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## COMMENTARY

### Domestication of Cartagena Protocol in Botswana

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KKL; Designed the study, collected data, preparation of manuscript. DGMG; Conceived the idea, substantial correction of manuscript

#### ABSTRACT

Genetically modified (GM) plants are currently grown in many countries in the world. These crops offer advantages such as improved nutrient composition, and resistance against viruses, fungi, bacteria and insects as well as drought. Despite the advantages that such crops offer, major concerns relating to their use have been raised and these include potential toxicity to humans and environmental impact. To safe guard against these possible adverse effects, the Cartagena Protocol on Biosafety (CPB) was negotiated under Convention on Biological Diversity (CBD) in 1995 and adopted in Montreal, Canada in January, 2000. The CPB was developed to address issues related to the trans-boundary movement of Living Modified Organisms (LMOs) that may have adverse effect on the conservation and sustainable use of biological diversity. Botswana government has developed the Draft National Biosafety Framework in partnership with United Nations Environmental Programme- Global Environment Facility (UNEP-GEF). The goal is to develop a framework upon which policies on conservation and sustainable use of natural resources and protection of human health would be anchored. To date the National Biosafety Policy has been approved. In this paper we report the activities that have been undertaken to domesticate Cartagena Protocol in Botswana

**Keywords** Biosafety, Biotechnology, Conservation, Genetically Modified Organisms, Sustainable Use

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#### INTRODUCTION

Biotechnology complements technological developments in main sectors of economies, such as health, energy, and agriculture, and thus contributes to economic development (Erbas and Memis, 2012). It is defined as any technological application that uses biological systems, living organisms, or derivatives thereof, to make or modify products or processes for specific uses (Biotechnology and Biosafety in Botswana, A report of the surveys, 2005). There are two categories/classes of biotechnology; traditional and modern biotechnology. Traditional biotechnology has existed for many decades and is used in fermentation processes such as cheese making, brewing and bread preparation. The use of modern biotechnology techniques has led to development of genetically engineered organisms (GMOs) or Living modified organisms (LMOs). This technology has not only over- come the natural barriers in the breeding process but has also speeded up the breeding process in agriculture (The National Biosafety Policy for Government of Belize. 2009). A large number (27) of genetically modified (GM) plants are currently grown in 28 countries in the world and GM technology is therefore regarded as the fastest adopted crop technology in the history of agriculture (James, 2012). In 2012, GM crops were planted in 170.4 millions of hectare by 17.2 millions farmers. South Africa is the only country in the Southern African Development Community (SADC) region that is commercially growing GM crops.

There are however, human health risks, environment risks and socio-economic risks often associated with the

use of modern biotechnology. To safe guard against the possible adverse effects of modern biotechnology uses and its products, the Cartagena Protocol on Biosafety (CPB) was negotiated under Convention on Biological Diversity (CBD) in 1995 through Opened-Ended Ad-Hoc Working Group on Biosafety CPB is a supplementary treaty to Convention on Biological Diversity which is focusing on ensuring safe handling, transfer and use of LMOs resulting from modern biotechnology, commonly known as genetically modified organism (GMOs) that may have adverse effects on the biological diversity. It was finalized and adopted in Montreal, Canada in January, 2000 and has been ratified by 166 countries (97 countries of these are from Africa)

In the SADC region only 5 countries have legally-binding biosafety systems in place, South Africa since 1997, Zimbabwe (1998), Mauritius (2002), Malawi (2004) and Zambia (2006), while the rest of the countries have draft legislation still at various levels of progress towards enactment (Mugwagwa, 2011). The main legal instrument governing GM activities in South Africa is the GMO Act (15) of 1997, which came into effect on the 1st of December 1999. In order to comply with the requirements of the Cartagena Protocol on Biosafety (which became binding on South Africa in November 2003), the Act was amended in 2006, and came into effect on the 26th of February 2010 (Hazardous Harvest: Genetically modified crops in South Africa, 2008-2012).

Botswana became party to CBD in 1995 and ratified CPB in 2003. In order to conserve and use the natural resources sustainably and protect the human health,

Botswana Government has recognized the need to develop the National Biosafety Framework. The draft framework has been developed in partnership with the United Nations Environmental Programme- Global Environment Facility (UNEP-GEF). The process was facilitated by the National Biosafety Coordinating Committee (NBCC) with Department of Agricultural Research acting as the secretariat.

### Status of GM Crops

Biotechnology is globally recognized as a powerful tool of plant and animal genetic modification (GM) that holds promise of improving productivity, profitability and sustainability of farm production systems, including those existing in small and poor farming situations (Cohen, 2005; Delmer, 2005). In 2012 the global value of biotech seed was estimated at ~US\$15 billion and a record 17.3 million farmers grew biotech crops in 170 million hectares (James, 2012). Over 90% of these farmers (over 15 million) were resource poor farmers.

