Research-based evidence in African policy debates

Case study 3
The contemporary debate on genetically modified organisms in Zambia

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Abbreviations

ACTESA	Alliance for Commodity Trade in Eastern and Southern Africa
AU	African Union
COMESA	Common Market for Eastern and Southern Africa
CP	Cartagena Protocol
EBPDN	Evidence-based Policy in Development Network
EU	European Union
FAO	Food and Agricultural Organization
FARA	Forum for Agricultural Research in Africa
GMO	Genetically Modified Organism
GMP	Genetically Modified Product
IAASA	International Service for the Acquisition of Agri-Biotech Applications
IFPRI	International Food Policy Research Institute
JCTR	Jesuit Centre for Theological Reflection
KATC	Kasisi Agricultural Training Centre
MISA	Media Institute of Southern Africa
MSTVT	Ministry of Science, Technology and Vocational Training
NAIS	National Agricultural Information Services
NGO	Non-governmental Organisation
OECD	Organisation for Economic Co-operation and Development
OPPAZ	Organic Producers and Processors Association of Zambia
PELUM	Participatory Ecological Land Use Management
RABESA	Regional Approach to Biotechnology and Biosafety Policy in Eastern and Southern Africa
RAPID	Research and Policy in Development
SACAU	Southern African Confederation of Agricultural Unions
SADC	Southern African Development Community
UN	United Nations
UNECA	UN Economic Commission for Africa
US	United States
USAID	US Agency for International Development
WFP	World Food Programme
WTO	World Trade Organization
ZARI	Zambia Agricultural Research Institute
ZLA	Zambia Land Alliance
ZNFU	Zambia National Farmers Union
RAPID	Research and Policy in Development
SACAU	Southern African Confederation of Agricultural Unions
SADC	Southern African Development Community
UN	United Nations
UNECA	UN Economic Commission for Africa
US	United States
USAID	US Agency for International Development
WFP	World Food Programme
WTO	World Trade Organization
ZARI	Zambia Agricultural Research Institute

About this study

The link between research and policy, which is increasingly occupying the interest of researchers, policymakers and practitioners alike, is a complex one. Policy is framed by the discursive context in which it is made: the wider debate in which a policy is positioned effectively determines it. In order to probe this discursive context and the role of research-based evidence in informing it, the Politics of Research-based Uptake in African Policy Debates research project, jointly funded by the Mwananchi programme and the Evidence-based Policy in Development Network (EBPDN) at the Overseas Development Institute (ODI), investigates the role of research-based evidence in four policy debates in Africa. The exploratory research is based on information gathered on four policy debates in four case study countries – Ghana, Sierra Leone, Uganda and Zambia – during the period October 2010–November 2011.

Policy debates offer an entry point into the wider discursive practices at play within policymaking, and therefore a wider analytical snapshot than is made possible by focusing on the impact of a particular piece of research or tracing the formation of a particular policy, as other studies have done. Each case study aims to probe the 'politics' behind the role of research-based evidence in policy debates in Africa by posing the question: What factors affect the use of research-based evidence in African policy debates? It is not, however, the aim of this research to arrive at an explanatory model of research uptake in Africa; rather, the study is explorative and aims to provide an initial attempt to conceptualise 1) the role of research-based evidence in African policy debates; and 2) factors that account for or help to explain this role. Any answers will need to integrate initial reflections on how policy debates in Africa can themselves be characterised.

This study is informed by the Research and Policy in Development (RAPID) programme's work over the past 10 years. RAPID has systematically tried to identify how best to support and promote research-based evidence approaches for civil society actors to influence the policy process, guided by the belief that a policy informed by research-based evidence is better – and more effective – than one which is not. One of the central tenets of RAPID's approach to policy influence is the recognition that political context matters when it comes to policymaking and, subsequently, so does whether, which ('whose'?) and how research-based evidence is used. The RAPID approach holds that attempts to influence policy using research-based evidence must incorporate this insight in order to be able to best tailor their strategies to political realities.

This study is conceived of as a way of formulating action in Africa based on the realities of how policy debates are conducted and the role of research-based evidence in these, by potentially 'going with the grain' to support policy influence for pro-poor outcomes in the African contexts described. An understanding of the current state of policy debates in Africa is important, as it reflects national capacity to engage in deliberative dialogue, to construct logical arguments and to gather and use relevant and credible information to employ in critical analysis. In Africa, where political institutions do not enjoy the precedent they do in many western countries, and where educational levels are low, the notion and practice of policy 'debate' is likely to face challenges. Policy debates do not occur in isolation from the policy process: they provide a window into the 'politics' of policymaking.

Introduction

This paper presents the findings of the first EBPDN case study investigating the role of research-based evidence in policy debates in Africa. This forms the central part of EBPDN's research component, consisting of a series of four case studies in sub-Saharan African countries. Overall, the research project is designed to inform subsequent thinking on how best to support evidence-based approaches in developing countries by 'going with the grain' with the reality of policymaking in Africa, rather than seeking to change the existing system from the outset.[1] The first task in this, however, is to establish what the 'grain' is in the context of evidence use and presentation in a policy debate.

This case study considers contemporary discussions surrounding Zambia's acceptance of genetically modified organisms (GMOs), a rich debate which stretches back to the Southern African famine in 2002, when the Zambian government refused the entry of food aid found to contain GMOs. It arguably offers the most straightforward comparison of uses of 'traditional' (science- based) evidence and can therefore be seen as a good example of competition between different sets of evidence – essentially asking different research questions. The debate itself follows a well-known narrative and has been well documented. Unlike the other case studies, therefore, there is less need to 'reconstruct' the debate into a straightforward simplified narrative. Along with the Sierra Leone case study, the discussion arguably offers greater scope to comment on how political interests and incentives operate in the use of research-based evidence.

The case study is organised as follows. Section 1 presents the historical and regional context of the GMO debate in Zambia, focusing on the government of Zambia's rejection of food aid containing GMOs in 2002 and how the debate is currently resonating across the region, given Common Market for Eastern and Southern Africa's (COMESA's) attempts to support a regional biotechnology for its member states. Section 2 focuses on the role of evidence in the debate. It first describes the contours of the debate, considering how far it has moved since 2002, then identifies how different approaches to risk and evidence have led to differing treatments of GMOs and finally presents the evidence and arguments used by both supporters and opponents of GMOs. With these discussions in mind, Section 3 delves into the reasons why opponents and supporters of GMOs have formed their positions, and thereby why particular evidence is used.

Key findings

The paper's key findings are that, although the debate is *framed* entirely by a consideration of evidence (even though specific references are often vague and indirect), in the absence of Zambia-specific evidence and adequate communication from the government of Zambia, it has reached both an 'evidence stalemate' and a 'communication stalemate', exacerbated by international actors on both sides of the debate which – arguably – offer and/or are motivated by significant financial resources. Overall, the case study suggests that evidence use is affected by a number of factors:

- The *availability* of evidence, affected by both the government of Zambia's effective silence on the issue and prohibitions against doing research in the country, meaning there is no research precedent on the issue and thus a reliance on data from international sources;
- What the debate is *understood* or *perceived* to be about;
- Different policy objectives or questions determining what an argument is effectively seeking to 'prove';
- International involvement and varying incentives and interests in relation to the issue;

1 See Kelsall (2008) for a detailed discussion of 'going with the grain' in African development.

- Levels of capacity to undertake, understand and use research-based evidence, which in Zambia are relatively high;
- The financing of research, which dovetails with the existence of particular interests and incentives to produce evidence to support action, particularly among biotechnology companies;
- Who is given a platform to participate in the debate – and on what (i.e. *whose*) terms.

While there is considerable scope to suggest that evidence selection is based on economic interests, this paper argues that this is not unsurprising, nor illogical, but a reflection of an emphasis within international circles on communication, persuasion and 'evidence-based policy' which lends itself to the partisan use of evidence.

Methodology

The purpose of this case study is to generate evidence on the role of research-based evidence by pursuing an innovative line of enquiry which considers a polarised policy debate and asks the following questions:

- What arguments are being made and by whom, and how they are communicated?
- How can the role of research-based evidence – or other forms of evidence – be accounted for in these arguments?

As this case study illustrates, the debate under consideration transcends national boundaries to effectively take place at a regional level, influenced by global-scale evidence and arguments. This particular debate was selected, however, because it presents an opportunity to examine the interplay between the private sector and the research community in a context which is undoubtedly African but which is also shaped significantly by global scientific developments and trends.

The manner in which the case study was undertaken is explorative: there is no existing theory this research is attempting to prove or disprove (see Thomas and James, 2006). The findings are therefore presented tentatively, based on recognition that there is much in this paper that may require revision, further reflection and greater input from the parties concerned. The research occurred during the period April–June 2011, with a two-week research trip to Lusaka in May during which the author was based at the Zambia Land Alliance (ZLA) office. Every effort was made to contact relevant parties, but inevitably the research process contains gaps.

The research methodology consisted of the following:

Review of media items

Relevant media articles appearing online in the period 2002–July 2011 were collected, the majority of which came from the three largest newspapers in Zambia – The Mail, The Times and The Post, an independent newspaper. Relevant radio and television programmes proved extremely hard to access and were not obtained. A number of articles appearing in the international media were also collected.

Review of literature

A number of relevant research papers in the following areas were collected, on:

- GMOs in Africa;
- Evidence and the GMO debate;

- GMOs in Zambia;
- The political economy of biotechnology;
- The media in Zambia.

This was supplemented by a gathering of relevant conference and meeting reports (where available), policy documents and legislation. All the aforementioned documents are cited throughout this case study.

Interviews

The research was informed by 21 semi-structured interviews with a range of individuals conducted face-to-face in Lusaka or the city's outskirts. The interviewees fell into the following categories: donors (2); biotechnology company employees (1); journalists (1); government (3); research/academic (6); non-governmental organisation (NGO)/development consultancy (4); farmers organisation (3); and regional organisation (1). The research was also informed by a number of other individuals and organisations, who are listed in the Annex.

1 Context and development of the debate

The debate on the relative merits of GMOs in Africa is 'polarised into two extremes' (Clark et al., 2005). African governments are trying to keep a tricky middle ground between allowing the development of the technology while alleviating fears among its opponents over the impact of GMOs on agriculture, health, the environment and trade, through regulatory mechanisms they can often ill-afford to implement. The debate in Africa has escalated during the past decade, reflecting the rapid worldwide growth of GM technology as a means of obtaining perceived benefits such as greater and better quality crop yields. An estimated 130 million hectares of genetically modified food are being cultivated across 25 countries (Menya, 2011) and the sector grew 7% in 2010, according to the ISAAA, a non-profit body which monitors the sector (ISAAA, 2010). According to research undertaken by the International Food Policy Research Institute (IFPRI), most of soybeans, half of maize, about a third of global cotton production and an increasing share of canola are 'likely GM' (Greure, 2010).

Although GM technology has traditionally been confined to Organisation for Economic Co-operation and Development (OECD) nations (most notably the US), developing countries are thought to account for half of the amount of hectares used for GMOs. As a result, the technology's apparent success has been heralded by those in the sector as an outright solution to food security problems of lesser developed nations, as well as being a way for poor farmers to enter a popular export market (ISAAA, 2010).

Nowhere would these alleged benefits be more significant than in Africa. However, as is evidenced by the widespread coverage the government of Kenya received recently for passing legislation which will open the country up to GMO maize imports, GMOs are not only fast growing but also highly controversial, with pertinent political and economic interests at play among those involved in the debate. This section seeks to set the tone of the paper by introducing both the historical and regional dimension in which the contemporary debate over GMOs in Zambia is taking place.

Zambia's watershed decision not to accept US food aid shipments found to be containing GMOs during the country's 2002–3 famine provides the impetus for how the subsequent debate is framed, and is therefore the starting point of this narrative. Importantly, the GMO issue in Zambia cannot be understood as a purely national debate. Rather, the actors taking part are active participants in a wider regional debate which spans the membership of regional organisations such as the African Union (AU), the Southern African Confederation of Agricultural Unions (SACAU), the Southern African Development Community (SADC) and –

probably most importantly in Zambia – COMESA, all of which have expressed their recognition of the large role GM technology could play in Africa's development.

In Zambia, the introduction and development of GMOs is supported largely by those who look set to benefit economically from a change in government policy: namely, international biotechnology companies (such as Biotech) and agencies whose objective it is to pursue foreign interests abroad (e.g. the US Agency for International Development – USAID); international donors concerned with food security issues (e.g. the World Food Programme – WFP); and farmers whose crop yield – and thereby income – would be enhanced by the use of GMOs (e.g. cotton farmers). These groups are supported by a number of international and national scientists who argue that Zambia stands to benefit more than lose from a sensible application of regulatory mechanisms to lift the government's effective ban on GMOs. Support for GMOs within the government is a tricky issue to gauge, and is subject to considerable questioning in this paper.

