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EXPERTS TO THE RESCUE? AN ANALYSIS OF THE ROLE OF EXPERTS IN BIOTECHNOLOGY REGULATION IN KENYA

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Abstract: The biotechnology sector attracts a wide range of interested actors with some getting entangled in the development of requisite regulatory systems as experts in the virtue of being knowledge suppliers and innovation drivers. However, questions have arisen as to whether experts enhance or constrain the evolution of regulatory structures for management of biotechnology as part of its broader governance. This has direct impact on biotechnology development based on the roles played by different governance actors. Using a dynamic case study of Kenya in its effort to institute a viable regulatory system to govern biotechnology, this paper explores the role of experts in regulating innovations. It draws insights from the Kenyan experience with a view of evaluating how the role of experts, in particular the scientific community can spur positive contributions towards pro-innovation and pro-poor biotechnology policy processes. This recontextualised role of experts is explored from the perspective of knowledge use and how it is linked to development. This is because of the tension between undisputed role of biotechnology as an economic driver and the political nature of biotechnology regulation in the African context. Copyright © 2010 John Wiley & Sons, Ltd.

Keywords: biotechnology; biosafety; innovations; Kenya; regulatory policies; science and technology

1 INTRODUCTION

Scientific and technical knowledge emanating from new technologies such as biotechnology has long been linked to development; in the case of biotechnology, this is intricately intertwined with public controversies around its use (Martin and Richards, 1995).

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Development of modern biotechnology[1] in particular is further pegged to effective implementation of biosafety regulatory systems as part of broader governance (Cartagena Protocol, 2000). As broadly defined, governance in the context of biotechnology targets the nature of decision-making processes based on rules, institutions, practices and power that shape the ultimate behaviour of different actors (Harsh and Smith, 2007: p. 252). Arguably, decision-making processes on biosafety regulation and related regulatory practice are hampered by social factors such as different interpretations of risk (Jasanoff, 1987). This is in addition to the growing demand for greater public participation in scientific decision making and policy formulation associated with new technologies (Martin and Richards, 1995; Lyall and Tait, 2005). These aspects complicate further the usage of seemingly controversial knowledge associated with governance of new technologies, and the process of knowledge contributing to tangible economic development. In this political context, so-called 'experts'[2] get entangled in public controversies not only as 'consultants or providers of expertise, but overt and committed defenders or opponents of one side or the other, as active participants in the debate' (Martin and Richards, 1995: p. 506). In Africa, establishing regulatory systems to manage biotechnology has not been smooth. In Kenya for example, the process has been controversial occasioned by conflicts between interests of different actors (Harsh, 2005). This complicates the context under which biotechnology is expected to contribute to development based on the politics experienced at domestic level, and yet linked to international politics (Harsh and Smith, 2007).

It is imperative to understand the knowledge use dynamics involved in relation to the role of experts and what the implications are for the emerging regulatory policies and biotechnology transfer for development more generally. This is because, for contemporary technologies like biotechnology, the changing social context demands experts to draw from a pluralistic knowledge base (Nowotny *et al*., 2001). In addition, unlike the normative thinking that experts are scientifically trained and technically skilled individuals who are informed by their professions and disciplines, lay knowledges also confer expertise (Jasanoff and Martello, 2004: p. 344). Moreover, in biotechnology regulation, experts are interested actors who have a stake in decision-making processes as well as power to impact change positively or negatively (Ayele, 2007). A focus on experts therefore spurs a need to recontextualise the biotechnology regulation by putting the multiple perspectives, interests and needs at the centre of the analysis.

Focusing on low-income countries like Kenya is also crucial considering the urgent need to apply biotechnology for Africa's development (Juma and Serageldin, 2007). Despite all the collaborative efforts to enhance technical and bio-policy capacities to harness this much-needed development in Kenya, no biotechnology product has been commercialised. All the initiatives started in 1990s have been undergoing research under confinement within public research institutes and affiliated institutions (Ayele *et al*., 2006; Kingiri and Ayele, 2009). Knowledge flows either for technological development or biosafety

[1]This involves application of genetically engineering (GE) technology which is manipulation of living organisms to produce goods and services useful to human. It is distinguished from traditional (or conventional) in that it is a modern or transgenic approach that develops products (such as seed varieties) through insertion of genetic material from different species into a host plant. The products derived using these techniques are commonly referred to as Genetically Modified Organisms (GMOs).

[2]The term 'expert' is understood from the perspective of expertise that denotes the mechanism by which problems are framed whereby experts are called upon to respond to these problems. In the process, they incorporate scientific judgments and basic social, political and cultural predispositions and commitments (Nowotny *et al*., 2001: p. 215). The expertise advanced in the process therefore captures technical knowledge in both scientific and non-scientific domains (Nowotny, 2003).

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regulatory purpose have generally been contained within a restricted group of knowledge suppliers and users, and have excluded the ultimate users such as farmers.

Despite this contradiction in the knowledge and development trajectory, the modern biotechnology context in Kenya enables a meaningful analysis of the role of experts in regulatory decision processes. By illuminating the dual role of experts as knowledge producers and users in decision-making processes pertaining to biotechnology regulation, this paper seeks to explore: *how the players in the biotechnology regulation are engaged as experts and how they use knowledge in practice to influence decision-making processes*. The analysis is guided by the argument that biotechnology development is synonymous with the regulatory context under which experts are called upon to provide expertise to regulatory problems. Thus, exposing the role played by experts in this context helps illuminate how decisions are made, the implications for biotechnology and augments the scholarship on better governance of biotechnology for development (Smith, 2009a, 2009b).

