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PRACTICE INSIGHTS

Communicating the uncertainties associated with genetic biocontrol approaches: insights from communicators, science journalists and scientists in Africa

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Abstract

Genetic biocontrol approaches, such as gene drive technology is rapidly gaining interest from scientists and public health professionals due to their potential to overcome many challenges of current malaria control tools and strategies. This is particularly the case in Africa where the burden of malaria is most significant. Uncertainty exists about whether these approaches will work, how effective they might be, who is controlling them, and potential unintended consequences for human health and the environment. Therefore, efforts to enhance the understanding of genetic engineering and biotechnology are needed, to ensure that accurate information about this technology is disseminated in the media by science communicators including the journalists and scientists. In this practice insight, we review the outcomes from workshops and courses hosted by the African Genetic Biocontrol Consortium aimed at equipping communicators and journalists with skilful techniques to proficiently articulate the uncertainties associated with genetic biocontrol interventions to the African public. we discuss the gaps and provide insight on how communicators can address some of the basic challenges of developing effective communication and decision-making for genetic biocontrol approaches in Africa.

Keywords

Professionalism, professional development and training in science communication; Public understanding of science and technology; Science communication in the developing world

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1 ▪ Introduction

Genetic biocontrol tools, such as gene drive modified mosquitoes (GDMMs), have emerged as promising new tools that could be deployed within an integrated vector management system to improve malaria control and elimination prospects [Hammond & Galizi, 2017; Collins et al., 2018]. As several of the leading research teams in this field are currently working in Africa, where the burden of malaria is most significant [World Health Organization, 2020], interest in the research in the continent is particularly strong [AUDA-NEPAD, 2018; African Union, 2019].

In 2020, the African Union's High-Level Panel on Emerging Technologies singled out gene drive mosquitoes as one of three priority technologies to contribute to malaria elimination [AUDA-NEPAD, 2018, 2020]. The first field trials of gene drive mosquitoes are expected in 5–10 years in Uganda, Mali or Burkina Faso [Naegeli et al., 2020; Scudellari, 2019]. These mosquitoes are likely to be the first gene drive organisms field-tested anywhere in the world and, therefore, place a spotlight on scientific developments and risk governance in sub-Saharan Africa [Hartley, Stelmach, Opesen, Openjuru & Neema, 2024].

Although gene drive technology is at an early stage of development, it has attracted controversy and led to calls to ban its development as it is considered high risk [Callaway, 2018]. Unlike other genetically modified organisms (GMOs), gene drive organisms are designed to spread in wild populations, which means they could cross regional and national boundaries. Uncertainty exists about whether it will work, how effective it might be, who is controlling it, and potential unintended consequences for human health and the environment [Webber, Raghu & Edwards, 2015; de Graeff, Jongsma, Lunshof & Bredenoord, 2021]. Other concerns include how to govern it responsibly and who should be included in governance decisions [Hartley et al., 2024]. Despite these uncertainties, there is frequent mention in the academic literature and reports about how "Africans will have the ultimate say in when and how these technologies will be used" [Patrão Neves & Druml, 2017]. Assertions have also been made that decisions about gene drives were in the public and Africans' hands [Hartley et al., 2024].

Although contributions to science debates in the media have become more pluralistic and now include a wider range of voices [Schäfer, 2008], scientists maintain considerable influence over what is being said about science and how [Bubela, 2004; Nelkin, 1987]. This is because scientists remain a primary source of scientific information in the press [Peters, 2013; Hartley et al., 2024] and they use the media to advance their political agenda, especially during controversies [Brossard, 2008]. This influence is compounded by pressures on scientists to strategically use the media to disseminate their findings and demonstrate the social relevance and responsible conduct of their research [Nerlich & McLeod, 2016; Weingart, 1998].

The media are a crucial channel through which public issues are framed, serving as the focus of intense lobbying and acting as an arena within which policy struggles are defined and played out [Terry, Yang, Yao & Liu, 2023; Fischer, Barata, Scheu & Ziegler, 2024]. They can also have a demonstrable, although not predetermined, impact on how we think [Kitzinger, 2000; Petersen, 2002]. How scientific/medical issues are represented in the media is thus an important area to study when examining the battle both for public opinion and for legislative change. Public debates about novel and contested technologies such as gene

drives usually revolve around the issues of risk and ethics [Kastenhofer, 2009], two prominent lenses alongside that of benefits through which technologies are given a particular meaning [Bogner & Torgersen, 2014].