Opponents of GMOs unsurprisingly include international environmental groups such as Greenpeace, as well as regional and national ones such as the Participatory Ecological Land Use Management Association (the PELUM Association). Zambia's leading policy research institute – the Jesuit Centre for Theological Reflection (JCTR) – has also been at the forefront of calls to resist international pressure to lift the ban, arguing that introducing GMOs would affect small-scale farmers negatively. The self-titled Anti-GMO lobby also includes the Kasisi Agricultural Training Centre (KATC) and the Organic Producers and Processors Association of Zambia (OPPAZ), which support organically based sustainable solutions to food security problems. Other scientists have voiced concerns over Zambia's readiness to introduce GMOs, and therefore advocate for the strengthening of regulations and frameworks prior to lifting the ban. A common criticism of the debate is that there has been little effective input from small-scale farmers themselves (Mulumbi et al., 2005).

Box 1: GMOS: the basics

Biotechnology is any technological application that uses biological systems, living organisms or derivatives thereof, to make or modify products or processes for specific use. *Genetic engineering* refers to a set of laboratory techniques for isolating genetic material from organisms, cutting and joining it to make new combinations, multiplying copies of the recombined genetic material and transferring it into organisms, bypassing the process of reproduction. Therefore, genes which would never interbreed may be exchanged.

This whole process is known as genetic modification or genetic manipulation (GM). GM allows the transfer of genetic material (in the form of DNA sequences) between unrelated organisms that would not naturally breed. This entails removing segments of DNA from one species of an organism, modifying that DNA and then inserting the modified DNA segments into the genomes of cells or embryos. The cell or embryo is then allowed to develop to a new organism, out of which a genetically modified line (commonly called a genetically modified organism, or GMO in short) or transgenic line is derived. G< is currently used only to introduce a single new trait, which might be based on the activity of a single gene or a small number of genes.

GMOs are thus organisms whose genetic material has been changed artificially to enable them to perform functions they would not normally do naturally, such as survive in extreme temperatures.

1.1 Zambia and food aid 2002–3

In the summer of 2002, when Southern Africa faced severe food shortages and Zambia had nearly 3 million starving people (nearly 30% of the population), the country's government elected to reject 35,000 tonnes of food aid from the US owing to the presence of genetically

modified maize in the aid shipments. Since then, there has been a blanket ban on GM products. While other governments in Southern Africa accepted milled GMO maize that could not be replanted and therefore eliminated the risk of cross-contamination with existing crops, Zambia remained steadfast in its refusal to accept the maize, with then-President Mwanawasa declaring that GMOs were 'poison' and Zambians not 'guinea pigs' (Irwin, 2002; Manda, 2003).[2] He also referred to GMOs as potentially 'toxic' and not subject to sufficient testing.[3] In response, the US argued that it was not able to supply non-GM food aid, and it refused to pay for the milling.[4] The government of Zambia was widely perceived to have decided to let its people starve owing to seemingly irrational fears over the potential effects of GMOs. The decision was received with particular recalcitrance by the WFP, USAID and the Food and Agricultural Organization (FAO) on the grounds that not only did this endanger the lives of starving people, but also the cited reasons – a lack of evidence about potential effects – should not preclude acceptance of GMOs.

However, it would appear that the government's decision was not taken lightly and without a degree of deliberation. The decision to implement a ban on not only the food aid shipment but also *all* GMO imports in 2002 came after intense debate in which environmental and other interest groups critical of GMOs were both vocal and influential. While President Mwanawasa has been described as having 'bowed' to concerns voiced over the safety of GMOs, the decision appears to have been based on a serious weighing-up of existing knowledge on their effects. After a number of research institutes advised the government not to accept the GM maize, the US funded study tour by a number of Zambian scientists and civil society representatives to the US, India, South Africa and Europe to investigate *views* about genetic modification in other countries. The delegation's visit yielded a note of caution in relation to accepting GMOs (Clapp, 2005): 'We established from all the countries we visited that GMOs are a health hazard' the team maintained after returning to Lusaka (Kakunta, 2010d).

Fear of unknown effects, combined with apparent evidence of negative health impacts, led to Zambia ratifying the Cartagena Protocol (CP) in 2004, which petitions for caution when dealing with potentially harmful and scientifically uncertain matters. A mainstay of the CP's approach to GMOs is the Precautionary Principle, which the CP employs a weak form of. Adherents of the CP hold that *in the face of scientific uncertainty*, a country should not take action that might adversely affect human and animal health or harm the environment.[5] The issues surrounding different perceptions of risk and certainty in this debate are explored further in Section 2.2.

The government's Biotechnology and Biosafety Policy – ratified by the Cabinet in 2003 and currently being implemented – was drawn up in response to the events of 2002 and embodies this approach:

> *'The Precautionary Principle: No approval for transfer, use and release of GMO(s) shall be given unless there is firm and sufficient evidence that the GMO(s) or products thereof pose no risk to human and animal health, biological diversity or the environment. Approval shall not be given where there is reason to believe that harm or damage may result, even when there is lack of scientific evidence or certainty' (MSTVT, 2003).*
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> *The policy, which was later accompanied by related legislation in 2005, was introduced as part of a national Biosafety and Biotechnology Strategy and was intended to address the problems of a lack of national detection, regulation and*

2 The government did eventually accept it in milled form, but this was restricted to the 130,000 Angolan refugees in camps within its borders (Irwin, 2002).
3 'If it is safe, then we will give it to our people. But if it is not, then we would rather starve than get something toxic' (in Dynes, 2002, in Clapp, 2005).
4 The WFP attempted to find non-GM aid for Zambia but was able to provide only about half of the necessary 21,000 tonnes of maize required (Irwin, 2002).
5 In 2002, Agriculture Minister Mundia Sikatana stated, 'In view of the current scientific uncertainty surrounding the issue […] government has decided to base its decision not to accept GM foods in Zambia on the precautionary principle' (BBC News, 2002).

> *research capacity as revealed by the 2002 GMO situation. In its final stage of implementation under the auspices of the Ministry of Science, Technology and Vocational Training (MSTVT), it constitutes the government of Zambia's official response to GMOs, effectively maintaining a ban on them but also, interestingly, stating that it is designed to* 'guide the judicious use and regulation of modern Biotechnology for the sustainable development of the nation, with minimum risks to human and animal health as well as the environment, including Zambia's biological diversity' *(MSTVT, 2003).*

The very existence of a draft policy and the MSTVT's recent activity to facilitate its implementation has meant that the government of Zambia is acknowledging the existence of GMOs as a seemingly inevitable 'fact', which is therefore a sign that it has reneged on its steadfast position during the 2002 food crisis. The government's current position – and the Biotechnology and Biosafety Policy currently in the pipeline – is subject to more detailed discussion in Section 2.

Alongside references to environmental and health concerns regarding the effects of accepting GMOs, it is thought that the government of Zambia's primary concern was related to the impact of accepting GM maize – and thus the risk of cross-contamination to other produce – on its significant maize exports to the European Union (EU), whose de facto moratorium on new varieties of GMOs (see Section 2.3 for a further discussion) effectively prohibited EU members from purchasing this produce given a lack of conclusive evidence regarding its effects.[6] The US, which at the time accounted for 60% of world food aid contributions, blamed the EU for the government of Zambia's decision and subsequent prolonging of severe famine. After an official complaint was made by the US, Argentina and Canada to the World Trade Organization (WTO) in 2003 alleging that the moratorium contravened international trade rules (see Greure, 2006), the EU issued the following statement:

> *'The European Commission finds it unacceptable that such legitimate concerns are used by the U.S. against the EU policy on GMOs […] Food aid to starving populations should be about meeting the urgent humanitarian needs of those who are in need. It should not be about trying to advance the case for GM food abroad' (EU, 2003, in Clapp, 2005).*

Perceived US aggression in pushing both its food aid (GM surplus produce) and the development of biotechnology (of which GMOs constitute a significant part) in order to secure and maintain an important market and protect economic interests (the EU ban on new varieties of GMOs effectively blocked the sale of US corn on the EU market, according to Greure, 2006) is often criticised in the debate for obscuring considerations of the risk faced by large-scale GMO production and consumption. The African GMO debate is also, quite accurately, seen as an arena in which politico-economic rivalries between the EU and US are played out. In response to the 'internationalised' nature of the food aid crisis in Zambia, issues regarding the country's national sovereignty came to – and have remained at – the fore, with former Minister of Agriculture and Cooperatives Mundia Sikatana declaring in 2002 that, 'We will get good food for our people, food that we can guarantee is good. We should not be bulldozed into accepting what we do not want' (in Lewin, 2007). The concept of 'food sovereignty' plays an instrumental role here, and is described by Nkhoma (2010) as the 'right to healthy and culturally appropriate food produced through ecologically sound and sustainable methods and their right to define their own food and agriculture systems', including the right to food and the rights of farmers.

6 See Clapp (2005): 'The value of Zambian exports of maize in 2002 was U.S.$2.23 million, according to the FAO.' According to Lewin (2007), food exports account for 30% of the Zambian economy.

1.2 GMOs in Southern Africa

The debate prompted by Zambia's decision to reject food aid in 2002 is part of a far wider discussion on how biotechnology can best (and indeed whether it should) be introduced in East and Southern Africa with sufficient regulation, legislation and technical capacity. The accompanying voice of dissent has a similar regional outlook, while echoing the concerns and arguments of opponents in other countries – both developed and developing. This section outlines how the regional context is being played out, largely through the involvement of COMESA, which receives substantial funding from the US.

The East and Southern African regional economic bloc, COMESA, has provided much of the impetus for the debate through its attempts to draft and implement and regional policy on GMOs, although the status of GMO acceptance differs across its 19 member states. Both Egypt and South Africa are the most advanced, with Egypt growing commercial maize and South Africa successfully exporting GM maize and soybeans to other African nations. The regional debate entered into a new phase in July 2011, when the Kenyan Cabinet cleared the importation of GM maize in order to resolve the country's food shortages (Menya, 2011), inevitably sparking off a fresh round of arguments in the region over fears that other governments may follow Kenya's lead. Other countries either have only recently approved contained trials of crops such as cotton and maize (e.g. Malawi and Zimbabwe), or do not as yet have any regulatory or scientific capacity to conduct such trials. Only three countries (Malawi, South Africa and Zimbabwe) have established legal mechanisms for the safe development and application of biotechnology; the rest are still at varying stages in the development of their biosafety systems. Although the region can be characterised as maintaining an 'anti-GMO' policy, it is Zambia that is considered the most vehemently opposed, and therefore most 'behind' with regard to establishing national policy instruments and legal frameworks.[7]

Despite the difference in levels of GMO activity (as well as capacity to regulate and develop the industry following its introduction), there would seem to be a common buy-in by all COMESA member states to develop a regional approach, as well as national policies and frameworks to support this (Nkhoma, 2010). This process is being overseen by the Alliance for Commodity Trade in Eastern and Southern Africa (ACTESA), a specialised agency set up by COMESA in 2009 to support and promote both the productivity and the incomes of farmers in the COMESA region through trade in staple crops. On the basis of COMESA's recognition of the potential contribution biotechnology can make to the lives of farmers and overall food security in the region, ACTESA – whose headquarters are in Lusaka – is now responsible for leading the development of the biotechnology and biosafety agenda in the COMESA region.

ACTESA is not COMESA's first attempt to support and guide the development of both a regional approach to GMOs and regional capacity to implement any framework. In 2001, the Regional Approach to Biotechnology and Biosafety Policy in Eastern and Southern Africa (RABESA) was initiated by COMESA ministers of agriculture, with the purpose of coordinating a regional response to biotechnology and biosafety issues, focusing particularly on mitigating potential impacts of GMOs on trade and food security through greater awareness, collaboration, understanding and capacity to make informed decisions (see COMESA, 2010). The RABESA project has strong links with the research community; partner organisations have included the Policy Analysis and Advocacy Programme of the Association for Strengthening Agricultural Research in Eastern and Central Africa, the Programme for Biosafety Systems, the African Centre for Technology Studies and ISAAA AfriCenter.