To support the discussion advanced in this paper, empirical research was conducted in Kenya by the author between 2006 and 2009. It involved qualitative in-depth semi-structured interviews with 42 individual actors who had (or claimed to have) a stake in decisions pertaining to biotechnology as researchers, policy makers, employees of non-governmental organisations (NGOs) and members of the public (mainly consumers and farmers). This was complemented by observation carried out during different scientific and public workshops in biosafety and biotechnology held during this period, and analysis of relevant secondary documents. Respondents' points of engagement in the regulatory decision processes are seen in the context of effort to provide expertise to influence biosafety regulation. Consequently, the data analysis below highlights the perceptions of the respondents on biosafety regulation and the role of different players in the regulatory processes, in particular the biosafety bill (now Biosafety Act) formulation process.

The paper is structured as follows. The institutional and political scenario under which biosafety regulation occurs is discussed first. This is followed by a brief overview of the renewed role of experts in the context of knowledge and development. Lastly, the paper illuminates empirically the regulatory context under which experts operate using Kenya as an example. It concludes by revisiting the emerging issues related to experts' role in regulatory decision processes and what might be a productive process that would lead to biotechnology development.

2 BIOSAFETY REGULATION IN KENYA

Kenya signed and ratified the Cartagena Protocol in May 2000 and January 2002, respectively. This synergised the on-going efforts by the government to put up regulatory structures to operationalise the protocol. At the early stages of biotechnology research activities which commenced in 1990s, Kenya opted to use the existing infrastructure, the Science & Technology Act (RoK, 1980), to institute regulatory mechanisms through the drafting and adoption of the *Regulations and Guidelines for Biosafety in Biotechnology in Kenya* (RoK, 1998). There have been concerns that these regulations were not legally binding, hence not providing the requisite guidance needed on biotechnology and biosafety (Wakhungu and Wafula, 2004). Thus, in an effort to legalise the early draft regulations and the on-going biotechnology activities, *the National Biotechnology Development Policy* was approved in 2006. Later the draft biosafety bill became law in February 2009 (RoK,

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Table 1. Tabulated review of the key regulatory instruments

Issue	RoK, 1998	RoK, 2009
Legal status	Lacks legal authority	Legally binding
Decision making procedure	Notification through the National Biosafety Committee (NBC) but lacks well defined standards Guided by risk assessment (RA) audit of research activity under review	Clearly defined notification process through the proposed National Biosafety Authority (NBA) Guided by RA audit of technological activity under review
RA procedures & decision making	Based on available scientific information but with precautionary approach	Based on technical & scientific information and uncertainty is handled through more information and appropriate RM measures
	RA information obtained through responding to RA based questions in the GE research application form. RA audit risk-based but questions are broad (human & ecological safety). RA standards are minimum commensurate with level of risk (Biosafety Levels I-1V)	RA information obtained from applicant, regulatory agency reports and relevant social economic concerns from the public RA audit is risk based but specific to type of application (contained/deliberate release)
		Regulations to define specific standards are being developed to be appended to the Act
Public participation & transparency	Emphasised but entrusted to NBC, emphasis is on prudence and openness with regards to information disclosure	Provided for during decision making process pertaining to regulatory approval
		Public comments are to inform RA and decision making process
Implementation of the instrument	This has been achieved through Institutional Biosafety Committees (IBCs) & NBC	Full responsibility of legally empowered NBA
	Membership of these institutions not specified but broadly qualified as private and public	Constitution of NBA membership-majority will be institutional representatives but with technical knowledge on biosafety and biotechnology

2009). According to this Act, biosafety regulation encompasses the regulatory mechanisms that the government has put in place for the governance of modern biotechnology.

Prior to the enactment of the Biosafety Act, biosafety regulation had been managed under an interim structure, adopting a multi-sectoral approach involving many institutions and sectors. These actors included different ministries and regulatory agencies whose respective mandates touched on biotechnology in various ways (Harsh, 2005). All these actors constituted the National Biosafety Committee (NBC) under the umbrella and coordination of the National Council for Science and Technology (NCST), serving as a secretariat to this committee. (This coordination role will be taken up by the National Biosafety Authority (NBA) under the Biosafety Act of 2009.) The NBC was the 'boundary organisation' overseeing the implementation of the biosafety regulations that governed the

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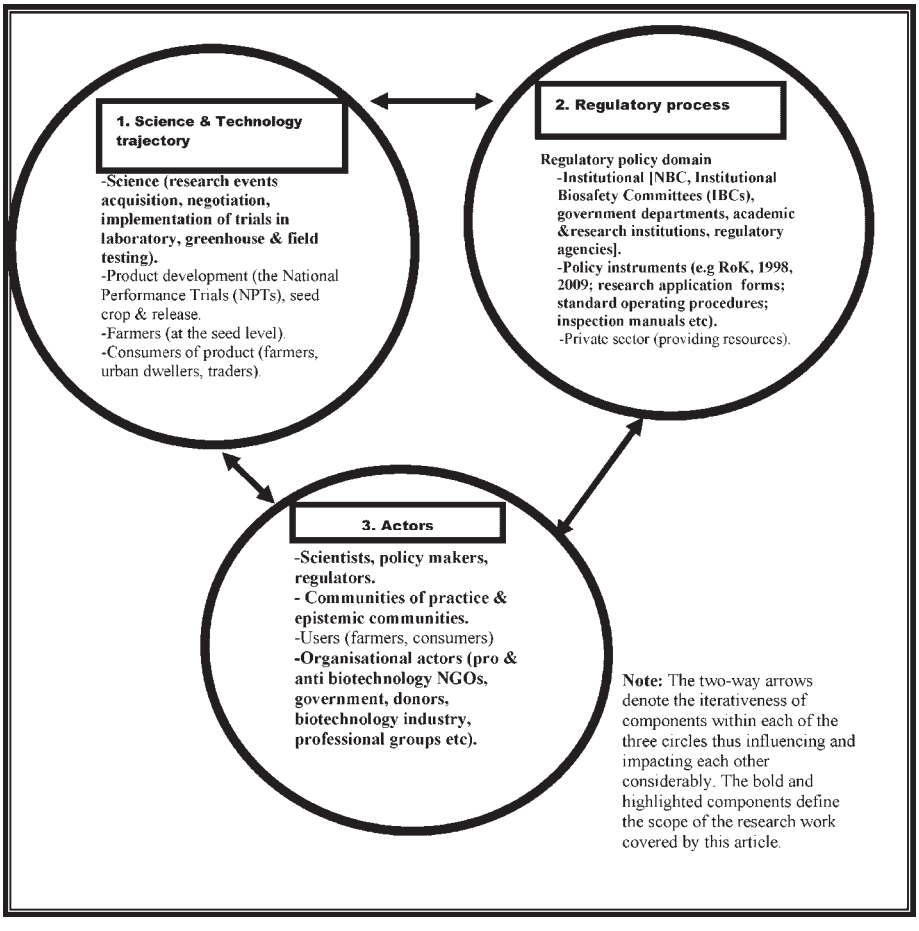