Currently four countries are growing GM crops in Africa; South Africa, Sudan, Egypt and Burkina Faso. In South Africa the first GM varieties were commercially approved in 1997: Monsanto's insect resistant (IR) cotton, known as 'Bollgard', and its IR maize, MON810. The first GM soybean variety (produced by Monsanto) was cleared for growing in 2001, genetically engineered to be herbicide tolerant (HT). In 2012 the estimated area of biotech crops in South Africa and Burkina Faso was 2.9 million hectares and 0.3 million hectares respectively and both Sudan and Egypt planted less than 0.05 million hectares (See Figure 1) (James, 2012). The potential benefits of GMOs are (Flavell, 1999):

- improved agricultural performance;
- improved nutrient composition;
- bacterial and fungal disease resistance;
- resistance to insects
- virus resistance and
- delayed over-ripening of fruits and vegetables.

### Concerns regarding GM crops

Two main problems potentially associated with GM crops relate to human health and environmental impact (George, 2009). Safety issues associated with transgenic crops relate to the possibility of increased allergenicity and toxicity (FAO and WHO, 2000). Numerous studies have been carried out with dairy cows, pigs, poultry and fish, all of which have failed to detect the presence of 'transgenic' DNA fragments with genetic integrity or novel proteins in any animal derived food (George,

2013). No evidence has been found to suggest that food derived from animals fed GM feeds is anything other than as safe as that produced by conventional feed ingredients. Also, there has been no evidence to suggest that any commercial GM crops are deleterious to

humans (George, 2013). To date transgenic crops and their products have been judged to be safe to eat.

The United Nations Programme describes the potential negative effects of GMOs on the environment (UNDP, 2001) as follows:

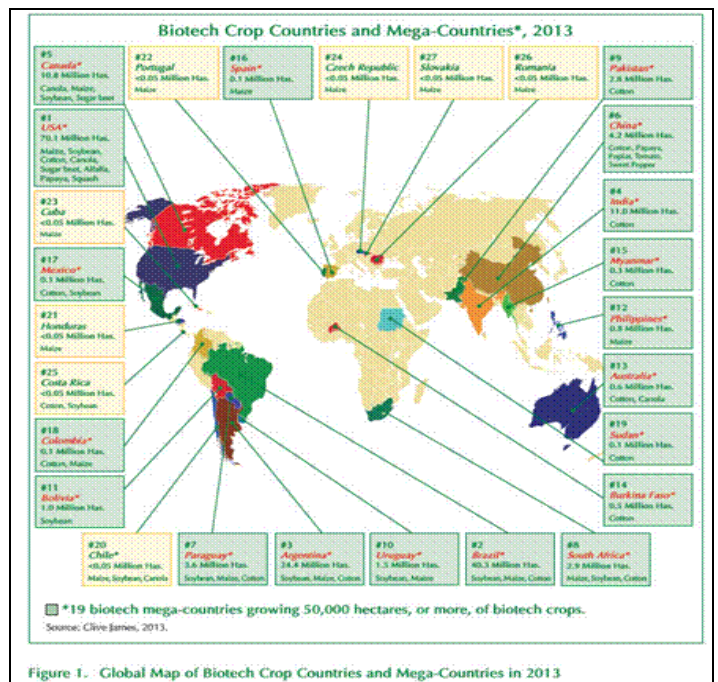


Figure 1. Global Map of Biotech Crop Countries and Mega-Countries in 2013

**Figure 1:** Global map of countries cultivating genetically modified crops

Transformed organisms could displace and even make extinct existing similar plant species because their new, improved characteristics make them likely to survive. This is particularly important in regions that are centers of origin for particular crop species.

- Flow of genes between plants could transfer genes from GM species into related species leading to super weeds.
- Unintended harmful effects on non-target organism.

The enactment of biosafety legislation is an important step in complying with the provisions of the Cartagena Protocol on Biosafety (Wafula et al, 2012). Article 2 of the protocol requires parties to take necessary and appropriate legal, administrative and other measures to implement its obligations under the Protocol. Botswana has fulfilled some of her obligations under the Cartagena Protocol.