In March 2009, the process of drafting COMESA regional biosafety policies and guidelines on the commercial planting of GMOs, trade in GM products and handling of emergency food aid with GM content began following an agreement by COMESA ministers of agriculture in 2007 to move forward. The draft policy was subject to discussion at a regional RABESA workshop in

7 See Nkhoma (2010) for a detailed discussion of legislative mechanisms in Southern Africa.

Nairobi in 2010. A communiqué resulted from the discussions, effectively declaring that COMESA member states had agreed to endorse the (by then revised) regional draft policy and guidelines on planting, trade and emergency food aid, as well as to support the setting-up of a Regional Biosafety and Centralized GMO Risk Assessment Desk and Biosafety Roadmap in order to identify capacity gaps and weaknesses in fellow member states. A national workshop in 2011 built on that of 2010, although there are ongoing concerns that progress will be slowed by the anti-GMO lobby.[8]

1.3 Relevant policy and legislative mechanisms and guidelines in Zambia

Aside from the draft national Biotechnology and Biosafety Policy and the draft regional policy and guidelines, Zambia is subject – directly and indirectly – to a number of relevant policy and legislative mechanisms and guidelines.

The most important with regard to how the GMO debate is framed is the *Cartegena Protocol on Biosafety 1993*, which was invoked by the government of Zambia in 2002 and subsequently became an obligation after ratification in 2004.[9] The objective of the Protocol (which is part of the UN Convention on Biological Diversity) is to,

> *'[…] contribute to ensuring an adequate level of protection in the field of the 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 also into account risks to human health, and specifically focusing on transboundary movements' (Secretariat of the Convention on Biological Diversity, 2000).*
>
> *At base, the CP respects the right of a sovereign country to regulate bio-engineered organisms, and provides a framework to enhance the capacity of developing countries to protect biodiversity through the regulation of biotechnology. Labelling and documentation requirements are one strategy introduced to facilitate this, with the 87 signatories obliged to indicate whether any food, feed or processing exports 'may contain GMOs', as well as providing details about both the importer and the exporter. However, this provision is thought to be limited given the indeterminate information required ('may contain'). Interestingly, both the US and Canada – two of the world's major exporters of GMOs – are not yet party to the CP.*

Though it does not figure directly in this discussion, it is worth noting that the UN addresses biotechnology and biosafety issues in Africa through the Economic Commission for Africa (UNECA), which has created UN-Biotech Africa, an inter-agency mechanism which works to coordinate the UN's biotechnology-related programme work in Africa.

The *African Model Law on Biosafety* was ratified by the AU Executive Council in Maputo in 2003. Based on a recognition of the role biotechnology could play in the continent's development (FARA, 2010), it was drafted in order to provide for a harmonised approach to biotechnology on the continent and for national governments to draft their own domestic legislation on the issue. Given the rapid development of GMOs in Africa, the Model Law has been subject to a revision process led by the Africa Biosafety Project. This will address the increasing amount of cropland being devoted to GMOs and ensure African farmers benefit from biotechnological developments.

The *SADC Guidelines on GMOs, Biotechnology and Biosafety* were made available in 2004 following the establishment of an SADC Advisory Committee on Biotechnology and Biosafety.

8 Documentation regarding this event seemed to be unavailable to the public as of 27 July 2011.
9 Zambia did not, however, complete a national implementation report in 2005 or 2007 alongside other signatories (national implementation reports are available at http://bch.cbd.int/protocol/cpb_natreports.shtml, last accessed 24 July 2011).

Zambia is one of four SADC member states to have acted on SADC's recommendation to formulate national legislation on biotechnology and biosafety, alongside Namibia, South Africa and Zimbabwe. The guidelines cover the handling of food aid according to whether the produce is milled or un-milled (i.e. can be replanted); the development of national policy and regulatory mechanisms; and public participation and awareness raising on biotechnology and biosafety issues.

In order to support the labelling aspect of the national Biotechnology and Biosafety Policy, the *Zambia Bureau of Standards* is drafting standards for GMOs which would apply to the labelling and advertising of food and feed in order to distinguish whether or not it is GM, is made by or may contain GMOs or does not contain ingredients that are GM. According to Nkhoma (2010), the standards apply to products of GM, such as maize or potato, or food or feed products that consist of organisms that have undergone genetic engineering. However, the standards do not appear to apply to foodstuff derived from GM-fed animals (e.g. meat, milk and eggs).

2 The role of evidence in the debate

This section explores the nature of the debate and the main arguments used in discussions over GMOs (and biotechnology development more generally). It begins by charting how the debate has moved from one purely about food aid to one about the conditions under which biotechnology can best take place – leading to a widespread fear among GMO opponents with regard to a perceived government U-turn – before discussing the methodological difficulties surrounding the use of evidence in the debate and the employment of differing understandings of what constitutes 'risk' and 'uncertainty', drawing directly on the work of Myhr and Travik (2003). However, the main purpose of this section is to consider how arguments on the benefits and drawbacks of GMOs are presented by various parties in the debate, so Section 3 can comment on the political and economic reasons *why* evidence is being used in a particular way.

2.1 Contours of the debate

The context in which the debate is taking place has changed from that described in Section 1, and subsequently so has the debate. In short, the major contextual driver of the debate is – arguably – *not* whether Zambia should accept food aid which is GM or contains GMOs, but how Zambia can (and whether it should) implement a framework for regulating GMOs and biotechnological development in general. This change in context is attributable to two principal factors: 1) accelerated moves towards regional biotechnology and biosafety mechanisms and approaches, namely those of the AU, SADC and, most importantly, COMESA; and 2) an improved food security situation in Zambia and in the Southern African region as a whole given a number of good harvests and the availability of different foods, which has thereby reduced pressure on maize supplies. The death of President Mwanawasa in 2008 and President Rabiah Banda's succession has also been something of a perceived 'game-changer' in the debate. The pace of change arguably looks set to accelerate further following Zambia's elections in October 2011, which saw Michael Sata, leader of the major opposition party and previously an outspoken critic of the government's reluctance to accept GM technology, succeed President Banda.

At base, there is a tension between those who view the government of Zambia's formulation of a national policy, combined with participation in regional processes, as a welcome signal that it is implicitly accepting the reality of biotechnology, and those who either fear a change in government position given their opposition to GMOs or believe that formulating regulatory mechanisms is not tantamount to accepting GMOs. The debate's current fault lines with regard to the policy process can be said to fall along this axis. The debate itself boils down – as it did

in 2002 – to an overall disagreement between those who argue that GMOs offer a number of benefits and/or that there is no substantial evidence to indicate they have a harmful effect on the environment or health (e.g. Gregory and Simwanda, 2002); and those who argue that crop biotechnology is either inadequately tested (e.g. Lubozhya, 2002 on behalf of the JCTR) or do not provide any substantial benefits over and above those offered by non-GM crops.

Dilemma and dichotomy

In 2002, the government was portrayed as facing a stark dilemma: letting people starve to death or giving them GM food (Manda, 2003). The framing of the debate in terms of an either/or dichotomy was repeated in a number of media items and is still used to describe the situation today. Discussions surrounding the potential impacts of GMOs on the health of the Zambian population took place in the subjunctive, with frequent references to 'fear', 'belief' and projected long-term effects based on predictions regarding a number of variables. This was the case on both sides of the debate. Zerbe (2004) quotes opposing viewpoints from two African scientists, the first predicting that, given the average health status of most Zambians in rural areas, 'if consumption [of GM grains] is high, then toxicity would equally increase' as a result of a resistance to antibiotics; and the second, while admitting there may be some health-related side effects to consuming GMOs, 'the short-term effects of malnutrition coupled with HIV/AIDS outweigh the long-term effects of GM foods on health'.

Government U-turn?

In recent years, the dichotomous nature of the debate has subsided as food security has increased and the government has focused its attention on addressing technical issues regarding the implementation of its Biotechnology and Biosafety Policy. Then-President Levy Mwanawasa was thought to maintain his personal stance against GMOs and the use of Zambians as 'guinea pigs', with government officials at the MSTVT along with the Ministry of Agriculture and the Ministry of Health supporting this position, based on the draft policy document of 2003. However, following Mwanawasa's death in 2008, there was a widespread feeling among both supporters and opponents of GMOs that the government's position was changing.[10]

There is a perceived disjoint between politicians – most notably current President Rupiah Banda – and ministry officials, the former inching towards acceptance of GMOs; the latter attempting to stick squarely to the national policy spearheaded by former President Mwanawasa. The seemingly shifting momentum towards a pro-GMO stance among politicians was underlined by President Banda's own public call for a reopening of the debate on GMOs in 2009 (Chanda, 2009). This call was echoed by a statement by WFP Country Director Pablo Rebalde, who advised the government to reopen the debate on the introduction of GMOs as way of helping reduce poverty in the country (Simpelwe, 2011a).

The call – amid fears of a wider government U-turn – was met with sharp criticism from environmental activists and academics, including that of Dr. Judith Lungo at the University of Zambia (Chanda, 2009). In general, there is very little in terms of concrete information or evidence with regard to President Banda's current thinking and – perhaps more importantly – current influences. Activists within Zambia (e.g. the PELUM Association and JCTR) are keen to speculate about the existence of secret deals between private sector actors and Zambian politicians, but this is yet to be substantiated. In truth, the GMO issue is shrouded in secrecy.

It is also worth questioning how accurate this new dichotomy painted between President Mwanawasa and his successor, President Banda, is. There is evidence to suggest that, prior to his death in 2008, Mwanawasa presided over a 'reversal' in the draft Biotechnology and Biosafety Policy; in 2005, he allowed the entry of food aid containing GMOs. In the US media,

10 This emerged in interviews with Brenda Kachapulula Nang'amba of Agri-Business Forum and Machiluzyi Chuba of the Zambia National Farmers Union (ZNFU).

this development was described in one well-circulated article as if Mwanawasa had 'allowed' his people to eat (Center for Consumer Freedom, 2005).

Does a policy framework preclude eventual acceptance?

Similarly, there is scope to suggest that the very existence of a Biotechnology and Biosafety Policy precludes an eventual acceptance of GMOs. The policy states that 'Biotechnology and products of Biotechnology can contribute significantly to economic development of Zambia, especially in the areas of agriculture, health care, environment as well as industry', but that the benefits can be realised only when biotechnology development takes place in a manner which is both judicious and sustainable (MSTVT, 2003). Therefore, it gives a degree of recognition to the instrumental role of biotechnology but, owing to scientific uncertainty (the Precautionary Principle), GMOs remain under a strict ban. However, the policy provides for the development of research and industrial capacity for the 'enhancement of Zambia's socio-economic and environmental well-being' and the subsequent establishment of the National Biosafety Authority and Biosafety Advisory Committee (ibid.).

Officials at the MSTVT, however, are adamant that 1) the policy does not indicate any acceptance of GMOs; and 2) the government's position is not changing: the bottom line is that the policy has been ratified by the Cabinet and therefore constitutes the government's final position. MSTVT Science and Technology Director Jane Chinkusy was particularly keen to counter claims in the media that the government was 'opening' up the debate, suggesting that this rather referred to extending an invite to all stakeholder to participate in discussions regarding the implementation of the policy. In terms of the fundamental questions regarding GMOs, the government's original decision to ban GMOs owed to the 'fact' that there was no evidence on their impact, and this situation remains.

Both Chris Kakunta, a journalist at the National Agriculture Information Service, and Getachew Belay of ACTESA have agreed that the government's game plan is, in actual fact, to maintain a total ban on the importing of GMOs, which are crops of 'strategic importance' to Zambia, as well as a ban on the development of GMOs in the country. This is despite the government in their view not having explicitly rejected GMOs and their development.

An inevitable path?

Some supporters of GMOs view biotechnological development as something of a global inevitability, and subsequently see the government of Zambia's ratification of the CP, the development of a national policy and participation in regional biotechnology discussions as its own recognition of this fact. For instance, Getachew Belay, ACTESA's Policy Advisor, argued that Zambia's acceptance and development of frameworks and regulations for biotechnology and biosafety preclude an eventual acceptance of GMOs, despite also holding that the government of Zambia currently has no intention of relaxing its position.

The 'inevitability' argument is used by others, such as the ZNFU leadership and the Zambia Agricultural Research Institute (ZARI). It is argued that the Zambian agriculture sector must keep up with global developments and therefore make provisions for the development of research and technical infrastructure. There is a concurrent fear that Zambian farmers – far from suffering the negative impacts of GMOs – will somehow lose out if the government is unable to keep pace with technological change.[11] Lubozhya (2002) deems this argument 'propaganda', employed by the pro-GM group to suggest that what is 'modern' can be equated with what is best for Zambia. Such claims divert attention from the 'hard data' available on the impact of GMOs (ibid.). The inevitability argument has a stellar cast of international supporters, however, including Paul Collier, who has said that GM is 'analogous to nuclear

11 For example, Chris Kakunta, Science Reporter at the National Agriculture Information Service, said in interview, 'a complete rejection of the technology without science-based evidences will not do the country well because it is a matter of time that the technology will soon catch up with us and unprepared'.

power: nobody loves it, but climate change has made its adoption imperative' (New York Times, 2009).