This practice insight is meant to support stakeholder engagement in Africa where several teams are already working towards developing novel gene drive-based tools for controlling populations of malaria vector mosquitoes. Public engagement activities are meant to ensure that development of these novel tools take place with the agreement of communities, and that these communities should be able to play a role in shaping the eventual outcomes that are in line with the community needs and concerns [Dicko et al., 2024]. A study in Uganda has demonstrated that local stakeholders are able and willing to contribute relevant and important knowledge to the development of risk frameworks. The authors also argue that if Ugandans are to have a role in decision-making about gene drives, they need access to more information about this technology [Hartley et al., 2024].

The African Genetic Biocontrol Consortium (herein referred in text as the Consortium) was established as an agreement among member organizations committed to contributing and expanding African self-determination of the course of research, development, and use of Genetic Biocontrol approaches for animal, and public health and for conservation of wildlife and the environment in Africa. The Consortium was officially launched on November 30, 2020, by not-for-profit member organizations based in Africa that included the Africa One Health Network, Africa Biological Safety Association (AfBSA), The Multilateral Initiative on Malaria (MIM), Network of African Science Academies (NASAC), Pan-African Mosquito Control Association (PAMCA) and the GeneConvene Global Collaborative. The goal for establishing the Consortium is to provide a platform for interaction for public good among experts, scientists, product developers, policy makers, universities, research organizations and other stakeholders, promote sustainable training and capacity building programmes, knowledge exchange on the science, development, use, and communication during development and decision-making of genetic biocontrol approaches in Africa.

Since its inception, the Consortium has been providing webinars, workshops, and courses to support the science journalists, communicators, and scientists to effectively communicate science to the public. Evidently, the development of GMOs, and use of other biotechnological tools, has been associated with communication challenges including misinformation. Therefore, as a platform for interactions, recommendations from these trainings informs the Consortium to better understand public engagement in relation to the use of genetic engineering and genetic biocontrol approaches which include gene editing, gene drive technologies and use of synthetic biology for public health, including for the control of vector-borne diseases in Africa. It is hoped that these efforts will lead to an increase in the number of people with sufficient knowledge and understanding to be able to communicate genetic biocontrol. They will, in turn, promote communication tools and practices to a variety of stakeholders and collaborators that advance best practices and informed decision-making for development of genetic biocontrol technologies to improve animal, public health and conservation of wildlife and the environment in the continent.

Early 2023, the government of Kenya came up with a directive to lift a ten-year ban on planting and the importation of GM food products into the country. This triggered a lot of enquiries to the Consortium from the media and the science communicators asking for a training on GMOs and other GM biocontrol technologies including gene drives, synthetic

biology and genome editing. The Consortium in partnership with African Institute for Development Policy (AfiDEP) and Kenya's National Biosafety Authority (NBA) collaboratively hosted a training workshop *"GMO 101 Course for Journalists and Science Communicators"* for Kenyan science journalists and communicators themed *"understanding the basic science, field trials and deployment of genetically modified organisms (GMOs)"*.

On completion the GMO 101 course, the participants came up with a communique which emphasized a call to promote and advocate for increasing funding at national and regional levels for training of journalists and science communicators, with a focus on existing and emerging biotechnologies; enhancing public participation, biosafety communication, awareness, and sensitization programs on GMO issues among various stakeholders; and ensuring unbiased coverage, including positive stories while avoiding sources that are likely to promote misinformation on GMO issues to the public.

As a result of the publication of the communique on the Consortium website and in the weekly newsletter, requests were received from journalists and scientists from other African countries for similar courses to be held in their countries. To accommodate all these requests, the Consortium responded by providing a pre-conference course on "communicating the uncertainties associated with emerging biotechnologies" during the 1st Global Congress on New and Emerging Genetic Biocontrol Technologies that took place in Nairobi between August 28 to August 29, 2023.

In this practice insight, we review the outcomes from workshops and courses hosted by the African Genetic Biocontrol Consortium aimed at equipping communicators and journalists with skilful techniques to proficiently articulate the uncertainties associated with genetic biocontrol interventions to the African public. In this Practice Insight we discuss the gaps and provide insight on how communicators can address some of the basic challenges of developing effective communication and decision-making for genetic biocontrol approaches in Africa.