Figure 1. A non-linear, iterative illustration of a complex inter-relationship between components in biotechnology development and regulation in Kenya

conduct of all actors, including the general public, scientists and institutions involved in modern biotechnology in Kenya. A boundary organisation, as described by Guston (2001), is a political institution mediating between science and policy controversies. It is thus a site of simultaneous production of knowledge and social order between scientists and non-scientists. From this description and based on provisions of the regulatory instruments analysed in Table 1, the NBC has been articulating two major roles:

- Risk assessment (RA) and decision making processes pertaining to modern biotechnology activities, and;
- coordination of development of the regulatory instruments.

However, this description of the institutional setup intended to manage biotechnology and biosafety does not bring out the embedded dynamics brought about by the intense interaction between individual actors, organisations in which they belong and biotechnology as a new science and technology. Figure 1 attempts to show visually the iterative dynamics involved.

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It exposes a complex interaction between biotechnology, institutions/organisations and individual actors, which influences the multifaceted dynamics of biotechnology development, including the regulatory process. This map situates the role of different actors, and in particular those in the biotechnology development and biosafety regulation, in various decision-making processes and the systemic issues that determine the way these roles are articulated. The map illuminates (albeit implicitly) governance issues that have implications for eventual, and economically viable, biotechnology deployment. Later sections of this paper bring the implicit issues to the fore through the analysis of experts and their interaction with Kenya's biotechnology development, on the one hand, and biosafety regulatory processes, on the other. The twin processes have been co-evolving for more than one and a half decades (Kingiri and Ayele, 2009) which implies that experts have inevitably had to grapple with issues that concern both processes.

3 CONTROVERSIES IN BIOSAFETY REGULATION

Application of modern biotechnology generates several social concerns and attracts different perceptions related to risk and uncertainty. This is the reason why the Cartagena Protocol at the global arena has been put in place to regulate environmental biosafety (Cartagena Protocol, 2000). Arguably, the protocol suggests that biotechnology development is only feasible if it passes the safety tests based on scientifically sound procedures. This risk approach to analysing biotechnology development is largely linked to Europe's precautionary approach (Tait and Levidow, 1992). It has nevertheless influenced approaches adopted in Africa to regulate biotechnology (Paarlberg, 2001; Newell, 2002).

Debates on biosafety regulation from the African context have been rife and contested, exposing embedded politics as well as complex contextual factors that constrain biotechnology development (Mugwagwa, 2008). These factors include, among others, the inability of governments to make independent needs-driven decisions devoid of influence by international, local and regional politics (Smith, 2009a). Africa is perceived to be confronted with chronic, poverty related challenges and cannot feed its ever-increasing populace (Kelemu *et al*., 2003). This being the case, proponents of new biotechnologies argue against a risk approach to biotechnology regulation citing its negative impact on development (*cf*. Paarlberg, 2008). Some of them, including scientific experts, view biotechnology in terms of its potential to address some of these challenges, thus contributing to food security directly.

Overall, these debates reveal the contextual and contested nature of biosafety regulation, but despite this, many countries in Africa have progressed towards embracing biotechnology through the development of requisite regulatory mechanisms (Nang'ayo, 2007). It is however important to understand how different social actors, as interested parties, are involved in regulatory regime development and the implications in terms of development. This subject is discussed next through empirical exploration of the role of experts in decision processes pertaining to regulation of Kenya's modern biotechnology sector.

4 RENEWED ROLE OF EXPERTS IN THE CONTEXT OF KNOWLEDGE AND DEVELOPMENT

Science, technology and development are highly interconnected, all being products of interactions between knowledge and social activities (Jasanoff, 2004). Development is

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interpreted in this paper in terms of how science and technology seek to improve the livelihoods of people through fulfilling their developmental needs (Smith, 2009b). In this particular case, these needs are embedded in agricultural production and its role in addressing food insecurity in developing countries.

The view that modern biotechnology holds a key towards addressing major challenges in agricultural production in developing countries has been globalised and advanced at international arenas. The FAO report (2004) on the state of food and agriculture seems to support that biotechnology may be explored in terms of its potential to meet the needs of the poor. This reflects a seemingly narrow view of the role of technology in economic and social development, ignoring the complex social and institutional issues inherent in the process of impacting change (Jasanoff, 2002). It also underplays the complex process of knowledge production and how it is brought to bear on meaningful development (Smith, 2009b).

