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Implications of Import Regulations and Information Requirements under the Cartagena Protocol on Biosafety for GM Commodities in Kenya

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This study investigates the implications of implementing information requirements under the Cartagena Protocol on Biosafety's Article 18.2.a in Kenya. It also assesses the challenges associated with the upcoming introduction of import regulations for genetically modified (GM) food in a country that largely imports and transports grain in East Africa. The analysis shows that Kenya has been importing GM grains for the past few years and that border control under pending regulation will be difficult and costly. While the Protocol's information requirement's "may contain" option does not require too much effort, implementing the strict "does contain" option will significantly increase the cost of trade and potentially the price of grains in Kenya. These results suggest that a regional approach to import control is necessary, and that Kenya should reconsider its support to the "does contain" option of the Protocol.

Key words: genetically modified food, international trade, Kenya, Cartagena Protocol.

Introduction

The Cartagena Protocol on Biosafety (CPB) establishes international principles to govern the transfer, handling, and use of living modified organisms (LMOs), also called genetically modified (GM) organisms, with a particular focus on transboundary movement. Although the Protocol is not explicitly defined as a trade agreement, its nature and the inclusion of export and import provisions makes it a de facto trade agreement (Gruère, 2006; Redick, 2007).

One hundred and fifty-seven countries are members of the Protocol,[1] but some of the major producers and exporters of GM commodity crops (e.g., Argentina, Australia, Canada, and the United States) are not members of this agreement. The lack of participation of these countries increases the likelihood of international conflicts on GM trade regulations, especially between reluctant importing countries with consumer opposition to GM food and large GM food exporters. It also reduces the probability that such regulations will effectively be implementable in the near future.

Most developing countries (particularly in Africa) have ratified the Protocol, and consider it the reference point in setting their own biosafety regulations (Gruère, 2006; Jaffe, 2006). Kenya signed the Cartagena Protocol for Biosafety in May 2000. After several years of debate, Kenya passed a law on biosafety in 2008, following some of the general principles listed in the Protocol. The Kenya Biosafety Act requires the establishment of a National Biosafety Authority to supervise and control the development, transfer, handling, and use of GMOs for research or commercial purposes (Parliament of Kenya, 2009). While regulations are being developed, Kenya is bound to use the provisions of the Protocol, especially as they relate to issues that still need to be resolved—such as liability, socioeconomic considerations, and more immediately, the use of information requirements for traded shipments of LMOs.

In the Protocol, there are specific rules related to the approval and documentation of imported LMOs intended for direct uses as feed, food, or processing (noted LMO-FFPs) that are essentially unprocessed GM commodities. Under Article 18.2.a., parties to the CPB "should request information" from exporters regarding the presence and the identification of LMO-FFPs in any shipment before importation.[2] Initially, the default requirement was to indicate that a shipment may contain LMO-FFPs. But in the third meeting of parties in March 2006 in Brazil, Protocol members agreed to have a two-option rule on information requirements (BRIDGES, 2006).

Under this rule, shipments containing LMO-FFPs identified through means such as identity preservation systems must show that the shipment "does contain"

1. *As of April 20, 2010.*

2. *See the Appendix for the entire text of this article.*

Figure 1. Map of Kenya with border posts.
Source: United Nations (2004).

LMO-FFPs and provide a list of GM events present in the shipment (BRIDGES, 2006). Shipments of LMO-FFPs that are not well identified will only have to label their shipment as "may contain LMO-FFPs," and information on the complete list of GM events commercialized in the exporting country would be available to the importers via the Biosafety Clearing-House (BCH)—or if not, upon the importers' request (Redick, 2007). In the same meeting, parties decided to reconsider the rule during the 2010 meeting with the possibility of extending the requirements with "does contain" and list of events to all shipments of LMO-FFPs in 2012 or later.

Several studies have underscored the expected costs of implementing a general "does contain" information

requirement for traded LMO-FFPs in the Americas or Asia. Gruère and Rosegrant (2008) assessed the economic implications of strict information requirements in the Asia Pacific Economic Cooperation countries and showed that, while the benefits are not clear, it would impose significant costs on exporters and importers and have implications on future GM technology adoption. Other studies show that stringent documentation requirements could be very costly for the Argentinean soybean industry, the Canadian grain exporters, the US maize industry, or grain traders in Australia (Direccion Nacional de Mercados Agroalimentarios, 2004; Foster & Galeano, 2006; JRG Consulting, 2004; Kalaitzandonakes, 2004). Lastly, Huang, Zhang, Yang, Rozelle, and Kalaitzandonakes (2008) focus on the case of China and demonstrate that there would be both cost and price effects on GM commodities with such requirements.

Although exporters and countries with large testing capacities like China may be able to absorb the implementation cost of this measure (Huang et al., 2008), smaller developing nations will likely face more challenges (Gruère & Rosegrant, 2008). There has been no study of the implications of such measure on Sub-Saharan African countries, many of which are Protocol members, vocal supporters of the "does contain" option, and—paradoxically—likely importers of commodities that may contain LMO-FFPs. In this region, a number of currently importing countries are also moving towards GM crop adoption and may become regional exporters of LMOs-FFPs in the near future and face the issue of implementing information requirement for their exports.

The objective of this article is to provide an analysis of the implications of implementing documentation requirements in Kenya. Using primary and secondary data collected in Kenya in 2009, we evaluate the practical implications of implementing a detailed list requirement in a country that will likely face formal and informal trade of GM products at the border. By providing information on the current situation and the effects of applying the strict "does contain" option in Kenya, the study aims to inform policymakers in Kenya and other African nations on a possible pending decision at the Protocol. While doing so, we also review the upcoming challenges pertaining to import regulations of GM products at the borders, at a time when Kenya is finalizing its own regulations, and after persistent controversy over imports of potentially GM maize from abroad (e.g., Odhiambo, 2010).

The rest of the study is organized in four parts. The following section uses trade data to evaluate the likely volumes of LMO-FFPs subject to potential import or export requirements for Kenya and reviews the main standards currently in use. Next, we review the implications of the pending import regulatory framework for GM products in Kenya and the potential costs of testing at the border. Using this information, the next section analyzes the implications of information requirements and discusses upcoming regulatory challenges. We close the article with a general conclusion.

Potential LMO-FFPs Imported Into or Transited Through Kenya and Routes of Entry

As shown in Figure 1, Kenya is bordered by Ethiopia to the North, Somalia to the East, Tanzania to the South, Uganda to the West, and Sudan to the Northwest. Its economy remains primarily agriculture oriented, with about 75% of the population employed directly or indirectly in agriculture. Kenya is the most developed economy in East Africa, and due to its geographical location and industrial development, it is the trade hub for the East and Central African region.

The Mombasa port is the transit point for a number of countries, including Uganda, Rwanda, Burundi, and the Democratic Republic of Congo. Several border points with Tanzania, Uganda, Sudan, and Somalia are also important transit points for several countries beyond East Africa. The following sub-sections analyze the potential entry, transit, and/or export of the four main unprocessed LMO-FFPs (maize, soybeans, cottonseed, and rapeseed/canola) in Kenya.

Maize

Maize is the most important food crop in Kenya. Annual maize consumption is approximately 33-36 million bags, or 2.97 to 3.24 million metric tons (Ministry of Agriculture [MOA], 2009). The difference of roughly 3 million bags equivalent is met by wheat, rice, sorghum, millet, cassava, and other alternatives. About half of the maize grain produced or imported is milled to produce flour. The flour is used to make a meal called "ugali," which is commonly eaten with vegetables and/or meat. The rest of the grain is cooked either as dry maize mixed with beans, peas, pigeon peas, cow peas, or as green maize in various forms. About 1% of maize production is used for livestock feed for cattle, poultry, and pigs (D. Wiest, personal communication, 2009). A small proportion of the maize is also extracted and used for production of oil.[3]

The crop is grown in almost all agro-ecological zones and on two out of every three farms. Over the last

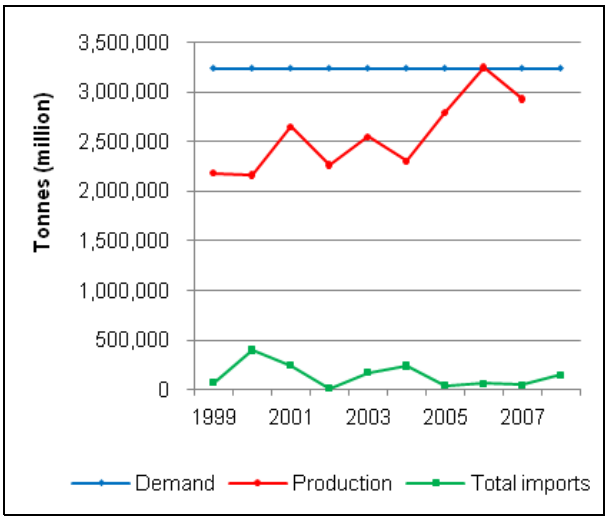

Figure 2. Demand, production, and imports of maize grain into Kenya, 1999-2008.