2 ▪ Methods

The Consortium held 2 public face-to-face events in 2023. The first workshop featured a course in GMOs where knowledge for both the journalists and the scientists was shared on how to effectively communicate and strengthen the understanding and communication on GMOs. The main goal was to share key tools and techniques that support and build competence in communicating research, field trials and deployment of GMOs and emerging technologies (e.g. Gene drives/editing and synthetic biology) to the public in the African continent. The second event was a congress. Within this event, a pre-conference activity on communication was embedded. Topics covered uncertainty aspects of emerging biotechnologies considering the social, economic, and cultural aspects of the communities. The Consortium events were tailored such that stakeholders involved in disseminating scientific information in a form that is comprehensible to all who took part.

2.1 ▪ *GMO 101 Workshop for Journalists and Science Communicators*

A training workshop, *"GMO 101 Course for Journalists and Science Communicators"* for Kenyan science journalists and communicators was held. It was themed, *"Understanding the basic science, field trials and deployment of genetically modified organisms (GMOs)"*.

In the GMO 101 course, attendees were 76.4 % journalists and 23.8% scientists with a balanced 50% representation from each gender. The age brackets for participants were between the ages of 30 to 45 years respectively.

Scientists from research institutions and universities who work in the field of genetic biocontrol and regulators from NBA and other regulatory bodies in Kenya, were invited to facilitate the course. To attract the journalists to the course invitation letters were send out to all the media houses by email and official letters. Social media channels were also used to attract freelance journalists. Nominees from the media houses were invited and given information on the venue and the training programme. A total of 20 nominees were received out of which 11 were females and 9 males. Course participants for the GMO 101 Course were experienced journalists working in Kenya (including foreign as well as local media groups) who report on science, particularly in the areas of health, agriculture, and environment.

The GMO 101 course attracted individuals from 12 different local media outlets and two foreign (BBC and Xinhua) and scientists from 3 institutions. Distinguished scientists and experts in biotechnology, plant science, and regulation on GMOs shared their knowledge and experiences with the participants. Also in attendance were representatives from the Kenya Editors Guild and the Media Council; a regulatory body that oversees media in the country.

The Workshop was divided into one-hour sessions each consisting of a mixture of short presentations and panel discussions, provided by carefully selected experts from various fields, and hands-on group exercises performed by all participants to provide practical experience and further insight into the issues highlighted in the presentations.

The Workshop began by providing the basic introduction on genetically modified organisms (GMOs), and emerging biotechnologies which included gene editing, gene drives and synthetic biology. Thereafter, sessions discussed how GMOs are governed through international, regional, and national frameworks and initiatives currently in place for GMOs. Case studies were provided on regulatory perspectives governing laboratory sciences, Institutional oversight, facility required during research, risk assessment methodologies, field trials, public engagement, and deployment. Issues related to concerns on human and animal health, environment and biodiversity were also addressed. Other sessions included discussions on ethics of science communication, the procedures for registration, testing, commercialization, and post-release monitoring of GMOs.

Journalists and the scientists were also given an opportunity to share experiences on where they can get reliable information, and how they can work together by providing suggestions on how to communicate effectively to the public as well as how to write persuasive opinion pieces about matters of broad concern emanating from the scientific and publication on GMOs.

As a practical activity, the participants were grouped into groups of five each drawn from 1 scientist, 1 journalist from the print media, 1 journalist from the TV sector and 1 communication practitioner from a research organization. Groups were given 3 hours to develop a story on issues related to GMOs for evaluation by senior journalists from the Kenya Guild and the Media Council of Kenya. The Kenya Editors' Guild is the professional association for editors in Kenya, including senior print, broadcast and online editors, and scholars of journalism and media studies. The association promotes quality and ethical journalism through improvement in the quality of journalism through active support of

education and training. The Media Council of Kenya is an independent national institution established by the Media Council Act, No. 20 of 2013 for purposes of setting of media standards and ensuring compliance with those standards as set out in Article 34(5) of the Constitution and for connected purposes. One of the main aims of the Media Council in Kenya is to improve professionalism among journalists as it ensures that all accredited journalists have the right skills to carry out their duties.

On completion of the Workshop participants were given a questionnaire using google forms to comment on how the course has impacted their know-how by rating their understanding of GMOs and emerging biotechnologies, awareness of ethics and on regulatory issues.

