of this development, Phase I of the Regional Approach to Biotechnology Policy in Southern Africa (RABESA) commissioned country studies with the aim of establishing the general perception of GM crops within SADC member states in 2004. In the case of Malawi, the general perception on GM crops among randomly selected respondents drawn from a cross section of stakeholders was that genetic transformation has potential to improve food security, but there is apprehension and fear of the risks associated with safety to humans, animals and the environment. This situation is orchestrated by lack of public awareness due to insufficient information on the long term effects of introducing GM

crops in the country. The Government position was that whatever developments occur in the scientific and technological fields elsewhere will affect Malawi and that the country could not afford to remain behind the GM revolution. However, there is need to build capacity to manage and regulate the use of biotechnology in the country. Against this background, a Draft Biotechnology Policy which includes all aspects of biotechnology, GMO and bio-safety, social and ethical issues and all other concerns in environment, human health, ecology, plants and animals, industry, trade, food and nutrition, and cross cutting issues, has been completed and is being circulated for reviews by a wide cross section of stakeholders.

The second phase of RABSAC builds on results of the SADC-wide stakeholder consultations to determine the possibility of harmonizing the development and implementation of GM policies, legislation and regulations with a view to addressing the pervasive and deep-rooted poverty and food security in the SADC Region, one of the major pillars of the Millennium Development Goals, i.e., "Eradicate Extreme Poverty and hunger whose target is to "halve the proportion, by 2015, of people living in extreme poverty, and hunger".

The paper comprises nine sections. Section 1 provides a general background while Section 2 outlines the objective. Section 3 discusses methodology whereas Section 4 covers food security policies and situation in the country. Trends and quantities of imported food are presented in Section 5 and Section 6 summarises public and government views on importation of GM commodities. Section 7 discusses potential impacts of transgenic maize, cassava and cotton, while Section 8 provides and economic analysis of maize and cotton. Sections 9 and 10 draw conclusions and recommendations on issues raised in the paper, respectively.

2. OBJECTIVE

The purpose of this paper is to estimate how the impact that different import policies toward GM commodities might have on food security in Malawi and the SADC region in general. If the government decides not to import GM commodities, either on commercial terms or as food aid during an emergency, will it jeopardize the country's access to needed food supplies? To help in answering this question the paper analyses the level of commercial and food aid import policies and practices in Malawi within the context of trade policy with specific reference to GM crops. The paper further addresses Government regulations and requirements for importing GM food analysing the nation's actual practice in terms of imported commercial shipments of maize that might contain GM varieties, identifying sources of imports, form (milled or unmilled),

agents, mode and routes of transshipment. Since GM technology has been extended to maize the paper also examines Malawi's position on this crop.

Finally, the paper attempts to estimate the possible farm-level impacts and adoption rate indications if GM crops were permitted to be released for commercial production by national authorities. This analysis is based in part on current production systems in the country.

3. METHODOLOGY

The paper heavily draws on secondary data and in-depth interviews from a limited number of public/private sector stakeholders. Secondary data and information have been sourced from a wide series of private and public sector publications and research literature. Findings of the Phase I RABESA stakeholders' consultations on GM crops have also been instrumental in drawing conclusions on critical issues addressed in the paper.

4. FOOD SECURITY POLICIES AND FOOD SECURITY SITUATION

Despite various initiatives, interventions and macroeconomic frameworks during the past 20-30 years, the overall performance of the food sector has been unsatisfactory. These initiatives included maize self sufficiency through government input subsidies from the time of independence in 1964 to 1994, Maize Productivity Task Force, and Maize Agronomy Research Programme (Manda 2001), donor-supported agricultural productivity investment program (APIP) and the starter pack and targeted inputs programme (TIP) which expanded access to credit and provided limited quantities of free inputs to smallholder farmers, respectively. Most recently in 2005/06, the Government re-introduced the input subsidy scheme targeting the poorest of the poor growing maize and tobacco. This programme is likely to continue for the next three to five years.

In spite of the various initiatives, the country has increasingly become incapable of availing itself of enough maize largely because production levels are not keeping pace with population, which more than doubled from six to almost 13million between 1977 and 2005. Based on estimates of food balance, Malawi has experienced six episodes of food crises during the past two decades, the worst being that of 1991/92 with a food deficit of approximately one million tones in maize equivalent. In relative terms, the deficits of 1993/94 and 2002/03 estimated at 798,085 mt and 600,000 mt, rank second and third respectively.

The prevalence of food insecurity is alarming. For example, UNICEF (2006) estimates that almost 5 million people were in need of food aid from November 2005 to March 2006. A total of 118,393 had global acute malnutrition, with over 53,647 as severe cases. An estimated 44,500 pregnant women and 80,000 lactating mothers are in need of supplementary feeding. Some 4.9 million people were in need of food assistance until end of March 2006.

The impact of food insecurity as manifested in nutritional and health shows that 24.5% (353,763 children) of under 5 children are underweight, 41.6% (600,676 children) are stunted (chronically malnourished) and 4.4% (63,533 children) acutely malnourished (wasting) (UNICEF 2006). Stunting which indicates chronic malnutrition has not changed between 1992 and 2000. Stunting is significantly higher among boys than girls. The prevalence of stunting is significantly higher in rural areas (51%) than town (37%) or other 'urban' areas (33%). The prevalence of chronic and acute malnutrition is highest in the age of 12 to 23 months, indicating inadequacy of complementary feeding. In addition, incidence of low birth weight (LBW) babies remains high (16.5%) based on MDHS and about 20% based on hospital reports indicating that a significant proportion of the babies are born under-weight, a reflection of maternal inadequate energy and nutrient intake during pregnancy, low pre-pregnancy weight and high incidence of diseases such as malaria.

Estimates of micronutrients deficiencies by UNICEF show that 59%, 38% and 57% of children under 5, school-age children and mothers are vitamin A deficient, respectively. Approximately, 80% of children under 5 and 22% of school age are reported to be anaemic.

Preliminary data from the Malawi Demographic Health Survey (MDHS) show that, in the period 2000-2004 (OPC 2005), the Under-five mortality rate was 133 per 1000 live births while the infant mortality rate was 76 per 1000 live births. These recent figures are substantially lower than those reported in the preceding years. The under-five mortality rates were 190 and 187 per 1000 live births in periods 1990-1994 and 1995-1999, respectively. The corresponding figure for infant mortality rates in these preceding years were 104 and 112 per 1000 live births respectively. Despite this recent decline, Malawi's under-five and infant mortality rates remain one of the poorest in sub-Saharan Africa and world-wide.

The maternal mortality ratio (MMR) in Malawi rose sharply from 620 to 1120 per 100,000 live births from 1992 to 2000. Although the MMR for the period 2000-2004 has not yet been officially reported, there are

indications that there is a downward trend from the 2000 figure. The preliminary report of the 2004 MDHS shows a figure of 984 maternal deaths per 100,000 live births. Even with this figure of MMR, Malawi remains one of the countries with the highest MMR in the world.

Some of the major factors contributing to the dismal performance of the food sector include:

- Policy reforms did not adequately address problems identified even during the past 20-30 years;
- Policy and strategy has not been consistent with the investment programmes;
- There has not been a clear framework for addressing short, medium and long-term strategy to address food insecurity and malnutrition;
- The policy documents on food security and nutrition have not clearly spelt out the roles, responsibilities and relationship between the various players in the food industry and even between the programmes; and
- Monitoring and evaluation systems have also been non-existent and if they exist they have not been functional.

Recent Government efforts to address the above issues have culminated into the development of the **Food and Nutrition Security Policy** whose long-term goal is to significantly improve food security and nutritional status of the population. The goal implies a rapid and substantial reduction in the degree and severity of malnutrition, in all its forms, i.e., chronic and acute malnutrition and micronutrient deficiencies of all forms, among the men, and women, boys and girls, especially under-fives, expectant and lactating mothers of the population. Within the context of stability in food and nutrition the policy underscores the importance of improved coordination and management of food aid and imports through the following strategies:

- promoting a coordinated approach to planning and management of food aid and commercial import; and
- ensuring that food aid conforms to the bio-Safety and other related legislations.

It is acknowledge in the policy document that low content of science and technology in national economic development programmes is a barrier to economic growth and therefore exacerbates poverty and food insecurity. One of the key areas that science and technology would contribute in the fight against food insecurity is the reduction in post harvest losses which are estimated at 30 per cent of the national crop output. The traditional

method of controlling pests and diseases is to apply crop protection products which are expensive and some of which are environmentally unsustainable. In this context, the policy provides for improvement of the capacity and capability of the national system for science and technology, intensified promotion and transfer of technologies to key livelihood systems and increased investment in research and development particularly for food and nutrition security as high priority areas.

Although the issues of bio-safety, science and technology are mentioned, the policy does not adequately link them to GM crops with respect to national and global food security dimensions. The vacuum created by the document makes it subservient to biotechnology policy and creates room for varied interpretations of Government stand on GM food and crops.

5. IMPORTATION OF COMMERCIAL AND FOOD AID

Import of commercial and food aid requirements have ranged from five per cent in good harvest season such as 1999/00 to as high as 27 per cent in a bad harvest year such as 2001. Although the national food balance sheet is based on nine crops which account for 85 per cent of the energy supply in the national diet, maize constitutes the major commodity in food imports due to the fact that it contributes approximately 72 per cent of the daily calorie. Increasing levels of imports of commercial and food aid which are presented in this section demonstrate policy failure to reverse the deteriorating trend in the food security status in the country.

