Media as mediators in a science-based issue: politics, foreign influence and implications on adoption of Genetically Modified Organisms in food production in Uganda

Ivan Nathanael Lukanda, Sara Namusoga-Kaale and George Claassen

Abstract

The paper highlights the feedback loop between media, politics, foreign influence and science in relation to the adoption of Genetically Modified Organisms (GMOs) in food production in Uganda to demonstrate that socio-cultural considerations are important in the GMO science and technology debates. Based on the science-in-society model, the findings from a content analysis of newspaper articles over a four-year period, supplemented by interviews with scientists, activists from non-governmental organisations, journalists, and Members of Parliament's Science and Technology Committee, the study found that food is a politically thick issue. Both activists and scientists opportunistically use the media, the platforms where the public access and contribute content, to appeal to the politicians to legislate GMOs in their favour, arguing that the activists or the scientists' position is in the 'public interest'. Often, such coverage produces a paradox for the public by accelerating uncertainty regarding the science and the products of genetic modification, especially when politicians fail to decide for fear of the political implications of their action as is the case in Uganda.

Keywords

Participation and science governance; Popularization of science and technology; Public engagement with science and technology

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Introduction

Public participation can significantly influence national policy on GMOs as was the case in Mali [Pimbert & Barry, 2021].

GMOs first captured global attention in 1974 and were commercialised in the U.S.A. in 1996 [International Service for the Acquisition of Agric-biotech Applications (ISAAA), 2021]. Since then, GMOs have been media material. Media

are the regular avenues for transmitting information, coordinating and dominating debate on key issues in society. The centrality of the media is not only important in politics but also science, as commercialisation of any laboratory product depends on consumer approval [Lamphere & East, 2017; Malyska, Bolla & Twardowski, 2016], which the media can help to achieve. Studies show that the significance of food allows the media to blend the science, governance, market, foreign influence and personal interests for the public in form of news or related content in relation to Genetically Modified Organisms (GMOs). The media play the role of informing, reflecting, shaping public perceptions, and influencing policy developments about new technologies such as GMOs [Du & Rachul, 2012; Ojanji & Otunge, 2017]. Through political economy analysis and issues culture, the structure of the media market may define the social groups to be focused on by the media platforms in negotiating the regulation [Lukanda, 2019, 2018; Vigani, 2017].

Perspectives from African journalists indicate that GMOs issues are under-reported compared to politics, health, economics and art, and such coverage contributes to the limited understanding of the subject [Ojanji & Otunge, 2017]. Media are in position to influence public perceptions because GMOs are a fairly new technology clouded in uncertainty as news value [Gustafson & Rice, 2019], thereby allowing leaders to take shady political positions about the issue. While the sharing of such information is crucial on health, for example Covid-19, as such issues affect everyone, other sectors of science such as artificial intelligence, climate change and GMOs have followed suit to command relative importance [Bauer, 2002; Brüggemann & Engesser, 2017; Lukanda & Walulya, 2021]. In the context of GMOs, the conflict between the US and the EU has influenced diversity in regulation of biotechnology. The diversity has resulted from the "domestic politics through the mobilization of domestic interests both within and outside the core state — to shape GMO policy, without either side gaining control over the regulatory process" [Falkner & Gupta, 2009, p. 128]. The democratization of GMO risk governance, especially the ideas of demanding for accountability, media reportage, political opportunity structures, have made the NGO community critical in galvanizing alliances, nurturing and sustaining the debate in various countries [Jia, 2022; Seay Fleming, 2022; Falkner & Gupta, 2009]. Besides, many political parties are likely to engage in the GMO debate during peaks of political mobilization [Schwörer, Vidal & Vallejo, 2022]. Therefore, scientific knowledge is as important as the ability to lobby policymakers to influence the adoption of the science to save it from the shelves. Thus, because of science democratisation, it has become increasingly important for scientific processes and results from laboratories to be published in the popular media, where many experts and laypeople access information.

The use of GMOs — including altering of genetic material of a plant, animal or micro-organism through gene transfer to make a new organism or product — in improving agricultural productivity requires domestic regulations on biotechnology and biosafety [Secretariat of the Convention on Biological Diversity, 2000]. Although most low- and middle-income countries are still struggling to enact enabling laws, most developed countries already have regulations on the use of GMOs. While GMOs are considered the future of food production, skepticism regarding their potential risks to human health, environment, labelling of GMOs, intellectual property rights of the innovations, and biodiversity, has persisted for decades [Almeida & Massarani, 2018; E. A. Galata, 2017; Scheufele, 2014]. The controversy involves multiple actors and interests. The key actors in the debate

have historically been biotechnologists (the makers of GMOs), GMO multinationals, anti-GMO non-governmental organisations (NGOs) (activists), the government, other scientists, farmers, journalists and the general public.