Source: Data drawn from Kenya National Bureau of Statistics (2009), Ministry of Agriculture (2009), and Tegemeo Institute (2009).

10 years, domestic production has stagnated between 24 and 28 million bags (Kibaara, 2005; MOA, 2009). The excess demand of 8-12 million bags is satisfied by imports from several sources (see Table A1 in the Appendix). Figure 2 shows a comparison between production and an annual estimated demand. Table A1 in the Appendix provides detailed import data of formal trade.

The share of imported maize on total consumption has increased from 2.9% between 1970 and 1991 to an average of 12% in the last 10 years.[4] These shares and volumes are likely underestimated because there is substantial unreported cross-border maize trade from Uganda and Tanzania. For example, according to Ackello-Ogutu and Echessah (1997),[5] from August 1994 to July 1995, 84,000 tonnes of maize were imported from Uganda without being reported. This represents about 3% of national production during that period (Ackello-Ogutu & Echessah, 1997). Occasional export restrictions from Tanzania also cause a thriving informal cross-border trade south of Kisumu.

Maize intended for domestic consumption is managed by the National Cereals and Produce Board (NCPB), a parastatal organization under the Ministry of Agriculture. The NCPB is charged with keeping a strategic grain reserve of 4 million bags with an equivalent in cash. Much of the grain handled by the NCPB is locally grown. When there is a shortfall, grain is imported, whereby demand is estimated and the 25% duty is waived for a suitable period. The NCPB then ensures that the reserves are maintained.

Table 1. Quality parameters for maize applied by the NCPB.

	Parameters	Grade K2 or better
1	Moisture content	13.5% max
2	Foreign matter	2.0% max
3	Pest damaged	7.0% max
4	Rotten, diseased, and discolored (RDD) grains	4.0% max
5	Other colored grains	3.0% max
6	Total defects (foreign matter + rotten, diseased, and discolored + pest damaged grains)	8.0% max
7	Free from live insect infestations	
8	Total aflatoxin (with B1 5% maximum)	10ppb max
9	Must be non-GM	Max 0.1%

Source: National Cereals and Produce Board (2009).

The quality of maize imported is set by the Kenya Bureau of Standards (KEBS). The NCPB uses an older KEBS classification with grades K1, K2, and K3. K2 is the grade of choice for NCPB. Table 1 shows the quality parameters applied by the NCPB. In addition to standards quality parameters, all NCPB imported maize is supposed to be non-GM, at the 0.1% level (Table 1).[6] In theory, the pre-verification from the exporting country is carried out according to this list of parameters, and on arrival at the port, moisture and aflatoxin content are tested by KEBS and the Kenyan Plant Health Inspectorate Services (KEPHIS). In practice, no separate certificate confirming non-GM status is required by either KEPHIS or KEBS. Private testing laboratories are sometimes contracted to confirm aflatoxin and moisture content, but there is no test for GM status. When duty is waived and maize imports are allowed, millers and other interested groups may import the commodity.

Kenya also imports food aid. The World Food Programme office in Mombasa is a logistics office that han-

3. *Crude maize oil is also imported.*
4. *According to FAOSTAT data.*
5. *See also Regional Agricultural Trade Intelligence Network (RATIN, 2008).*
6. *It is interesting to note that the threshold for GM maize (0.1%) approved by authorities in the country of origin is lower than that of foreign matter (2%) which has not passed any approval and may include some intrinsic risk (animal waste, etc.).*

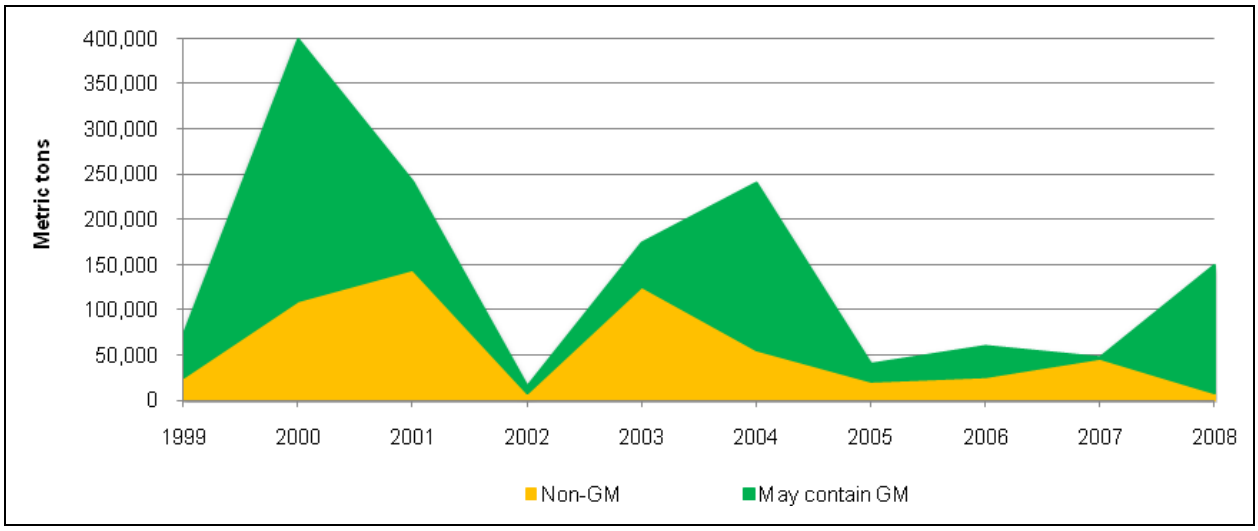

Figure 3. Annual maize imports from GM and non-GM producing countries (metric tons) from 1999-2008.
Source: See Table A1.

dles food supplies for southern Sudan, Somalia, Uganda, and the Democratic Republic of Congo (DRC). The largest bulk of this is maize grain. A large proportion of corn-soya blend is also handled here and shipped to various destinations in and out of Kenya. Consignments for Uganda and the DRC are transported by road through Tororo and Kampala and, in the latter case, through Western Uganda to Goma. Consignments for Somalia are transported by ships to Mogadishu, escorted by various support troops due to the threat of pirates.

The most significant sources of imported maize are South Africa, the United States, Tanzania, Italy, and Argentina. Grains from South Africa, Tanzania, Uganda, and Argentina are imported by traders, while grains from the United States are mainly imported by the World Food Programme to meet the needs of refugees, internally displaced persons, and school feeding programs. These consignments are either gifts or maize commodity bought from the exporting country.

Many of these countries produce GM maize. Using the same methodology as Gruère and Sengupta (2010), we sorted imports by country of origin and respective GM status to determine the volume of potentially GM maize. Figure 3 shows import volumes of maize from GM and non-GM countries between 1999 and 2008. South Africa is currently the most important source of maize to Kenya. In 2008/09, Kenya imported 140,000 tonnes of maize from South Africa, which represented over 90% of total maize imports that year.

South Africa was the first African country to commercialize GM crops. Bt white and yellow maize have been produced since the late 1990s, and are now completed by herbicide-tolerant and multi-trait GM maize (Gruère & Sengupta, 2010). South Africa has not always been a net exporter during the past 10 years, but when it was, Kenya was one of its significant grain destinations. In 2009 and 2010, several news outlets reported that shipments of GM maize had been imported from South Africa despite the preference of the government to import non-GM (e.g., Biyase, 2010; Odhiambo, 2010; Thatiah, 2009). Officials denied these claims,[7] but given the premium price of non-GM maize,[8] procuring conventional maize is clearly becoming increasingly challenging for policymakers.