South Africa and the United States of America (USA) have been the major sources of commercial imports and food aid since the 1990s. The great drought of 1992 in Southern Africa, necessitated a large influx of foreign produce, especially yellow maize from the USA and South America. It is well documented that by the late 1990s, a significant and growing proportion of U.S. food aid included GM maize (either as whole grain or flour) or GM soy extract (which is used to make “blended foods” that Congress mandates be given). It is also known that WFP has been distributing GM food aid in southern Africa since the mid-1990s. The United States provides more than half of the food aid, much of which is distributed by WFP, and approximately 35 per cent of U.S. food aid may contain GMOs. Furthermore, from 10 to 15 per cent of South Africa’s maize production was estimated to be from GM seeds by 2002. It is therefore interesting to note that that concerns of SDAC members states about the risk to consuming GM only surfaced a decade later (see Box 1).

Box 1. The GM Dilemma

In 2002 Malawi experienced severe food shortages in rural and urban areas in excess of 600,000 mt of maize. This was attributed to a number of factors including:

- Prolonged mid-season dry spells and drought that destroyed many crops before harvesting.
- Occurrence of destructive floods in some areas.
- Low use of agricultural inputs such as fertilizers and improved seeds.
- Reduction in the size of the free farm inputs distribution program to poor smallholder farmers resulting in low output.
- Low use of improved/modern agricultural technologies.

The maize shortage was worsened by the fact that other countries in the Southern African Development Community (SADC) region, including Zimbabwe, Zambia, Mozambique, Namibia, and Angola, also experienced similar food shortages, which resulted in a high demand for maize in the region. To protect the Malawi population from the adverse effects of hunger, the Government of Malawi instituted a number of measures that included the purchase of maize from countries in Africa and abroad.

The government imported relief maize, and in addition, the donor community offered to support Malawi with 210,000 mt of maize for free distribution. Of the donation, 73,000 mt was from the United States comprising bulked GM grain and non-GM grain. Considerable debate was held in the country on the advisability of accepting this maize. Eventually the Government of Malawi accepted the maize on condition that it would be milled prior to distribution.

Lack of information about the extent to which maize and food aid imports destined for food insecure nations in Southern Africa in the 1990s and 2000s contained GM material serves as a warning that without developing national and regional policy, legislation and regulatory frameworks, food security programmes and technological development in agriculture in the SADC region, with the exception of South Africa, would be externally driven.

5.1 Commercial Maize Imports

The worst year of food insecurity in Malawi was 1991/92 growing season when, due to drought, only 657,000 mt of maize was harvested from the 1.5 million mt expected. Approximately 500,000 mt of maize were

imported to partially offset this deficit. Since 1994, maize imports have ranged between 200,000 mt to 350,000 mt (Figure 1) except in 1999/00 and 2000/01, the period in which the country produced more than its requirements largely as a result of free input distribution by Government. The year 2001 was another bad year with a total production estimate of 1.7 million mt, resulting in a shortfall of 300,000 mt. Official statistics from the MoA show that the government imported 334,671 mt in 2002.

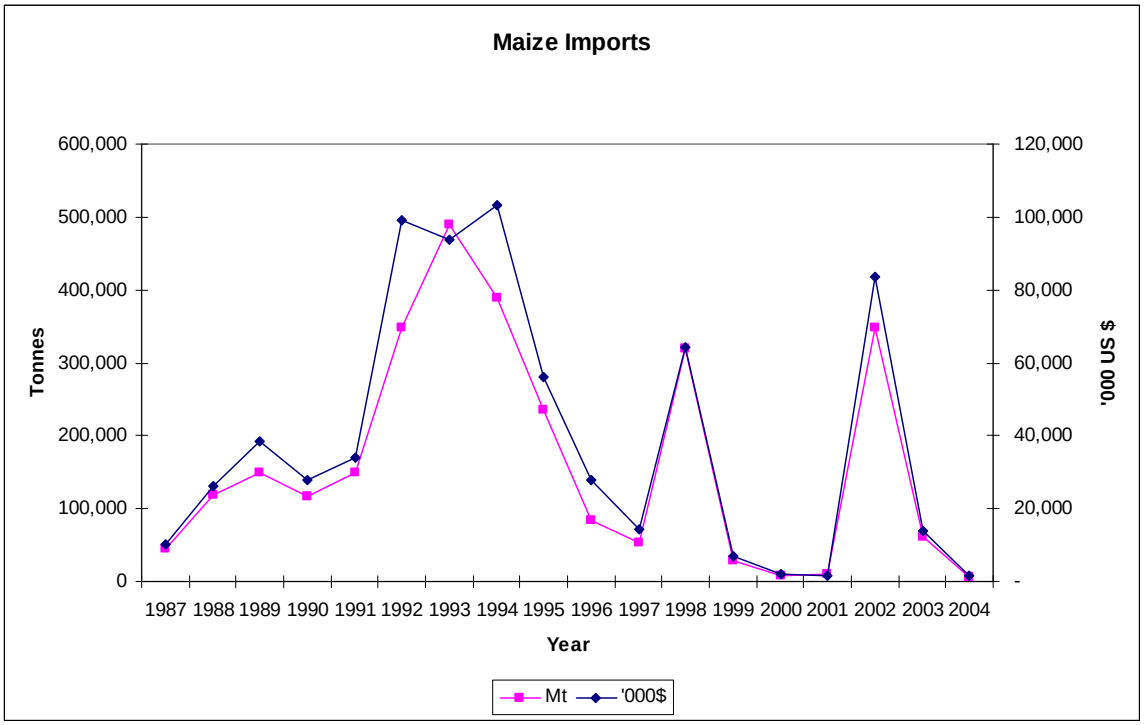


Figure 1. Maize Imports (mt) 1987 - 2004
Source: FAOSTAT (2006).

According to the Malawi Vulnerability Assessment Committee (MVAC) assessment conducted in May 2005, between 4.2 million and 4.6 million people were food insecure from April 2005 to March 2006 and required between 272,000 mt to 423,000 mt of food aid to be imported. According to the recent MVAC revised needs estimate, the number of people at risk has risen to about 4.9 million, with missing food entitlements of 280,400 mt for the whole year (April 2005 to March 2006).

In the periods of scarcity, the majority of imports have been government procurements, with the private sector responsible for approximately one third of the total import volume. For example in 2002, of the 337,321 mt imported, 234,500 mt were bought by the government, with the private sector accounting for 102,821 mt. The net contribution of ADMARC during the 1990s when the corporation was responsible for SGR

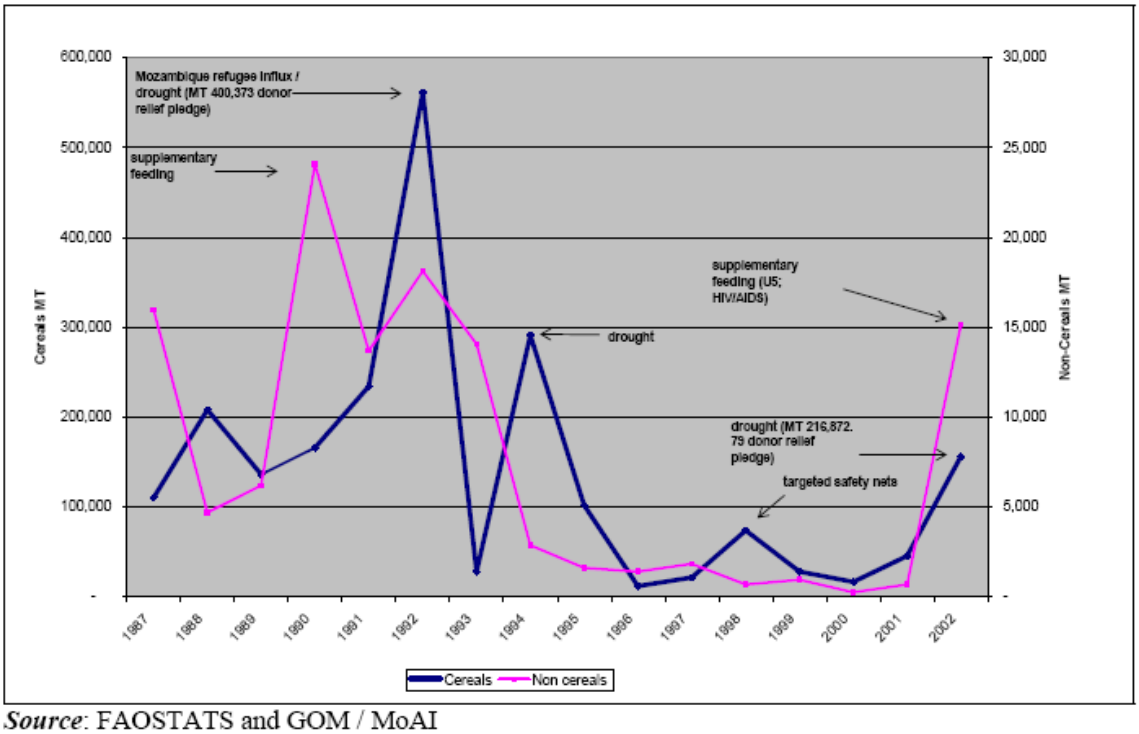
management varied between 240,000 mt (1992) and 120,000 mt (1995). However, one major concern with maize procurement is that government importation tends to be delayed until either funds become available or the demand is clarified and thus frustrates private sector participation in the importation and marketing of this commodity.

5.2 Food Aid – Maize Imports

The trend of cereal and non-cereal donations (food aid) to Malawi over the period 1987-2002 in Figure 2 shows that non-cereal food aid volume is closely correlated to the supplementary feeding requirements for the refugee population which fluctuated between 4,682 mt in 1988 and 24,076 mt in 1990, before falling below 2,000 mt between 1994 and 2001 (WFP Malawi, 2004). Non-cereal aid volumes rose to 15,128 mt in 2002, as a consequence of the increased emphasis, within civil society safety nets programmes, on targeted nutrition (under 5s and people living with aids (PLWA)).