Indeed, the debate appears to be running away from being nationally owned, if it ever was: the fate of Zambia's decision-making remit would appear to be dwindling in the face of wider regional developments, namely, ACTESA and the RABESA project. A statement to come out of the 2010 regional RABESA workshop is indicative of this, stating definitively that the debate has moved from one over whether biotechnology should be accepted to one over the best methods to employ in its introduction: '*Today, the debate is no longer about IF Africa should or should not use biotechnology for its sustainable development; the debate is about HOW Africa should harness biotechnology for its development' (RABESA, 2010)*. Further, according to Cris Muyunda, ACTESA's Chief Executive, the 'wise and responsible use of GMOs in other parts of Africa, in my opinion, is only a question of when, not if' (RABESA, 2010).

The extent to which this is a descriptive, rather than a normative, statement agreed on by all participating in the debate is debatable, however.

Going back to basics: revisiting the original GMO question

While ACTESA's priority is to undertake a regional risk assessment on the introduction of biotechnology, opponents of GMOs are keen to bring the debate 'back' to fundamental questions regarding impact on and suitability to the Zambian agricultural context. For staunch opponents of GMOs – in particular the PELUM Association, the JCTR and the KATC – it is imperative that the debate does not move too far away from basic questions regarding whether the entry of GMOs into the country should be accepted. As recently as 2010, Peter Henriot, formerly of the JCTR and one of the principal faces of the anti-GMO lobby in Zambia, published a short article restating the JCTR and KATC's position, using much the same arguments as in 2002–4.

However, those who attempt to inject an element of the original debate surrounding GMO acceptance into contemporary biotechnology discussions face being seen as disruptive, lacking awareness or failing to move with technological developments. According to Getachew Belay of ACTESA, the debate in Zambia – and the COMESA region in general – has not moved on because of a lack of understanding and mobilisation of those who oppose GMOs, leading to the persistence of existing worries. These groups are described in terms which suggest they are derailing the righteous – and of course inevitable – path of science. Further, GMOs are still feared by 'ordinary' Zambians. One reason for this is that there has not been enough – or enough convincing – evidence to alter perceptions of GMOs. There would appear to be a deadlock regarding the terms on which the debate should be taking place, therefore: some participants have moved on to technical discussions concerning the *how* of biotechnology, whereas others feel the essential questions of *why*, *should* and *can* have not been addressed adequately.

There are a number of points to make clear here, overall. The context in which the debate is taking place has inevitably changed from that of 2002, and now new questions concerning a harmonised regional approach are being posed. It is evident that the debate has lost much of its alarmist character – likely because of a lessened level of food insecurity creating 'panic' conditions – with government actors refraining from using words such as 'poison' and 'revolting' to refer to GMOs. However, the main variables when characterising this debate are 1) whether the government's position has changed on the issue of GMO acceptance; and 2) what the government's position actually is. A widespread uncertainty regarding the government's current thinking – and more importantly its influences – creates unstable conditions for a debate: what needs to be debated and who needs to be influenced?

In these circumstances, it is not surprising that opponents of GMOs have thought it necessary to maintain their arguments, both anticipating and guarding against a change in the government's approach. While this has been seen as symptomatic of a lack of understanding of

biotechnology, it has also meant the debate has not – despite movements on the contrary – become dominated only by technical issues regarding the formulation and implementation of national and regional legislation, policy, frameworks and guidelines.

2.2 The Precautionary Principle, risk and problems with evidence

The debate is characterised not only by uncertainty regarding the government's position, but also scientific uncertainty surrounding the effects of GMOs on health and the environment. It has as a result been centred on the issue evidence, but more so on a lack of certainty regarding what scientific evidence concludes. As Myhr and Travik (2003) argue, at present 'scientific uncertainty concerning the […] impact of GMP [Genetically Modified Product] utilization impedes consensus with regard to relevance of hypothetical, but possible hazards'. The lack of global scientific certainty regarding GMOs means they are deemed a 'risk'. Understandings of risk differ, however, and the GMO debate in Zambia is a good example of this. This section presents the general problem of scientific risk and limitations of the evidence base within the GMO debate, before Section 2.3 considers the evidence concerning the impact of GMOs.

In 2002, then Agriculture Minister Mundia Sikatana famously declared that,

> *'In view of the current scientific uncertainty surrounding the issue […] government has decided to base its decision not to accept GM foods in Zambia on the precautionary principle [and therefore] the country should thus refrain from action that might adversely affect human and animal health, as well as harm the environment' (BBC News, 2002, in Irwin, 2002).*

The then-government based its decision, according to Jane Chinkusy of the MSTVT, on the 'fact' that there was 'simply not enough credible and relevant evidence'.

The Precautionary Principle as it appears in the CP observes a 'Recognition of Uncertainty', allowing countries to err on the side of caution when there is lack of scientific certainty about the impacts of GMOs and until there is evidence to demonstrate adequate safety. It also reserves the right of sovereign countries to take precautionary measures to avoid harm caused by GMOs, even when there is lack of scientific certainty regarding the extent of harm that might occur. This is reflected in the draft Biotechnology and Biosafety Policy, which states that the Principle is the policy's first guiding principle (Section 5.1). Importantly, employment of the Precautionary Principle means that scientists have a responsibility to communicate uncertainty to the public. Myhr and Travik (2003), however, argue that countries often do not possess adequate frameworks for communicating uncertainty and doubt, nor adequately addressing issues of public concern or conflict of interest with regard to GMOs.

In the view of its opponents, the Precautionary Principle represents a non-scientific attitude that prevents the onward development of science and technology. Views on this matter relate largely to the different perceptions of the risks GMOs pose, which are thereby reflected in the level of caution the development of GMOs is met with. According to Clapp (2005), the North American attitude is far less concerned about the potential risks biotechnological developments present and more interested in the benefits such developments may bring. In this case, the potential benefits are thought to outweigh the known negative effects: *'agricultural biotechnology products are assumed to be innocent until proven guilty. It is further argued that the benefits of GM crops, in terms of higher yields and easier management of weeds, far outweigh the (known) risks associated with them'* (ibid.).

The EU's precautionary approach differs in that biotechnology products are considered guilty until proven innocent. Thus, until there is sufficient evidence proving that GMOs provide no significant threats to health or the environment they will be treated with caution. This assumes that the costs of approving GMOs without adequate evidence are likely to outweigh the known

benefits. It also assumes (based on evidence) that countries often lack the regulatory structures to deal with biotechnology, and in these circumstances the risks would be multiplied.

The US is highly critical of this approach, and is somewhat resentful of the influence it has had on the decisions of African governments such as Zambia's. Such an approach is deemed to be 'emotional' and not scientifically rigorous, nor favourable to the development of scientific solutions to real world problems. As US Senator Chuck Grassley commented in a speech to the Congressional Economic Leadership Institute in March 2003, *'By refusing to adopt scientifically based laws regarding biotechnology, the EU has fed the myth that biotech crops are somehow dangerous […] The European Union's lack of science based biotech laws is unacceptable, and is threatening the health of millions of Africans'* (in Clapp, 2005).

Again, the argument is framed in terms of either/or: either GMO is accepted or Africans die and/or starve. As we have seen, the contours of the debate have moved on somewhat, but the important point to make is that a precautionary approach is painted by supporters of biotechnology (in this instance the US) as nonsensical and, in short, bad science: the Precautionary Principle is based on the existence of 'potential risks' but, according to Chris Kakunta of National Agricultural Information Services (NAIS), no serious hazard is known to have occurred in the 15 years since the technology was commercialised (Kakunta, 2010d).

Barriers to research and agreed research questions

As this discussion about perceptions of risk suggests, there are a number of basic methodological differences in approaching the evidence base on the relative merits and risks of GMOs. As this section and Section 2.3 demonstrate, there is a recognised lack of scientific data concerning the effects of GMOs, in part attributable to differences in how research questions about GMOs differ and, unsurprisingly, how arguments are subsequently constructed.

The principal difficulty on a global level is that there is no common unit of analysis: some participants in the debate try to prove the negative effects of GMOs, others the positive effects; others try to disprove the arguments made by those claiming evidence of positive or negative effects. Another difficulty is that there are differences in time perspective – scientific evidence tends to be focused on short-term effects, whereas long-term perspectives tend to be more educated 'forecasts' or projections over likely effects. Given the dearth of long-term studies which ask about the effects of GMOs (Myhr and Travik, 2003), the need for long-term studies into the effects of GMOs is broadly accepted, based on the advice of experts, such as food safety expert Professor Richard Lacey (Catholic Bishops of South Africa, 2001).

Those participating in the national debate face an absence of any Zambia-specific research findings on the effects of GMOs. This means the evidence being used – on both positive and negative effects – comes from South Africa, Asia, Kenya, Europe and the US – ensuring the debate is 'internationalised'. There is an appetite among the Zambian population to understand what GM technology means for them, but this is difficult to demonstrate when no trials have taken place in the country. Research into GM crops considered 'strategic' by the government of Zambia is currently forbidden, though the recently established National Biotechnology Authority has been given a mandate to undertake research into genetic engineering as long as 'due procedures' are followed (Kakunta, 2010a). This effectively constitutes something of a Catch-22 situation: the government will not allow GMOs because of a lack of evidence – and moreover a lack of Zambia-relevant evidence – yet no research into the GMOs in question is permitted.

The MSTVT holds that this situation is temporary, and one of the main purposes of the Biotechnology and Biosafety Policy is to allow for greater investment in building the capacity of Zambians research institutes to undertake research in an environment which possesses adequate infrastructure. There is a broad consensus regarding the need to strengthen Zambia's research capacity, although responsibility for agricultural research lies with three

ministries: the Ministry of Agriculture, the Ministry of Education and MSTVT. Cooke and Downie (2010) note that, *'Unfortunately […] agriculture is not the priority of the MSTVT; research is not the top priority of the Ministry of Agriculture; and neither agriculture nor research is a priority for the Ministry of Education*'.

In spite of the perceived low level of interest in biotechnology research, the draft policy commits the government to building the capacity of a number of institutions including the National Institute for Scientific and Industrial Research; the Tropical Diseases Research Centre; the University of Zambia; the University Teaching Hospital; the Soil and Crop Research Branch; the Golden Valley Agricultural Research Trust; the Seed Control and Certification Institute; the Cotton Development Trust; the National Artificial Insemination Centre (Animal Genetic Resource Centre); the Central Veterinary Research Institute (Balmoral); and the National Malaria Control Centre.

However, Jane M. Chinkusy, Director of Science and Technology at the MSTVT, was reluctant to elaborate on how these institutions were being supported, and what they were being supported to do, whereas employees at another relevant institution – ZARI – were unable to discuss what research was being undertaken at the institute (see Section 3 on openness and communication). Further, knowledge of research across the responsible ministries is likely to be low and, although the Ministry of Agriculture does have the Soil and Crop Research Branch, according to one official all research is conducted 'away' from the ministry and it is, apparently, 'nothing to do with us [the ministry]'.

In general, supporters of GMOs, such as Getachew Belay, feel that the environment and research culture created by the government – in the form of strict research regulations and large amounts of bureaucracy - acts as a major disincentive for researchers and their funders, including the research sections of seed companies such as ZAMSEED. Zambia has, however, accepted trials on GM cotton, which is not currently considered a 'strategic' crop, although there are widespread calls for it to be classified as such given the likelihood of cross-pollination with unmodified cotton or other oil seed plants (e.g. castor oil). The trials – which began in 2000/01 – were quickly suspended owing to a perceived lack of regulatory mechanisms for undertaking such research in Zambia. A National Biosafety Laboratory was then set up as part of the National Biosafety Act 2007, with help from the Norwegian government, its main purpose being to detect GMOs in seeds and grains using testing equipment. The laboratory, located at the Seed Control and Certification Institute, started operations in late 2009, and it is thought that the testing equipment will help control the movement of GMOs across Zambia's borders (NAIS, 2009). Use of testing equipment is in its infant stages: Zambia is in the curious position of prohibiting GMOs but having little capacity to actually prove an organism is in fact GM.

2.3 Impact and effectiveness of GMOs

The apparently inconclusive evidence surrounding the impact and effectiveness of GMOs has so far determined the government of Zambia's response to their introduction, most notably in the adoption of the Precautionary Principle, which takes the potential risks posed by GMOs as a starting point. This section further describes how – and what – evidence is employed to discuss the relative merits of GMOs by considering the narrative on the impact of GMOs on the following areas (which for the purposes of the discussion have been separated but are inextricably interlinked): 1) food security; 2) small-scale farmers; 3) health and the environment; and 4) trade. The section also considers how ethical and religious arguments have presented themselves before concluding with a brief characterisation of the debate and the role of evidence.