Other countries have also likely exported GM maize to Kenya. Maize imports from the United States are on a declining trend since 2005. From that year, the KEBS issued the maize standard KS EAS 2: 2005 (KEBS, 2005). In this standard, the label should include a statement of LMO status. In 2006, imports from Argentina accounted for nearly 20% of total maize imports, surpassing only South Africa. In 2007 and 2008, its imports

7. *In 2010, in a report to the Parliamentary Committee on Agriculture, KEPHIS admitted that of the eleven vessels that brought maize to Mombasa between 2008 and 2009, five cargoes included GM maize (Daily Nation, 2010). The Inspectorate service is equipped to analyze GM content and routinely collects samples of all consignments at the Port of Mombasa.*
8. *Non-GM maize was sold at a premium of about US$80-100/metric ton, or up to 33% in 2009 (Boit, personal communication, 2009), and reported in the media as being $300/metric ton in 2010 compared to $200 for conventional maize.*

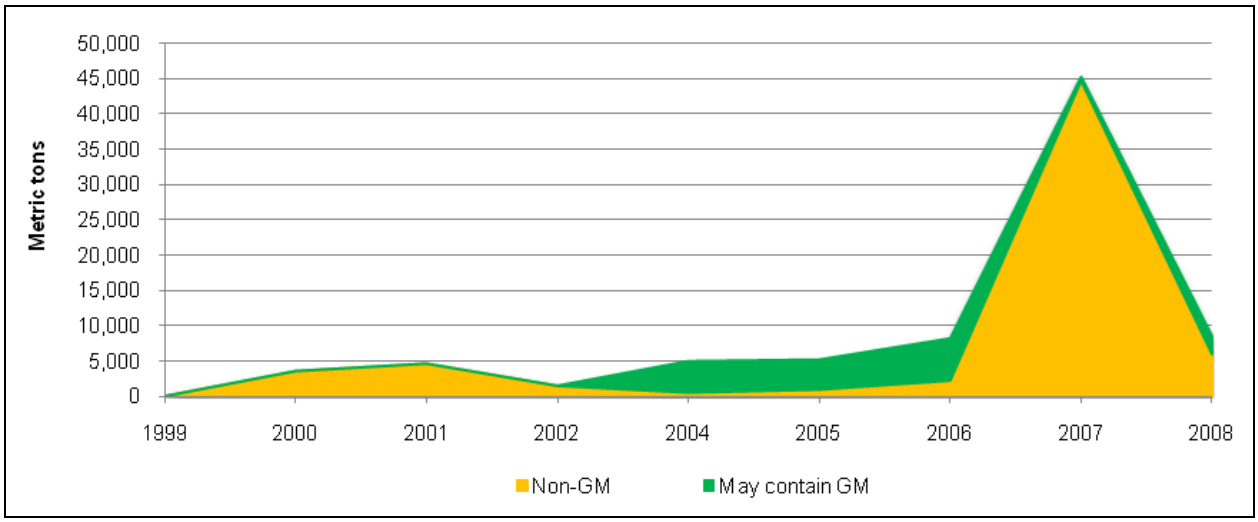

Figure 4. Soybean imports to Kenya from GM and non-GM producing countries (1999-2008).
Source: See Table A2. Notes. (1) no data for 2003; (2) we assume that imports from Uganda in 2007 are non-GM, but they could have been originally imported from a GM-producing country.

fell significantly, perhaps because of this requirement. In contrast, maize imports from Canada have been intermittent. A sizable consignment of maize was imported from Egypt in 2000, but Egypt only adopted Bt maize in 2008.

Non-GM maize was imported from Italy, Tanzania, and Uganda. Tanzania has ratified the Cartagena Protocol and drafted National Biosafety Guidelines. Tanzania has not commercialized GM crops but is moving towards the commercialization of GM cotton and potentially GM cassava. Uganda, also a member of the Protocol, has launched a series of field trials for GM cotton and GM banana. Both countries may be interested in the use of GM maize in the long term.

Kenya also exports small quantities of maize. Exported volumes are, however, a very small proportion of production and are always below import figures. There are restrictions on exports, and maize is classified as a sensitive item (SI), which provides a disincentive to formally engage in grain exports.[9]

Soybean

The domestic production of soybeans is roughly 5,000 tonnes. Soybeans are mainly used for the manufacture of animal feeds. Soybeans are also used in processing of soya flour and "tea." Corn-soya blend is also in high demand in the country. A small amount of soya margarine is also produced. The demand for soybean has been rising irregularly in the last 10 years, reaching a peak import of more than 45,000 tonnes in 2007 and a drop to 8,000 tonnes in 2008.

The sector still faces significant market constraints. In Kenya (and Tanzania), the emerging small-scale food and feed processing sector and other potential domestic buyers of soybeans constantly face shortages of soybean grains, while farmers complain of the lack of a market and low prices for their soybeans. As soybean global importance continues to rise, it is expected that Kenya's demand will also increase proportionately.

Figure 4 differentiates potentially GM from likely non-GM soybean imports based on the country of origin and its use of GM soybeans.[10] The largest provider of soybean has been Uganda, followed by three major GM-producing countries: the United States, Argentina, and South Africa. The largest consignment was from Uganda in 2007. A small proportion of imported soya is also exported.

9. *A sensitive item is an item that attracts more than a 25% import duty.*

10. *See Table A2 for details. Although not included in Table A2, the demand for soya for corn-soya blend is significant in Kenya, providing supplies to the World Food Programme in large quantities for use in refugee camps and for feeding children. But the fact that this is a processed product, and therefore not a "living" modified organism, excludes such a product from regulations under the CPB.*

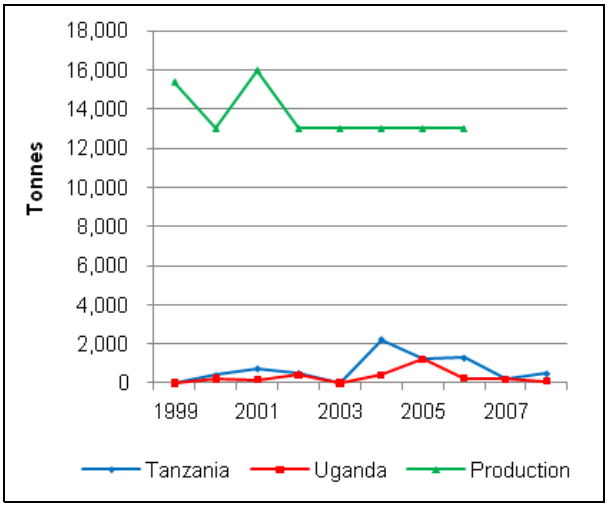

Figure 5. Production of cottonseed and imports into Kenya, 1999-2008.

Source: Kenya National Bureau of Statistics (2009); Ministry of Agriculture (2009).

Cottonseed and Rapeseed

Cottonseed is used as the main ingredient in cottonseed cake, which is an important animal feed raw material in Kenya. Table A3 provides bilateral import data for 1999-2008 and Figure 5 depicts the trends in supply, demand, and imports. The seed comes from Uganda and mainly Tanzania. From Uganda, much of the commodity enters the country via Busia and Malaba (close to Tororo—see Figure 1), while consignments from Tanzania are imported through Isebania (on the road to Migori), transported to Tanzania through Namanga for extraction and then re-exported into Kenya.

While these two countries are not producing GM cotton, both are considering the commercialization of GM cotton in the near future. Kenya is in the later stages of GM cotton field trials and may begin commercially growing the crop in the next two years. However, Kenya is considered to be a high-cost cotton-producing country compared to Tanzania. It is therefore likely that imports will continue in the future and may face the possibility of GM cottonseed imports. Uganda is also a significant exporter of cottonseed and may continue to provide for the shortfall in production in Kenya. The successful adoption of GM cotton by one of the three countries would likely result in informal seed trade at the borders as observed in other regions.