### Domestication of Cartagena Protocol on Biosafety in Botswana

The CPB has 40 Articles and 2 Annexes as Follows; Article 1 – Objective

- Article 2 – General Provisions
- Article 3 – Uses of Terms
- Article 4 – Scope
- Article 5 – Pharmaceuticals
- Article 6 – Transit and Contained Use
- Article 7 – Application of the Advance Informed Agreement Procedure



Article 8 – Notification  
 Article 9 – Acknowledgement of Receipt of Notification  
 Article 10 – Decision Procedure  
 Article 11 – Procedure For Living Modified Organisms Intended For Direct Use As Food Or Feed Or For Processing.  
 Article 12 – Review Of Decisions  
 Article 13 – Simplified Procedure  
 Article 14 – Bilateral, Regional and Multilateral Agreements And Arrangements  
 Article 15 – Risk Assessment  
 Article 16 – Risk Management  
 Article 17 – Unintentional Transboundary Movements And Emergency Measures  
 Article 18 – Handling, Transport, Packaging and Identification.  
 Article 19 – Competent National Authorities and National Focal Point.  
 Article 20 – Information Sharing and Biosafety Clearing House  
 Article 21 – Confidential Information  
 Article 22 – Capacity Building  
 Article 23 – Public Awareness and Participation.  
 Article 24 – Non-Parties  
 Article 25 – Illegal Transboundary Movements.  
 Article 26 – Socio-Economic Considerations  
 Article 27 – Liability And Redress  
 Article 28 – Financial Mechanisms And Resources  
 Article 29 – Conference of Parties Serving As Meeting of The Parties To This Protocol  
 Article 30 – Subsidiary Bodies  
 Article 31 – Secretariat  
 Article 32 – Relationship with the Convention.  
 Article 33 – Monitoring and Reporting  
 Article 34 – Compliance  
 Article 35 – Assessment and Review  
 Article 36 – Signature  
 Article 37 – Entry into Force  
 Article 38 – Reservations  
 Article 39 – Withdrawal  
 Article 40 – Authentic Text  
 Annex I – Information Required In Notifications under Articles 8, 10 And 13  
 Annex II – Information Required Concerning Living Modified Organisms Intended For Direct Use as Food or Feed, Or For Processing Under Article 11  
 Annex III – Risk Assessment

The main objective of the protocol (Article 1) is to ensure 'adequate level of protection in the field of safe transfer, handling and use of living modified organisms resulting from modern biotechnology that may have adverse effects on the conservation and sustainable use of biological diversity, taking into account risks to human health and specifically focusing on trans-boundary movements' (CBD Secretariat, 2000).

#### *Article 23: Public Awareness and Participation*

One of the important articles in the CPB is article 23 Public Awareness and Participation. Under this article parties are obliged to promote and facilitate public awareness and education, including access to information, regarding the safe transfer, handling and use of living modified organisms (LMOs). Parties are also required to consult the public in the decision-making process regarding living modified organisms. In implementing article 23 of CPB, the government of Botswana has established the Botswana Biotechnology and Biosafety Public Awareness and Participation Innovation Platform (BOPAPIP) in partnership with

Regional Agricultural and Environment Initiates Network-Africa. This multi-disciplinary platform consisting of scientists, lawyers, farmers, accounts and media personnel was launched by Honourable Minister of

Agriculture Christian De Graaf in November 2011. Its mandate is to sensitize the public on biotechnology and biosafety related issues.

The platform has undertaken a number of activities such as training workshops for Members of Parliament, Traditional Leaders, farmers associations (refer to Figure 2), consumers' cooperatives, environmental trusts and public health committees and media personnel. These workshops and Kgotla<sup>1</sup> meetings were organized in different regions of the country such as Central (Serowe), North East (Francistown and Tsamaya), Southern (Kanye and Mmathethe), Chobe (Kasane) and Ghanzi (Ghanzi and Charles-Hill). Live radio and TV broadcasts were also organized to sensitize the public on issues of biotechnology and biosafety. A number of outreach materials such as brochures, banners and t-shirts were produced (see Figure 3). As a result of these campaigns there were 6 articles published about the Biotechnology and GMOs in the local newspapers. Besides the activities undertaken by BOPAPIP, there were other biotechnology outreach campaigns conducted by Dr. D. George (DAR Researcher) and Dr. W Parrot (Plant Biotechnologist from United States of America). These campaigns were mainly public lectures on biotechnology targeting the media personnel, scientists, students from senior schools and the general public. The campaigns were sponsored by the United States of America Embassy in Gaborone, Botswana and were conducted in the month of September, 2013.

<sup>1</sup>Kgotla is the traditional meeting place in Botswana



**Figure 2** Platform Participants, (A) attendants during Platform launching; (B) workshop participants; (C) shows Kgotla meeting; (D) breakfast seminar for Honorable Members of Parliament

#### *Article 19: Competent National Authorities and National Focal Points*

Cartagena Protocol requires parties to have Competent National Authorities and National Focal Points. In Botswana the Department of Agricultural Research (DAR) in the Ministry of Agriculture is the Competent National Authority and the Department of Environmental Affairs in the Ministry Environment Wildlife and Tourism is the National Focal Point. The Genetic Resource Laboratory under DAR and the National Veterinary

Laboratory were nominated to be GMO detection laboratories in order to fulfill the requirements of Article 33 (Monitoring and Reporting) and Article 34 (Compliance) of CPB.