The findings of this section indicate a palpable lack of evidence to which to refer (see Section 2.2), with little change in the evidence used since 2002. Nevertheless, concerns about evidence and methodology frame the debate, although references to research and evidence

are often generalised. Unsurprisingly, there is a 'zeroing-in' on certain evidence to support different arguments, largely in the form of scientific studies or trials, but also biblical references. Overall, however, the uncertainty surrounding the long-term effects of GMOs has led to the debate being one which employs a significant amount of prediction and projection which – while not lacking logic – can lack an evidence base. It is concluded that opponents of GMOs have made better use of *both* sides of the evidence base when constructing their arguments.

Food security

GM technology is presented as something a 'magic bullet' for alleviating food insecurity problems and thereby improving the lives of millions of rural people in Zambia and Southern Africa more generally. The ISAAA places GM crops firmly at the centre of social and economic development, with its Annual Report 2010 arguing that, *'Biotech crops have played a perhaps underappreciated role in progress toward attainment of the 2015 Millennium Development Goals […] Their impact by 2015 will be more universally recognized'* (ISAAA, 2010).

Supporters of GMOs emphasise the greater crop yields GM technology is thought to bring, leading to greater food security at the macro level and increased household income for farmers at the micro level. The steady and impressive increase of GM crops being planted – 14 million small and large farmers in 25 countries planting 134 million hectares, according to Kakunta (2010d) – is offered as evidence of its effectiveness and the 'confidence and trust' it inspires in farmers across the world (ISAAA, 2010). In a context where famine may have subsided for the time being but will 'inevitably' return, it is argued, Zambia needs to prepare by ensuring it has met its required food production levels.

Proponents of biotechnology refer to the wide body of evidence demonstrating the efficacy of GM over non-GM crops, leading to higher yields. Key studies cited include the Syngenta-funded Bt maize trial in Kenya (de Groote, 2004) and the Monsanto-funded 'Makhathini flats' Bt cotton trial in Kwa-Zulu Natal, South Africa (Ismael et al., 2002). Critics point out that this evidence is used selectively, with key findings and methodological limitations overlooked, however (e.g. Lubozhya, 2002; Mzinga, 2005). Opponents of GMOs also use contrary evidence to argue that GMOs do not provide higher yields than non-GM crops (e.g. Lubozhya, 2002) and that field trials may work because of substantial private sector investment and support, leading to questions about its replicability (e.g. Mzinga, 2005 on the 'Makhathini flats' trial) . Much of the evidence used by opponents is, however, not particularly recent – suggesting there is either no updated evidence or a need to revise and update the evidence in use.

The response to such claims is well captured in a recent media article in the The Post which quotes Professor Kyambalesa from the University of Zambia saying that GM foods not only pose potential risks to human health, the environment and the economy but also 'do not taste better, [..] are not more nutritious, [..] do not cost less, and [..] do not look nicer than non-genetically modified foods' (Simpelwe, 2011b).

In response to claims that GM technology will solve food insecurity in Zambia and on the African continent more generally, opponents of GMOs explain that food insecurity is more than just a problem of production: it is about a far more complex process of supply and access. Citing the example of Argentina in 2001 which – as the world's then second-largest producer of GM crops – was unable to alleviate widespread hunger among its own people, Lubozhya (2002) argues that introducing GMOs will not inevitably solve food insecurity, largely because of the external pressure to export large quantities of produce. The same report argues that Zambia does not need additional seeds: sufficient crops are already produced and even exported to neighbouring countries, such as Angola, Malawi and Namibia, through Zambia-based seed companies such as ZAMSEED.

There is a wide appreciation of the need to address wider inequalities in the agricultural market in order to address Zambia's food security issues, therefore. In his recent article, Henriot

(2010) refers to the UN-sponsored International Assessment of Agricultural Knowledge, Science and Technology for Development (2010) report, which considers the intertwined problems of global agriculture, hunger, poverty, power and influence. This concludes that governments and stakeholders need to significantly rethink the existing food system, which is neither socially nor environmentally sustainable, and instead focus on small-scale farmers as the 'backbone' of the global agricultural system.

Zerbe (2004) in his reconstruction of the GMO debate in Southern Africa argues food aid is not needed if local markets are functioning properly. In keeping with this argument, Jane Chinkusy at the MSTVT has agreed that since Zambia does – allegedly – produce sufficient crops (e.g. maize) to feed the nation, it is not logical to introduce GM technology to ostensibly 'fill a gap' in the market when it is the distributive aspects of the value chain that must be addressed.

Rather than introduce GMOs, and instead to address the 'bigger picture' in Zambia, a number of proposals have been made, largely entailing a greater investment in agricultural infrastructure such as feeder road and irrigation systems; the empowerment of rural farmers through extension services for training and market access (see Henriot, 2010); a greater emphasis on sustainable agricultural techniques such as organic farming and rainwater harvesting (e.g. Mzinga, 2005); and a strengthening of agricultural policy design and implementation (Dr. Henry Kyambalesa, in Simpelwe, 2011). These proposals are no doubt informed by calls at international level to stem the decreasing interest in agricultural investment by taking a long-term perspective on agricultural and environmental sustainability in order to ensure food security.

Impact on small-scale farmers

Directly linked to the issue of food security and whether GM crops do fulfil all that is promised of them is the question of what their introduction means for small-scale farmers. While those who are positive about the effectiveness of GM crops vis-à-vis non-GM crops argue that an increase in crop yield can benefit only small-scale farmers, those who are concerned about the introduction of GMOs to Zambia have been more reticent.

When Margaret Karembu of ISAAA AfriCenter declared at the regional COMESA workshop that 14 million farmers were growing GM crops, 90% of them small and resource challenged farmers (RABESA, 2010), she did so in order to demonstrate the benefits small-scale farmers set to enjoy if GM technology is embraced. However, others, such as Lubozhya (2002) and Henriot (2004), argue on the basis of a study conducted by the JCTR and KATC that, in the case of Zambia, where 80% of the planting seed in the country is grown by small-scale farmers, they set to lose out owing to the dependency on external inputs (e.g. GMO seed controlled by overseas corporate companies such as Monsanto) that Zambia's entry onto the GM technology scene would herald. Put simply, farmers would be pushed out of the market because of a rapid industrialisation of agricultural methods and greater input costs – contrary to the claim that they would save money on pesticides and herbicides (Lubozhya, 2002).

A key concern here is that the rights of small-scale farmers would be overlooked by large corporations thought to operate principally with profit – rather than people – in mind. Peter Henriot of the JCTR has made this issue a central tenet of his argument, suggesting that an introduction of GMOs in Zambia would lead to a further marginalisation of small-scale farmers who would not set to benefit from commercially promoted GMOs, which is: '*based on an industrial model of agriculture that favors large dependency of small-scale and mostly poor farmers on large multinational corporations for seeds and complementary necessities [...] In Zambia, it threatens the continued existence of the small-scale farmers that we daily work with'* (Lesseps and Henriot, 2003).

Fears of additional input costs and lost revenue for small-scale farmers are thought to be allayed by 'evidence' that small-scale farmers do not face additional input costs or loss of revenue, largely referring to the Kenyan and South African trials mentioned above. A report

published by an alliance of scientists with connections to the biotechnology industry accuses the KATC and JCTR of not paying attention to the available evidence: citing an analysis of 40 case studies undertaken by the US National Centre for Food and Agricultural Policy, Apel et al. (2002) argue there is overwhelming evidence that Monsanto's GM soybean has led to significant reductions in chemical use, and thereby an increase in farmers' incomes.

Unsurprisingly, opponents such as the PELUM Association cite a follow-up study to the original 'Makhathini flats' trial, where Biowatch found that four years after the start of the trial only 700 farmers were delivering cotton to Makhathini Cotton ginnery – equivalent to an 80% drop in farmers growing Bt cotton (Pschorn-Strauss, 2005). However, other farmers have extolled the benefits of GM technology, based on 'evidence' from countries such as Burkina Faso. During the 2010 COMESA Regional Workshop, one ZNFU member – a cotton farmer from Choma – argued that by restricting GM technology the government of Zambia was denying Zambian farmers the opportunity to increase their incomes and reduce poverty (RABESA, 2010).

A further issue is that of the patenting of GM crops by their (it is assumed international) owners. Opponents of GMOs such as the JCTR, the KATC and the PELUM Association point out that under the provisions of intellectual property rights legislation, small-scale farmers who cultivate GM crops would not 'own' their seed: they would not possess the right to plant, replant or propagate them without express authority of the owner of the patent. To do so would incur a royalty payment.

Joe Mzinga of the PELUM Association argues in one briefing paper that the introduction of GMOs to small-scale farming will bring 'total loss of control for smallholder farmers and middle commercial farmers as to what to farm and how to farm' – causing a loss of livelihood to 'millions' (Mzinga, 2005). Mzinga cites the example of Monsanto, which has filed lawsuits against US farmers thought to be in breach of intellectual property laws, totalling $15 million payouts. The fear is that international companies – described as 'profit seeking' and 'giant' – will do the same in Zambia, and Southern Africa more widely. Supporters of GMOs refer to de Groote (2004), who describes an additional review of intellectual property rights in relation to the introduction of Bt maize to farmers commissioned by the same research project. The review found no patents had been filed for Bt maize in the country – contrary to farmers' expectations.

Environmental and health impacts

The debate on environmental and health risks appear to be drawn along the lines of two reports, both of which emerged as a result of the government of Zambia's deliberations over whether or not to accept GM food aid. The first was a report commissioned in 2002 by the ZNFU to advise the government on which course of action to take. The report concludes, *'Crop biotechnology is one of the most extensively reviewed agricultural advancements to date. There have been no substantiated harmful effects of GM crops on human health or the environment'* (Gregory and Simwanda, 2002). This position is shared by a number of organisations and institution, such as COMESA and the AU, which wield a large influence over the debate in Zambia.

A second – more influential – report came out of the aforementioned study tour to a number of GM-producing countries. The participating scientists – who had already voiced their concern – concluded that the environmental and health risks (such as the erosion of local maize varieties, cross-contamination, crop toxicity, resistance to pesticides and herbicides and allergenicity) associated with GMOs were not resolved and therefore advised the government not to accept the aid shipments (Zerbe, 2004). This position was echoed by the JCTR and the KATC, which argued there was 'no conclusive scientific position' on the effects of GMOs on health and the environment (JCTR, 2002).

Both reports are therefore concerned with a lack of evidence to prove either side 'wrong', but similarly lack reference to concrete evidence to prove their own position 'right'. It is this type of 'evidence stalemate' which the Precautionary Principle presumably offers a degree of leeway to resolve, but it also pertains to larger questions about scientific method.

The mainstay of the discussion on environmental and health impacts appears to constitute a statement of what is believed to be fact based on a prediction of a likely outcome – particularly in the case of GMO opponents. Whilst this is not *not* based on evidence per se, references to evidence – or research – are scanty. In general, there is a concern with how the environmental impact of GMOs may affect sustainable agriculture in Zambia (e.g. OPPAZ), as well as the potential for GMOs to 'erode genetic diversity and thus undermine socio-economic and cultural security of many households who rely on biodiversity for food security' (Nkhoma, 2010).

Lubozhya (2002) also speculates that the introduction of GM seeds could have an impact on the informal seed sub-sector that supplies 80% of planting seed to the 75% farming community in the Zambia, and therefore 'there would be less biodiversity because there are fewer seed companies controlling the genetic material that is being marketed'. However, when discussing cross-contamination, the same author refers to a concrete example in Mexico of wild maize being contaminated with GM maize. In response, Apel et al. (2002) criticise the evidence presented, pointing out that the Mexico study ('the Quist paper') was subject to heavy criticism in the journal *Nature* but Lubozhya does not acknowledge this.

Another – untested – scenario cited is that introducing GM maize to Southern Africans, who 1) consume greater amounts than in the US where there is seemingly no evidence of negative health effects and 2) live in conditions of hunger and famine, would expose them to a far greater risk. According to Zerbe (2004), the argument here is that there is no evidence on whether consumption of GM maize under these circumstances is safe. Similarly, Lubozhya (2002) acknowledges a lack of evidence on the possible negative impacts of GMOs on humans, animals, and/or micro-organisms' health, but uses (unreferenced) evidence on the 'findings of some farmers on the negative effects that GM maize have had on their animal herds' to argue that this offers 'some clues on what could happen'. An alternative argument is that, while there is no concrete evidence of negative effects on health, there is little to indicate that nutritional levels improve: during Zambia's previous experience of GM maize in the 1980s, nutritional surveillance data are said to have indicated no improvement in nutrition, and in fact declining levels in some areas (ibid.).