Importation of food worsens the already poor economic situation of the country. According to Charman (2004) the cost of commercial maize imports in 2002 was MK 5,9billion, equivalent to approximately US $77 million. In the 2002/3 scenario, the combined government, donors, civil society organisations effort resulted in the importation of 788,538 mt, which is double the marketable surplus. The estimated cost of these imports was MK 15,6billion or roughly US$ 201.88 million, a figure comparable to the 2002 tobacco export value of MK 17,9billion.

Charman also observes that the food crisis bore an immense cost on the Malawi economy at the macro-economy level. Commercial maize imports in 2002 amounted to $77 million of which the government alone spent $67.4 million, a sum more than double the recurrent and development expenditure combined on agriculture in 2002/03.



Source: FAOSTATS and GOM / MoAI

Figure 2: Donor Food Aid, Volumes 1987-2002

The food bill for the WFP Emergency Operation was $85.7million (WFP Malawi, 2003). It is reasonable to surmise that the total food costs to solve the crisis (both imports and aid) were in excess of US 200 million, a figure which exceeded the Malawi debt re-servicing bill (Charman). In order to meet its import bill, the government was forced to dramatically increase borrowing on the domestic market and from international institutions. As a result of the debt incurred, the government had to revise its expenditure on debt interest payments upwards by 64% during the 2003-2004 financial year. This kind of fiscal expenditure is detrimental to the country's economic stability

The magnitude of expenditure on commercial maize and food aid is so enormous that it raises especially inflation whose magnitude is directly linked to maize shortages and associated expenditure on imports. The enormous expenditure on commercial maize and food aid underscores the need to consider alternative strategies such as introduction of biotechnology to address some of the roots causes of food insecurity, for example low yields and post harvest losses resulting from pests and diseases.

5.3 Wheat and Barley Malt Imports

Wheat and barley malt constitute another important dimension of cereal imports into Malawi. Since 1994 the country has been importing an average of 6,388 mt of wheat and 2,202 mt of barley malt representing an average expenditure of approximate US $6.4 million and US $1.1 million, respectively. Wheat imports have declined since 1994 whereas barley malt imports have remained relatively stable, but rising marginally between 2002 and 2004.

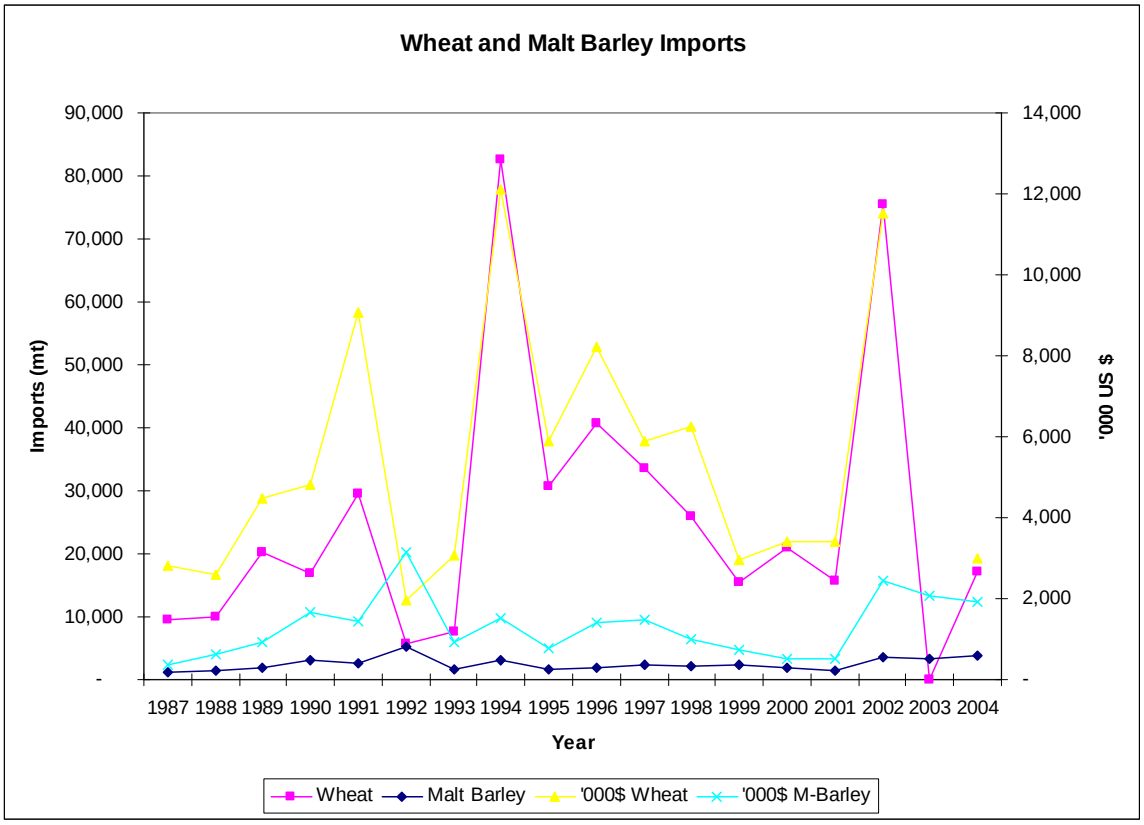


Figure 3. Wheat and Barley Malt Imports – 1987-2004
Source: FAOSTAT (2006)

5.4 Soya Beans Imports

Malawi imports an average of 5,285 mt and 5,450 mt of soyabeans and oil of soya valued at US $2.5 million and US $4.million, respectively (see Table 1).

Table 1. Importation of Oil of Soya Beans and Soya Beans

	Tonnes	000 $
1989	1,641	1,166
1990	5,348	3,755
1991	4,345	2,295
1992	4,681	4,120
1993	3,114	2,390
1994	6,122	3,638
1995	6,600	5,215
1996	600	480
1997	7,852*	4,800
1999	3,000 *	1,650
2000	5,500 *	900
2001	11,111	6,612
2002	4,786	2,588
2003	12,495	11,575
2004	3,891	2,663

* Soya beans,
Source: FAOSTAT (2006)

Imports of oil of soya has increased from 1,641 mt in 1989 to 12,495 mt in 2004, while imports of soyabeans appear to have declined from 7,852 mt in 1997 to 5,500 mt in 2000. These figures are likely to underestimate the actual imports since estimates of cross-border trade have not been factored in. Soyabeans is increasingly being used as a raw for of stockfeeds and food processing industries. Household utilization of the grain legume into weaning foods also explains the increased consumption of soya in the country. Increased importation of oil of soya reflects a rise in non-cereal aid volumes as shown in Figure 2.

The import statistics of maize, wheat, barley malt and Soya beans serve as a reminder that Malawi like other food deficient Southern African countries has been importing GM foods even before the regional outcry in 2002. As observed by Greenpeace (2002) the United States has since February 2002 delivered or pledged approximately 500,000 metric tons of emergency food assistance, valued at $266 million, to the southern Africa region. Part of the US strategy to respond to the situation in Africa has been to utilize the Bill Emerson Humanitarian Trust, established as an emergency reserve to allow the US to respond to unanticipated food crises. This has allowed the US to release up to 300,000 tonnes of wheat controlled by the Trust, but on the specific proviso that "the wheat is be sold in exchange for an equivalent value of US commodities that are more typically consumed by the poor in southern Africa. These commodities which are likely to have been shipped as emergency food translate to 190,000 tonnes of US GM-contaminated commodities, including maize and soybean oil, valued at $86 million.

6. PUBLIC/GOVERNMENT VIEWS OR OPINIONS ON IMPORTATION OF GM COMMODITIES ON COMMERCIAL TERMS

Malawi accepted genetically modified maize from the USA as food aid during the famine that hit the country in the year 2001. The Government was taken unawares that the food aid would contain GM in nature and had to come up with a position on GMOs there and then. The choice at that time was between starvation and eating GMOs to survive. The Government opted for survival. However, the question the lingered on the minds of policy makers was "for how long will Malawi continue to be a passive recipient of technologies, which she does not even understand very well?" Considering that the thrust of the new Government Policy was to reorient the country's development paradigm from a consumption based economy to a production based one, science and technology, especially biotechnology were perceived as critical elements towards the attainment of this economic.

Box 2. Quotation from one Policy Maker during a National Consultative Forum on GMO

"When we are putting in place these instruments, we must be very clear in our minds about what we intend to achieve as a country. Is our intention, as a country to prevent biotechnology or permit it? My own view is that we have no choice but to accept and even promote it but with precautions. It has to be in line with the needs of the people of Malawi as espoused in the vision 2020 and the Malawi Poverty Reduction Strategy Paper. Furthermore, our decisions will need to be guided by the changes in the global economy. We need to be reminded that the green revolution did bypass us and the end result is the food shortages we are experiencing. We should also be mindful that our local land races are by nature of low yielding potential. Even if our farmers followed all the recommended cultural practices for farming, only so much can be achieved."

In the wake of this development, the Biosafety Bill was enacted into law by Parliament in October 2002 when the debate on genetically modified maize was at its highest peak. The Biosafety Bill was intended to ensure wise use and management of biotechnology and products thereof. The MBA provides for safe management of biotechnological activities. In specific terms, the Act can be applied to:

- Regulation of genetic modification of organisms [plants and animals];

- Importation, development, production, testing, use and application of GMOs;

- The use of gene therapy in animals, including humans.

During the GM Maize food crisis, the Act could have assisted the Malawi Government and other stakeholders to decide on whether or not to import the GM maize. It could also have firmly guided on safe importation, distribution, public awareness, monitoring of possible contamination and health hazards; as well as liability and redress régime.