Smith (2009b: p. 10) suggests that analysis of developmental impact should incorporate aspects of how knowledge and its products are constructed as outcomes of social interaction. Consequently, the role of experts as interested social actors in development activities need to be analysed from knowledge production perspective. Moreover, modern biotechnology as a new form of science and technology needs to be seen in the context of the globalised knowledge economy (Fukuda-Parr, 2006). This approach requires new understandings of how knowledge production occurs, departing from the simplistic assumption that basic knowledge generated in research institutes or universities would linearly lead to development if taken up by government or industry. This is because 'socially robust knowledge' driven by the needs of the society is embedded in society (Nowotny *et al*., 2001). As these authors contend, this view makes us reconsider that knowledge emanates not only from the scientific experts, but also from other members of society who are also good stewards of knowledge.

These new insights are associated with the changing role of science in society, and can provide new perspectives for investigating:

- The renewed role of 'experts' or 'specialists' who must use knowledge in a socially responsive and accountable manner geared towards addressing societal needs (Gibbons *et al*., 1994: p. 148).
- The role of public or non-scientific experts as legitimate 'experts' in the new spirit of democratising expertise (Nowotny, 2003).
- The learning process and the way knowledge is used to impact policy change in innovations that are political in nature (Sabatier, 2007).

5 EXPERTS AND BIOSAFETY REGULATION IN KENYA: EMPIRICAL EXPLORATION

Kenya's modern biotechnology sector initiated in the early 1990s triggered the establishment of a regulatory system to manage the sector (Sander, 2007), as outlined above. As noted, this process resulted in two key regulatory instruments which are encapsulated in Table 1 as benchmarks for the analysis of activities of different actors associated with biosafety regulation.

Sander (2007) highlights that different public and private actors were instrumental in the establishment of the first regulations (RoK, 1998) through politicised networks. Harsh (2005, 2008) makes the same observation, citing the political role of non-governmental organisations

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(NGOs) in the formulation of the Biosafety Act (RoK, 2009). Both scholars bring out the institutional connection between biotechnology development, biosafety regulation and social actors.

The social actors targeted in this research were heterogeneous scientific communities linked to policy makers, regulators and NGOs senior officials unified under their training background in biological sciences. Others included the non-scientific communities represented by social scientists and non-biological scientists affiliated to civil society, legal fraternity, media and the biotechnology industry. The contribution of these actors to the regulatory decision processes as experts is analysed in the context of their institutional links and interactions (see Figure 1).[3]

Experts were engaging in the regulatory decision processes at three main stages. Firstly, biotechnology research activities needed to be licensed by the NBC through initial vetting of the research dossiers by the IBCs before actual research could commence. The IBCs were formed from institutions interested in biotechnology research, such as public research institutes and universities.[4] In addition, although it was argued that the constitution of the NBC is heterogeneous representing different institutions[5], analysis of secondary documents suggest that it is largely dominated by scientists and out of the over 25 members, only three representatives are from the civil society.[6] Members of the IBCs and the NBC participated in the regulatory decisions which directly or indirectly were informed by RA audit undertaken by selected experts.[7] The process of undertaking RA and related deliberations was however hampered by contested IBCs and the NBC representations.

The RA information that ultimately informed the regulatory decisions was another contested issue. Based on the research application form, this information was solicited from researchers and biotechnology industry who were joint applicants. The RoK (1998) puts emphasis on those handling biosafety information to exercise 'openness' in order to promote public trust and 'safeguard public interest' (Executive Summary). Despite this clear guideline, some respondents in research and public arenas cited potential conflict of interests. They were wary of the authenticity of data/information provided by some interested actors as applicants and by those consulted by the NBC as RA and biosafety experts.[8] A member of a consumers' organisation notes:

> It is difficult to say *per se* that in the current [donor] context the information from those researchers would be fully reliable. (NGOco-NS4, January 2008)

Secondly, scientists' contribution to the drafting of the regulatory policies as experts was not contested because of what was linked to technical expertise:

> The constitution of the first team that wrote the guidelines was predominantly scientists. It was historical in that capacity of other groups such as consumers and

[3]Unless otherwise stated, codes are used to report all information cited in this paper in order to guarantee anonymity of some of the interviewees as requested. Where PS, GP, NSS and NS are used, they refer to policy scientist, genetic engineering practitioner, NGO /non-state scientist and non-scientist, respectively). For instance, ATp-PS3 refers to a policy scientist interviewee who is a biological scientist engaged in policy related roles.
[4]Minutes of Kenya Agricultural Research Institute (KARI) IBC meetings; interview with ATBp-PS5, chairperson of one of the IBCs.
[5]Interview with ATp-PS3, NBC chairperson, November 2007.
[6]Minutes of NBC meetings availed to the author during field work.
[7]Interview with ATp-PS3, public university & NBC member, November 2007.
[8]Interviews with NGOf-NS1, farmers' organisation, November 2007; RSIn-PS6, international research organisation, November 2007.

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> other groups was limited in understanding the science behind the development of biotechnology. (ATBp-PS5, public university, November 2007)

Indeed experts who constituted the biosafety bill drafting committee were drawn from various academic institutions, government departments and individual scientists, with majority of them being NBC members.[9] The drafting process was however marred by controversies associated with representation and transparency which resulted in mistrust and suspicion between different actors.[10] With regards to the biosafety bill, the bone of contention was the potential influence through possible manipulation of technical information to favour the interests of certain actors:[11]

> Whatever they [drafting committee] put down, it needed to receive a consultative process to receive views from different stakeholders to question the content. There is a danger if it gets to be overwhelmingly driven by scientists, then they will structure it just to address scientific needs. Science is for the benefit of the society and society must view it from that light. (RSIn-GP9, researcher, November 2007)

This seemed to be a justified concern because the government, which was supposed to steer a legitimate process, received considerable backing from the pro-biotechnology NGOs and media (Mbaria, 2008[12]; Program for Biosafety System-PBS Newsletter, Issue No. 13).