Rapeseed is used in the making of vegetable oil or as an animal feed principally for cattle. Imports into the country have been for seed, expected to be planting material as the volumes have been fairly low (see Table A3). Some farmers have been growing rapeseed in the Rift Valley area of Kenya. Demand, however, appears to be low, as importers prefer soybean and cottonseed for animal feed use. All exporters are non-GM-producing countries. As rapeseed and/or canola gain acceptance as a vegetable oil globally, Kenyan imports are likely to resume, especially as GM soybean becomes more available than non-GM soybean. Countries that desire non-GM soybean but cannot access it may prefer canola or rapeseed for both human and animal feed.

Routes of Entry of Potential GM Commodities into Kenya

Table 2 presents a summary of the border entry points for bulk imports of maize, soybeans, and cottonseed. The Mombasa port is the most significant for imports that may contain LMO-FFPs. This is because none of Kenya's neighbors has commercialized GM crops. The most predominant exporting countries for these commodities are the United States and South Africa, which are both major GM-producing countries.

Still, within the region, several border points stand out. Namanga, on the Tanzania/Kenya border, may also be used by importers, with Dar-es-Salaam as the point of entry into Tanzania (Figure 1). Consignments from South Africa, Zambia, and Malawi may also enter through Namanga. It is therefore likely that maize may also be transported through the same route. Indeed in 2001, roughly 21,000 tonnes of maize were imported into Kenya from Malawi, a country that is about to launch field trials of GM cotton. Another significant port of entry may be the Kisumu Port on Lake Victoria. In 2008, a large consignment of maize entered through this port in transit to Sudan. There has been no movement of commodities in the opposite direction. There is also significant movement of unshelled green maize from Tanzania (on a seasonal basis) through the Loitokitok border point (located between Taveta and Namanga in Figure 1). On the Kenya/Uganda border, consignments are likely to be coming only from Uganda, with the likely exception of Rwanda, Burundi, and the DRC.

Import Regulations, Capacity, and Documentation Requirements

Procedures for Import Approval of GM Products in Kenya

Figure 6 shows the overall process, as intended under the proposed biosafety regime as of 2009. Applications for the introduction of GM crops intended for environmental release are made to the National Biosafety Com-

Table 2. Major points of bulk entry of potential LMO-FFPs into Kenya.

Border	Location	Commodities	Form and use
International	Port of Mombasa	Maize	Grain for internal use and on transit
		Canola	Oil for internal use and on transit
		Soya bean	Meal for internal use and on transit
Uganda	Malaba	Maize	Grain for milling
		Soya bean	Grain for milling
		Soya bean	Cake for animal feed
		Cotton seed	Cake for animal feed
	Busia	Maize	Grain for milling
		Soya bean	Grain for milling
		Soya bean	Cake for animal feed
		Cotton	Cake for animal feed
Tanzania	Namanga	Maize	Grain for milling
		Cotton seed	Cake for animal feed
	Isebania	Maize	Grain for milling
		Cotton	Seed for extraction
	Kisumu Port	Cotton	Cake for animal feed
		Maize	Transit to Sudan via Lokichoggio
	Loitokitok	Unshelled green maize	Domestic consumption

Source: Authors.

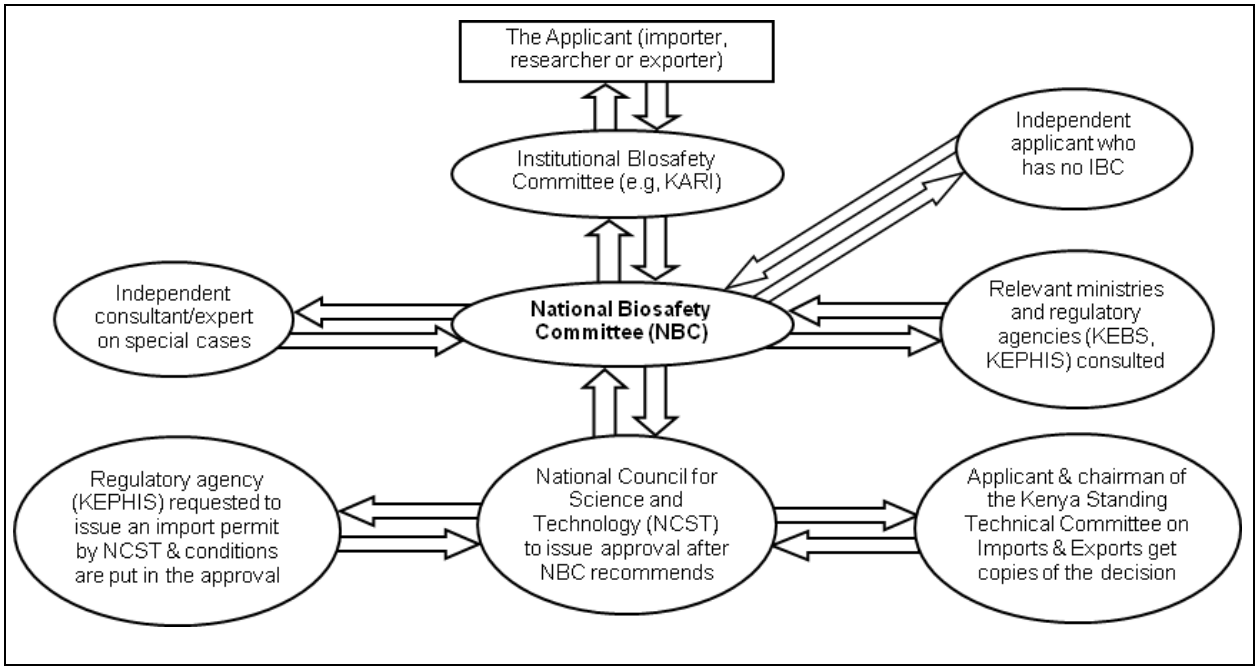

Figure 6. Approval process for handling of applications/requests for genetically modified organisms in Kenya.
Source: KEPHIS (2009).

Table 3. Membership of National Biosafety Committee.

1. National Council for Science and Technology (NCST)
2. Kenya Plant Health Inspectorate Service (KEPHIS)
3. International Livestock Research Institute (ILRI)
4. Ministry of Agriculture
5. University of Nairobi, Department of Biological Science Chiromo
6. Kenya National Federation of Agriculture Produce (KENFAP)
7. Africa Biotechnology Stakeholders Forum
8. Kenya Industrial Property Institute
9. Kenya Medical Research Institute (KEMRI)
10. Kenya Plant Breeders Association
11. Ministry of Public Health and Sanitation
12. Consumers' Information Network
13. Seed Trade Association of Kenya
14. Ministry of Higher Education, Science, and Technology
15. Kenya Bureau of Standards (KEBS)
16. National Environment Management Authority
17. Department of Veterinary Services
18. Kenya Agriculture Research Institute (KARI)

Source: National Biosafety Office (2009).

mittee (NBC)[11] via the relevant research institutions' biosafety committee. The committee then forwards the application to the NBC, which is a committee composed of a number of institutions as listed in Table 3.

The NBC then assesses the application on the basis of the National Guidelines for the Release of Genetically Modified Organisms into the Environment.[12] The applicant defends the application in a meeting convened for this purpose. In addition, the NBC may consult with an independent consultant who is an expert on the particular material under assessment. The decision of the committee is submitted to the National Council for Science and Technology (NCST) to issue an approval for import. The NCST then requests the corresponding regulatory agency to issue the import permit with conditions clearly specified therein. Once the permit is obtained, trade can occur under a specified monitoring system.

As noted above, this system is not formally in place. In particular, as of 2009, there has not been approval of any GM product and no inspection or testing was conducted at Kenyan borders. Ad hoc sampling has been carried out and samples were submitted to the headquarters of KEPHIS for testing; the results, however, have not been released.[13] The following section describes the current general information and document requirements for imports of food commodities.

Import Documents and Inspection Procedures for Food Commodities and Expected Changes with GM Regulations

Exports from East Africa and the Common Market for East and Southern Africa (COMESA)[14] countries are imported with the form C63, which is completed online and printed for presentation at the point of entry. The customs officer has the same copy and confirms the description of goods on the ground. Goods from East Africa and COMESA are zero-rated when accompanied by a Certificate of Origin from the country of origin.

