GMOs in Africa: Governance adaptation in the agricultural sector for climate change

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Introduction

The combined pressures from continually evolving climatic conditions could imperil Africa's food security. As such, various states have looked to adaptive approaches such as alternative farming techniques and alternative crops in order to adapt to changing climates. As options are explored, a common denominator seems to be the implementation of genetically modified organisms (GMOs) for adaptive management techniques (Paarlberg, 2010). In light of its findings, this paper argues that a GMO governing body, seated at the national level must ensure the potential for safe GMO adoption to aid in combating the forces of climate change in Africa. It will draw upon empirical evidence in the United States and the European Union, along with cases from Ethiopia and South Africa exploring their governance of GMO harmonisation into legislature.

In 2009, the number of GMOs planted rose to 126.1 million hectares; this growth accounted for 13 per cent in developing nations, and three per cent in developed nations (SANBI, 2011). Many of these current GMOs are engineered with herbicide, pesticide, and drought resistance; some make the product grow quicker and larger, while others can sustain long periods without precipitation (FAO, 2004; USAID, 2014). For the purposes of climate change adaptation, the paper will focus on GM drought tolerance implementation, deriving policy adaptation from current Bt (pesticide tolerant) and Ht (herbicide tolerant) crops.

Governance arrangements for GMOs are widely described as important, but Africa took a long time to adopt the technology, primarily due to a lack of political 'will', insufficient access to proprietary technologies, and scientific uncertainties (Ayele, 2007; Okeno et al., 2013). Okeno (2013) argues that fear of assigning decision-making powers to a proponent would be blurred by significant bias, and the creation of a GMO Regulatory Authority to have access to information and resources to make informed decisions on behalf of the state and in the interest of farmers and food security to be the best course of action (see *Figure 1*) (Payumo et al, 2009). The Authority would coordinate research and interest of relevant stakeholders with the participatory involvement of the government, farmers, GM seed companies, scientists, and local stakeholders. Protocols such as the Cartengna Protocol on biosafety have been developed to help states prevent adverse

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socio-economic and environmental impacts, such as the ones that Okeno hopes to avoid (Secretariat, 2000; WTO, 2000).

Convention on Biological Diversity of GM crops: Slow move to ratify

The recognition of the Protocol as an international commitment to conserve biological diversity is shared by all states in Africa (IUCN, 1994; WTO, 2000). The Convention of Biological Diversity (CBD) recognizes two critical governance aspects of modern biotechnology. First, the CBD provides access to and transfer of technologies including modern biotechnology that are relevant to conservation and sustainable use of biological diversity, along with promoting human health as well. Secondly, the CBD aims to install appropriate procedures to enhance the safety of biotechnology in the context of the Convention's overall goal of minimizing and eliminating potential threats to biological diversity and human health (Nang'ayo, 2006). The Protocol is a significant step forward as it provides an international regulatory framework that reconciles the needs of trade and environmental protectionism with respects to trans-boundary movements of genetic material. However, the Protocol is also daunting for some countries to enforce, thereby developing a stance against GMOs for political, financial, or capacity related reasons (Chester & Moomaw, 2008).

Some socio-economic concerns that arose pertinent to the Protocol's Article 26 were the need to regard and incorporate indigenous and local communities before the approval process (WTO, 2000). GMO Acts of Kenya, Nigeria, and Uganda emphasise this need before application approval, for determining any socio-economic impacts that may adversely affect indigenous populations. This is not well elaborated on within the confines of the article, nor how impacts will be measured and analysed, and then merged with biosafety decision-making processes. Thus, underpinning the slowness of ratification in national context.

Currently, five countries in Africa: Burkina Faso, Mauritius, South Africa, Sudan and Zimbabwe have met the obligations of the Protocol with South Africa leading the pack (Nang'ayo, 2006). These countries have taken the necessary legal, administrative, and institutional-based action to ensure the proper handling, transport and use of GMOs as to prevent risks to biological diversity (Jacobson & Myhr, 2012). So far, the only African country that has permitted planting of GM crops is South Africa. They have a number of private and public laboratories to adequately carry out research and development work of GM foods. To date, they have over 160 plant biotechnology projects and over 172 GM crop field trials. South Africa is currently one of the only countries with a fully functioning National Biosafety Framework (NBF) (Nang'ayo, 2006), which is aiding in climate-adapted crops for the future.

The European and United States perspective: A developed stance

While institutionalisation of biosafety systems advance, and more countries in the African continent are scaling their legislation based off local context, there still remains much polarisation on the topic. These two perspectives have entirely different focal

points: the United States is based on the characteristics of the final product, whereas the EU is concerned about the process that is used to produce the product (Paarlberg, 2010). These conflicting and contrasting views are not unique to the US and EU, but global in scope (Chester & Moomaw, 2008). In Europe, there is scientific consensus that the GMO products and crops currently on the market have brought no new documented health risks to either the human or natural environment (Paarlberg, 2010). However, unlike Americans, Europeans remain sceptical about the unknown potential adverse affects, even though as mentioned these effects have been absent to date (FAO, 2004).