Thirdly, during the various stages of the public debate on the draft biosafety bill, different groups from the pro- and anti-biotechnology NGOs, civil society and government engaged different experts (scientists, lawyers and policy makers) to sensitise the public and parliamentarians on various aspects of the bill and implications. On the one hand, the government and the pro-biotechnology groups as proponents of the bill exploited expertise from various professional organisations for the purpose of popularising the biosafety bill and biotechnology as a tool of development.[13] On the other hand, members of the civil society engaged the services of a number of experts from their umbrella body the Kenya Biodiversity Coalition (KBioC), previously known as Kenya GMOs Concern (KEGCO).[14] As opponents, they came up with a preferred parallel biotechnology and biosafety bill (2007) that claimed to be balanced in terms of social and technical issues.

As the preceding analysis shows, there were underlying issues that constrained the way experts played out their roles in the regulatory decision processes. These are explored next.

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[9]Interview with BIp-PS1, NBC Secretariat, January 2008 & reports of NBC minutes availed by the NBC secretariat.

[10]The public was represented by the civil society and the government by a number of policy, regulatory and scientific communities. At the time of field work, there were increased media reportage on these controversies generated by the biosafety bill [*cf.* an open letter by civil society to Kenyan members of parliament to reject the draft biosafety bill (Sunday Nation, 7 December 2008); University lecturers endorse the 'GMO bill' as a gateway to embrace biotechnology (Sunday Times, 23 November 2008; People Daily, 24 November 2008)].

[11]Interviews with RSPo-GP6, international research organisation, March 2008; NGOf-NS2 farmers' organisation, November 2007.

[12]This media article claims that pro-biotechnology reports had increased fronted by scientific organizations and funded by biotechnology industry.

[13]Interview with TAN-NSS2, pro-biotechnology NGO, January 2008; see also Handbook for policy makers (2007); crop biotechnology updates published at www.isaaa.org/kc.

[14]Interview with NGOco-NS4, Secretariat, KBioC, January 2008; see also Action Aid, 2004.

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6 KENYA'S CONSTRAINED EXPERTISE AND IMPLICATIONS

Despite a relatively advanced biotechnology infrastructure, institutional structures to guide in regulatory decision processes were weak (Kingiri and Ayele, 2009). The government advocated for a legitimate scientific and democratic process which was difficult to achieve in practice. Unclear regulations were largely to blame (see Table 1). Regulations of 1998 (RoK, 1998) put emphasis on science-based policy procedures but also give room to social and economic consideration. It is however not explicit how the latter should be inputted in the decision-making processes. This left room for different interpretations on how this should be advanced. Further, although the NBC was charged with all regulatory policy mandates, mechanisms for engagement of experts were not clearly spelt out in the regulations prior to enactment of the Biosafety Act. Consequently, the government solicited expertise from the dominant pro-biotechnology coalition that comprised of mainly biological scientists, while trying to demonstrate legitimacy through engagement of the only few experts from civil society who were NBC members.[15] Consequently, these public representatives at the NBC were overwhelmed by the purportedly scientific deliberations in terms of numbers and technical capacity:

> The only representatives of farmers and consumers sitting at the NBC are not adequately informed and do not contribute effectively to the biotech debate. In most cases they are ill-prepared and do not represent the views of stakeholders. The common perception of scientists is that the issues are too technical for non scientist to understand. (EPA-NSS5, civil society, January 2008)

Debatably, smooth operations of experts in the articulation of regulatory decisions should be guided by defined rules or procedures. The regulations of 1998 (RoK, 1998) do not provide clear guidelines in this respect, leaving loopholes where actors could play different and sometimes conflicting roles commensurate with their interests. For instance activities of the NCST as the government coordinating agency on matters of biosafety regulation were blurred by activism of interested parties, particularly those who were pushing for the enactment of the biosafety bill:

> The whole thing [bill formulation process] was supposed to be an initiative of the government but the interest was with people from the biotechnology industry than what we would call the broader section of Kenyan society. The main players were biotechnology industry and the scientists make much of the industry. (JO-NS6, journalist, local daily, April 2008)

The uncoordinated policy decision processes prompted experts to align themselves with proponents and opponents that expressed opposing standpoints about biotechnology and biosafety bill.[16] It also made it possible for conflict of interests to take root unabated, and perhaps even influenced the content of the biosafety bill as debated elsewhere.

Undefined and unclear guidelines notwithstanding, it is possible for experts to be subjective in decision processes based on a number of factors. First, the varying perceptions

[15]Interview with BIp-PS1, NBC secretariat, January 2008.

[16]The way stakeholders were engaged in the formulation of the biosafety bill exposed controversies that placed actors in 'pro' or 'anti' positions. On the one hand, the media and anti-GMOs activists were the opponents perceived to be either opposing the bill or impacting negatively upon its enactment. On the other hand were scientists and their affiliated institutions (pro-biotechnology actors and government) as proponents.