GMO supporters have also relied on the appeal of the 'not enough evidence' argument – in this case relating to those who want to disprove the benefits of GMOs rather than prove their negative effects – which can also be described as the 'so far so good' argument. This is employed widely. In support of his own belief that the government of Zambia should embrace GMOs, NAIS Science Reporter Chris Kakunta references biotechnology expert Dr. Wynand van der Walt, a consultant for the Food Agriculture and Natural Resources Policy Analysis Network and member of the Maize Industry Technical Committee in South Africa, who argues,

> *'I have eaten it [GM food] before and my family too because it is scientifically proved to be safe and for your own information the bulk of the maize grown in the recent past in South Africa is GM maize, so even those countries that have restricted GM maize may have already eaten the crop' (Kakunta, 2010c).*

Kakunta goes on to say that if GM maize in South Africa is 'bad', *'the South African population could all be sick because 30 million metric tonnes of GM foods are consumed in the country and about 75 percent of all the maize produced in that country is genetically modified* (ibid.).

WFP argues along similar lines, concluding that it has received no reports of deaths or health concerns in Southern Africa or elsewhere. FAO has also stated that it is not aware of any scientifically documented cases in which the consumption of GM foods has been thought to lead to negative health effects (Manda, 2003). The 'so far so good' argument employed by

supporters of GMOs does not sit well with GMO opponents, however, who are concerned about the limited testing and monitoring of the effects of GMOs. This issue – which cuts to the heart of the discussion about evidence in this debate – is discussed further in Section 3.

Trade impacts

Fears over a potential loss of the European export market have also played a pivotal role in the GMO debate and, according to many (e.g. Zerbe, 2004), were the fundamental driving force behind the government of Zambia's decision to ban GMOs in 2002. It was – and still is – anticipated that, given the EU's de facto ban on GM imports, a great deal of Zambia's produce would not be suitable for export if GMOs were being produced.[12] This has been a particular concern for farmers associations producing and exporting fresh flowers, fruit and vegetables, tobacco, coffee, honey, baby corn and organic products (Lubozhya, 2002), such as the Tobacco Association of Zambia, the Zambia Export Growers Association and the Zambia Coffee Growers Association.

Cross-contamination is another source of concern, involving cross-pollination between GM seeds and non-GM seeds, known in scientific terms as 'out-crossing', which would also render contaminated crops un-exportable (JCTR, 2002; Kakunta, 2010c). This particular fear is supported by commonly cited (yet unspecific and poorly referenced) 'evidence' on how GMOs have made their way into the food chain (Anti-GMO Alliance, 2010) and contaminated non-GM crops (e.g. the contamination of wild maize in Mexico [Lubozhya, 2002]).

While fears over a loss of EU export market appear to be well founded, given the perceived existence of a de facto EU moratorium on imports of new varieties of GMOs, research undertaken in other countries indicates that the trade impacts are limited (e.g. Anderson and Jackson, 2004, in Greure, 2006). This has led to the suggestion that, in the case of Zambia, the appeal to the loss of trade is somewhat mistaken (i.e. not based on comparative evidence). Further, it is thought that Zambia's export to EU markets is reasonably small (Paarlberg, 2005, in Greure, 2006) – not significant enough to account for the government of Zambia's policy decision in its entirety. In addition to this, there is research suggesting that major importers within the EU continue to import non-GM crops from a country which produces GM crops, undercutting the 'contamination' argument (Knight et al., 2005).

Surprisingly, however, there is relatively little *detailed* discussion and critical analysis regarding the EU's de facto moratorium. This has led to a situation in which the existence of an EU moratorium is both assumed and unquestioned in the Zambian discussion, without recourse to the nuances that exist within the EU's approach to biotechnology.

Ethical considerations

Particularly with reference to social justice and the impact of GMOs on small-scale farmers, opposition to GMOs has been conducted using not only scientific evidence but also ethical- and religious-based reasoning, with the JCTR and KATC (both explicitly guided by Christian principles) at the forefront of this aspect of the debate. The presence of ethical and theological considerations in the GMO discourse is important for two reasons: 1) it provides a different 'source' and type of evidence which 2) is not easily countered by GMO supporters without stepping out of the debate's 'contours' to debate fundamental questions on ethics and religion.

In public, this means GMO supporters have left ethical and religious arguments alone; in private, GMO supporters express the view that religious arguments in particular have little resonance in their camp, and in effect serve to consolidate the view that opponents of GMOs use arguments based on 'feeling' rather than sound scientific deliberation. The purpose of the numerous ethical and religious pronouncements appears to be less about convincing the various parties in the pro-GMO camp, but more generally about registering their opposition to

12 See Greure (2006) for details on recent regulations and authorisation procedures.

the technology and raising awareness among fellow Christians – many of whom are likely to be farmers.

While the JCTR's interest, involvement and influence in the debate has subsided somewhat since the departure of Brother Peter Henriot, who took a personal interest in the GMO issue, the ethical and religious aspect of the debate was reintroduced in 2010 in an article written by Henriot which appeared in The Post newspaper. The article restated much of Henriot's previous arguments, which were captured in a presentation entitled 'The Church's Social Teaching and the Ethics of GMOs' (Lesseps and Henriot, 2003). The approach outlined by Henriot and Brother Roland Lesseps is based on the 'fundamental theological principle' that 'all of God's creatures have intrinsic value, in and of themselves', as they argue is evidenced by the creation in Genesis and in the prayer of an early church father, St. Basil, which communicates the idea that the earth is the dominion of God – not of humans.

Following this, Lesseps and Henriot's (2003) presentation offers a Christian social teaching based on the four principles thought to express 'respect for the natural world': 1) the common good; 2) option for the poor; 3) subsidiarity of decision making; and 4) solidarity. It is on this theological basis that Henriot rests his arguments concerning the lives of small-scale farmers, as seen in the previous section. The ethical and religious arguments presented do not only concern just political and economic justice, but also are used to address questions regarding the transformation of one life form into another; claiming ownership (through a patent) over a livelihood; and the use of technology to kill soil micro organisms in order to improve crop yield (see Lubozhya, 2002).

Aspects of this approach have provoked criticisms for seemingly prioritising the survival of micro organisms over starving humans (Apel et al., 2002), which is thought to be contrary to the Judaeo-Christian tradition which focuses on the primacy of the human beings as stewards of the earth and which is thereby *against* biblical evidence.

2.4 Conclusions

It has so far been argued that the national debate on GMOs can only be understood as on one level a regional one, taking place in the context of ongoing COMESA discussions, as well as regulatory mechanisms emerging from both the AU and SADC. In Zambia, however, country-specific concerns and perceptions have determined the response to the development of biotechnology and, more specifically, GM technology. There is considerable debate concerning not only the relative merits and risks of GMOs, but also what the 'debate' constitutes: have the principal questions guiding the debate moved away from *theoretical* questions about whether GMOs should or should not be allowed in the country, to more *practical* questions regarding how Zambia's regulatory framework can best be implemented and enforced?

Theoretical questions do persist, however, and continue to be the 'bread and butter' of the debate thanks to vocal civil society organisations such as the PELUM Association, the JCTR and the KATC, which have produced two important reports clearly stating their argument. Both of these reports make use of the evidence cited by GMO supporters in order to demonstrate weaknesses in their argument: there is an active engagement and acknowledgement of 'other' evidence which is not rejected *ad hominem* or avoided. There would seem to be a genuine appetite on all sides for open discussion about GMOs, but different understandings of the contours of the debate have led to frustrations among GMO supporters, who feel that GMO opponents are holding the debate back. The quality of the debate is, however, high: Zaza Curran, Governance Advisor at ActionAid Zambia, said that, on a general level, one of the reasons the country is so stable is that Zambians respect the need to debate national issues and are therefore very prepared to listen to alternative points of view.

A concern for research-based evidence frames the entire debate, but this owes largely to a perceived lack – or lack of relevant and credible – evidence on which to base decisions. For

supporters of GMOs, however, there *is* sufficient evidence, and where doubts over evidence exist further research should be supported. It is the opponents of GMOs who have made better use of evidence from both 'sides', however, although even then there are doubts regarding how balanced the selection of evidence is.

Even if comprehensive evidence does not yet exist, it is argued, the evidence that is available indicates that GMOs are safe. Others argue there has not been sufficient research into the negative impacts of GMOs, and that existing evidence can be interpreted in different ways. The government of Zambia, the somewhat silent locus of the debate, has adopted an approach which takes this lack of certainty surrounding GMOs as its *modus operandi*. As a result, the debate has reached something of an 'evidence stalemate': there is a need for commonly agreed research questions, the findings of which will be treated as 'Zambia applicable'. Further, existing references to 'evidence' and 'research' are often indirect and vague (see Weiss, 1977; 1979), making it difficult for those following the debate to consult exact sources for further information.

3 What influences what evidence is used and how?

Having characterised the debate and the role of evidence within it in Section 2, the following section discusses some of the proposed reasons for why and how evidence is being used, considering first the government of Zambia's position and current lack of openness on the issue. This is followed by a longer discussion on how the supporters of GMOs have used both produced and communicated evidence to support their own position, and why. Subsequently, this section considers what supporters of GMOs have said about the motivations behind the arguments put forward by GMO opponents. In conclusion, it is argued that, while there is a clear politicisation of evidence within the debate, this is unsurprising, given the interests, motivations and the available financial support of GMO supporters (and opponents, to a degree), as well as the problems surrounding the available evidence base.

3.1 The government of Zambia

The entire debate has been subject to considerable discussion regarding the economic and political reasoning behind the decisions and actions of various actors in the debate, not least the government of Zambia, whose decision in 2002 to reject food aid containing GMOs according to some commentators (e.g. Zerbe, 2004) should not be viewed purely in terms of a consideration of (evidence of) negative impact versus perceived gain, but also in terms of economic matters – specifically concerns about potential EU market loss. Evidence in this case may have been used selectively to bolster a government decision based on economic interests. Different types of evidence may have also been considered: not all evidence in this debate is based on scientific trials of GM crops, but on an analysis of the economic and political environment.

Evidence obtained from scientific trials – both positive and negative – seems to have been considered in conjunction with an analysis of the economic and political situation, which dictated that a loss of the EU market would pose a significant threat to Zambia's exports. The government's stance against GMOs has also been seen as a way for it to assert a degree of political independence, countering claims that it follows the lead of South Africa and donor countries such as the US and thereby bolstering support among the electorate.

The perceived softening of the government's position towards GMOs is also subject to – largely unsubstantiated – speculation regarding the 'co-option' of individual politicians by biotechnology companies, leading to a disjuncture between them and ministry officials. It is thought that politicians have big stakes in multinationals and are therefore doing the bidding of

private sector actors with an interest in ensuring Zambia is not a GMO-free zone. Even as early as 2001, Dr. Bernadette Lubozhya, then of the National Biosafety Committee, blamed the 'hurried' introduction of the Monsanto Bt cotton trials (later suspended) on political interference by ministers 'convinced' by sales representatives from GM seed companies (Chinsembu et al., 2001 in Zerbe, 2004). Perceived pressure on the government of Zambia is not attributed only to the private sector in the US, but also to the private sector in neighbouring countries – in particular South Africa – which possess a surplus of GM produce and need to 'get rid of it' in a profitable way.

This says very little about the evidence being used by the government of Zambia in the debate, however. A major problem, touched on already, is that the government is apparently not communicating anything on the GMO issue. This – combined with a lack of evidence – seems to constitute a major barrier to participation in the debate: opponents of GMOs do not know what strategy to use, and those who support the development of GM technology in Zambia are scared to come out and say so as the government's position is an unknown variable. The 'evidence stalemate' is being combined with a 'communication stalemate' therefore, with some actors (e.g. Hydratech, a South African-owned seed company) deciding not to enter the debate until the government's position is clearer. Others are allegedly waiting until after Zambia's next election.

It is therefore difficult to see how the government of Zambia is approaching the issue of evidence gathering. A trip to the government's agricultural research centre ZARI revealed very little – aside from a genuine fear among its researchers of providing any information to the public. According to ZARI's director, the 'debate [on GMOs] has died'; he is further not able to comment on any research they are currently undertaking or not undertaking. On the wider scale, the 'fact that that people are afraid of losing their jobs and therefore afraid to talk' is thought to be a major barrier to the debate in general and thereby the use of evidence.