In the past, cases of protestors vandalizing government field trial sites in many European countries have been reported [Kuntz, 2012]. Such scenarios could have contributed to 17 European countries, including Austria, France, Italy, the Netherlands and Poland, banning GMOs in 2015 [Lynas, 2015]. In 2018, a court in California ruled that roundup, the key component in spraying GMOs was cancerous [Bellon, 2018]. The rise of anti-science politicians can exacerbate objection to GMOs [Dorius & Lawrence-Dill, 2018; Ehrenberg, 2018]. A comparison of media coverage of GMOs in the U.S.A. and U.K. signposts persistence of the controversy of the potential risks versus potential benefits [L. Galata, Karantininis & Hess, 2014].

Besides, the debate on GMOs can be influenced by related issues in other countries as published by the media. By allowing non-journalists to write or talk back to the media, media outlets, such as newspapers, provide a fairly uniform platform where elite and lay-man's ideas about scientific issues become nationalised. For instance, in the case of Sweden, the issues related to GMOs being identified tended to be more local than global [Fischer, Wennström & Ågren, 2019].

That said, a recent study conducted in China indicates that individuals with weak emotions about GMOs are more likely to trust scientists than to rely on their abilities to process information published through digital platforms [Huang, 2020]. Moreover, the use of social media by expert organisations to correct misrepresentation of GM technology has the potential to negatively influence such technology among the public [Bode, Vraga & Tully, 2021]. In fact, a study has demonstrated that the use of government agency and news media can help in improving belief accuracy compared to social peers in public health misinformation crises [van der Meer & Jin, 2020]. Therefore, the arguments, and the respective actors, play a pivotal role in forming public opinion and "affect ethical, practical, political, and scientific considerations of GMO" [Mintz, 2017, p. 285]. Adoption of GMOs presents a conundrum in the global discourse as the benefits associated with the biotechnology also face conflicts in regard to safety of GMOs. GMOs may interfere with trade between African countries and the European Union, where resistance to such products is still serious [Muzhinji & Ntuli, 2021; Falkner & Gupta, 2009]. The current ability of Southern African Development Community (SADC) countries to monitor GMOs is doubful [Mulwa, Wafula, Karembu & Waithaka, 2013].

A study conducted in Kenya reveals that "more articles mention perceived benefits than risks, but when risks are mentioned, new articles contain more references to risks than to benefits [sic]" [DeRosier et al., 2015, p. 263]. Indeed, a transnational network of donors, farmers, governments, NGOs and researchers influences how newspapers in Kenya, Tanzania and Uganda report about GMOs [Randall, 2014]. In Ghana, anti-GMO activists have demonstrated confidence in law courts and have used the legal regime to block the GMO Bill [Issifu, 2018]. Diplomacy can also be a key tool in endorsing or dismissing GMOs on the African continent [Sida, 2021].

Sources influence the way media report about GMOs [Omeje, 2019]. Both traditional and social media have contributed toward moving the debate from a polarized to a more favourable global debate about GMOs through the framing of the perceived benefits [Evanega, Conrow, Adams & Lynas, 2022; Kahuthia, 2021]. The salience has resulted from multinational companies choosing to conceal the losses the consumers, local farming communities and the environment make through accepting untested technology by portraying GMOs as being in the public interest in various countries [Aerni, 2018].

ISAAA [2021] indicates that 44 countries around the world have approved GMOs. The ISAAA Statista [2019] report cites U.S.A., Brazil and Argentina as the leading producers of GMOs. The report lists soybean, maize, cotton and canola as the most planted crops. South Africa and Sudan are the only African countries growing GMOs [Statista, 2019], although approval has been done in eight countries on the continent [ISAAA, 2021]. By 2017, 12 African countries, including Kenya, Malawi and Uganda, were researching the possibilities of growing GMOs [Cerier, 2017].

ISAAA [2016] cites the unsuitable regulatory systems that foreground uncertainty as the major constraint to the adoption of GMOs. American companies Monsanto (a branch of Bayer Germany) and DuPont, and the Swiss multinational Syngenta, control 75% of the GM seed market, even though Switzerland itself has not commercialised GMOs [GMWatch, 2009]. The newness of the technology, the backtracking of some countries, and the failure by countries hosting some of the GM companies to approve GMOs, seem to amplify the controversy.

The increasing coverage of science in the media has been attributed to the fact that politicians allocate resources that fund scientific research, and therefore visibility in the media is a measure of public accountability in democratic societies where communication is key [Bucchi & Trench, 2016; Peters, 2013]. Thus, responding to socio-political issues regarding food systems and societal values supersedes the science versus the anti-science stigma and requires "political deliberation at many levels of government and civil society" [Hicks, 2017, p. 69]. For this reason, the North, with better capacity to test GMOs, is still contesting their adoption. For Uganda, which exports agricultural products to its neighbours, the European Union and other countries where GMOs are barred, the adoption of GMOs would have serious implications in terms of market restrictions related to the supposed threats GM technology poses to humanity and the environment.