Policy was successful passed during the June, 2013 Parliamentary Session.



**Figure 3** Materials used during the campaign, (A) educational poster; (B) promotional materials and brochures used during Public Awareness Campaign

The two laboratories are members of Southern Africa Network for GMO Detection Laboratories (SANGL). SANGL is a network of laboratories in ten Southern Africa countries namely; Botswana, Malawi, Mozambique, Namibia, Swaziland, South Africa, Tanzania, Zambia and Zimbabwe. The network was launched in 2009 in Harare, Zimbabwe and its objectives are to:

- i. Build and strengthen capacity for GM detection in Southern Africa.
- ii. Establish guidelines and harmonize GM detection methods in Southern Africa.

#### *Article 20: Information Sharing and Biosafety Clearing House*

Parties are expected to put in place a biosafety clearing house for the purpose of:

- Facilitating exchange of scientific, technical, environmental and legal information regarding LMOs
- Sharing existing laws, regulations and guidelines for the implementation of the protocol.

Efforts are underway to develop a Biosafety Clearing House in the country.

#### **Status of the Botswana National Biosafety Framework**

The Department of Agricultural Research, the Competent National Authority was the lead institution in the drafting of National Biosafety Framework. The framework was prepared by the National Biosafety Coordinating Committee and the final draft was completed in 2010. Funding for the framework was obtained from the United Nations Environmental Programme-Global Environment

Facility (UNEP-GEF). The draft framework consists of the National Biosafety Policy, National Biosafety Bill and the Regulations and Procedures. The National Biosafety

The goal of the Policy is to 'regulate and monitor the application; and promote the development of biotechnology by ensuring the application of Biosafety measures to guarantee the protection of biological resources, to ensure sustainable use of biological resources, protection of human health, and to minimize the adverse socio-economic impacts of biotechnology' (Botswana National Biosafety Policy, 2013).

The Policy has seven main broad objectives:

- a) to promote and ensure the application of Biosafety measures in the development and use of biotechnology.
- b) to promote the development and application of biotechnology.
- c) to regulate the importation, use, handling, transfer, introduction into the environment and contained use of genetically modified organisms and the products thereof.
- d) to ensure public participation and access to information on biotechnology and Biosafety.
- e) to establish and strengthen national capacity for biotechnology, development, application and Biosafety regulation.
- f) to raise public awareness on modern biotechnology and Biosafety.
- g) to protect human health, the environment and social values from potentially adverse effects of modern biotechnology.

It is anticipated that the National Biosafety Bill/Law will be debated in 2014 session of Botswana Parliament. The Regulations and Procedure will be prepared after the passing of the Bill.

#### **Constraints/challenges**

The domestication of Cartagena Protocol in Botswana has proceeded at a slow pace due to a number of challenges/constraints; the most critical are discussed below.

- Lack of resources: human, financial and infrastructural resources are an impediment to the domestication of the protocol. Biotechnology and biosafety are capital intensive fields and in Africa resources are not readily available, Botswana being no exception. There are also very few experts in the area of Biotechnology and Biosafety in Botswana. The public awareness campaigns were conducted in few and selected regions of the country due to financial constraints.
- Lack of research and development on GMOs. The country has not any strides in research on

GMOs. Research work is needed in areas such as risk assessment and management of GMOs/LMOs.

- The science of modern biotechnology is relative new to policy makers and the public at large. This has resulted in lack of mainstreaming of biosafety and biotechnology issues in the national agenda.

### Conclusions and Recommendations

The country has made some notable progress in implementing some articles of Cartagena Protocol such as article 23, 19, 33 and 34. However little or no work has been done on some articles such as Article 15 (Risk Assessment) and Article 16 (Risk Management). More resources should be committed towards implementing these articles. The development of the National Biosafety Framework is long overdue; therefore it is recommended that the National Biosafety Bill should be fast tracked in parliament so as to enable the country to have a functional Biosafety Framework. The observations made during public awareness campaigns at the kgotla meetings and the results of the survey on public understanding of Biotechnology and Biosafety indicate that majority of the general public do not understand issues related to Biotechnology and Biosafety. There is need for more public awareness campaigns. Both print and electronic media should be used to achieve this goal. The country should also invest in capacity building in biotechnology and biosafety. Financial, human and infrastructural resources should be availed to enable the country to achieve the desired goals in field of biosafety and biotechnology.

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