In spite of passing the MBA, no single application for testing, use and application of GMOs has been authorized in Malawi at the pretext that there is insufficient human and technical capacity to monitor the trials and applications. Maize, cassava and cotton are potential candidates for GM trials in the country. Suffice to note that Chitedze Agricultural Research Station already has a purpose-built biotech lab. What remains is to buy in suitable equipment. Also, there will be need for facilities for conducting field trials under containment, which would include green house(s), and fencing material. In addition, it would be important for the research station to have an information centre to help researchers keep up-to-date on biotechnology developments worldwide. In addition, testing of GM-maize by Monsanto does not have to wait for scientists to come from training, as it will also serve as a form of training. What is required is for the tests (under containment) to be done in collaboration with Chitedze Agricultural Research Station once field-testing facilities are in place. This will not only help build capacity of local scientists but (if trials are successful) will also help improve maize yields within a short time.

Considering that the enactment of the MBA was rushed due to the emergence of the GM food aid, the National Research Council of Malawi (NRCM) organized a consultative workshop that brought together various stakeholders in biotechnology whose purpose was to brainstorm, discuss, and make recommendations for harmonizing the policy, legal, and institutional framework for managing the use of modern biotechnology in Malawi. During ensuing discussions it was apparent that there was no clear policy on biotechnology/ GMO related issues in Malawi to the extent that there are no guidelines and regulations on how biotechnology can be introduced and managed in the country. The meeting further observed the following weaknesses with the Malawi Biosafety Act:

- It does not define the term Biosafety. However, according to the Food and Agriculture Organisation (FAO), Biosafety is defined as "the avoidance of risk to human health and safety and to the

conservation of the environment as a result of the use for research and commerce of genetically modifies organisms."

- It mainly focuses on the regulation of GMOs and gene therapy i.e. modern biotechnology. If this is intentional, then it must be GMO Act, but if its not the case, then a decision must be as whether to: (i) Broaden the Biosafety Act to include all aspects of biosafety, GMOs and gene therapy (hybrid act); or (ii) Amend the Act to address GMOs and gene therapy.

- If Biosafety relates to the Cartagena Protocol on Biosafety, to which Malawi is a signatory, then there are several key areas that are not included in the Act.

- The Biosafety Act is "to provide for the safe management for biotechnology activities and to provide for matters connected therewith the incidental thereto". But the definition of "biotechnology" includes many techniques that are considered traditional, conventional or not requiring safety measures.

- The Biosafety Act defines Biotechnology as any technique that uses living organisms or parts of organisms to: (i) make or modify plants; (ii) improve plants or animals; or (iii) develop micro-organisms for specific purposes". While the Catagina Protocol on Biotechnology defines Modern Biotechnology as the application of: (i) In vitro nucleic acid techniques, including recombinant deoxyribonucleic acid (DNA) and direct injection of nucleic acid into cells or organelles, or (ii) Fusion of cells beyond the taxonomic family, that overcome natural physiological reproductive or recombination barriers and that are not techniques used in traditional breeding and selection;

- Administration in the Biosafety Act is assigned to the Minister responsible for environmental affairs. As such has the following problems: (i) Environment is only one sector – biotechnology is a cross-cutting issue that effects many other sectors such as health, agriculture, forestry, industry, nature conservation, (ii) Environment could itself be an applicant (e.g. bioremediation of environment) and (iii) Acceptability of Environmental Affairs to other stakeholders

In the light these concerns, the meeting agreed on the following key issues to be considered for taking the process forward:

- That the development of the biotechnology law in Malawi should begin with the development of the policy which should guide the process. The policy should be all encompassing including all aspects of biotechnology, GMO and Biosafety and all other concerns in areas of environmental, human health, ecology, social, ethical, livestock and other plant and animal welfare;
- The policy should be backed by a well thought legislation and regulatory framework that comprehensively address the demands of the legislation. Further, the policy should provide guidance on the naming of the Act;
- There is need to build capacity at sectoral and national level to ensure that the various responsibilities that emerges as a result of taking forward this work is easily met within this country;
- There is need to ensure that proper mechanisms for sourcing funds are instituted for this purpose, otherwise, failure to do so may frustrate and jeopardize the whole exercise. Mobilization of both public and private resources for this purpose should be expedited and special consideration should be given to those activities already in the pipeline;
- There is need to foster public/private partnership and encourage public awareness programs and that the success of this work would depend on the degree of consultation and participation during policy formulation stage and implementation; and that
- There is need for policy harmonization at national, regional and international levels so that there is complementality between national and global initiatives.

In order to facilitate implementation of the above resolutions, the International Fertilizer Development Centre (IFDC) in collaboration with the Program for Biosafety Systems (PBS), the International Food Security and the Ministry of Agriculture, Irrigation and Food Security provided technical and financial support to the country through the National Research Council of Malawi (NRCM) to develop a comprehensive policy on biotechnology.

The process of policy development was precede by commissioning of an assessment of the requirements for establishing a biosafety/biotechnology regulatory system in Malawi by IFDC in Malawi whose findings demonstrated among other issues that introduction of GM maize and cottonseed would double farmers' gross margins per hectare as long as yield or price levels are increased. In the case of maize, yield will have to be doubled for farmers to break even at MK10/kg, whereas cotton farmers will break even at existing yield levels as long as prices are not less than MK25/kg. Further, the study indicated that GM

technology has the potential to increase return to investment. A 15% reduction in yield loss as a result of using GM technology would double farmers' gross margins in both bt-cotton and bt-maize (IFDC 2004). The analysis also showed that agronomic practices that lead to high yield levels are critical to the success of both conventional and GM technology.

In line with government objectives of ensuring household and national food security, it is imperative that all forms of technology including GM should be explored to assist farmers in improving their productivity. In this regard, introduction of GM technology should be promoted along with other agronomic practices.

Currently, the draft Biotechnology Policy is being circulated before being presented to parliament and cabinet for adoption. The policy stance with on food aid and GMO tolerance is that before any GM food is released, it should be assessed with respect to food, human health and the environmental effects and, wider input should be sought before a final decision on commercialisation of common foods is made. Further the policy states that proper labeling and regulation through a bureau of standards, and regulation of food additives in dairy products, shellfish, nutrition mixes, dietary supplements, processed foods like meat, poultry and eggs should be observed.

In principle, the policy is geared towards promoting commercialisation of biotechnology and international trade in biotechnology products. The policy also aims at promoting free enterprise and international collaboration in biotechnology industry so that public agencies and private enterprises can become involved in research and development (R&D) and commercialisation of new biotechnology products and services. Strategies to promote these aims and objectives as stated in the draft Biotechnology Policy are as follows:

e. Staring the national biotechnology development programme and acquiring the necessary items of equipment and expertise with the view to building capacity and achieving self-reliance;
f. Establishing appropriate linkages between the biotechnology programme and Science and Technology coordinating institution to facilitate a strong, locally based bio-informatics system;
g. Establishing small and medium-scale biotechnology industries to engage in domestic bio-resource and biotechnological entrepreneurship development through:
    - Purchase of patent or trademark
    - Open market purchase of technology
    - Technical assistance and collaboration

h. Setting up standards, specifications, guidelines and codes of practice according to international practice for biotechnology production and processing, including the handling of food aid.

Following the national consultative forum held in August 2006, the Consumers' Association of Malawi (CMA) requested government to postpone the implementation of National Biotechnology Policy until the needs of Malawians are accommodated. The policy, drafted by the National Research Council of Malawi is aimed at guiding the development and dissemination of relevant technology in the country. According to CAMA the policy falls short of outlining the benefits and risks associated with such technology. "The draft policy for instance fails to acknowledge the risk of extinction of several plant and animal varieties due to gene pollution". CAMA observes that the policy does not acknowledge that gene pollution would contaminate traditional crops and disrupt production patterns of millions of farming households. It is important to note, however, that CAMA's views are only bent to delay the process of policy implementation considering that issues of risk are adequately addressed in the draft policy document.

Based on the provisions in the draft policy, importation of GM commodities on commercial terms or food will be guided by provision of the MBA but also opinions and policies in the SADC Region which include milling and/or stelirisation of grain to avoid contamination of the genetic pool. Since South Africa is the major producer of GM maize in the region it is likely to dominate in trade of milled GM cereals during the next decade.

Testing of GM technologies is likely to be restricted to three crops, maize, cassava and cotton. Considering the sensitivity surrounding maize as the major source of food in the country, introduction of Bt maize is likely to be unsuccessful. The problem of introducing transgenic maize is compounded by the problem of isolation especially among smallholder farmers. On the contrary, cotton does not enter the food chain directly, as such, little resistance is expected with the introduction of Bt cotton. However, the extent to which Bt cotton will improve farmers' income and food security will depend on observance of improved farming practices and prices incentives paid by buyers.

6.1 Public/government views or opinions on importation of GM commodities as food aid

As observed in Box 1, the Malawi Government and the general public accepted GM maize under abnormal circumstances. Even when the

maize grain was milled, there was anxiety and fear especially among members of the civil society of unknown consequences of consuming the product. Therefore importation of GM commodities as food aid is an issue that will continue to generate fear and public debate unless there is adequate information of the likely effects of transgenic products to human and animal health.

6.2 Public/government views or opinions on importation of GM commodities on commercial terms or food aid.

Government opinion on importation of GM commodities on commercial terms or food aid is guided by provision of the MBA. The Act (see Annex 1) stipulates that the authority to import, develop, produce, use, release or distribute genetically modified organisms is: (i) Subject to provision of sub regulation (2) which states that no applicant may import to or export from the Republic of Malawi, or develop, product, use, release or distribute any genetically modified organism in the Republic of Malawi except in terms of a license or permit to undertake such an activity. Thus any violation of this article would attract a penalty. But as stated earlier no GM application has been accepted or rejected based on the argument of inadequate human and technical capacity.