Exports from countries outside the East African region follow a more complex procedure. An import declaration form (IDF) is completed at the Kenya Revenue Authority (KRA) custom services via registered and authorized agents. The IDF form is sent to KEBS electronically by KRA. KEBS passes it to its partners in the exporting countries. Effective September 2005, KEBS implemented the Pre-Export Verification of Conformity (PvoC) to the standards program as a conformity assessment and verification procedure applied to imported products. KEBS has four inspection partners under the PvoC program. These organizations act on behalf of KEBS in the exporting country.

Upon receiving the IDF, the exporter completes the request for certification depending on the route preferred for use (A or B). Under Route A, products are inspected and upon satisfactory inspection and testing, the inspector will issue a certificate of conformity (CoC). The CoC is valid only for one consignment and for a maximum of 90 days from the date of inspection. Route B is recommended for frequent exporters with

11. *From the time of data collection to the publication of this article, there had been changes in the biosafety regulatory framework. While the guiding principles are the same, the governance structure has been altered. In particular, the previously defined National Biosafety Committee is now a National Biosafety Authority, with a Board and Chairman and a Chief Executive.*
12. *See http://www.biosafetykenya.co.ke.*
13. *However, in a recent report (unavailable to the public), KEPHIS reported that 5 out of 11 consignments handled in 2009 included GM grains (Daily Nation, 2010).*
14. *The COMESA is a preferential trading area comprised of 18 countries of Eastern and Southern Africa. The East African Community (EAC) is a sub-regional body that includes Kenya, Tanzania, Uganda, Rwanda, and Burundi.*

Table 4. Relevant institutions in the import process of agricultural commodities into Kenya and expected changes with the implementation of the Biosafety Act and proposed regulations.

Organization	Documents and role in import process	Procedure
Kenya Revenue Authority (KRA)	Receiving and verifying the customs declaration form C63 for EAC and COMESA countries and inspection of Certificate of Origin from EAC or COMESA	Compares the agent's hard copy with KRA's soft copy and goods at point of entry
	Receiving and verifying the customs declaration C63, IDF, and the certificate of conformity for goods outside the EAC and COMESA	Sends online copy of C63 to KEBS
KEPHIS	Inspection of goods clearance and sampling	Visual inspection of goods for live organisms and other contaminants and sampling for on-site and laboratory tests concerning moisture, aflatoxins, etc.
	Inspection of phytosanitary certificates and issuance of plant health certificates	Inspection of forms and preparation of certificates
	Authorization via the Kenya Revenue Authority document	Stamping C63 for approval and occasional issuance of inspection certificate
Kenya Biosafety Authority (KBA) or designated institution	**Inspection and sampling of goods**	**Visual inspection of documents on country of origin and sampling of consignments**
	On-site testing for presence/absence of proteins or indicative of LMOs and issuance of approval form for conforming consignments	**On-site testing, forwarding of positives to laboratory for DNA and gene identification of unapproved LMOs**
	Submission of positive samples to laboratory for DNA testing	**Laboratory testing and reporting**
	Documents to advice on release or return of consignments	**Release, return, or destruction of consignments**
KEBS	On-site verification via inspection of goods at EAC and border points	Stops the consignment for inspection, inspects, and finally stamps for approval on customs form C63
	On-site verification and inspection of documents before and after verification by KEPHIS for goods from outside EAC and COMESA	Stops the consignment, inspects documents, and approves via stamp on C63

Notes. EAC=East African Community
Source: compiled by authors.

homogenous products. Testing will only be done on selected shipments to monitor continued compliance. Registration is renewable annually. In addition, exporters who have shown consistent shipment compliance under Route A can apply to have their products licensed by the Registration and Licensing/Certification Centers (Route C). KEBS also has collaboration with standardization bodies in countries of origin and may accept goods on the basis of the corresponding institution.

In all cases, a CoC is needed. In exceptional cases, at the sole discretion of KEBS, consignments without CoC undergo destination inspection after receiving the appropriate application from the importer. Such consignments will be subject to a penalty of 15% of the cost, insurance and freight (CIF) value of the goods plus 15% bond, and the testing and inspection costs. All other expenses incurred at destination will be borne solely by the importer. A copy of the CoC is sent to KEBS and the products are shipped. Imported goods will be subjected to customs clearance procedures.

The Customs and Exercise Department has implemented a system of electronic cargo tracking, use of X-ray scanners and a customs computer system. A customs declaration in the prescribed form (C63) is a requirement for clearance of imports. In all cases, the guarantees are discharged on application and production of proof that imports have been transported or entered into bonded factory as the case may be.

There are various fees charged for PvoC. Route A is charged 0.475% of free-on-board (FOB) value subject to a minimum of $180,[15] Route B is charged 0.425% of FOB value subject to a minimum of $180, and Route C is charged 0.25% of FOB value subject to a minimum of $135. Testing, registration, and licensing fees are calculated on a case-by-case basis. The IDF is 2.25% of FOB value.

15. All amounts in the article are in US dollars.

Table 5. Expected changes in documentation and procedure with adoption of "does contain" or "may contain" options of the Biosafety Protocol's Article 18.2.a. compared to the Biosafety Act.

Option	Institution	Likely change in documentation	Likely change in procedure
May contain	KRA	None	All institutions to finalize with the import document before clearance
	KEPHIS (on behalf of KBA)	Insertion of LMO status (may contain LMO-FFPs) in import permit	No change
	KEBS	None	No change
	KBA	Introduction of import permit stating the list of potential crop/trait/gene	No change
Contains	KRA	None	All institutions to finalize with the import document before clearance
	KEPHIS (on behalf of KBA)	Insertion of specific list of LMOs in import permit	Sampling of all consignments that are potential LMOs
	KEBS	Mandatory inclusion of certificates of analysis	Strict PvoC before shipment
	KBA	Introduction of import permit stating the crop/ trait/genes	Sampling and analysis of all LMO consignments

Source: compiled by authors.

Table 4 shows the typical procedure for the import of food commodities into Kenya from the land borders and the ports. The text in bold indicates the expected changes in procedure, taking into account the Biosafety Act and proposed regulations.

The current import procedure does not differentiate between GM and non-GM products. Though maize importers such as the NCPB specifically ask for non-GM consignments, allowing a threshold of only 0.1%, the inspecting organization (KEPHIS) does not require materials to be declared as containing or not containing GMOs. This is because there is no specific national legal framework for the import of LMOs-FFPs. The applicable framework applies to all food commodities without separate reference to those covered by the Cartagena Protocol.

As noted above, in 2005, KEBS released the KS EAS 2:2005 standard, which states that a statement of GMO status must be included in labeling consignments (KEBS, 2005), but up until recently the standard was not systematically enforced. In 2009, the KEBS also issued a new standard entitled "*Code of Practice for handling, transfer, and use of genetically modified organisms and derived products*" (KEBS, 2009). This standard has a clause that states that an import consignment shall be labeled to clearly identify the nature of the genetic modification and intended use. In addition, the consignment shall be accompanied by documentation as may be prescribed by the National Biosafety Authority, and these include—but are not limited to—approval for importation and a permit from a regulatory authority. This new standard will likely be employed in the PvoC process. It is therefore expected to affect imports of GM commodities from countries outside the East African community more profoundly. Countries in the East African Community (EAC) are not subject to PvoC and goods from there are cleared on the basis of the Certificate of Origin only.

Table 5 shows the likely changes in documentation and procedure that may be expected with the adoption of either the "may contain" or "does contain" options. Perhaps the most significant change in procedure would be the pre-verification of goods by KEBS agents in the case of the "does contain" option for goods coming from outside the EAC and COMESA. Each consignment would have to be accompanied by a certificate of analysis clearly stating and verifying the GM events in the material.[16] With the "may contain" option, KEPHIS is expected to insist on declaration of status as they issue the import permit, especially if they will be acting on behalf of the Kenya Biosafety Authority as the latter is established.