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of risk among non-scientists and scientists aggravated tensions regarding how RA should be approached despite an agreement that research in biotechnology poses potential risks:

> When you are dealing with anything new. . .you try to think about the possible risks that you may be putting yourself to (NGOco-NS5, local NGO, January 2008)

> I perceive risk as something that I am not quite sure of, and that is how the ordinary Kenyan sees it (JO-NS7, journalist, local daily, March 2008)

Second, institutional obligations and motivations prompted by opportunities and interests linked to biotechnology development brought about conflict of interests:

> This drive by the scientists [to engage in GE] is because they have been given an incentive, motivated since the country needs food. [The policy makers] have also seen GE might be an answer and rely on scientists to help them. [This being the case], why wouldn't I [as a scientist], want to discover something for the country? (ARBp-PS16, researcher, March 2008)

As an institution, NBC was the only existing official organ through which all players including the public could channel their concerns pertaining to biotechnology regulation. However, the majority of members, who are scientists, were perceived to be interested parties as researchers or as partners with funding agencies (an observation made by one interviewee [RSIn-PS6] from an international research organisation who sits at the NBC). This has implications in that, as experts, they were likely to influence regulatory decisions to favour particular interests.[17] This view was also echoed by scientists, which may explain why some preferred academic scientists as experts:

> The NBC should have more independent scientists to give very independent scientific views in their independent personal capacity as scientists and not representatives from institutions without fear of redress. There are certain things other [non-academic] scientists will not say and their views may be influenced by the position that has been taken by their institutions. I would trust academic institutions with independent views a lot more than scientists who come from other institutions that are research based. (RSIn-GP3, research scientist, March 2008)

From the standpoint of proponents (mainly researchers and policy makers), the public represented by a number of experts from the civil society were perceived to have activists' interests:

> The most unfortunate thing in Kenya is, the anti-GM groups. . .influenced more with opinions of international NGOs. . .who fund them to carry out advocacy. . ..their major concern is to take a position of denial that gives an advantage of criticism. (ATBp-PS5, technological & biosafety policy advisor, public university, November 2007)

Members of the civil society defended this activism and argued that they were fighting for views of the public to be articulated effectively during regulatory policy deliberations (Action Aid, 2004; Daily Nation, 2008).

[17]Interview with NGOf-NS1, civil society, November 2007.

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Third, there were cited difficulties in communicating technical subjects about biosafety and biotechnology in the backdrop of uncertainty and fear. This was blamed on fear of misinterpretation by public and media, a concern by scientists as potential experts:

> Scientists fear being misquoted. We would like to tell the facts out there to the people, but the media always misquote us. That is the constraint that the scientists are having in communicating science out there to the world. A lot of them fear because they don't know what impact it may have on their jobs. (RSIn-GP3, international research institute, March 2008)

This situation was confounded by the limited understanding of modern biotechnology by the public.[18] This made it difficult for experts to articulate their role effectively. Some players, particularly scientists, were deliberately biased in terms of information they publicly shared:

> Research scientists have avoided bringing negative stories and even when they see them they remove them and instead keep quiet. The reason being the activists grab that and start using it as a tool of propaganda to make people turn against GE. So why talk about the negatives if they would bring you problems? Experience has shown that, any negative you bring will be used against you. So we have to continue in the way I think we are at least less risky. (TAR-NSS1, probiotech NGO, February 2008)

This fuelled suspicion and distrust among different stakeholders. It also puts to question the quality of information shared out for the purpose of regulatory decision processes alluded to previously, considering the different multiple obligations, motivations and interests that drove actors in Kenya:

> In Kenya, all we are hearing are the positive aspects of biotechnology. We know that no technology in this world is without risks. So why is the potential risk side [of GE technology] silent? That in itself sends alarm bells to us the civil society. (NGOf-NS1, farmers' organisation, November 2007)

Fourth, various activities linked to the enactment of the biosafety bill, such as sensitisation and awareness creation about biotechnology and biosafety and lobbying in parliament, were strategically articulated via institutionalised networks and coalitions. Among these were three key professional and knowledge-based networks where scientific and non-scientific communities served different roles as experts. The first was the Open Forum on Agricultural Biotechnology in Africa (OFAB), which was launched at the height of debate on biosafety bill in 2006 out of the need for 'national scientists and experts to provide policy makers and the general public with evidence needed to harness new technologies' (see www.ofabafrica.org/country). It had two main objectives: to popularise biotechnology, and to push for conducive policies to enhance technology transfer. The second, the Kenya Biosafety Consortium (KBC), on the other hand, was formed in 2006 to lobby for enactment of a biosafety law:

> We got together as different stakeholder in the biotechnology arena in Kenya and formed what we called the Kenya Biosafety Consortium. . ... We all agreed that one of the major [development] milestones that we can make in this country if we

[18]Interview with TAI-NS10, biotechnology industry, January 2008.

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> really have to move with the technology is to have the biosafety law. (TAN-NSS2, pro-biotech NGO, January 2009).

The third, on the civil society front, was the Kenya Biodiversity Coalition (KBioC), which actively lobbied against the enactment of the biosafety bill, citing the unwillingness of the government to consider interests of majority of the public.[19] Indeed there were respondents from both scientist and non-scientist groups who supported this claim, arguing that the biosafety bill was overly scientific:

> I could read clearly that the biosafety bill is scientists' work. I do not blame the scientists because to them they see things that way. They say they want to improve the farmer's life but at the same time I think they are really not looking at the issues from the farmers' perspective. (NGOf-NS2, farmers' rights advocacy, November 2007).

> We could have missed out the social science bit of it. . ..so that at least the bill really speaks also on social economic issues. You find that the bill is too scientific. . . So it needed someone who can speak on it from the sociology and economic bit of it, not just the science bit. (RSIn-PS6, international research organisation, November 2007).

This suggests that scientific expertise largely drove the Kenya's regulatory policy process, which has policy implications, explored below. However, not apparent from these data and not within the scope of this paper, is the less tangible learning interactions within these opposing coalitions that may have impacted on the final regulatory policy documents. Some reflections in this respect are drawn out in the concluding section.