Although the country has no capacity to monitor traces of Bt products such as maize or soyabeans, import permits are given on condition that the importer stipulates to the supplier the country's requirements on non-GM products. The Malawi Bureau of Standards (MBS) is currently building capacity to monitor GM products through training and acquisition of testing equipment from the USA. One scientist will be trained in Zimbabwe on identification and testing of GMOs. This training will be replicated in the country upon return to expand the knowledge and skill base among commodity inspectors.

The Malawi Bureau of standards has also adopted GMO standard specification developed in South Africa as a mechanism to enforce compliance of the MBS Act with respect to transgenic products. Within two to three months time from now the country should be in a position to regulate importation of GM products. Violation of GMO standard specification may attract a variety of penalties depending on the extent of severity. These may include suspension of import permit, rejecting product entry into the country, returning the product back to country of origin or outright blockade of the business interest in Malawi. Financial penalties are being formulated and will be gazzetted once approved by parliament.

6.3 Public/government views or opinions on infrastructure and capacity at ports of entry for testing maize or other commodities for GM content

Malawi has four major outlets: the northern corridor via Mbeya which gives access to the port of Dar Es Salaam; the Nacala corridor with access to Mozambique; the southern route to Beira also with access to Mozambique; and the southern route via Mwanza to Durban. Of all four, the Nacala corridor is the shortest (815km from Blantyre), and has the potential to be cheap, but is not the fastest. The port is generally regarded as the best natural harbour on the east coast of Africa. The harbour is situated in a large sheltered bay with an entrance 800 metres wide and a water depth of 60 metres. Maintenance dredging is not required. The port can accommodate container ships of any size; the main container quay has a length of 335 metres and an alongside water depth of 14.0 metres. In addition, a further 726 metres of quay provides berths with alongside depths of up to 12.0 metres.

In spite of having many positive attributes, the Nacala Corridor faces competition from private road haulage operators of varying size and efficiency who provide services between Malawi and Beira as well as between Malawi and Johannesburg due to inefficiency in services delivery. Currently, road haulage is the dominant mode of goods transport serving Malawi. Of an estimated total of 997,800 tons import/export cargo, the railways only carry about 145,000 tons of traffic.

6.3.1 Beira Corridor

The shortest road corridor from Malawi to a port is the route via Mwanza-Tete-Bandula- Gondola to Beira, a distance of 1,194 km from Lilongwe and 883 km from Blantyre. However, rail distances on the Nacala Corridor (1,014 km to Lilongwe and 803 km to Blantyre from Nacala) are shorter. The road has two lanes, is tarred, and is usable in all weather.

Approximately 100,000 tons of Malawian import cargo is moved from Beira annually by road, and 25,000 tons of export cargo is moved to the port. In addition, there is a considerable amount of traffic from Zimbabwe (540,000 tons of exports, 175,000 tons of imports in 2001) to Beira by road and rail along this corridor from the border at Manica. Huge quantities of drought-relief maize often build up at the port due to transport and administrative limitations and delays, and the indications are that this could become a protracted feature, impairing the efficiency of the Corridor for other regular import and export commodities.

6.3.2 Malawi-Tete-Zimbabwe-South Africa Corridor

This is the longest regularly used route to the coast (the Zambian route is longer but is not used as much). Despite the distance, it is favoured by many users since breakbulk goods can be containerised at either Harare and Johannesburg. Durban is the busiest general goods harbour in Africa and, with a large number of shipping lines calling there, can offer the greatest flexibility and most competitive rates.

6.3.3 Malawi-Dar es Salaam Corridor

At various times in the past, mainly due to the instability in Zimbabwe and Mozambique, Malawi has had to make use of the northern route via Songwe and Mbeya to Dar es Salaam. The distances from points in Malawi to Dar es Salaam (Lilongwe 1,667 km; Blantyre 2,031 km) are shorter than to Durban but longer than to Beira and Nacala. Road conditions in Tanzania and the problems experienced at the port have resulted in minimal use over the past few years, apart from POL imports by road particularly to the northern areas of Malawi for which this route appears to be competitive. There is some import and export movement of goods between the northern areas of Malawi and parts of Tanzania, but the total volumes are reported to be small.

Average daily traffic counts at Songwe in 2000 showed 220 vehicles of which only 10% are estimated to have been cargo trucks. By extrapolation of this level of freight movement, it can be estimated that about 50,000-60,000 tons of goods are moved in each direction annually. The trip time from Dar es Salaam to Blantyre is 7-9 days, which means that a rig can only manage two round trips per month on average.

Tanzanian road traffic regulations limit the size of vehicle combinations to a 52-ton gross combination mass (GCM), allowing maximum payloads of 32 tons, with most carriers using truck-tractor and single tridem semi-trailer or rigid and drawbar trailer combinations. Overloading control is reportedly being improved in Tanzania, with truck impoundment pending payment of the assigned penalty. Stricter overloading control could lead to a further decline in import/export cargoes on this route.

With the exception of Beira, it is generally difficult detect and monitor the in and outflow of GM food in all the routes due to capacity constraint. The fact that borders between Malawi and neighbouring countries are porous makes it even more difficult to monitor informal cross border movements of GM grain.

6.3.4 Malawi-Zambia Corridor

This route is sometimes used for freight traffic between Malawi and South Africa. It is the longest route to a port but has offered the advantages that, first, South African 56-ton Interlink combinations are legal for through loads, and secondly, overloading control in Zambia and Botswana is virtually non-existent. The Lilongwe-Mchinji road is in good condition but beyond, on the T-4 to Lusaka, the road is in poor condition in places. From Lusaka, two alternative routes to South Africa are available – one via Chirindu to Harare and Beit Bridge, and the other via Livingstone, Kazungula on the Zambezi, and Botswana.

6.4 Trans-shipment of GM maize (commercial or food aid) consignments.

At the height of the controversial debate on GM food aid, a meeting of SADC Heads of State in Maputo in 2003, it was declared that any GM grain had to be milled at the port of entry before being transshipped to neighbouring countries. In the event that milling could not possible due to logistical and capacity constraints, the grain would have to be transported through sealed containers. In the case of Malawi which accepted delivery of GM maize, the latter applied.

6.5 How non-GM maize moves across the borders

Major modes of transporting GM or non GM goods in and out of Malawi include head portage, bicycles, ox-carts, small, medium and large (30 tonner) vehicles and railway line through Nacala port in Mozambique. Both formal and informal cross-border trade are used to transport no-GM maize. However, large consignments often have to move through the official entry and exit points due to logistical problems and poor road network in areas outside the official routes.

6.6 How refugee camps access to GM maize through the borders of the country of study

The World Food Programme is responsible for distribution of food in refugee camps. The food distributed to the refugees includes maize grain and flour, rice, vegetable oil[1], pulses, sugar and salt. Although importation of cereals and any other form of food aid has been in line with the 2002 Government's declared position on GM foods, it is likely that some of the food imported before that contained GM stocks. It is currently difficult to monitor GM content in relief food brought by WFP and other humanitarian relief agencies due to limited human and technical capacity in this area.

[1] (very likely oil of Soya beans judging from import trend in Table 1)

7. POTENTIAL BENEFITS OF TRANSGENIC CROPS

Potential benefits of agricultural biotechnology have been well documented in literature (see Makoni, Mohamed-Katerere and Chenje, (2003) and NRCM (2006)). Makoni, et.al., no technology or human activity is completely risk-free; people accept new technologies because they believe the potential benefits outweigh the potential risks, as such, this section examines the positive aspects of biotechnology.

As documented by NRCM, agricultural biotechnology has helped to increase crop yields through improved pest and disease control, more effective use of fertilizer, more tolerance to drought, production of pathogen free and clean seeds and propagules (vegetatively propagated crop plants) shorten breeding cycle of crops and facilitation of minimum tillage. Other benefits include the reduced use of chemical pesticides, improved product quality, bio-fortification and creation of small business opportunities. Furthermore, biotechnological methods have led to organisms that improve food quality including nutrition, consistency and shelf life, or that clean up oil spills and heavy metals in fragile ecosystems thereby reducing toxicity to crops.

Benefits of crops improved through biotechnology include increased nutritive value especially those that are staple foods in developing countries. Biotechnology also promises to improve the health benefits of functional foods that contain significant levels of biological active components that impart health benefits, for example compounds in garlic and onions lower cholesterol and improve the immune response; antioxidants found in green tea; and the glucosinolates in broccoli and cabbage that stimulate anticancer enzymes (NRCM).

Benefits of biotechnology are not equally shared between producers and consumers and are largely invisible to the latter. For example, the first generation of transgenic crops primarily benefited farmers (NRCM). Studies have shown that because insect-resistant maize (B-t maize) variety suffers relatively little insect damage, it can not be easily infested by fungi and moulds as non-insect resistant crops (NRCM). Therefore, the level of toxins such as aflatoxin produced by pathogens some of which are fatal to livestock is much lower in Bt-maize than in non-Bt-maize.

The significance of benefits resulting from adoption of transgenic technologies better appreciated by examining production constraints affecting major food and cash crops grown by a considerable proportion of food insecure farmers in the country, i.e., maize, cassava and cotton.

7.1. Maize

Among the food crops grown in Malawi, maize is major staple contributing approximately 72 per cent of the daily calorie intake. The country requires 2,173,600 mt of food in maize equivalent to feed an estimated 11.4 million people.[2] The requirement increases to 2,654,080.00 mt maize equivalent if seed, wastage and processing losses are taken into account. Maize is grown almost throughout the country involving an estimated population of smallholder farmers between 1.8 and 2 million. Smallholders normally cultivate maize on small sub-plots of 0.2 or 0.3 ha/household and usually plant local seeds and apply inadequate quantities of fertilizer, resulting in low yields.