GMO Testing Methods and Capacity in Kenya

There are several GMO testing methods basically classified as qualitative and quantitative (Table 6). Laboratory methods are either protein based or DNA based. There

16. *This may be coupled with certificates of identity preservation, if this becomes part of the Protocol's requirement.*

Table 6. A summary of detection methods for rDNA products of GM foods.

Parameter	Western blot	ELISA	Lateral flow strip	Southern blot	Qualitative PCR	QC-PCR	RT-PCR
Ease of use	Difficult	Moderate	Simple	Difficult	Difficult	Difficult	Difficult
Special equipment needed	Yes	Yes	No	Yes	Yes	Yes	Yes
Sensitivity	High	High	High	Moderate	Very high	High	High
Duration	2 days	0.5-1.5 hours	10 minutes	6 hours	1.5 days	2 days	1 day
Cost/sample (USD)	$150	$5	$2	$150	$250	$350	$450
Quantitative	No	Yes	No	No	No	Yes	Yes
Field application	No	Yes	Yes	No	No	No	No
Where applied	Academic lab	Test facility field testing	Academic lab	Test facility	Test facility	Test facility	Test facility

Notes: PCR=PolyChainReaction; QC-PCR=Quantitative-Competitive PCR; RT-PCR=Real Time PCR.
Source: Ahmed (2002).

Table 7. GMO testing methods and institutional capacity in Kenya in June 2009.

Institution	Category	Type of tests	Parameter used	Types of samples commonly tested	Number of samples per day	Capacity of service in terms of samples*
KEPHIS	Regulatory/ service	ELISA strips	Protein based	Plant materials	Unlimited	H
		PCR	DNA based		Unlimited	M
		Real-time PCR	DNA based	Maize, soya bean	Unlimited	H
KARI	Research	Dipsticks	Protein based	Maize, cotton	Unlimited	L
		ELISA plates	Protein based	Animal	100	L
		PCR	DNA based	Maize, cotton	96	L
University of Nairobi BiosafeTrain	Research / teaching	PCR	DNA based	Plant based	24	M
University of Nairobi- Centre for Biotechnology and Bioinformatics (CEBiB)	Research / teaching	PCR	DNA based	Plant based	96	L
ILRI	Research	Real-time PCR	DNA	Animal/plant		M
Kenyatta University	Teaching / research	PCR	DNA	Plant		L
Biotech Forensic	Service	PCR/real-time PCR	DNA	Human and animal	96	H
University of Nairobi Medical School	Teaching / research	PCR/real-time PCR	DNA	Human	> 96	L
KEMRI	Research	Real-time PCR	DNA	Various	> 96	L

** L=low, M=Medium, H=high*
Source: Compiled by authors based on locally collected information.

are different versions of the ELISA method[17] used for GMO detection. One version uses lateral flow strips and delivers results in 2-5 minutes.

Most of the GMO testing methods described above are in use in Kenya. There are several categories of institutions with varying GMO testing capability. These are regulatory, service, research, teaching, and capacity building. Table 7 shows the different methods that are being used, the types of samples being tested and the

17. *ELISA stands for Enzyme-linked immunosorbent assay, which implies a set of procedures used to detect specific proteins.*

Table 8. Unit cost and estimated turnaround time for GMO testing in Kenya, 2009.

Type of test	Usage	Unit cost (USD)	Turnaround time
Bioassay	Field tests in maize research	< $10	7-10 days
ELISA strips	Protein based at KEPHIS headquarters	$24	1 day
ELISA plates	Protein based at KARI	$1.25	24 hours
PCR	DNA in several labs	$200*	2 days
Real-time PCR	DNA tests in grain import consignments and seeds DNA sequencing and identity at ILRI	> $300*	2 days
	Private laboratory	$20**	5 days

** Based on an international quote from a European laboratory—local quotes were unavailable.*

*** Based on a quote from a private forensic lab, which has not been involved in plant biotech identification.*

Source: Compiled based on locally collected information.

potential for the use of the laboratories to analyze service samples.

Table 8 synthesizes the costs of GMO analysis in Kenya. KEPHIS carries out occasional analysis for grain and seeds, while the International Livestock Research Institute (based in Nairobi) does research samples frequently. There is one private laboratory that has been analyzing human post-mortem samples for identification.

Implications of Import Control and Information Requirements for Kenya

Imports of LMO-FFPs

Our analysis shows that Kenya likely imported LMO-FFPs during the last 10 years or so. In the absence of deliberate import policy and of economic effort to avoid GM maize or GM soybean, with a bulk trade system, there is a very high probability that these products entered the market at least in some of the shipments coming from foreign and non-regional sources. While they were not formally approved in Kenya, it should be noted that these products nonetheless had been approved for planting and consumption in the country of origin and therefore did not come in unregulated.

Overall, there has been a steady increase in maize imports from South Africa, while maize imports from both the United States and Argentina have declined. A new maize standard for the EAC (KS EAS 2: 2005) stipulates that information on GMO status must be contained on the label. While this new requirement apparently puts Kenya in consistency with its default requirement under the CPB, it may have led exporters in the United States and perhaps in Argentina to reduce their exports to Kenya.

KEPHIS has been sampling maize imports, especially those coming in through the port of Mombasa. The results of their analysis were not released, but in general, no consignment of maize has been rejected on the basis of containing GMOs. There may be other reasons for maize import decline from the United States, Canada, and Argentina. Imports of soybeans have not attracted media attention even though some of the exporters are large producers of GM soybeans. No cottonseed or rapeseed has been imported from GM-producing countries.

Considerations in Border Testing

The oncoming Biosafety Authority is expected to bring about substantial changes in the import of GMOs. Inspectors will be appointed and have authority to enter and inspect premises, facilities, vessels, or properties to confirm that the requirements of the 2008 Biosafety Act are met. It is possible that in the initial stages of its operations, the Authority will designate other collaborating regulatory agencies such as KEPHIS to oversee their role at border points. In this case, the designated authority will carry out inspections as well as take appropriate samples for analysis. The most practical option would be ELISA strips. These are limited to identifying the presence/absence of GMOs and, therefore, further analysis of positive samples would be carried out at an advanced laboratory—most of which are based in Nairobi.

The cost of an ELISA test is about $25. This cost would be considered minimal by importers of large consignments. Importers of smaller quantities may consider it a substantial cost. This is particularly the case for importers from neighboring countries who mostly import small but frequent consignments. Currently, food and feed imports from EAC and COMESA countries are not taxed when they are accompanied by a Certificate of Origin. Any additional charges would therefore be seen as a barrier to entry. In practice, KEPHIS officially sam-

Table 9. Strategic border points for testing of potential LMO-FFPs.

Border	Point of entry	Type of product likely traded	Likely exporting country
International	Kenya Ports Authority – Mombasa	Maize, soya beans, canola	South Africa, United States, Argentina, Canada
Kenya-Tanzania	Namanga	Maize	South Africa, Malawi
	Kenya Ports Authority – Kisumu Port	Maize, cotton seed	South Africa, Tanzania
	Isebania	Maize	Tanzania
	Loitokitok	Unshelled green maize	Tanzania
Kenya-Uganda	Malaba	Maize, soya beans	Uganda, DRC (Re-exports)
	Busia	Maize, soya beans	Uganda, DRC (Re-exports)

Source: Authors.

ples 5% of a consignment and then makes one composite sample from several representative ones. Nevertheless, importers bringing in many small consignments would pay for analysis of each consignment, thus translating to a significant cost.

In the case where the test proves positive and a more definite test (such as DNA) would be required, the cost would be even higher. A quantitative test run via real-time polymerase chain reaction (PCR) may cost about $250. This is substantial for small consignments and non-negligible even for larger consignments (especially as it may consider different GM events). A one-sample/one-event test would exceed current administrative fees (under Route A, B, or C).

The ELISA strip test would take less than 20 minutes. This length of time is within the normal clearance time needed by the various regulatory authorities—that is, KRA, KEPHIS, and KEBS. However, tests to be run at laboratories in Nairobi need four days for results. This would be considered too long for land transporters but is within the clearance time at the port of Mombasa, where large consignments may take days before off-loading.