Theoretical framework

This paper adopts the science-in-society communication model as a theoretical framework for understanding media as mediators between science, politics and the media. The model aims to bridge the gap between professionals and laypeople who do not have formal education in science, in this case in GMOs [Bauer, Allum & Miller, 2007; Saltelli, Giampietro & Gomiero, 2017]. For this model to work, there must be communication processes to link the three most important parties in the science communication process — "scientists, the media and the general public" [Friedman, Dunwoody & Rogers, 1999, p. xii]. The model looks at communication as a mechanism for energising democratic discourse, a process punctuated by the negotiation of meaning. The assumption is that individuals and communities understand science in the context of how it relates to their cultural, socio-economic, and political factors that influence their daily lives [Bucchi & Trench, 2016; Secko,

Amend & Friday, 2013]. It is believed that informedness can generate engagement between scientists, government, civil society and the public on the challenging science of GMOs. In other words, the model looks at science as "part of social and institutional connections" [Einsiedel & Thorne, 1999, p. 50]. Thus, the model seeks to democratise science by looking at the subject as knowledge generated from within society. Science, then, is accompanied by the prejudices in the society from which it is generated. The approach encourages people to make the right decisions on uptake of science based on their knowledge of political processes and institutions that support politics. This model considers the relationship between science and the public as a construction of social processes, partly influenced by the media [Bauer et al., 2007]. The current study uses the science-in-society model to analyse how social processes, especially politics, influence the media coverage of the science of GMFs in Uganda's print media.

Strategies used by politicians to capture media attention on GMOs

Public figures learn to respond to media logic or the conditions that determine what is published. Indeed, some groups in society, especially politicians and activists, have mastered those criteria and apply them even better than the scribes, not only to endear them to the public, but also retain media attention.

The borrowing of journalistic criteria by politicians reflects an understanding that issues are socially constructed through interaction between the press, other institutional actors, events, and the public [Brants & van Praag, 2017; Lamphere & East, 2017; Wenzelburger & König, 2017]. In the case of GMOs, media logic will differ in the different media platforms, depending on type of ownership, the politics of the day and the corresponding commercial logic and controversies [Reul, Paulussen, Raeijmaekers, van der Steen & Maeseele, 2018]. Thus, the logic may define what, when, how, and why the subject of GMOs is covered. By implication, the logic of covering GMOs and science generally is shaped by years of conceptualisation and practice, dotted by collaborations and conflicts between scientists, journalists and political regimes. This interaction between and among various stakeholders moves science from the realm of the laboratories to the science-in-society, the major theory guiding this study.

The context of GMFs in Uganda

Uganda has a fast-growing population that needs to be fed, yet GMFs are being contested. Uganda's situation is precarious considering that neighbouring Kenya has approved the growing of GMOs [Akinbo et al., 2021]. Besides, South African multinational businesses, *Game* and *Shoprite*, were already selling unlabelled agricultural products through their Ugandan outlets. There is no guarantee that such agricultural products are GMO free.

Yet Uganda is still interested in adopting GMOs to boost its key sector in the face of climate change and its related effects such as extreme weather conditions and fluctuations in food production. At least 72% of the country's working population is involved in the agricultural sector [World Bank, 2021]. Despite the significant contribution to the GDP, the agricultural sector has not received the attention it requires, leaving many parts of the country occasionally in dire need of food. A Food and Agricultural Organisation [FAO, 2017] annual state of food insecurity report indicates that Uganda is at high risk of hunger and undernourishment.

Several reports have highlighted the problem of hunger and its consequences of malnutrition, along with the inability to think and work, that have resulted in mortality over the decades [FAO, 2017; Mugisha, 2000]. The drive toward the adoption of GMOs seems to be a response to such reports. In 2016–2017, Uganda experienced a fatal famine causing the postponement of local council elections to enable the government to use the money to provide food to the most affected areas of Isingiro, Teso and Karamoja [Nakato, 2017]. In 2018, however, the market was flooded with maize grain and farmers were forced to sell their produce at Uganda Shillings 200 (about US$0.05). The appeal for better prices from the farmers' federations generated a response from government which ring-fenced Shillings 100 billion (about US$ 27 million) to enable businessmen to borrow the money from the commercial banks to buy the maize grain from the farmers at Shillings 500 (about US$0.2) [Monitor, 2018]. It seems that the difference between food scarcity and abundance is management of produce, rather than adoption of GM technology.

Nonetheless, Uganda has been conducting research in maize, bananas, rice, and cassava among other crops at its research institutes at Kawanda and Namulonge. The research is guided by the National Biotechnology and Biosafety Policy 2008 [Republic of Uganda, 2008].

This paper, therefore, seeks to establish the feedback loop between media, politics, foreign influence and science in relation to adoption of genetically modified organisms/food (GMO/F) in Uganda. The subsequent sections will demonstrate the relationship between politics and access to food, why scientists are collaborating with politicians and journalists, the implications of international influence and the politicisation of the GMO debate in Uganda.