Farmers in Europe are few in number, however, due to the favourable climate and access to resources are highly productive (Paarlberg, 2010). Paarlberg (2010) notes that on the other hand those in Africa by contrast, 60 per cent of the population still rely on agrarian modes, and are not highly productive. The United States enjoys GMOs to increase food production that would otherwise be hampered by pests and weeds. Below, is a caption of the governance arrangements in both the Europe and the United States.

Table 1: Key Regulatory Differences between US and EU approaches to GMOs (Paarlberg, 2010)

Topic	United States	Europe
Governance and Regulations	Uses existing laws to govern GM food safety and environmental safety that are used for non-GM products	Separate laws specific to GM foods and crops
Institutional Capacity	Institutions that screen and govern GMOs (FDA, the Animal and Plant Health Inspection Service, and the Environmental Protection Agency) screen and approve non-GMOs as well	Requires the creation of new institutions (ex: National Biosafety Committees) and a separate screening and approval process for GMOs
Approval of Technology	If standard tests such as toxicity, allergenicity and digestivity have passed successfully, there is no regulatory barrier to commercial/public release	Can decline to approve new technology or products based on the grounds of 'uncertainty alone', without any evidence of risk. Hypothetical risks that have not been tested for, or lack testing capacity may be sufficient for dismissal (Precautionary Approach)
Marketplace	FDA does not require labelling	EU requires labelling

Which system is best out of the US and EU models shown above? It is truly a matter of context. The US model allows for new technologies to be implemented with proper risk assessments to both human and environmental health. On the other hand by the EU employing the precautionary approach, they would be unwilling to adopt new technologies if they worked or not based simply off the principle ‘no negative effects to date’. This can have perceived benefits, however, foregone opportunities as well. The EU also has no current need for GMOs to aid in current agricultural as noted by Paarlberg;

the region produces more than enough food for their demands, and therefore do not wish to consider GM crops at the present time. On the other side of the ocean, in the US, they are proactively seeking out the answers for future scenarios, when climate change no longer just picks on Africa, but also the mid-latitudes of the West. We are then left with a region that employs the precautionary approach, and one that proactively seeks new developments. The case in Africa however is one of immediate concern, where climatic conditions lead to frequent droughts and food insecurity is becoming a pressing concern.

Case 1: Developed role and legitimization of GMO governance in South Africa

Perhaps a brief historical context would do well to describe where South Africa was, and where it is today in terms of GMO governance. Experimentation and recognition of the potential benefits of GMOs began in the 1970s in South Africa, however, at this time, there were no regulatory activities or institutions to properly govern GMOs until 1990 (Ayele, 2007). South African scientists took initiative and organised themselves in 1978 to form the South African Committee on Genetic Experimentation (SAGEN) to advise on policy formation regarding GMOs and biotechnology development (Ayele, 2007). Since 2003, and later revised in 2006, the current regulatory framework is employed as seen in *Figure 1*.

The role of party participation is becoming increasingly clear in the GMO debate, the more bodies - the more opinions: which equals the more informed the decision. It is often argued that conventional government agencies, acting on their own, are insufficiently accountable to the public demands, and lack the knowledge and resources to address GMOs in an appropriate fashion (Ayele, 2007). The governance arrangement, as illustrated by *Figure 1* addresses the gap by drawing on experts in the field, stakeholder resources, and scientific accountability and is currently employed for governance in South Africa.

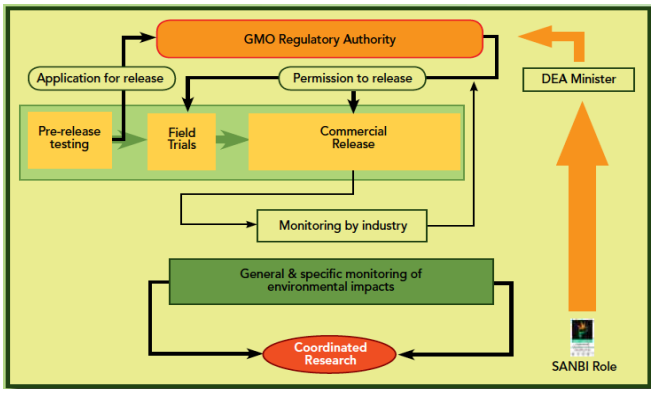

Figure 1: Graphical representation of the South African GMO regulatory system, indicating coordinated research (SANBI, 2011)

The South African legislature falls under the Department of Agriculture (DoA), with some historical reasoning behind it – called the Office of the Registrar for GMOs, which sets up an advisory committee and inspection service (SANBI, 2011). The DoA was chosen because as the Act was being written, most of the products at the time were agricultural in nature; secondly, the DoA had, and still is comprised of a adequate number

of experts in the field of biotechnology; and finally it already had inspectorates and an inspection infrastructure that stretched from the federal to provincial levels employed to ensure no gaps in legislation, or foregone opportunities (Ayele, 2007).