Pests and diseases are the most important biotic constraints to maize production with stem borer and streak disease caused by maize streak virus (MSV) as being the most economically important in Africa. Stem borers seriously affect a significant proportion of the 96 million ha of maize in developing countries. In Kenya, for example, stem borers cause 15% of the maize grain yield loss valued at US $90 million annually (IFDC). In particularly bad years or in combination with drought stress, total crop loss can occur. A survey carried out in 1990 in sub-Saharan Africa showed that MSV is one of the two most important biotic constraints affecting maize production in Africa. (IFDC). MSV epidemics have been known to lead to maize shortages/famines and maize yield fluctuations. The large fluctuations in maize production also generate large price fluctuations. Insect-resistant *Bt* maize grown in South Africa during the 1998/99 growing season provided an estimated financial advantage of 86 ZAR/ha.

7.2. Cassava

Cassava is a staple food for approximately 30 per cent of Malawi's population, especially among those living along the Lakeshore districts of Karonga, Rumphi, Nkhata-bay, Nkhota-kota and Salima (Benesi, Moyo, Mkumbira, Chipungu, Mtukuso and Mahungu). Apart from being drought resistant, the crop is an important source of income among resource-poor households in the rural areas. In response to increasing household and industrial demand, drought and escalating fertilizer prices, smallholder farmers have resorted to planting cassava in addition to traditional cash and food crops. The hectarage of cassava has been estimated to have increased from as low as 71 919 hectares in 1990 to

[2] This is based on the premise that 2,200 kilocalories of energy is require per capita per day. To provide 80 per cent of these calorie requirements, about 190kg of maize flour (mgaiwa) is needed per person per year.
An equivalent maize of production of 232 kg per person per year is required, assuming losses of 18 per cent are taken into account for seed, wastage and processing (UNDP/Malawi Government (1993). Situation Analysis of Poverty in Malawi).

202 338 hectares in 2001, representing approximately 200% rise (MoAI, 2000). Output is estimated to have increased from 167 818 tonnes in 1990 to 1 735 065 tonnes in 2003.

Africa Cassava Mosaic Virus (ACMV) transmitted by the white fly is the main virus that drastically reduces cassava yield (estimated to cause losses of up to 50 million mt annually). The virus is transmitted by the white fly. GM cassava plants with resistance to cassava mosaic virus disease can drastically reduce the yield loss.

7.3. Cotton

In Malawi, cotton is largely grown by the smallholder sub-sector. The crop is generally grown in hot lowland areas in the Shire Valley and Mwanza/Neno, Phalombe Plain, Zomba West, Machinga, and Mangochi West. The agronomic potential for increased cotton production is very high, both at smallholder and estate levels. Malawi's cotton industry is one of the agricultural enterprises that have witnessed serious production fluctuations. Besides the poor performance during the drought years of 1992, 1994 and 1997, the industry has seen stagnant production levels. For instance, production for the 1990/91 season, estimated at 42 780 tonnes, increased to 83 591 tonnes in 1995/96 and then declined to 37 622 tonnes in the 2000/2001 season. In the subsequent years 2001/02 to 2002/03, production is estimated to have marginally increased by 1% from 39 992 tonnes to 40 446 tonnes. A very small proportion of raw cotton produced in Malawi is exported. Nevertheless, Malawian cotton has a reputation for high quality, and if supported with increased production, the export market for cotton lint can easily be revived.

Cotton—Cotton has traditionally been an important cash crop in Malawi, especially in the lakeshore districts and in other low-lying areas where the climate and soils are not suitable for tobacco. Between 80,000 and 100,000 smallholder households cultivate the crop, as well as maize and drought-tolerant small grains. A limited number of larger commercial farms previously cultivated cotton; yet its declining profitability, in the face of sharply reduced international prices over the past 5 years, has led most of these growers to move away from this crop.

Historically, a major proportion of the ginned Malawi cotton was sold to domestic garment or textile companies, with the balance of the crop exported as lint within and outside of the region. The downsizing of the garment and textile industries since the early 1990s has resulted in most of the seed cotton being ginned and then exported as lint.
Seed cotton production in Malawi is lower today than it was in the mid-1980s. As Figure 4 illustrates, production levels have been highly uneven

over the past decade, reaching a peak in 1995 and 1996 and declining sharply since then.

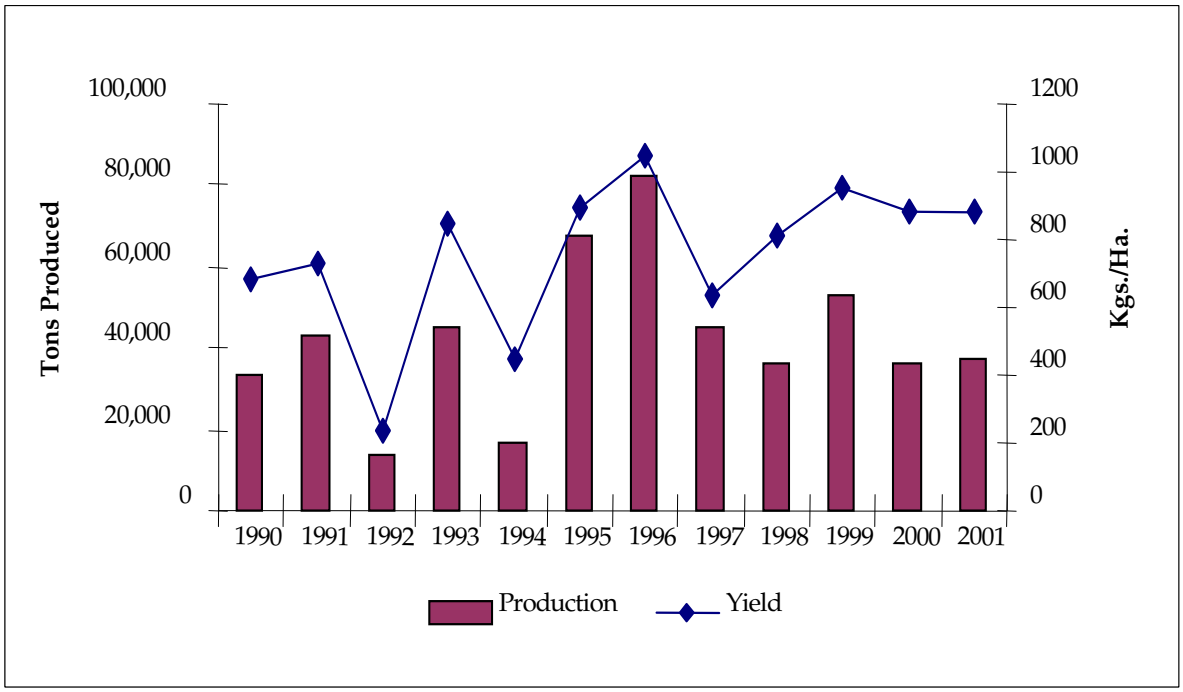


Figure 4. Malawi Seed Cotton Production and Yields From 1990 to 2001

The 2002 crop is estimated at less than 20,000 mt. This decline in production has resulted in the mothballing of two of the country's six cotton gins with the others operating at 40%–50% of their capacity.

Not only is production down, but also quality. Malawi used to have the reputation for producing a well-graded, good-quality cottonseed. This is no longer the case. The varieties grown locally have deteriorated, and there has been a large increase in polypropylene contamination. The production of Malawi's gins is well below those of regional and international standards. Average yields are lower today than in the mid-1990s.

A variety of factors have contributed to the adverse developments in this sector:

i. The deteriorating quality of available seed arising from the mixture of different varieties by ginners and their distribution into non-suitable areas and the limited introduction (or approval) of newer varieties.
ii. The general decline of the official extension service and the resultant decline in cotton husbandry, including pest management.

iii. The decline in international prices and the inefficiencies in marketing arrangements have resulted in substantially lower prices for farmers.
iv. The weak competition and instability in the ownership of gins. The Agricultural Marketing and Development Corporation (ADMARC) has remained in the ginning business, yet ownership of the competing gins has changed twice since 1998.
v. The weakness of producer organizations in this sector, limiting farmer access to credit and an inability to achieve economies through joint purchases of inputs and/or transport of seed cotton.

Returns by cotton farmers in Malawi have maintained quite a low profile of about US$ 72/ha for low input agriculture and US$1 000/ha for potential. The main obstacle for increased production, productivity and incomes has been the low prices which farmers have been offered by the domestic market. The crop prices have been suppressed for quite a long time and are still as low as US$ 0.30 per kilogram, even after the market liberalization policy. The low prices offered by private buyers have scared away large-scale producers, resulting in the lack of growth of the industry.

Bollworm is a major cotton pest which causes severe damage and yield loss. With conventional cotton varieties, bollworm is controlled with insecticides. *Bt* cotton is protected against this insect pest because it contains a naturally occurring substance, a *Bacillus thuringiensis* (*Bt*) protein, which has been the active ingredient in safe and effective biological sprays for over 50 years. Commercial production of *Bt* cotton in South Africa under irrigation had 18% higher yields and required and average of two insecticide sprays instead of six, whereas commercial dryland production had a yield advantage of 23% and required an average of one spray. Small-scale farmers had 29% higher yields and seldom needed to spray. The reduction in labor and pesticide inputs coupled with higher yields and gross profit margins have assisted in improving the living conditions of small-scale cotton farmers.

In rural South African farming areas, *Bt* cottonseed has been tested and widely accepted by small-scale farmers. In the Makhathini Flats area of South Africa, a recent study of the 1998/1999 and 1999/2000 growing seasons found that in the first season only 19% of the surveyed farmers grew *Bt* cotton, whereas by the second season this percentage had increased to 65% that had adopted the technology. Additionally, all those who grew *Bt* cotton in the first year continued growing the following year.