The politics of access to food

The link between food and politics emerged in 1973 following the devastating, but disregarded, famine in the Wollo and Tigray regions of Ethiopia [Butterly & Shepherd, 2010]. The authors argue that the Ethiopian case was monumental in triggering two key events the following year. First, it largely led to the coup that ousted Ethiopian Emperor, Haile Selassie in 1974. Second, the famine led to the first World Food Conference that united donors, the United Nations and governments in Rome the same year. Further, Butterly and Shepherd assert that decades and perhaps centuries of politically motivated starvation had been ignored as was the case of the Great Irish Famine (1848), Soviet Union (1923), Ukraine (1933), Bangladesh (1943), and China's Great Leap Famine (1958). Recently, the Tigray region of Ethiopia suffered a manmade famine planned by the Ethiopian and Eritrean regimes for the region's attempt to secede [Weldemichel, 2022]. Even more recently, the European Union blamed Russia's invasion of Ukraine as the major cause of a global food crisis [Davies, 2022]. From the scholars' assertions, it can be argued that the case of Ethiopia was an eye opener to the fact that governors can define who suffers, when and where the starvation takes place, and how the government and international community react to the crisis as described in media reports. Indeed, high food prices were cited as one of the reasons for the 2019 coup in Sudan.

Uganda's response to the low prices in 2008 suggests that the government is alive to the political implications of hunger, although many shortages of food have been ignored in the past. In July 2022, political leaders from Karamoja sub-region

appealed to the central government to provide food in the wake of a fatal famine [Onyango & Kamurungi, 2022] Conceivably, the political implications could explain the government's reluctance to adopt GMOs. In ethnic societies like Uganda, every tribe is associated with certain food, much the same way some religions forbid the consumption of selected foods [Kikulwe, Wesseler & Falck-Zepeda, 2011; Muggaga et al., 2017]. It, then, appears that any alterations in the production of food disrupts societal settings since food is a key component of religious rituals and group identities. The link between food and politics also influences research and international relations as demonstrated by the results of a newspaper content analysis and interviews conducted for this study.

Methodology

A content analysis of 317 stories published over a period of four years (2012–2015) in two Ugandan national dailies — the *New Vision* and the *Daily Monitor* — was conducted. The articles were selected from the 2,924 newspaper copies (1462 from each publication) that were reviewed. The period 2012–2015 is important because the Biotechnology Bill was enacted in 2012, and in 2015 the ruling National Resistance Movement party resolved to support the Bill if it was presented before Parliament. The two leading newspapers were chosen because, unlike tabloids, elite newspapers usually avoid sensational reporting on "contentious" issues in society [Beyeler & Kriesi, 2005, p. 100]. For their elite nature, the publications are often reviewed by almost all radio and television stations. Moreover, the publications are read by the elite who influence public agenda and legislation.

The study focussed on issues such as agricultural production, effects on the environment, health risks, and GMO labelling. The stories chosen had to bear the word biotechnology, GMO, GMF, genetic engineering or a combination of any of these words. The study considered all stories in the newspaper i.e. front page, news, cartoon, opinion, pull-out and sports pages. Articles which contained any of the key words were coded. The dominant meaning of the story was taken to constitute a theme. A coding sheet was developed based on the science-in-society communication model to reflect and categorise how experts and non-experts interact with the science of GMOs. The coding sheet captured the date, position, size, source of information, and the key words related to GMOs in the story, and the issue-category the information was related. Two coders were selected and trained before the pre-testing of the coding sheet. After pre-testing, a comparison by the principal investigator revealed that the inter-coder reliability was 75%. The coders harmonised their coding and the inter-coder reliability increased to 86% for the actual coding. The articles were aggregated by theme and presented in Table 1.

Interviews were conducted with three anti-GMO activists from food rights' NGOs, four biotechnologists (scientists involved in breeding GMOs), 10 science journalists, and two members of the Parliamentary Science and Technology Committee — the chairperson and the clerk to the Committee. The chairperson was chosen because he was the political head (and face) of the committee, and the clerk was the technical head by virtue of her legal background and having been a parliamentary staff longer than the Members of Parliament on the Committee. Only those two members of the committee were available for interviews. The activists, biotechnologists and Parliamentarian had all appeared as sources in the newspapers articles analysed. Only activists and biotechnologists who were available were interviewed for the study. The 10 science journalists were identified

based on their by-lines in the content analysed. Four of the 10 journalists were female. The age range for journalists was 28–45. In other words, all the journalists had experience in reporting about GMOs. Interviews with activists, biotechnologists, and journalists were stopped because saturation had been reached. The respondents are identified using letters in this report to ensure their anonymity and to protect them from any possible repercussions as a result of participating in this study. The shortest interview was 11 minutes and the longest was 17. The interviews were audio-recorded and transcribed verbatim. The analysis was done using Atlas.ti. to generate themes and quotations. The analysis was done by one person.

Results

The results are presented in form of tables and text. The tables contain figures, and the text includes some quotations from respondents. The results from content analysis are presented in Table 1.

Table 1. Articles by focus.

Issue-Category	*Total*	*Percentage*
Food production	140	44%
Regulation	82	26%
Health risks	41	13%
Effects on environment	29	9%
Other issues	16	5%
GMO labelling	6	2%
Unidentifiable	3	1%

From Table 1, the use of GMOs in food production dominated newspaper coverage at 44%. The Bill was also heavily covered in relation to how the science will be regulated, to minimise the environmental and health risks. Many articles mooted GMO labelling as a way of preventing accidental consumption of GMOs. Other issues included the intellectual property rights in relation to the seeds, loss of market for organic agricultural products as mistrust of the ingredients raises.