2.2 ▪ *Pre-conference course on communicating the uncertainties associated with emerging biotechnologies*

The Consortium provided a pre-conference course on communicating the uncertainties associated with emerging biotechnologies during the 1st Global Congress on New and Emerging Genetic Biocontrol Technologies that took place in Nairobi between August 28 to August 29, 2023. The Preconference Course drew participants from various countries in Africa which included Kenya, Uganda, Ghana, Burkina Faso, Mali, and Cameroon. Participants included science communicators (23), scientists and researchers (5), and policy makers (3).

The course was a duplication of the GMO 101 course however it was presented from the African context. Overall, the course was aimed at encouraging science communicators, journalists, and scientists to reflect critically on the social, historical, cultural, and ethical dimensions of science. Further, the Course provided an opportunity for the participants to interrogate innovative communication approaches that could address gaps in communicating GM biocontrol technologies, explore how to develop key messages and appreciate the impact of official communication, mainstream and social media in the public exchange of scientific information between experts, policymakers, journalists and social media platforms, non-experts and influencers during the development of GM biocontrol products using engineered gene drive mosquitoes as an example.

Practical sessions on Identifying biosafety concerns for different target groups which include farmers, media, consumers, industry, researchers, and policymakers were provided. Mock media interviews and role play, playback, and effective media etiquette were also provided.

On completion of the Workshop participants were given a questionnaire using google forms to rate and comment on how the course has impacted their know how by rating their understanding on basic science of gene drives, principles of risk communication, identifying biosafety concerns, developing message maps and effective media interviews.

3 ▪ Results

3.1 ▪ *Possible interplay of key events between the various stakeholders on genetic biocontrol*

As a way of delivering scientific information on genetic biocontrol tools in a way that the public can easily understand and action upon at the same time, the Consortium endeavours to break the communication barrier between scientists and journalists. Our simplified

theoretical framework (Figure 1) captures the possible interplay of key events and how the same augments to the objectives of the Consortium. This interplay shows dynamic

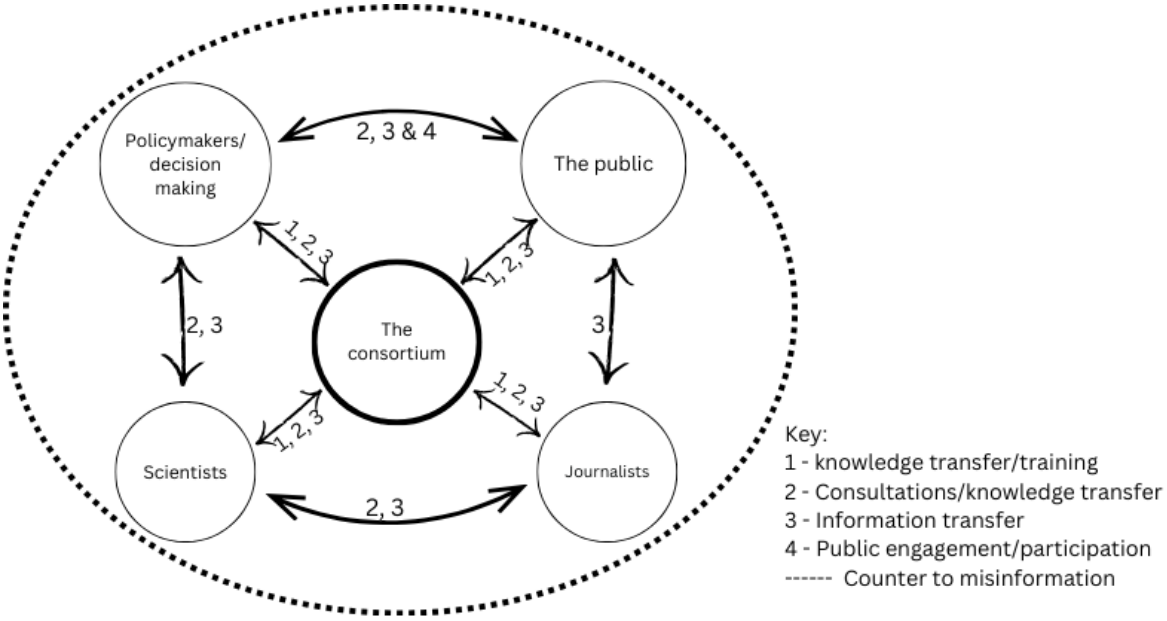

Figure 1. Collaborative knowledge dissemination framework: The conceptual interplay between stakeholders in mitigating concerns about genetic biocontrol.