7 CONCLUSION

The process of institutionalising biotechnology and biosafety in Kenya has been challenging and political as the regulatory regime co-evolved alongside the technology. This co-evolution seemed to provide a conducive environment for different actors at individual and organisational levels to pursue their interests at different points in the overall biosafety regulatory process. Undirected and uncontrolled multiple forms of expertise informed decisions pertaining to different stages of the regulatory process. More important is the institutionalised form of expertise emanating from different institutional nodes with diverse conflicting mandates ranging from research, regulation, policy development, advocacy and advisory roles.

It is likely that effective articulation of experts' role was aggravated by lack of structured decision processes. This encouraged informal governance that characterised Kenya's biotechnology regulation (Harsh, 2005). Lack of transparency in public representation and legitimacy in the decision-making processes hampered efforts to enhance a democratic expertise. Clear public engagement mechanisms are however not enough to guarantee a regulatory practice that would ultimately impact development.

This paper brings to the fore exogenous and endogenous factors that constrain role of experts with respect to independent, transparent and accountable decision processes

[19]NGOco-NS4, consumer representative, January 2008; Daily Nation, 2008.

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pertaining to biotechnology regulation in a developing country context. Conflicts of interests in particular curtailed efforts by experts to contribute effectively to these decisions. Inability of experts to provide requisite expertise in governance of biotechnology masks the ultimate knowledge or technology transfer goal that would enhance the role of biotechnology to impact development and the overall food security endeavours.

Multiple and different forms of expertise resulted into different types of codified and tacit knowledge driving the regulatory decision processes. These include the supposedly science-based knowledge emanating from research trials and biosafety RA, on the one hand, and non-scientific and value laden knowledge informing the regulatory decision-making processes, on the other. The latter is manifested when experts choose to pursue their interests during controversies linked to new technologies (Martin and Richards, 1995).

This is where states need to play a steering role in ensuring a balanced process that addresses the interests of all actors (Lyall and Tait, 2005). In Kenya, there was an imbalanced engagement of experts since avenues for soliciting non-scientists or public views were limited. In addition, despite the seemingly integrated nature of regulatory based processes, there were institutional weaknesses exposed through the government's inability to manage multiple forms of expertise linked to multiple obligations and interests emanating from individual and institutional levels. This has repercussions which include, among others, challenges in usage of socially robust knowledge to inform public policies considering the conflict of interests and the fact that quality may be compromised (Nowotny *et al*., 2001).

In conclusion, the controversies in regulation of biotechnology in Kenya suggest that experts' role must be analysed in line with the regulatory context. This is to minimise the negative impact that may be brought about by unchecked and imbalanced conflict of interests. From the empirical narrative presented in this paper, meaningful engagement of experts in the policy process as it currently stands will be severely hindered if they are not engaged from an informed, balanced and innovative stance. From an innovation point of view based on the expected policy outcome (e.g. addressing the food security agenda on the one hand and addressing biosafety concerns on the other), the current scenario can be said to be unproductive. Strategies will need to be devised that will encourage democratic engagement of expertise drawn from scientific and non-scientific communities. This would promote social and public accountability of the engagement processes which is likely to impact biotechnology for development.

The challenge of balancing diverse forms of expertise is linked to the fact that modern biotechnology regulation attracts multiple players with complex interactions and diverse forms of knowledge at different national and transnational levels (Smith, 2009b). Although the government is supposed to play a steering role, individual actors should be reflexive to accommodate other players' interests as well as other forms of expertise (Lyall *et al*., 2009). This paper exposes the regulatory context under which biotechnology development is advanced. This makes it possible for experts to be more reflexive in a manner that promotes balanced regulatory decision processes based on different interests. Reflexivity as a value based behavioural change involves 'the process by which individuals involved in knowledge production try to operate from the standpoint of all experts involved' (Gibbons *et al*., 1994). The behavioural change proposed here should also consider that actors as experts share different beliefs systems and hold different values which impact significantly the application of knowledge for both policy processes and technological change (Sabatier, 2007).

We cannot deny that biotechnology is knowledge intensive. Thus, the scientific community because of its good grasp of the biotechnology revolution will have a crucial role to play by looking at viable ways of connecting the knowledge users and knowledge

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suppliers. This may be a gradual learning process but one which will aim at acquiring 'reflexive capacity' crucial if a meaningful policy process that considers a balanced and legitimate mix of expertise is to be attained (Lyall *et al*., 2009).

REFERENCES

Action Aid. 2004. Analysis of the proposed biosafety bill, by the KEGCO coalition representing 12 NGOs. September 2004. *Action Aid International*, Kenya.

Ayele S, Chataway J, Wield D. 2006. Partnerships in African crop biotechnology. *Nature Biotechnology* **24**: 619–621.

Ayele S. 2007. The legitimation of GMOs governance in Africa. *Science and Public Policy*, **34**(4): 239–249.

Cartagena Protocol. 2000. Cartagena protocol on biosafety to the convention on biological diversity: text and annexes. *Secretariat of the Convention on Biological Diversity*, Montreal, Canada.

Daily Nation. 2008. Biosafety bill 2008. Kenyan MPs selling the country? Article endorsed by 66 members of the complainant KBioC. 25 November.

FAO. 2004. The state of food and agriculture 2003/2004. Agricultural biotechnology: meeting the needs of the poor? Food Agricultural Organisation: Rome.

Fukuda-Parr S. 2006. Introduction: global actors, markets and rules driving the diffusion of genetically modified (GM) crops in developing countries. *International Journal of Technology and Globalisation* **2**(1/2): 1–11.

Gibbons M, Limoges C, Nowotny H, Schwartzman S, Scott P, Trow M. 1994. *The New Production of Knowledge: The Dynamics of Science and Research in Contemporary Societies*. Sage: London.

Guston D. 2001. Boundary organizations in environmental policy and science: an introduction. *Science, Technology and Human Values* **26**(4): 399–408.