The issues identified through the content analysis i.e. issues associated with food production, effects on the environment, health, regulation and legislation, labelling, privatisation of seed production and intellectual property tend to be driven by politics. It is important to note that stories related to biotechnology as aggregated in Table 1 appeared as spikes. The spikes usually occurred when a politician, such as the president, a minister or a head of a government department, made a positive or negative reference to biotechnology, especially in the context of food. This finding confirms Scheufele's [2014] contention that the politicisation of an issue draws more attention to it, thereby making it sellable.

Indeed, the anecdotes from the interviewees are in sync with the view that politics drives or impedes adoption of (food) technology. Some excerpts from the interviews indicate how stakeholders attempt to court or provoke politicians in the GMO debate. The results show a "rising curve of the level of awareness and mistrust" in government institutions' capacity to "enforce laws in public interest" (Activist B); an effort by scientists to protect their ideas and "earn maximally from them all the time" (Scientist B); an attempt by all stakeholders to influence

Table 2. Summary of responses from interviews about GMOs.

Respondent	*Description of GMO debate*
Activist A	The bill is out to promote multinational seed companies
Activist B	– The debate shows a rising curve of the level of awareness and mistrust in government institutions' capacity to enforce laws in public interest – Scientists have not defined the challenge of food in depth – Stampede – The bill is a broader subject under a narrow context
Activist C	Media distort issues related to the debate
Scientist B	An effort by scientists to protect their ideas and "earn maximally from them all the time"
Journalist F	– An attempt by all stakeholders to influence legislation – Every side thinks you have been bribed to write about their nemesis
Member of Parliament	An attempt to monopolise the market by GMO promoters or organic agents
Journalist G	The debate is marked by ignorance among stakeholders of the implications of adopting GMOs
Clerk	The Bill aims at ensuring safety of agricultural biotechnology development
Journalist A	Journalists lack language and are not willing to read about GMOs
Journalist C	Journalists need training to know what to look out for

legislation (Journalist F); an attempt to monopolise the market by GMO promoters or organic agents (Member of Parliament); and "ignorance among stakeholders" of the implications of adopting GMOs (Journalist G). All these factors contribute to the emotions that manifest in the debate on the issue of GMOs in Uganda.

The anti-GMO activists claim that the proponents of GMOs have not defined the challenge of food production in depth. Activists argue that the problem of food and food insecurity being results of poor breeding is a creation of the scientists. Activist B called this a "stampede" in the debate. A summary of the accusations is presented in Table 2.

The debate on GMFs appears to be informed by the scandals in several departments of government that have aggravated corruption, land grabbing, state-inspired violence, electoral malpractices and impunity among other governance vices. The scandals in other sectors have heightened the mistrust in government institutions to regulate GMFs.

For instance, the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF) itself is riddled with scandals. The government newspaper, the *New Vision*, reported that MAAIF had spent a colossal five billion shillings (about $1,388,888) on buying eight bulls from South Africa [New Vision, 2017]. The government has also failed in running its own ranches that it inherited from past regimes [Okuda, 2017]. With government research institutions not declaring substantial non-taxable revenue as profits from their harvest and because of their inefficient management, public mistrust related to GMFs is unavoidable. A summary of the descriptions from the content analysis is provided in Table 3.

Table 3. Summary of responses from content analysis.

Scientists' description of activists	*Activists description of GMO (scientists/ pro-GMO politicians)*
Anti-GMO activists are denialists because Uganda already had GMOs imported in the form of food, medicine, poultry and animal products, chocolate, yogurt, juice, and peanuts	GMO scientists are crooks, renegades, terrorists and fundamentalists
Activists are opportunists	GMO science is strange
GMOs are a solution to food security	GMO science is demonic
GMOs are a solution to pests and diseases	GMOs are problematic
GMOs increase yields and farmers' income	Introducing GMOs is a sign that Government has failed to improve agriculture
Hope for more nutritious food resilient to drought	GMOs are unnecessary
	Uganda will lose the international market
Activists were promoting the agenda of foreign organisations such as Greenpeace and Friends of the Earth International	Scientists were promoting the agenda of foreign firms such as Bayer and Syngenta
	Politicians are liars who are deliberately weakening the agricultural sector; failing to respond adequately to climate change warnings by reviving and establishing irrigation schemes; and arguing that GMOs will solve Uganda's problems

Why scientists are creating collaborations with journalists and politicians

Based on the content analysis and the interviews, it is apt to argue that scientists have limited control over the scientific agenda. Indeed, most scientists do not know the political, economic and belief interests that shape and "control the flow of money" [Harari, 2011, p. 304]. As patrons of science, the politicians determine the relevance of the scientific knowledge by deciding whether, how and why science should be applied or not. As such, it is the intertwining of science, industry, and politics i.e. state machinery in capitalistic settings that empowers politicians to decide how technology, including nuclear and biotechnology, are used even if politicians do not know the science involved in making the products. Thus, based on the content analysis and the interviews, the media operate at the border of researchers, politicians, and business interests, and are likely to shape societal perceptions about genetic engineering, its value and application in making GMOs in the science-in-society model.