Some downfalls to the system however, as noted by interviewees, was that public participation was limited, and mostly driven by those who were either developing or supplying the technology (Herring, 2007). Others fault the system for its elitist views and non-participatory decision-making, largely due to a general lack of interest or public knowledge on the issue (Ayele, 2007). These are immediate issues of grave concern. It means that the Office of the Registrar for GMOs needs to further gain insights from smallholder farmers and relevant stakeholders should they wish to continue making informed decisions. Establishment of AfricaBio – a stakeholders association in South Africa, contributed to information and communication sharing, addressing earlier problems of inadequate scientific communication. However, the actual institutional capacity of the regulatory body on the DoA has enabled the system to draw from a wide range of expertise, knowledge innovation, environmental impact assessments and technological assessment, ultimately leading to informed decisions about South Africa's agricultural and food security future. (Ayele, 2007). Convergence of national and stakeholder groups (such as AfricaBio) is perceived as desirable, and is hoped to overcome and minimise differences in the technical and logistical contents of decision-making criteria and rules, and is poised to help overcome governance gaps in communication and information sharing in South Africa.

Case 2: Developing GMO governance in Ethiopia

As in most African states, agriculture contributes a significant portion of the national economy. In Ethiopia, agriculture contributes 85, 46 and 92 per cent of total employment, gross domestic product, and export earnings respectively (Beintema & Soloman, 2003). Ethiopia is hard hit by climate change, with seasonal drought rather than rain, environmental degradation, pests, and plant diseases (Gliessman, 1998). Ethiopia was late to adopt biotechnology – not until the 1990s did they acknowledge the role of biotech to aid in climate change adaptation (Desmarais, 2007). Ethiopia, unlike South Africa, does not have the same R&D capacity, has a low scientific base, limited training, and difficulties with recruitment and retention of university graduates (Ayele, 2007).

After adopting the Protocol in 2004, it embarked to implement the Protocol's biosafety framework, with legitimacy and direction: a steering committee (SC) was formed by 33 representatives, equally from the government and fields of relevant academia (Ayele, 2007). The SC was comprised of the Ethiopian Environmental Protection Agency (EPA), along with the Institute of Agriculture and a local university. However, unlike South Africa, major differences emerged among and exterior to the SC: developing the draft bill, its content, and the proposed situation of the GMO administration (Ayele, 2007). With all the confusion, the GMO administration fell under the EPA, and it immediately began preparing 'protective' principles, similar to the European model – the precautionary approach – which would potentially limit the development and usefulness of GMOs to combat food security in a country that is in dire need. Scientists who had

submitted written submissions to the draft bill noted that they hardly made any impact, and that the EPA, as the designated competent authority, was in pursuit of its own environmental and biodiversity issues, and did not present the neutrality to the issue that so many had hoped for (VOA, 2010). The EPA argued that in justifying their preferred GMO standards, noted that the Protocol was limited on GMO effects on "human health and socioeconomic considerations, and that there were no adequate domestic laws to address such potential risks" (Chester & Moomaw, 2008).

Any organisation with a particular opinion on a matter should not lead the debate and governance of the matter itself, it encapsulates the very essence of biasness. It is in the best interest for its scientists and farmers for the championing authority (EPA) to remain neutral to GMOs, competent, work with other actors and relevant stakeholders, and seek to produce a national consensus over the matter. Here, institutional resilience can be measured by levels of cooperation and conflict in the GMO debate. As much polarisation and debate has occurred in Ethiopia simply over who champions the process as other countries have in debate over the very existence of GMOs – such as Europe.

The biosafety rule-making institution of the EPA is perceived as a failure, as it did not adequately adopt information-sharing practices, and was inadequate to find a way through competing views and concerns over GMOs. It rather did well in employing the EU approach, however, in the context of Africa, it will not be able to encompass food security concerns of present day, nor in the future. The resultant leaves a significant landscape of improvement and alteration to the draft bill to be considered, and contesting impending decisions on GMO activities in the country.

Conclusion

The unique socioeconomic and environmental characteristics of each national approach preclude strict prototypes for building resilient GMO institutions (Ostrom et al. 2007). Institutionalising GM crops brings forth some fundamental questions of ownership and direction, as seen in the US, EU, South Africa, and Ethiopian cases. By bringing information relevant to the actors' discussion herein exposes the various modes of institutionalisation to be considered for the case of Africa. The perspectives raise significant questions over who champions it, to what end do they exercise their power, and what interests are taken into account. Analysis shows that critical consideration must be paid in three areas: legitimatisation, and socioeconomic, and environmental needs in order for proper adoption of GMOs. Progress made by first adopter nations such as South Africa is likely to provide information sharing to provide a roadmap for the inevitable adoption of GMOs across Africa. Increased collaboration amongst African nations on biosafety, the genesis of impartial governance agencies whose interests lie neither with or against GMOs, along with sharing of scientific data is the only way they can combat global climatic forces and induce a food secure future in the wake of climate change.

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