The reasons for such a silence from the government of Zambia are ultimately inconclusive, given the relative dearth of information available. However, the government is seen to be juggling a number of interests and biding its time, to some extent. Effectively 'killing' the debate is, arguably, a strategy to avoid criticism and enter preparations for the 2012 election.

3.2 Supporters of GMOs

> *'What we are witnessing are aggressive attempts especially by the United States through its agency for international development, USAID, and the genetic engineering industry to impose GM crops on Africa under the guise of addressing food insecurity, reducing environmental stress and fighting poverty. The potential for agri-businesses to profit from hunger in Africa through, ostensibly the provision of food aid, technical assistance, capital investment in agricultural research, capacity building and the funding of biosafety initiatives, is enormous' (Mayet, 2004).*

The above quotation reflects a widespread belief among anti-GMO activists and commentators in Africa and outside. The view that developed countries with GM technology – not least the US – are attempting to 'capture' an African market through the flexing of their economic and political muscles is widespread. The US government has been accused of 'pushing poor countries like Zambia' to accept GMOs for less than humanitarian reasons (Henriot, 2004). Following Zambia's rejection of food aid in 2002, a number of academics focused on understanding the underlying economic pressures which led countries such as the US to try to 'push' GMOs in Africa (e.g. Clapp, 2005; Zerbe, 2004). The perceived change in the government of Zambia's attitude towards GMOs has, as outlined in Section 3.1, been attributed to the seemingly 'aggressive' tactics of transnational corporations, acting in alliance with the US government.

Peter Henriot of the JCTR, for instance, has argued that, as an 'immense producer of GMO crops', led by large and influential transnationals such as Monsanto, the US is on a continuous search to expand its export market. When attempts to create African demand for GMOs through food aid fail, as they did in Zambia, this is seen as a 'threat to US dominance' (Henriot, 2004). However, Africa would still seem to be 'a frontier that the genetic engineering companies seem determined to conquer' (Mzinga, 2005). Food aid and the extending of technical and financial support to African governments in order to build their capacity to introduce GMOs, as well as understanding the benefits of GMOs, have been seen as key ways in which private sector companies – through the US government in many cases – are going about this.

This single-minded determination to find a home for surplus GMO produce, while additionally subsidising the production and sale of GM crops and the agricultural biotechnology sector in general (Clapp, 2005), is thought to have been prioritised over safety or efficacy concerns. Mzinga (2005) has gone even further in suggesting that transnational corporations such as Monsanto, with the consent and compliance of the US government, see Africa as a useful field in which to conduct 'massive human experiments' into the effects of GMOs. The perception that Zambia is being compelled by external forces to accept GMOs has been a major point of contention for both the government of Zambia and opponents of GMOs, such as the JCTR (Henriot, 2004): the economic motivations behind attempts to introduce and support the introduction of GMOs in Zambia have been recognised throughout the debate.

The broad connections between transnational companies, international donors such as WFP and FAO and the US government are somewhat murky and not well spelt out by critics, but there would seem to be a degree of logic in their conflations. Needless to say, for opponents of GMOs this is an unholy alliance between international donors, the US government and transnational biotechnology corporations. Another set of members – African governments – are increasingly being welcomed into the fold, it would seem. COMESA, and its biotechnology agency ACTESA, are seen as particularly 'co-opted' by international forces. Walking into the ACTESA office in Lusaka, one cannot help but notice the USAID sticker on the back of the receptionist's computer screen. US support to ACTESA's attempts to formulate and implement a common biotechnology and biosafety framework for the COMESA region through USAID has provoked suspicion from GM technology critics, who see the extensive financial support extended towards COMESA as a 'bribe' to pave the way for an inevitable GM takeover in the region.

In reviewing the relationship between GMOs, land and marketing in Southern Africa, Nkhoma (2010) argues that COMESA – through sponsored bodies such as the Alliance for a Green Revolution in Africa – is 'seeking to facilitate the entrenchment of the interests of agro-multinational corporations', not least in Zambia, where COMESA is thought to be mounting a concerted effort to encourage the government to reconsider its GMO policy. The PELUM Association called the proposed COMESA/ACTESA regional biosafety policy a 'tool to ram the COMESA countries, and in particular Zambia, open for GMO contamination' by creating a 'porous opening' for weak biosafety regulations which work to the advantage of biotechnology companies which – in turn – are thought to be sponsoring this process via USAID.

According to Jane Chinkusy at the MSTVT, the US government has filled a large gap in both bilateral and multilateral in-country involvement in GM technology issues left by an improvement in food security. The US Ambassador has allegedly asked the government of Zambia to lessen restrictions on GM technology in the country, arguing that it was impeding foreign direct investment. ACTESA's Lusaka-based science policy advisor argues that the conflation between the US government and transnational corporations is inaccurate: defending the significant funding ACTESA receives from USAID, Dr. Belay argues that, while there would be grounds for suspicion if Monsanto were directly funding a process of regional biotechnology capacity building and integration, given the clear conflict of interest involved, it is not; USAID, on the other hand, does not possess such interests.

Of course, that the US government may – as GMO opponents suggest – possess economic interests in ensuring the GMO market in Africa, and the GM technology-resistant Zambia in particular, is open to GMO export does not render their evidence invalid. However, when combined with the paucity of Zambia-specific research, which means a reliance on international research, it does warrant a degree of questioning. The pro-GM lobby's production of evidence has met with criticism over the alleged select use of data to demonstrate that GM technology 'works' rather than a fair review of all available evidence. As Lubozhya (2002) notes, those in favour of GM technology are in a position of economic – and therefore, arguably, political – power. Critics of GMO supporters have in general focused on two (interlinking) manifestations of this power: 1) control over information; and 2) influence over research. Needless to say, this feeds directly into the discussion regarding evidence in the debate.

Lubozhya (2002) argues that the control of how information on GMOs is presented is a conscious strategy employed by the GMO lobby. Years into the debate, GM technology is described as being presented to Zambians – who often lack access to comprehensive information on the subject – as 'gospel truth' rather than a possible option which needs careful deliberation. Further, organisations such as COMESA are funded to 'preach the wonders' of GMOs to Zambians, while critics are pigeon-holed as irrational and lacking an appreciation of scientific endeavour. Examples abound of how GMO supporters have been seen to control the flow of information to the government and the general public in Zambia. An oft-cited manifestation of the group's ability and desire to do just this is the establishment of the Biotech Outreach Society of Zambia, which was 'set up to promote the acceptance of GM technology' (Zulu, 2005, in Lewin, 2007) with USAID funds. The society is seen to have conducted an aggressive lobbying campaign to promote GMOs among policymakers, alongside the African Biotechnological Trust and the African Biotechnology Stakeholders Forum – similar organisations operating in Zambia with extensive private sector and international donor links (Pete, 2002b, in Lewin, 2007).

The key here is that both policymakers and the general public lack prior information about GMOs, and those with access to channels to disseminate information clearly have an advantage. One – controversial – example is that of the ZNFU, the leadership of which has since 2001 allegedly been influenced strongly by the GMO supporters. This has been reflected in a number of pro-GM technology publications in the union's monthly publication, The Zambian Farmer. This apparent allegiance has been met with suspicion and wonder by some, who argue that this is not reflective of the ZNFU's small-scale farmer membership but rather a demonstration of the union's leadership having been co-opted (Lubozhya, 2002; Mzinga, 2005).

However, only recently has the ZNFU openly supported a rethinking of the government's position on GMOs, with the union's President Jervis Zimba referring at the launch of the agricultural planting season in 2010 to potential profits to be gained by small-scale farmers (Sinyangwe, 2010). Meanwhile, this position has caused internal tensions among ZNFU members, particularly between cotton traders – who are in favour of GM technology – and organic farmers, who have threatened to leave the union on account of this advocacy of GMOs.

The ZNFU has received significant funding from both the Finnish and Dutch governments, with project funding from USAID – which they are currently petitioning for additional funding to support their biotechnology roadmap which reflects their openly supportive stance on GMOs. The union's leadership has quite clearly been subject to targeted dissemination of information on GMOs by the US government and private sector companies, with a study tour to the University of Michigan cited as one of the principal reasons why the ZNFU emerged from its 'ignorance' into an awareness of the benefits of GMOs. Opponents of GM technology, on the other hand, argue that such study tours constitute a manipulation of information as part of an aggressive strategy to 'convert' influential Zambians. Supporting study tours is clearly

successful: it also leads to subsequent 'dissemination' of information to others, such as ZNFU members.

Following the study tour in 2010, senior members of the ZNFU organised conferences through their specialised commodity committees in order to 'educate' their members, calling on 'experts' from Kenya and South Africa. The 'idea', says the ZNFU's head of research and consultancies, is to educate farmers about the benefits of GMOs and 'let them run with it', which, he says, they are doing owing to widespread support for GM technology among members. The union's fear, he argues further, is that their members 'lack information' and can therefore be 'swayed by anti-GMO elements [...] who lack evidence'. Others say that small-scale farmers within the ZNFU are being excluded from participating in the GMO debate, or have been manipulated into believing GM technology holds the answer to rural poverty.

The PELUM Association is currently the most vocal about these concerns, arguing that, prior to being co-opted by the ZNFU leadership (who are themselves thought to have been co-opted by the US government and transnational corporations providing significant amounts of funding), small-scale farmers understood the dangers of GMOs in Zambia, evidenced by their mobilisation for the World Summit on Sustainable Development in 2002, wherein the Commission for Agriculture formed a 'no' position on GMOs (Mzinga, 2005).

Small-scale farmers are also said to have been manipulated by COMESA/ACTESA which – through consultations and workshops – both 'educate' small-scale farmers and showcase 'token' farmers paid to 'extol the wonders of GM technology to Zambians and the outside'. Peter Henriot is a particular critic of transnational corporations, describing them as having 'captured' farmers through targeted 'pushing' tactics (Henriot, 2010); the PELUM Association accuses transnational corporations – largely through COMESA – as having 'misled' small-scale farmers through selective presentation of information (PELUM Regional Desk, 2011).

Conferences and workshops are, therefore, key ways in which particular information about GM technology is presented, discussed and disseminated. Evidence here would appear to be on the side of those who can afford to finance such meetings and convene influential players. Supporters of GMOs seem to be at an advantage here, although financial backing and convening power do not necessarily render the evidence presented at such meetings false, or somehow less valid than that of GMO opponents.

A second major way in which the supporters of GMOs are thought to have attempted to control how information is presented is, unsurprisingly, through the media. Zambia's principal newspapers are, however, government owned, and one famous Panos report on the media's presentation of GMO issues found that overall these papers had more articles against GMOs than for. The report also argued that the Zambian media had little engagement on GMO issues, and what interest it once had had waned in the post-2002 period (Mulumbi et al., 2005). Nonetheless, there is a perception that GMO supporters have tried to influence the GMO discourse through various trainings largely targeted at the media, including,

- A one-day Journalists' Workshop entitled 'Translating and Communicating Biotechnology' on 13 May 2004 as part of the company Africa Bio's implementation of the Biotechnology Outreach Society;
- A two-day Communicators' Workshop entitled 'Communicating Biotechnology for Sustainable Development' on 17–18 June 2004 as part of the same event, also including policymakers, scientists, students, researchers and seed company representatives;
- A one day Editors' Workshop on Science and Communication, funded by Zambia Trade and Investment Enhancement organised by the Biotechnology Outreach Society on 15 July 2004.
- ACTESA's implementation of a programme dedicated to 'capacity building for agricultural journalists'.

The support provided to reporting on GM issues and agricultural science in general has obviously had quite an impact on some Zambian journalists, with some beneficiaries of the training cited above subsequently penning articles in favour of GMOs in recent years, such as Violet Mengo in The Daily Mail and science reporter Chris Kakunta – of the government's NAIS – being a public advocate of GMOs (e.g. Kakunta, 2010d).

In general, however, the debate is thought to suffer from a lack of media capacity in a number of ways. The first is that journalists tend to report on specific events relating to the GM debate rather than involving themselves, despite a number of higher-profile examples, such as Chris Kakunta's articles. Journalists are thought to lack analytical skills when it comes to agricultural issues, and above all lack interest in reporting on them (Kakunta, 2010b). Often, this owes to a pressure to 'sell' stories to the public, who are in turn not thought to be interested in GMO issues unless there is a clear political angle (Banda, 2004).

The media also lacks the means available to it to both research and present comprehensive information on GM technology, given a lack of Zambia-specific evidence to use as a source, time and what Chris Kakunta has called a 'glass ceiling' created by editors who demand stories be written in simple language without technical detail – often, he says, because of their own lack of understanding of and/or interest in the issue. Information that is presented is therefore often lacking balance, particularly with regard to representing the views of rural communities who do not speak or read English (Kakunta, 2010b; Mulumbi et al., 2005).