Table 9 lists the key point of entry for potential LMO-FFPs and the respective exporting countries. Loitokitok is a notable case; currently, an access road connecting it to the Nairobi-Mombasa Road is under construction. On the Tanzanian side, there is also an access road connecting the border to Dar-es-Salaam. This development will result in a route from Dar-es-Salaam to Nairobi that is shorter than the Namanga one and would enable more access for commodities from southern Tanzania, including those on transit from Malawi and Zambia.

Even if the Authority focuses its efforts on key border points, it is clear that systematic inspections will be very difficult to enforce, especially at the inland borders with frequent entries of small traded volume. Enforcement will cost a substantial amount in training staff, reinforcement of testing capacity and setting up whole management systems, and will in effect constitute a new barrier to entry especially for small traders in the region. Even with the best effort possible, informal trade is likely to subsist without control. This means that if a country in the region was to adopt a GM crop, Kenya would face a real challenge in controlling entry of such a commodity.

These upcoming challenges emphasize the critical importance of regional regulatory initiatives for imports of GM products. The only way that Kenya and its East African neighbors can manage to regulate GM imports without facing transboundary movements of unapproved GM products is to operate at the regional level. While the European Union has de facto allowed member countries to each decide whether to ban the planting of a GM crop at the national level, any GM product is approved for import in the whole EU region. COMESA is actively pursuing harmonization (Daily Monitor, 2010), and if their efforts do not yield results fast enough, the EAC should pursue a common import approval system for LMO-FFPs.

Implications of Documentation Requirements: "May Contain" Versus "Does Contain"

The introduction of information requirements will add a new layer of complexity to these challenges. There are two ways to consider their implementation, either in the absence of import approval or after the implementation of import approval procedures. In the first case, as noted in Gruère and Rosegrant (2008), either option will not be used for import regulations, except if the country decides to ban GM. In the case of a ban, the "may contain" option would work as well as the "does contain" one, with less economic effect. Because of this, we will focus only on the second case, by assuming that import

approval regulation would precede or be accompanied by the implementation of information requirements.

On the one hand, the "*may contain*" option requests the exporting party to provide, at a minimum, some information on LMO-FFPs to the Biosafety Clearing House, which can be consulted by importing parties. Among other things, this includes information on the LMO-FFP, the genetic modification, the donor and recipient organisms, and a risk-assessment report. Thus, the onus is on a potential importing party to check the BCH for information on new LMO-FFPs that may enter international trade, and potentially to subject them to domestic regulation. If Kenya implemented this option, it will not have to account for testing accuracy, and will focus its efforts on testing for and rejecting unapproved events (something that needs to be done to enforce the import regulation).

In the case of the "*does contain*" option, the country would be testing to eliminate unapproved events and to verify the accuracy of the lists. The cost of testing, and associated use of identity preservation system, would ultimately increase the cost of the commodities to the consumer. Under this option, there is also a likelihood that certain events present in consignments may not have been tested for by the exporter and tests may be inconsistent. The possible inaccuracy of the list of GM events reduces the value of the system.

Discussion

The political climate has made it quite important for the regulatory authorities to know whether consignments contain GMOs or not. Until the Biosafety Authority is in place, KEPHIS and KEBS are likely to continue carrying out monitoring tests at their own cost. With the implementation of the Biosafety Act, costs will be passed on to the importers and this may raise the price of imported commodities.

Overall, the "does contain" option is likely to lead to more costs for Kenya due to the guaranteed tests by the exporter. Quantitative testing to ascertain conformity to thresholds would be expensive. Consignments of maize to the port of Mombasa are often in the range of about 20,000-40,000 tonnes, commonly about 25,000 tonnes. Each of these consignments would have one sample analyzed. In a crisis year such as 2008, more than 10 of such consignments may have entered the port. At a cost of about $250 per sample and if all consignments were to be tested, a minimum estimated budget of about $2,500 would have to be incurred for maize alone. This figure is valid when analyzing for one event. Consignments from the United States could have as many as 30 or more possible LMO traits. Consignments from Argentina and Canada also have a significant number of GMO events. South Africa has fewer events presently, but this is changing rapidly. Globally, it is estimated that by 2015, about 120 traits may be available (Stein & Rodriguez-Cerezo, 2010).

Much higher costs of analysis are likely. A realistic estimate may be obtained by taking into account the number of actual consignments entering the most important border points. This would require a tally of all the consignments over a period of time (possibly 3 months) since each consignment would be subject to testing. This frequency can then be projected for a year-long period and the total cost calculated on that basis.

Road consignments of both maize and soybeans from Uganda, Tanzania, Malawi, and possibly South Africa are likely to be smaller but frequent. Each would be subject to testing and the total costs would be highly significant. The costs of sample transport, storage, and recording would be significant. The laboratory capacity would also have to be increased. The other implications are that there may be delays in clearance of consignments.

One of the consequences of the mandatory testing may be realignments in trading blocks unless all countries adopt GMOs more or less at the same pace. The most significant will be importing from poorer countries that produce a surplus of potential GMOs and have low and therefore expensive testing capacity, but are not advanced enough to sell at lower prices. Countries in East Africa—for example Uganda and Tanzania—are moving towards commercializing GMOs and soon could be in a position to be trading in GMOs as well. However, their capacity for analysis is likely to be developing slower compared to countries that are well into producing LMOs, such as the United States, South Africa, and Argentina.

If Kenya insists on certificates of analysis from Uganda or Tanzania, the two may not provide them due to a lack of facilities for testing. Furthermore, the high costs of such testing will increase the cost of commodities such as maize, making South Africa and the United States the preferred suppliers. This may have implications on political relations in the East African Community.

Kenya is also on its way to commercialize GM crops.[18] For this reason, it will be important for the country to come up with export requirements that will be practical. If Kenya supports the "does contain" option, traders will also need to analyze exports and

attach certificates of analysis for each consignment. This cost will make Kenya's commodities effectively less competitive in the global trade market.

Conclusions

This article analyzed the implication of import regulations and information requirements under the Cartagena Protocol's Article 18.2.a. for GM commodities in Kenya, a country that acts as the gateway for international trade of grains in Eastern Africa, and that is in the process of moving forward in setting up and implementing trade-related regulations for GM products.

We first analyzed imports of potential GM commodities (maize, soybean, cottonseed, and canola), which are defined as living modified organisms intended for food, feed, or processing (LMO-FFPs), in Kenya in the last 10 years. We find that Kenya did import significant volumes of maize and soybeans from GM-producing countries. Since these countries generally do not differentiate grains according to their GM status, it is likely that Kenya—like many other countries in the region—imported these GM commodities in the last few years. Cottonseed imports in Kenya were sourced in neighboring countries that have not adopted GM cotton, but may do so in the near future. Rapeseed/canola was imported only from non-GM producing countries but may become more common in the future.

The study then reviewed the procedure and documents needed for the imports of grain and food commodities to analyze the effect of introducing import control and information requirements under the "may contain" and "does contain" options of Article 18.2.a.

Import control at border points is bound to be very challenging and costly, especially as it relates to land-based ports of entry. If traders have to pay for testing and validation of permits, the regulation will act as a new barrier to entry that could have significant effects especially for small traders. In the short run, consignments coming from neighboring countries may by-pass testing due to the frequency of imports leading to possible fatigue from border staff. Countries such as Uganda and Tanzania have not yet started commercial GM production. Therefore border staff may allow entry of these materials without testing. However, the Dar-es-salaam port may have consignments coming from further afield with the likelihood of GM content and therefore testing will likely be necessary. In the long run, these countries are intending to move forward with GM crop adoption, like Kenya, and control will become increasingly difficult.

This situation calls for the introduction of regional import approval and control procedures, as is done elsewhere. Regional initiatives at the EAC, if not at the COMESA, level are crucially needed both for efficiency, cost control, and practical implementation. Given some of the current constraints, avoiding a regional approach is likely to translate into partial and imperfect enforcement especially in the long run, with some products (whether approved or not) passing through, which may render the import regulations completely useless.