The scientific community worldwide cites the benefits of introducing transgenic technology in agriculture as the potential to reduce cost, increase yield and profitability per unit area, saving on labor and environmental protection. For example, the use of *Bt* cotton by smallholder farmers in South Africa has lowered labor costs and has also increased yield by a magnitude ranging from 27% to 48%. Although the seed costs more, the lower production cost combined with higher yield provides the farmer with a higher gross margin of US $50/ha on average. A reduction in the labor and pesticides input coupled with higher yields has assisted in improving farmers' welfare and livelihood.

Experiences in the use of *Bt* cotton elsewhere also have shown positive results. In Mexico, farmers have reduced the cost of pesticides application by 80% with the adoption of *Bt* cotton. In comparison with conventional varieties, yields for *Bt* cotton have risen by 0.29 mt/ha with a net profitability advantage of US $626.74/ha over the former.

Notwithstanding the risk implications of introducing transgenic technology, the declining productivity in the food and agricultural sector is a compelling reason for Malawi to weigh the benefits and costs of such initiatives in order to make an informed decision on the course of action.

8. ECONOMIC CONSIDERATIONS OF TRANSGENIC MAIZE AND COTTON

Economic considerations of adopting transgenic maize and cotton at both national and household levels using cost/benefit analysis and gross margins, respectively, were examined by Mataya (2004). Costs and benefits at the national level based on aggregate production cost and revenue with and without GM technology discounted over a period of 10 years using 46% as a discount rate were estimated. At the household level gross margins (a crude indicator of profitability) are computed using farm-level data with and without GM technology.

Currently Malawi uses approximately 400,000 ha to produce hybrid maize. In this assessment it is assumed that the total area will be devoted to GM maize. Further, the prevailing price of MK10/kg in 2004 was used in the first year and increased by 10% every year for the 10 years. In the case of cotton, it was been assumed that the GM variety would be grown on 30,000 ha and the prevailing price of MK25/kg (2004 price) would be used. In both cases, the cost of seed has been assumed to increase by 20%. Additional costs in terms of establishment and maintenance have been factored in.

Results of economic analyses of conventional technologies indicated that maize yields would have to be doubled in order for farmers to break even

at MK10/kg. In contrast to cotton, even at lower yield levels of 729, farmers would break even as long as the price was not below MK25/kg. In both cases, the Internal Rates of Return (IRR) were 46% and 47%, respectively, implying that it is economically unviable to produce the crops at interest rates higher than the IRRs.

The comparative analysis between conventional and GM technologies showed that introduction of transgenic maize requires a minimum yield level of 2.3 mt/ha for farmers to break even. However, in the case of cotton, a minimum of 0.7 mt/ha would still be economically viable as long as the price was not less than MK25/kg. In both GM maize and cotton, a 15% reduction in losses due to pests and diseases would result in the doubling of gross profit margins.

The most significant finding in this assessment was that regardless of the technology, yield levels or prices would have to be raised for farmers to break even. This finding confirmed the observation that gains from the introduction of any form of agricultural technology crucially depend on the farmers' investment in appropriate agronomic and farming practices necessary for that technology to manifest its potential.

9. CONCLUSION

The key question being addressed in this paper how the impact that different import policies toward GM commodities might have on food security in Malawi and the SADC region in general. Further, the paper is expected to analyse what happens if the government decides not to import GM commodities, either on commercial terms or as food aid during an emergency, will it jeopardize the country's access to needed food supplies. The data and information provided in the study indicate that the country imports between 200,000mt to 350,000 mt of maize during years of deficit. Some of the imported grain is likely to be GM considering that the country does not have monitoring mechanisms. Lack of information about the extent to which maize and food aid imports destined for food insecure nations in Southern Africa in the 1990s and 2000s contained GM material serves as a warning that without developing national and regional policy, legislation and regulatory frameworks, food security programmes and technological development in agriculture in the SADC region, with the exception of South Africa, would be externally driven.

The draft Biotechnology Policy provides for commercialisation of biotechnology and international trade in biotechnology products as long as GM food is assessed with respect to food, human health and the environmental effects and, wider input should are sought before a final decision on commercialisation of common foods is made. In this context,

should MBS successfully implement the GMO standard specification, it means any GM maize will have to enter the country milled. This will raise the cost of food and limit access to poor urban and rural households. Milling of GM maize will also raise the cost of delivering food to poor households further limiting the quantity to be distributed and the number of beneficiaries. Restriction of trade in GM grain at regional level will strengthen the position of South Africa, being the major producer of GM crops, in trading in milled products, leading to increased dependency by the rest of the SADC nations on the former to meet their food requirements.

Regulating imports of GM maize will not completely prevent entry of the product into Malawi considering the porosity of the border with neighbouring countries. In fact, it is likely that increased supply of GM maize either from South Africa and elsewhere will lead to a drastic reduction in prices, a condition that will encourage smuggling and informal cross border trade with neighbouring countries. For example, GM maize and rice varieties are already being planted illegally in various regions of Tanzania (Balile 2005). As Balile observes, in the absence of effective monitoring and enforcement, bans on the import of GM seeds are of no effect. It is therefore important that GM policies and regulation be harmonized and coordinated at regional level to facilitate monitoring. Monitoring GM crops will provide information for policies and regulations; it will give producers and policymakers better information to help them develop safer adoption processes.

In terms of production of transgenic crops, Bt-cotton appears to be a promising technology to be introduced in Malawi considering that the crop does not directly enter the food chain of most consumers like maize. However, it has been demonstrated that the shortfall in maize supply in years with normal rainfall such as 1999/00, 2000/01 and 2005/05 has been overcome by providing farmers adequate inputs, fertilizer and seed. This implies that, improvement in income and food security through introduction of transgenic crops can only be achieved if the input constraint in terms of seed and fertilizer is addressed.

Although the policy stance on commercialisation of biotechnology and international trade in biotechnology products is positive, debate on the risks of consuming GM maize is likely to continue as evidenced by the position taken by CAMA after national consultations on the draft Biotechnology Policy. As indicated in the draft policy, Government will have to mount national awareness campaign to counter unfounded fears spread by civil society organizations. However, to make these campaigns effectiveness, there will be need to create evidence-based information packages with respect to risk of consuming GM foods.

10. RECOMMENDATIONS

10.1 Harmonization of Regional Policies on Biotechnology.

Regulating imports of GM maize will not completely prevent entry of the product into Malawi considering the porosity of the border with neighbouring countries and the attractiveness of informal cross border trade. Furthermore, lack of information about the extent to which maize and food aid imports destined for food insecure nations in Southern Africa in the 1990s and 2000s contained GM material serves as a warning that without developing national and regional policy, legislation and regulatory frameworks, food security programmes and technological development in agriculture in the SADC region, with the exception of South Africa, would be externally driven.

- ***It is therefore recommended that Governments in the SADC regional allocate resources to facilitate development of a Biotechnology Common Policy and Regulatory Framework (BCPRF) within the next two years.***

10.2 Capacity Building

Considering that most countries in the SADC have unknowingly been importing and consuming GM maize due to lack of capacity to monitor transgenic commodities,

- ***Governments should allocate sufficient resources to build technical and human capacity through acquisition of appropriate GM testing equipment and knowledge and skills development of commodity inspectors.***

10.3 Awareness Campaign

Although the policy stance on commercialisation of biotechnology and international trade in biotechnology products is positive, debate on the risks of consuming GM maize is likely to continue as evidenced by the position taken by CAMA after national consultations on the draft Biotechnology Policy.

- ***It is recommended that Government in collaboration with the private sector should mount awareness campaign to counter unfounded and negative publicity of transgenic commodities.***

10.4 Biotech Information system

The uncertainty regarding health risks of GM food to humans and animals was orchestrated by lack of information and the absence of policy options on how to handle the product in emergencies and normal situations.

- ***It is recommended that Government in collaboration with the private sector invest sufficiently in evidence based biotechnology information systems development through national research centres and policy analysis networks.***

10.5 Input Support and technical education

This implies that, improvement in income and food security through introduction of transgenic crops can only be achieved if the input constraint in terms of seed and fertilizer is addressed.

- ***It is recommended that Government continues implementing a market friendly input support programmes through subsidies with a clearly defined exit strategy within the next five years.***
- ***It is also recommended that Government in collaboration with the private sector should implement a coherent and coordinated demand driven farmer education programme to support the input support programme.***

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ANNEX 1

Biosafety Act

1. SCOPE OF THE MALAWI BIOSAFETY ACT [MBA] 2002

The MBA provides for safe management of biotechnological activities. In specific terms, the Act can be applied to:

- Regulation of genetic modification of organisms [plants and animals];
- Importation, development, production, testing, use and application of GMOs;
- The use of gene therapy in animals, including humans.

Example: During the GM Maize food crisis, the Act could have assisted the Malawi Government and other stakeholders to decide on whether or not to import the GM maize. It could also have firmly guided on safe importation, distribution, public awareness, monitoring of possible contamination and health hazards; as well as liability and redress régime.

2.0 PROVISIONS OF THE ACT

The MBA provides for:

a) Establishment of a Biosafety Fund [Part III] that will be used to support implementation biosafety activities in the country.

b) Issuance of biosafety licenses s and permits to stakeholders or applicants in various sectors of national development [Part IV]. This intended to safeguard best management practices of the biotechnological system.

c) Handling, transport, packaging and identification GMOs and products thereof to avoid adverse effects on the environment [Part V]

d) Promotion of sales of genetically modified organisms [Part VI]

e) Inspections on GMOs and products containing GMOs [Part IV]

f) Miscellaneous Provisions for secrecy, offences and penalties for offences and establishment of biosafety regulations [Part IX]

3.0 NEXT STEPS

The institutional arrangements for operationalization of the Act have been constituted and are illustrated in Figure 1 below. Presently, there is need to mobilize human and financial resources for coordinating implementation of biosafety activities in the country.