Moreover, journalists and science communicators should remember that scientific developments are a demonstration of power [Horst, 2005]. Therefore, disagreements in the media are testimony to the fact that science has a role in determining the way society is governed. Indeed, the relationship between politics and the media influences what the public knows about science — cancer, HIV/Aids, and even biotechnology [Fowler & Gollust, 2015]. Thus, based on content analysis and interviews, science is a political weapon at local, national and international levels. As such, Ugandan scientists are bound by the Official Secrets Act [Republic of Uganda, 1964], which requires government employees to be cleared by government before releasing any information. Besides, one needs approval by the Office of the President through the Uganda National Council of Science and Technology (UNCST) before conducting any research in country.

Therefore, it is imperative to assert that the "diffusion of scientific culture" requires the public to use their "knowledge and skills" to face their lived challenges, beyond knowledge acquired through the school curriculum, to achieve an attitude of "participation and scepticism" [Govoni, 2010, p. 28]. Such a combination can be a product of collaboration among science communicators, journalists, scientists and politicians through the education system, or through orientation outside the academic curricula. The training must consider the impact of the increasing exchange of information through the Internet and social media in the international sphere and its influence on public perceptions in demonstration of the influence of society at local and international level in the generation of scientific knowledge.

Discussion

From the preceding sections, international networks involving NGOs, farmers, scientists, seed companies and governments influence decision-making on adoption of technologies, with due consideration to international trade, health, social and cultural factors. This argument is in line with scholarsly work which has demonstrated that the issues of GMOs are beyond the scientific realm and encompass sociology, anthropology, economics and politics [Mtui, 2011; Huff & Kruszewska, 2016; Muzhinji & Ntuli, 2021; Randall, 2014]. Wenzelburger and König [2017, p. 19], however, argues that while external influence is real, governments avoid being seen as yielding to "external pressure" to adopt or reject GMOs since liberalisation of GMOs can have direct consequences on support for the government in power. These forces seem responsible for the complexity in legislation and regulation of GMOs in Uganda. The Government's inability to predict the consequences of the adoption on its public support could explain its reluctance in supporting commercialisation or out rightly rejecting GMOs, in a relatively unstable political environment, open to conflict. Indeed, most of Uganda's neighbours in the SADC are equally unable to monitor GMOs and have remained non-committal in their uptake of the technology [Mulwa et al., 2013].

The political panic over GMOs in Uganda seems to have been 'imported' from oversees. While Europe sees GMFs as the future of food production, Russia and Italy are increasing organic food production and stamping out GMOs [Russia Today, 2017]. Besides, the United States ambassador to Uganda then, noted at a 'Feed the Future Uganda Agricultural' workshop in Kampala that Uganda's fertile soils, (without GMOs) have the capacity to feed 200 million people, beyond its population, then, of 41 million [Ssenyonga, 2017]. The push by scientists, government, and some companies such as Bayer, DuPont, and Syngenta to adopt GMOs is weakened by campaigns by some developed countries to move away from the same technology. Such confusing signals only add to the controversy and leave the public wondering whether they should eat (grow) GMOs or leave them in the laboratories. However, Falkner and Gupta [2009], and Seay Fleming [2022] opine that such controversy is likely to facilitate national response to regulation of GMOs to resonate with domestic politics rather than conform to the global regulation of the same technology.

Uganda's struggle to pass the law is reminiscent of other African countries facing similar scenarios since the turn of the 21st Century. The reluctance to pass such laws heightened when the U.S.A. demanded that African countries receive its food aid unreservedly, with the motive of promoting its foreign policy and boosting its multinational firms [Zerbe, 2004]. Even when faced with a severe hunger, Zambia

rejected consignments of US food in 2002, sparking a debate on GMOs on the continent. Cameroon, Ethiopia, Ghana, Kenya, Malawi, Mozambique, Nigeria, Zambia, and Zimbabwe are still struggling with this legislation [Cerier, 2017]. However, Eswatini, Ethiopia, Kenya, Malawi, Nigeria, Sudan and South Africa have approved the growing of BT Cotton to revitalise their textile industries [Akinbo et al., 2021].

With the help of NGOs and donors over the years, African elites have used their affiliations to Europe to influence the enacting of stringent policies, regulations, and legislation similar to their European counterparts [Bett, Ouma & De Groote, 2010], where individual member states of the European Union have to decide whether or not to cultivate or import GMOs and label them before distribution [Rzymski & Królczyk, 2016]. There is no doubt that Uganda needs a law to regulate GMOs, but the argument is about the strength of the law. Based on content analysis, the scientists want the US approach where researchers have been allowed to patent their products and commercialise the respective crops under research. Diplomacy then becomes a key factor in determining whether Uganda is influenced by other African countries or the multinational seed companies [Sida, 2021].