Handbook for Policy Makers. 2007. Status of biotechnology in Kenya. ISAAA, AfriCenter.

Harsh M. 2005. Formal and informal governance of agricultural biotechnology in Kenya: participation and accountability in controversy surrounding the draft biosafety bill. *Journal of International Development* **17**: 661–677.

Harsh M. 2008. Living technology and development: agricultural biotechnology and civil society in Kenya, *Unpublished PhD Thesis*, University of Edinburgh.

Harsh M, Smith J. 2007. Technology, governance and place: situating biotechnology in Kenya. *Science and Public Policy* **34**(4): 251–260.

Jasanoff S. 1987. Contested boundaries in policy-relevant science. *Social Studies of Science* **17**: 195–230.

Jasanoff S. 2002. New maternities: reimagining science, technology and development. *Environmental Values* **11**(3): 253–276.

Jasanoff S. 2004. Ordering knowledge, ordering society. In *States of Knowledge: The Co-production of Science and Social Order*, Jasanoff S (ed.). Routledge: London & New York. 13–45.

Jasanoff S, Martello ML. 2004. Knowledge and governance. In *Earthly Politics*, Jasanoff S, Martello ML (eds). Massachusetts Institute of Technology Press: Cambridge. 335–350.

Juma C, Serageldin I. 2007. (lead authors) Freedom to innovate: biotechnology in Africa's development. *A Report of the High-Level African Panel on Modern Biotechnology.* African Union (AU) and New Partnership for Africa's Development (NEPAD). Addis Ababa and Pretoria.

Kelemu S, Mahuku G, Fregene M, Pachico D, Johnson N, Calvert L, Rao I, Buruchara R, Amede T, Kimani P, Kirkby R, Kaaria S, Ampofo K. 2003. Harmonizing the agricultural biotechnology debate for the benefit of African farmers. *African Journal of Biotechnology* **2**(11): 394–416.

Copyright © 2010 John Wiley & Sons, Ltd.

DOI: 10.1002/jid

Kingiri A, Ayele S. 2009. Towards a smart biosafety regulation: the case of Kenya. *Environmental Biosafety Research* **8**: 133–139.

Lyall C, Papaioannou T, Smith , J (eds). 2009. Governance in action in the life sciences: some lessons for policy. In *The Limits to Governance. The Challenge of Policy-Making for the New Life Sciences*, Ashgate: Farnham, 261–273.

Lyall C, Tait J (eds). 2005. Shifting policy debates and the implications for governance. In *New Modes of Governance. Developing an Integrated Policy Approach to Science, Technology, Risk and the Environment*, Ashgate: Aldershot, 3–17.

Martin B, Richards E. 1995. Scientific knowledge, controversy, and public decision making. In *Handbook of Science and Technology Studies*, Jasanoff S, Markle GE, Petersen JC, Pinch T (eds). Sage: London, 506–526.

Mbaria J. 2008. ''How Africa's media is pushing GM crops''. Special correspondent in the focus column, The East African, 26 May – 1 June.

Mugwagwa JT. 2008. Supranational organizations and cross-national policy convergence: the case of biosafety in Southern Africa. *PhD Thesis*, Development Policy and Practice, Faculty of Mathematics, Computing and Technology. The Open University.

Nang'ayo F. 2007. The state of biosafety regulation in Africa. *Open Forum on Agricultural Biotechnology in Africa (OFAB)* **9**, Nairobi, Kenya. Available at www.ofabafrica.org

Newell P. 2002. Biotechnology and politics of regulation. *Biotechnology Policy Series 3. IDS Working Paper* **146**. Brighton, UK.

Nowotny H. 2003. Democratising expertise and socially robust knowledge. *Science and Public Policy* **20**(3): 151–156.

Nowotny H, Scott P, Gibbons M. 2001. *Re-thinking Science: Knowledge and the Public in an Age of Uncertainty.* Polity Press: Cambridge, UK.

Paarlberg RL. 2001. The politics of precaution: genetically modified crops in developing countries. *International Food Policy Research Institute.* The Johns Hopkins University Press: Baltimore and London, 9–66.

Paarlberg R. 2008. *Starved for Science: How Biotechnology is Being Kept out of Africa*. Harvard University Press: Cambridge, MA.

Republic of Kenya (RoK). 1980. *The Science and Technology Act*. Government printer. Nairobi, Kenya.

RoK. 1998. Regulations and Guidelines for Biosafety in Biotechnology for Kenya. *NCST*: No. **41**.

RoK. 2009. The Biosafety Act, 2009. *Kenya Gazette Supplement* No. **10** *(Acts No. 2)*, Government Printer, Nairobi, Kenya, 13 February.

Sabatier PA. (ed.). 2007. The need for better theories. In *Theories of Policy Process*, Westview Press: Boulder, 4–13.

Sander F. 2007. A construction of Kenya's biosafety regulations and guidelines. How international donor agencies interact with regulatory innovation actor-network. *Msc. Thesis*. Science and technology studies, faculty of social and behavioural sciences, University of Amsterdam.

Smith J. 2009a. Biosciences, ''development'' and the abstraction of governance. In *The Limits to Governance. The Challenge of Policy-making for the New Life Sciences*, Lyall C, Papaioannou T, Smith J (eds). Ashgate: Farnham, 153–169.

Smith J. 2009b. *Science and Technology for Development*. Zed Books Ltd: London, UK and New York, USA.

Tait J, Levidow L. 1992. Proactive and reactive approaches to risk regulation: the case of biotechnology. *Futures* **24**(3): 219–231.

Wakhungu J, Wafula D. 2004. *Introducing Bt. Cotton. Policy lessons for smallholder farmers in Kenya*. ACTS Press: Nairobi, Kenya.

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