Consistent with the Biosafety Act, draft Generic biosafety guidelines have been developed to guide implementation of biosafety activities. However, there is need to develop sector-specific biosafety guidelines and regulations to address sector-specific biosafety requirements.

- The Act stipulates that the authority to import, develop, produce, use, release or distribute genetically modified organisms is: (i) Subject to provision of sub regulation (2). no applicant may import to or export from the Republic of Malawi, or develop, product, use, release or distribute any genetically modifies organism in the Republic of Malawi except in terms of a license or permit to undertake such an activity; (ii) Notwithstanding the provisions of sub regulation (1) a license or permit referred to in the said sub regulation shall not be required for genetically modified organisms that have already been approved for general release in the Republic of Malawi; and (iii) An applicant shall besides complying with the provisions of these regulations, also comply with the provisions of all other laws regulating the importation and exportation of generically modified organisms.

- The biotechnology officer subject to the instructions of and the conditions laid down by the GMO Regulatory Committee shall: (i) issue or refuse to issue a permit or license as required or prescribed under the Act; (ii) amend or withdraw a permit or license issued under this Act; (iii) require the cessation of any genetic modification activity at facilities where the provisions of this Act or the conditions of a license or permit have not been or are not being complied with; (iv) ensure that appropriate measures are undertaken by all users a all times with a view to the protection of the environment from hazards; and (v) cause all inspectors to be trained in all relevant aspects of biosafety.

- The GMO Regulatory Committee shall: (a) evaluate all applications concerning or related to the genetic modification of organisms and make decisions in this regard; (b) advise on request or on its own accord, the responsible Minister other Ministers and appropriate bodies on matter concerning genetic modification of organisms; (c) liaise through the relevant national departments with international groups or organizations concerned with biosafety.

- Reviewers: The biotechnology officer may appoint one or more experts in various fields to review applications. The composition of reviewers is not fixed, but will vary depending on the type of application being considered. Upon conclusion of the risk assessment and auditing process the Reviewer shall provide the biotechnology officer with a risk assessment report that gives his opinion with justifications, on the disposition of the application and indicates any measures or actions that need be taken to ensure the safe use of the GMO. The report should include a summary of the risk assessment that does not include any confidential information subject to protect under section 13.

- Risk assessment of activities (i) no person shall undertake any activity involving genetic modification unless a suitable and sufficient assessment of the risks created thereby to the environment and human health has been made; (ii) risk assessment including the auditing of risk assessments shall be carried out in a scientifically sound manner, in accordance with recognized risk assessment technologies. Risk assessments shall take into account available information concerning any potential exposure to the GMO. Such risk assessments shall be based on the information included in the application and any other available scientific evidence; and (iii) lack of scientific knowledge or lack of consensus on the safe use of genetically modified organisms shall not be interpreted as indicating a particular level of risk, an acceptable risk or an absence of risk.

- Licensing of facility: (i) all facilities working with genetically modified organisms shall be licensed by the National Commission of Science and Technology working through the GMO regulatory committee and the biotechnology officer; (ii) an application for the licensing of a facility shall be submitted to the biotechnology officer on a form that is obtainable from the office of the biotechnology officer; (iii) applications for the licensing of a facility that has already been active prior to the commencement of these

regulations shall be submitted to the biotechnology officer within one(1) year of the date of such commencement.

- Public notification: (i) the applicant shall notify the public of any proposed release of genetically modified organisms prior to the application for a permit for such release; (ii) public notification shall be in form of a standard notice published in the printed media informing the public of the intended release.

- Scope of the regulations: (i) these regulations shall apply to the contained use, intentional introduction into the environment, and import and expert of LMOs that may have an adverse effect on the conservation and sustainable use of biological diversity taking also into account risks to human health. (ii) these regulations shall not apply to (a) LMO's that are pharmaceuticals for human use; (b) LMO's in transit through but not destined for use in Malawi; (c) any other LMO's or categories of LMO that are exempted pursuant to these regulations.

- Establishment of a National Focal Point: (i) the Environmental Affairs Department shall be the National Focal Point for purposes of the administration of these regulations; (ii) the National Focal Point shall ensure that all risk assessment and risk management studies are carries out in accordance with the Protocol through their representative on the GMO regulatory committee that has been established under the GMO Act 2002. (Act No. 13 of 2002)

- Functions of the National Focal Point: (i) to receive process and respond to information and notifications from the Secretariat of the Cartagena Protocol; (ii) to facilitate international information sharing as set forth in section 5; (iii) the National Focal Point shall establish and maintain a registry of LMOs for which authorization is granted the GMO Act, including whether the LMO has been authorized for placing on the market and LMOs and activities that are exempted or subject to simplified procedures.
- Establishment of a Competent Authority: (i) The Competent Authority for the Biosafety Protocol shall be as stipulated in the GMO Act 2002 (Act No. 13 of 2002); (ii) the final decision of the Competent Authority shall be recorded in a decision document that: (a) identifies the Applicant and summarizes the nature of the request; (b) describes the procedure followed in reviewing the application; (c) Includes the summary of the risk assessment; (d) states whether the requested activity is authorized with of without

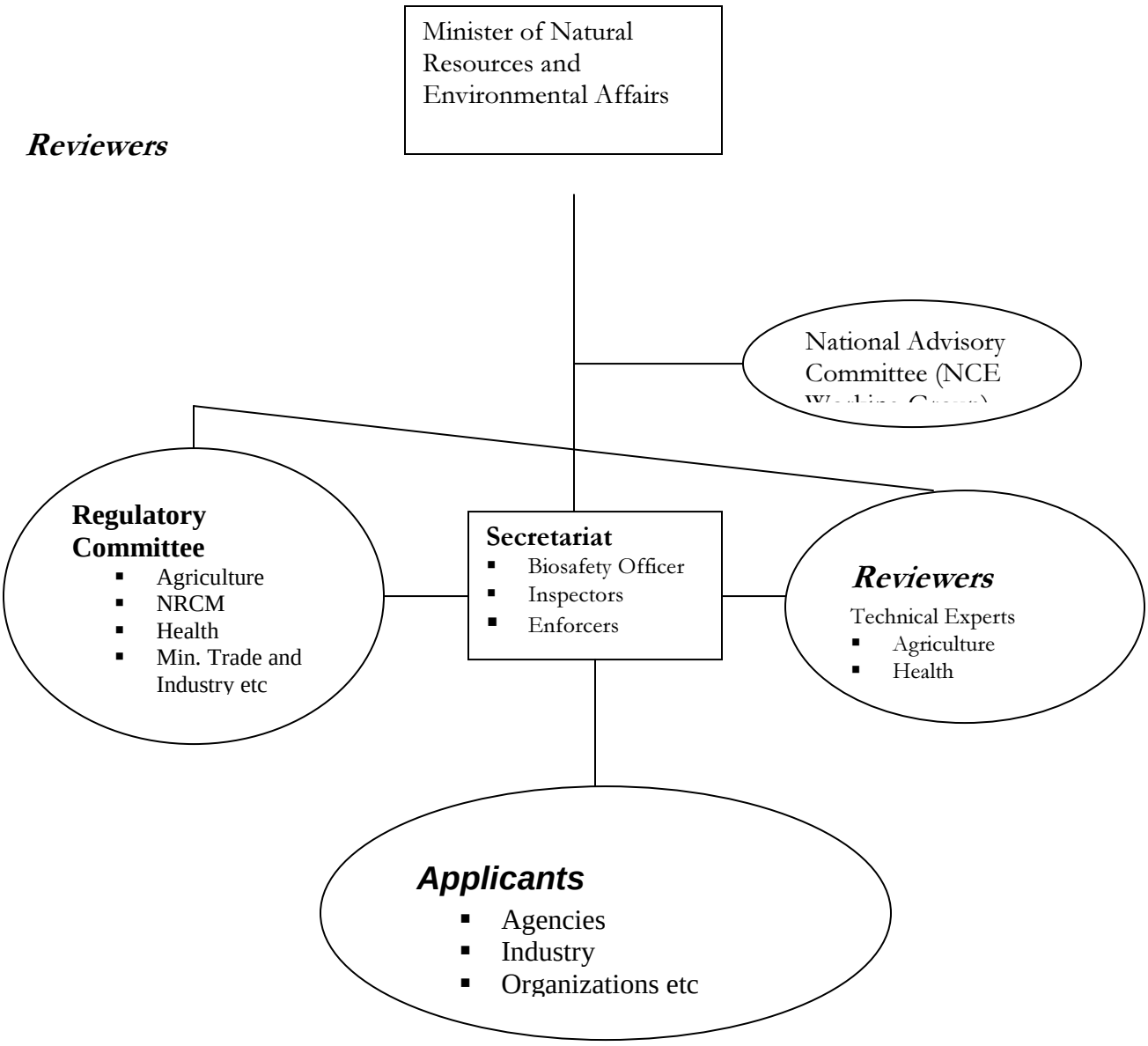
condition or whether the requested activity is prohibited; and (e) provides the reasons for the decision

- Notification of decisions made on LMOs: The biotechnology officer shall notify the National Focal Point of all application received and all decisions made regarding the use import or export of LMOs.

- Risk assessment and Risk management: The National Focal Point shall ensure that appropriate and adequate risk assessments and risk management studies are carried out for all activities that require authorization

- Decision-making and communication of Decision: Following receipt of the risk assessment report or decision from the Competent Authority, the National Focal Point shall notify the international Biosafety Clearing House in accordance with the requirements of the Protocol.

Figure 5: Institutional Structure for the Coordination of Biosafety Activities in Malawi



ANNEX 2

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