However, the NGOs want a rigorous law that will not burden Ugandans with patents, while holding government, scientists, biotechnology institutions and their funders accountable in case of liabilities resulting from their activities. In addition, the Bill should cover other forms of biotechnology such as medical and industrial products that may emanate from the agricultural products. With or without a law, the debate is likely to be fuelled when ideas such as the impact of labelling on trade exist and whether the public will perceive GMOs to be as safe as crops bred through other means. The implication is that future debates may focus on whether legislation should focus on not only the process of granting permission to research, grow, market and the value-added products of GMOs as biotechnology advances.

The advancements in biotechnology are facing radical socio-political challenges in regulation as mediatised by the newspapers and echoed by the interviewees. The ethical, moral, legal, regulatory, and political challenges, are resulting from public anxiety that Uganda is ill-equipped to resolve, considering the speed at which the industry is changing. Moreover, science does not seem to have answers to all the moral, philosophical and political issues raised by the activists in the science-in-society model. Yet, pressure is mounting on leaders to balance what science can do, and what is socially acceptable to the public. For this reason, political decision-making becomes inevitable since public participation significantly affects public policy in determining the social implication of the application of GMOs [Pimbert & Barry, 2021; Scheufele, 2014].

From the content analysis and interviews, the scientists are more concerned about the safety of GMOs than the politics surrounding food production. Politicians oversee legislation and govern science. In their consultations, politicians listen to both technocrats and voters. Voters may not be technical in scientific issues, but they give the political class power. Government agencies such as the UNCST and Uganda National Bureau of Standards (UNBS) are supposed to work hand-in-hand with the research institutes to engage the public about new science, such as GMOs. Politicians appoint the heads of those institutions. These and similar centres of government set up to protect public interests can be commandeered by politicians

to work against the interests of citizens. By implication, the heads of such institutions can be influenced to protect the interests of politicians and by extension the politicians' networks. Hence, politicians position themselves to be lobbied by the (anti)GMO companies to cause regulatory organisations to bend policies in their favour. GMOs tend to attract less controversy when they are presented as a development issue in pull-outs or in the science pages, than when newspapers try to play the watchdog role by presenting biotechnology as a political issue, in what appears to be news values overriding the association between science and politics. Politicisation of issues related to GMOs is comparable to debates on climate change and COVID-19 where science-based issues become debased when individuals misquote science to prove a point [Geiger, Gore, Squire & Attari, 2021].

Moreover, politicians decide policies on how to feed the population. The same group is privileged to allocate funding to all sectors of the economy, including scientific research. At the same time, they decide foreign policies by choosing the countries and companies to trade with and the items to import or export, most of the time. In addition, their interaction with local people can influence their perception about GMFs. It is apt to assert that politicians not only determine whether research should be done on GMOs or not, but can also influence the market for GMOs by determining how people assess the probable effects of science [Watson, 2016]. It is such influence that gives them access to media platforms, where they often experience a multiplier effect of their power.

By implication, biotechnology is a political issue since access to food can be used as a tool to control people or to influence international relations, as it happened in Ethiopia, Ukraine, Russia, and Bangladesh discussed earlier [Davies, 2022; Weldemichel, 2022]. If the new technology supports the status quo, it will receive the approval of Government. The science-in-society model implies that public participation in generation, application and governance of science and technology is the inevitable. Much as the technocrats and the activists are driving the debate, the decision to adopt biotechnology and GMOs is a signature away from the politicians, who must balance the personal, technical, and public interests. Therefore, based on content analysis and interviews, the science of GMOs is likely to be aligned to the dominant political interests and quality of arguments both sides put forward at the time of passing the law, as reflected in the media.

Implications of the politicisation of GMOs for Uganda's media

The politicisation of GMOs produces a paradox for the public by accelerating uncertainty regarding the science and the products. On the one hand there is 'scientification' of the politics regarding GMOs, and on the other hand, there is 'politicisation' of the science of GMOs. Knowledge for and against GMOs is likely to increase as pro-GMOs scientists continue to improve their research as a way of exhibiting genetic engineering as a viable option for Uganda and to give government reason to commercialise GMOs. Such a move will justify funding to scientific activities in the face of politicians who allocate resources. But also, activists are likely to be emboldened as they rely on court decisions in other countries and as they provide anecdotes of countries where GMOs have failed or have been rejected, citing the potential of accompanying herbicides in causing cancer. Court decisions have already been a factor in Ghana [Issifu, 2018] and U.S.A. [Bellon, 2018]. Based on the rulings in other countries, the activists may argue that the scientists are creating bioweapons for the nationals, much in the

same way they create toxins. The pro and anti-GMO groups are likely to appeal to the the media in lobbying government to accept their respective positions since the GMO media space acts like a referendum challenging the authority of decision makers in Uganda. Given the centrality of food in human existence and how politicians influence its production, processing, and access, the GMOs debate is likely to be embedded in public life, and journalists may find it inevitable to frame the emerging controversy as politicians highlight it on their menu of issues in society [DeRosier et al., 2015; Kahuthia, 2021; Evanega et al., 2022].