With regard to information requirements, we find that the default "may contain" approach would be largely consistent with import regulations and have limited or no effects on traders, consumers, and regulatory bodies. In contrast, implementing a stricter requirement whereby all consignments should be labeled "does contain" LMO-FPPs would lead to significant additional costs for public agencies that will likely be borne by traders and price increases, without obvious benefits for regulators. With this measure, in the future, Kenya may also have to adopt ways of ensuring identity preservation in order to guarantee purity of a locally grown commodity.

These conclusions suggest that the Kenyan Government should reconsider its support of the "does contain" option as it has done in the past. Import regulations at the regional level and a "may contain" approach are likely to be more effective and certainly less costly for all.

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18. Table A4 in the Appendix provides a list of crops being developed.

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List of Institutions Consulted

Bidco Oil Refineries, BiosafeTrain, Biotech Forensics, Centre for Biotechnology and Bioinformatics, East African Grain Council, Egerton University, Grain Bulk Handlers Ltd., International Service for the Acquisition of Agri-biotechnology Applications (ISAAA) AfriCentre, Kenya Agricultural Research Institute (KARI), Kenya Bureau of Standards (KEBS), Kenya National Bureau of Statistics, Kenya Plant Health Inspectorate Services (KEPHIS), Kenya Ports Authority, Kenya Revenue Authority (KRA), Ministry of Agriculture, Ministry of Finance, National Cereals and Produce Board (NCPB), National Council for Science and Technology (NCST), Program for Biosafety Systems Kenya, SGS Kenya, Unga Group Ltd., UN World Food Programme (WFP).

Appendix

Article 18.2(a) of the Cartagena Protocol on Biosafety

Each Party shall take measures to require that documentation accompanying:

(a) Living modified organisms that are intended for direct use as food or feed, or for processing, clearly identifies that they "may contain" living modified organisms and are not intended for intentional introduction into the environment, as well as a contact point for further information. The Conference of the Parties serving as the meeting of the Parties to this Protocol shall take a decision on the detailed requirements for this purpose, including specification of their identity and any unique identification, no later than two years after the date of entry into force of this Protocol.

See tables below.

Table A1. Maize imports into Kenya in metric tons (1999-2008).

Country	1999	2000	2001	2002	2003*	2004	2005	2006	2007	2008	Total
United Arab Emirates	4	16	3	0	n/a	242	67	8	88	58	**486**
Argentina	84	0	0	120	n/a	240	147	11,193	466	320	**12,570**
Canada	9	0	0	0	n/a	21	0	1,550	0	0	**1,580**
EPZ	0	0	0	0	n/a	0	270	0	0	0	**270**
United Kingdom	8	9,024	500	0	n/a	5,000	0	10,500	0	0	**25,032**
India	0	0	0	0	n/a	16,325	1	0	0	0	**16,326**
Italy	270	68,487	105,396	6,300	n/a	0	6,000	4,000	1	1	**190,455**
Tanzania	5,561	4,854	87	0	63,000	11,124	15,162	4,371	40,136	6,522	**150,817**
Ukraine	0	0	0	0	n/a	0	0	7,537	0	0	**7,537**
Uganda**	11,133	1,997	15,007	63	36,000	1,537	27	144	6,600	2,090	**74,598**
United States	9,004	61,372	74,575	6,945	n/a	30,004	7,784	126	363	59	**190,232**
South Africa	37,864	226,765	22,201	0	48,000	153,646	10,982	20,680	90	140,406	**660,634**
Belgium	1,006	0	0	0	n/a	0	0	0	0	0	**1,006**
France	0	3,000	2,391	0	n/a	0	0	0	0	0	**5,391**
Madagascar	0	0	454	0	n/a	0	0	0	0	0	**454**
Switzerland	0	5,104	1	0	n/a	0	0	0	0	0	**5,105**
Sweden	0	0	10	0	n/a	0	0	0	0	0	**10**
Malawi	0	10,338	20,903	0	n/a	48	0	0	0	0	**31,289**
Zambia	0	0	0	0	n/a	138	0	0	0	0	**138**
Bulgaria	0	0	0	0	n/a	24	0	0	0	0	**24**
Saudi Arabia	0	733	0	0	n/a	17,222	0	0	0	22	**17,977**
Tunisia	0	5	0	0	n/a	0	0	0	0	0	**5**
Kyrgyzstan	0	0	0	41	n/a	0	0	0	0	0	**41**
Western Sahara	0	0	0	2,151	n/a	0	0	0	0	0	**2,151**
Mozambique	8,051	6,626	0	0	27,000	4,531	0	0	0	0	**46,208**
Total	**72,994**	**398,321**	**241,528**	**15,620**	**174,000**	**240,102**	**40,440**	**60,109**	**47,744**	**149,478**	**1,440,336**

Notes: EPZ=Export Processing Zone
n/a=Not available
** Detailed data for 2003 is missing; the total is based on available data.*
*** Cross-border trade from Uganda is estimated to be higher than the official figures.*
Source: Kenya National Bureau of Statistics (2009); USDA (2009).

Table A2. Soybean imports into Kenya in metric tons (1999-2008).*

Country	1999	2000	2001	2002	2004	2005	2006	2007	2008	Total
United Arab Emirates	0	0	0	0	0	0	0	0	0	**1**
Argentina	0	0	0	0	2,200	0	5,210	0	0	**7,410**
DRC	0	0	0	0	0	20	0	0	0	**20**
EPZ	0	0	0	0	1	30	0	0	0	**31**
Ethiopia	0	0	0	0	0	54	0	0	386	**440**
United Kingdom	2	1	1	0	1	1	0	2	0	**8**
Italy	0	0	0	0	0	596	788	0	0	**1,384**
Malawi	0	391	0	150	0	198	510	3	0	**1,252**
Tanzania	0	120	0	12	0	33	283	1,370	770	**2,588**
Uganda**	0	1,225	4,094	1,137	506	18	640	43,305	4,710	**55,635**
United States	0	0	0	0	2,239	4,226	747	529	2,501	**10,242**
Andora	0	0	20	0	0	0	0	0	0	**20**
India	0	0	0	0	17	0	0	0	100	**117**
China	0	2	0	0	0	0	0	0	0	**2**
Western Sahara	0	0	0	175	0	0	0	0	0	**175**
South Africa	0	1,813	500	0	0	0	0	0	0	**2,313**
Totals	**2**	**3,552**	**4,615**	**1,474**	**4,964**	**5,176**	**8,177**	**45,209**	**8,467**	**81,636**

*Note: EPZ=Export Processing Zone * Data for 2003 is missing.*

*** Uganda exports are likely to be re-exports (WHO, 2002). Source: Kenya National Bureau of Statistics (2009).*

Table A3. Imports of cottonseed and rapeseed into Kenya in metric tons (1999-2008).

Country	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
Cottonseed imports											
Tanzania	0	405	745	515	n/a	2,215	1,242	1,281	200	490	**7,093**
Uganda	0	220	148	400	n/a	400	1,220	250	200	100	**2,938**
Total	0	625	893	915	n/a	2,615	2,462	1,531	400	590	**10,031**
Rapeseed imports											
Ethiopia	0	0	9	0	0.0	0.0	0.0	0.0	0.0	0.0	**9**
India	0	1	0	0	0.0	0.0	0.0	0.0	0.0	0.0	**1**
Tanzania	0	0	0	0	0.0	20.0	0.0	0.0	0.0	0.0	**20**
United Kingdom	0	0	0	0	0.8	0.0	0.0	0.0	0.0	0.0	**1**
Total	**0**	**1**	**9**	**0**	**0.8**	**20.1**	**0.0**	**0.0**	**0.0**	**0.0**	**31**

Note: n/a=not available Source: Kenya National Bureau of Statistics (2009).

Table A4. Status of GMO crops in Kenya.*

Crop	Trait	Status
Sweet potato	Feathery mottle virus (SPFMV)	Transformations with several local varieties
Cotton	Bt against various pests	Open field trials on-going
Maize	Bt against stem borer	Confined field trials partly complete
	Drought resistance	Preparation for trials in process
Cassava	Virus resistance, elevated protein, elevated beta-carotene (pro-Vitamin A), and elevated minerals (iron and zinc)	Preparation for trials in process

** Applications with the National Biosafety Committee not included.*