While there have been (arguably) well-financed attempts to influence the way in which journalists represent GMOs through 'capacity-building' activities, these attempts have run up against problems concerning the capacity of Zambia's media and – assumedly – the government's ownership of two of the country's principal newspapers, The Mail and The Times. Indeed, the pro-GMO lobby's influence over the media was found to be less than in other countries reviewed in the 2005 Panos report (Mulumbi et al., 2005).

A relatively more successful – and straightforward – means of influencing the GMO discourse is through an influence over research undertaken, which has been used – it is argued – to ensure the results of research display GMOs in a positive light. As argued, there is in general a lack of evidence concerning GMOs. This is partly attributable to weak regulation in the US, which means the US Food and Drug Administration does not oversee an independent mandatory safety assessment process to monitor the impact of GMOs on the health and the environment. Instead, it operates a voluntary system in which biotechnology corporations registered in the US submit their own safety procedures for their products (Mayet, 2004). In effect, collecting comprehensive data on the effects of GMOs is not demanded of corporations in a good position to do so.

On this point, Myhr and Travik (2003) point out that the results of safety assessments may be of questionable scientific merit, whereas Lubozhya (2002) argues that 'verification' trials should not be considered as objective scientific experiments, given a conflict of interest on the part of those conducting the trials. One example is that of the oft-cited Bt maize trial in Kenya, thought to allay all major concerns about GMOs (de Groote, 2004). The study was funded by the Syngenta Foundation for Sustainable Agriculture, which is involved in the development of GM technology. The funding of research by GMO supporters has provoked widespread criticism in Zambia, including in a ZNFU-commissioned review of available evidence undertaken by a known GMO supporter, Peter Gregory (Lubozhya, 2002).

Commissioned studies such as this are thought to be undertaken within a much wider context of investment into agricultural research both globally and nationally. Nkhoma (2010) describes the situation as follows: 'They [biotechnology companies] have invested billions of dollars over the past two decades in agricultural biotechnology research and development and want to see returns on this investment. To do so means the crops they have developed must be grown commercially sooner rather than later.' In short, he surmises, such companies 'desire to be in

control of agriculture', and the control of research is the principal means through which they go about doing so. The implication is here is not only that there is a virtual monopoly on biotechnology research and the facilities required to undertake such research, but also that this research is being used to justify the expansion of GM technology in Africa.

Studies which do not conform to what the biotechnology industry would like policymakers and the public to think about GMOs are quickly rejected, although not forgotten: Henriot (2010) in asking 'Should Zambia accept GMOs?' uses the example of a 2009 IAASA report, the result of four years collaboration between over 400 scientists and development experts who tasked themselves with considering global agriculture, poverty, food security and development. The report – which failed to endorse GMOs – was rejected by Monsanto and Syngenta, who quit the study prior to its publication. This, Henriot argues, is indicative of the biotechnology sector's attitude towards scientific research: only what supports the promotion of GMOs is accepted.

Biotechnology companies such as Monsanto are, in turn, thought to possess significant influence over the US government, as already argued. The aforementioned financing of research into GMOs, it is argued, is channelled through aid agencies such as USAID, which has financed a number of research projects and entities in Zambia, including the influential Food Security Research Project – which has a GM technology component – and the Zambia Capacity Building, Biotechnology Outreach and Information Transfer programme implemented by Africa Bio. This led to the establishment of the Biotechnology Outreach Society based at the University of Zambia, the first Chair of which was Dr. Luke Mumba, the controversial former head of the university's School of Natural Sciences.

Seeming attempts on behalf of the private sector (often in collaboration with bilateral governments or regional entities such as COMESA) to 'control' the GM discourse through information dissemination channels and support to biotechnology research are viewed as part of a wider trajectory which includes support to the formation and implementation of policy and legislation at regional and national levels. Subsequently, it is argued, the foundations on which biotechnology and biosafety policy are being based both lack scientific rigour and reflect the pursuit of economic gain over a thorough assessment of the efficacy and impacts of GMOs.

3.3 Opponents of GMOs

There is, unsurprisingly, much less to say about the explicit or known economic and political interests of opponents and their use of evidence. This is not to say they do not exist, or lack power. The first thing to note is that opponents of GMOs, including numerous groups of commercial farmers, small-scale farmers, environmental groups and NGOs, are in the curious position of being opposed not to the government (according to its official position) but to 'foreign' actors such as COMESA, the AU and the US government, not to mention transnational corporations. This means opponents have enjoyed the backing – at least in theory – of the government, which has also been reflected in newspaper coverage of their activities. Opponents have also been able to enjoy the support of international donors who are opposed to GMOs, such as ActionAid, Greenpeace and Friends of the Earth.

However, opponents of GMOs have been seen in much the same way as the government of Zambia was in 2002 – as irrational. Despite being arguably better at referring to evidence on both sides of the debate in their arguments than GMO supporters, their arguments have been deemed unscientific – 'irrational fears over hypothetical and unproven risks' – by biotechnology advocates (Manda, 2003), 'based on emotion' , 'fear and projection' and 'fear of the unknown'. Examples presumably include organic farmers' (and others') assumption that GMOs will cross-pollinate, and the adoption of the Precautionary Principle on the basis of not enough evidence.

Opponents, it is thought, lack a proper understanding of what GM technology is, and this has led to a vehement reaction to its introduction and a focus on the potentially – but not proven –

negative effects of GMOs. This 'emotional element' to the debate is painted as somewhat 'anti-technology' (akin, in the 21st century, to being called 'anti-progress'), with an apparent 'lack of awareness' as a key threat to the advancement of biotechnology and crop production in Africa (AgroNews, 2011). Evidence is also thought to have been used selectively, much in the same way as GMO supporters have been accused of using it, combined with a 'superficial reading' and 'poor understanding' of biotechnology issues (Apel et al., 2002).

As a result, in Zambia – opponents themselves argue – organisations that have raised a staunch voice against GMOs have been excluded from discussions on how to proceed with both a national and a regional policy framework for fear they will bring the debate 'back' to the fundamental question of whether Zambia should even be considering the introduction and development of GM technology in the future.

The largest criticism GMO opponents – largely NGOs – face is that they are doing the bidding of international donors who are against Africa becoming prey to transnational corporations keen to 'open up' the continent to GM technology. Organisations such as the PELUM Association, it is argued, receive money from a variety of environmental – and other – groups and are being paid to try to influence government policy through various projects and programmes. They are thought to be engaged in advocacy rather than research, and therefore encourage each other to 'shout louder' in order to win their share of the 'market' in which they all 'compete'. This is contrasted directly with GMO supporters, who are not seen to share the same market and therefore to be more open to debate and the appreciation of evidence.

Further, international concern about small-scale farmers has also, GMO supporters say, led to a preoccupation on the part of opponents with the apparently universal negative effects of GMOs on their livelihoods and rights. Not only is this not correct, they argue, but also it represents a selective use of evidence to create an issue NGOs know will be popular with international funders. For instance, in responding to the KATC/JCTR-commissioned report (Lubozhya, 2002), Apel et al. (2002) argue the arguments put forward are not made on a scientific or research basis, but are made to defend and/or 'achieve political and economic advantages' of particular groups of farmers rather than being concerned with food safety, as they profess.

Opponents are therefore seen not only to have a vested economic interest in not admitting the validity of evidence contrary to their own position, but also – interestingly using the same argument GMO opponents have used about GMO supporters such as the ZNFU – to have manipulated small-scale farmers with little knowledge of GM technology into supporting their cause and creating a discourse that suggests they are acting in the farmers' best interests. Apel et al. (2002) display concern that the name of the Catholic Church is being used to advance political and economic interests rather than protecting the needy. The implication here is that both evidence and religious ideology are being used as 'fronts' for other concerns.

3.4 Conclusions

As Section 2 made clear, the lack of an accepted and valid evidence base is a major characteristic of the debate. Importantly, however, a concern for evidence frames the debate. This section has further highlighted a number of general points:

- Both sides of the debate are thought to *possess significant financial motivations*: supporters are viewed as standing to benefit from expanded markets in Africa, or else are 'co-opted' by the private sector; opponents are thought either to have their livelihoods threatened by the introduction of GMOs to Zambia or to possess financial incentives to lobby against them.
- *Accusations and suspicions of 'co-option'* of the government of Zambia, COMESA, US government and small-scale farmers by biotechnology companies are therefore rife.

- Subsequently, there is a perception among both opponents and supporters of GMOs that each side consciously offers only *selected evidence* in order to support their position.
- The GMO lobby – which in Zambia includes transnational corporations, the US government, and COMESA – is thought to be *attempting to 'control' the GMO discourse* through the way 1) information is presented in workshops, consultations, meetings and how GM technology is presented in the media; and 2) the way research is conducted. Both of these 'strategies' have significant capacity-building elements.
- There is *less to say about the use of evidence by GMO opponents*, in part because they have fared better in acknowledging a wide range of evidence and also – arguably – because supporters of GMOs have focused less on discrediting GMO opponents as a homogenous group than on promoting GMOs.
- Overall, the use of selected evidence – or the presentation of evidence in a way to support a position – is both *unsurprising and fairly logical*. The wider 'communication' trajectory – of which capacity building to journalists is part, for instance – implicitly supports this, and is therefore a sign not of a weak debate but of a set of strategic arguments.

4 Conclusion

In concluding this case study, there are a number of important points to highlight. The preceding discussion has argued that the debate is a regional one taking place within a global context of biotechnology development and subsequent debate. It has also argued that the locus of the debate itself is subject to debate: supporters view the debate as a technical one about how best to regulate GM technology and provide support to the development of adequate infrastructure; opponents remain focused on fundamental questions – much like in 2002 – regarding the impact and efficacy of GM technology in order to argue that its introduction pose safety hazards. Subsequently, opponents of GMOs are described as somehow 'anti-modern'.

More so than the other three case studies, the Zambia GMO debate is framed by a consideration of *evidence*, whether this is with regard to making an evidence-based argument, *or* in terms of questioning its lack, its relevance to the Zambian context or its validity. The importance of the Precautionary Principle in guiding the government of Zambia's approach to GMOs is indicative of this, leaving the debate to have to contend with the problem of sufficient evidence. However, references to evidence on the part of both GMO supporters and opponents are often vague, indirect and broad – akin to how Weiss (1977) describes the indirect 'enlightenment' function of research in policy discourse.

The debate has reached what is referred to here as an 'evidence stalemate', given the various disagreements over what constitutes valid 'proof' of safety, with both sides viewing their respective challengers as not acting in good scientific faith. The undercurrent here is one of suspicion. However, while opponents of GMOs are thought to lack both a detailed understanding of biotechnology *and* financial incentives for lobbying against GMOs – largely in the form of international donor funds from NGOs and environmental groups – supporters are thought to have formed a somewhat united lobby which spans transnational corporations involved in biotechnology development, international governments (principally the US), regional economic blocs such as COMESA, small-scale farmers and, increasingly, the government of Zambia and its research branches. Charges of 'co-option' from powerful international private sector actors such as Syngenta and Monsanto are widespread, although the alleged conspiratorial web linking them is – as purveyors of this criticism readily admit – unsubstantiated by concrete evidence.

Inevitably, therefore, the evidence on respective sides in the debate is thought to be selective, used with the intention of supporting a position formed *prior* to any review of existing evidence. The debate – with its various nuances and scope for methodological variations with regard to the basis on which GMOs are being assessed – lends itself to the selection and dismissal of evidence on the grounds that it is either invalid or not part of the relevant 'discourse' (i.e. what the debate is taken to be about). Indeed, in many ways, the GMO lobby can be said to have 'internationalised' the Zambian policy discourse by disseminating evidence from international sources, supporting the formulation of regional approaches to biotechnology and framing the adoption of GMOs in terms of a global march towards technological progress. By not participating in this process, it is implied, Zambia stands against modernity.

While – and probably because – this national debate showcases a greater use of evidence and is also stronger and more dynamic than the other case studies, there is considerable scope to suggest that evidence selection is based on economic interests. However, an overall conclusion to draw from this case study is that this is not unsurprising, or illogical, but rather in keeping with an emphasis within international circles on communication, persuasion and evidence-based policy, which lends itself to the partisan use of evidence in order to achieve maximum 'impact'. Partisan use of evidence is by no means specific to the biotechnology sector. Further, as this case study demonstrates, selective use of evidence is not tantamount to *no* use of evidence: the task is to deduce – through informed policy analysis – how and why particular evidence is used.

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6 Annexe: list of interviewees

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