It then becomes necessary for scientists to look for visibility and for their institutions to try much to help the scientists get the necessary promotion, since publicity gives the science facility a competitive edge in lobbying. As such, public relations (advertorials) has become part of science as a good or bad press may have a corresponding effect on research funding, career, and position in the organisation. In the process of seeking visibility, sometimes, weak findings are packaged to appeal to the media. Skilled journalists can help the public scrutinise weak findings. An influential politician may be co-opted to support the biology, chemistry, physics or genetics, or GMOs without ever seeing the inside of a laboratory. For this and other reasons, science writing involves constraints and negotiations as many facts transcend the boundaries of laboratories. This was the case with HIV, climate change in many countries, and currently Covid-19 [Lukanda, 2018, 2019; Lukanda & Walulya, 2021].

Moreover, any story taken outside the realm of the "science section" is more likely to be politicised as editors attempt to popularise it through sensationalism [Palmerini, 2010, p. 127]. As discovered in the content analysis and interviews, scientists are aware of the possible misquotation in the process and usually require journalists to share the draft with them before it is published to check for factual errors, and/or misquotations if they do not trust the writer. As a result, journalists need to negotiate with both the science institution and the news editors regarding the framing, positioning, and perhaps length of the article. Control over this process is dependent on the experience of the journalist and the respect accorded to the writer in the newsroom. Failure by the journalist to manage the process leads to polarisation of the debate as science may be falsely critiqued against non-scientific facts, especially in the post-truth age where social media lace discussions, leading to politicisation of science-in-society.

The politicisation of the science of GMOs may accelerate the use of diplomacy since Ethiopia, Africa's diplomatic hub, established a policy to allow research in GMO technology [Sida, 2021]. In this case, countries hosting the multinational companies may resort to their diplomatic core to influence policymakers in Uganda to adopt the technology by portraying the largely untested GMOs, in newspapers, as being in the public interest.

Conclusion

GMOs have caused world-wide debate that has made scientists and activists on both sides to point bayonets at one another, requiring legal courts to decide on the truth of laboratory facts, and politicians to take action based on limited knowledge and expected voter support. With developed countries divided on whether GMOs are the solution to feeding the growing population in the age of climate change, some countries backtracking, taking precaution, and outrightly rejecting GMOs,

countries yet to commercialise GMOs, such as Uganda, Kenya and Tanzania are left at the crossroads. Besides, the future of commercialising GMOs in Uganda remains uncertain, as the country has posted mixed yields using the current technology. The support for, and opposition to, GMOs is an indictment on Uganda's regulatory institutions. In sum, the agricultural sector is enveloped more in governance rather than in scientific issues. In the case of Uganda, a country with fertile soils, perennial rivers and lakes, and receiving a good amount of tropical rainfall, the negative public perception about GMOs is influenced by mistrust in the political governance to manage such a sensitive technology basing on past failures in other areas of agriculture as portrayed in the media. Therefore, the highlighted drawbacks in the entire agricultural sector demonstrate that the GMO approach is a political jinx to solving the problems or it is simply an item on the political agenda to demonstrate that leaders care about their nationals.

This paper has contributed to establishing the feedback loop between media, politics and science in relation to the science-in-society model and GMO debate in Uganda. The newspapers tended to politicise the science of GMOs and to 'scientify' the politics related to GMOs. With some developed countries divided over adopting GMOs, backtracking on the technology and others taking precautions, uncertainty has contributed to the controversy as Uganda remains at the crossroads of taking up GMOs. Uptake is further complicated by the lack of trust in government institutions to manage such delicate technology based on past failures. By implication, being a major influence in shaping public perception, media politicisation of GMOs produces a paradox for the public by accelerating uncertainty regarding the science and the products from GMOs.

Limitations of the study

A key limitation of this study is that it considered only two mainstream newspapers for content analysis, and left out the other newspapers, including the tabloids, which are also major sources of information. The choice of newspapers was based on the fact that the *Daily Monitor* and the *New Vision* are currently the oldest newspapers in the country, and are often referenced by policymakers, including Members of Parliament in their deliberations. The study ignored radio, which is the most prevalent sources of information in Uganda, because there are no systematic mechanisms for archiving in the country's broadcast sector. Although the study considered only a four-year period, it provides an important starting point for understanding the politics and foreign interests in the GMO debate from a newspaper angle, especially in low income countries such as Uganda. While the findings may not be generalised because they are based on a small sample, the study's key strength is that it innovatively combines content analysis with interviews of key actors such as journalists, activists, scientists and a Parliament in the context of an African country.

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Authors

Ivan Nathanael Lukanda is a Lecturer in the Department of Journalism and Communication Makerere University Kampala-Uganda. He is a Research Fellow at the Department of Journalism Stellenbosch University, South Africa.

ivanlukanda@gmail.com.

Sara Namusoga-Kaale is a Lecturer in the Department of Journalism and Communication Makerere University Kampala-Uganda.

snamusoga@gmail.com.

George Claassen is a professor of science journalism and Stellenbosch University in South Africa.

gnclaassen@sun.ac.za.

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