interactions between key stakeholders: the journalists, the public, scientists, policymakers, and the Consortium. The Consortium acts a central go-between that facilitates interactions (1, 2 & 3) with all the stakeholders. The Consortium transfers knowledge through training and capacity building efforts, support information and provides consultancies to decision makers/policy makers, journalists, publics and scientists and in turn receives feedback and communication (2) from these stakeholders during trainings and through the social media. The decision/policy makers receive knowledge and information from scientists (2), the public and journalists (3) during policy development and during public engagement and participation (2 & 4). Overall, this network of scientists, the journalists and the public enable the Consortium promote communication tools and practices to a variety of stakeholders and collaborators that advance best practices and informed decision-making for development of genetic biocontrol technologies to improve animal, public health and conservation of wildlife and the environment in the continent.

3.1.1 ▪ *Personal drivers*

Questionnaires were sent out to participants before and after the course. Responses from journalists and science communicators who attended the GMO 101 course indicated that they were driven by their need for effective communication, and an opportunity to connect with scientists. Responses also indicated that there was a very strong need (100%) among science communicators and the journalists to develop effective media communication in science related matters.

During the pre-conference course, seven out of eight (87.5%) of the respondents indicated a desire to improve on their developing message maps; while five out of eight (62.5%)

indicated a desire to learn more about risk communication. Journalists and communicators with experience in science communication also indicated that they were driven by their need for effective communication, and an opportunity to connect with scientists.

Responses from all the twenty (20) scientists interviewed (100%) during the GMO 101 course and 5 scientists who attended the pre-conference course indicated that scientists wanted to effectively reach many people with their research.

3.1.2 ▪ *Collective objective*

Practical sessions and group activities during both the GMO 101 and the preconference course brought a feeling among the participants that there was sufficient awareness among the journalists and scientists on how to communicate GMOs related to crops. However, there is need for more awareness and understanding on all matters relating to communicating GM biocontrol tools and products amongst both the scientists and the journalists. There was a strong call to the Consortium to consider in order of priority to initiate more elaborate training programmes to both journalists and the scientists on emerging biotechnologies which are relatively new in the African region.

3.2 ▪ *Rationale for attendance*

Responses from participants who attended the GMO 101 and the preconference course indicated that their interest was centred on comprehending the fundamental scientific principles, regulatory and decision-making processes, risk communication, field experiments, and deployment of genetically modified organisms (GMO) and were primarily motivated by personal development. On completion, one respondent after the GMO 101 Course commented: *"…the trainers, they were really good and knew what they were doing*." This is also a positive finding since empathy with the trainer supports the success of the training.

3.3 ▪ *The impacts of training*

The objective of the courses was to equip the participants with adequate knowledge and information on GMOs on the fundamental scientific principles, regulatory and decision-making processes, risk communication, field experiments, and deployment of genetically modified organisms (GMO) and genetic biocontrol technologies. During the Couse, we used a polygon that has scores of 25%, 50%, 75% and 100% to indicate the level of understanding for a topic under consideration.

A notable testimonial shared by one participant upon completion of the training was:

> *"Now it is easy for me to tell people when communicating, what are GMOs, what is synthetic biology, you know all those things that people don't understand, and making people understand how technologies on GMOs work because I feel that's a gap that has been there and all we thought or knew is that GMOs are bad for your health. But now with the facts availed from the trainers in the last 3 days, it's easy now to tell stories that will change the perspectives of people".*

Another participant also remarked:

> *"My expectation of meeting scientists was met, my expectation of also learning from other journalists was met, and my expectation of also learning about regulation was met which is also very intriguing. Let science speak so that it's not opinion, it's not conjecture and that's the beauty, in the end science will win."*

Overall, on completion most of the participants felt that the course had helped them to improve their understanding of GMOs and emerging biotechnologies, awareness of ethics and on regulatory issues (Table 1). It can be concluded from the survey finding, that journalists who participated in the training exhibited high level of understanding in reporting of this technology stories.

Table 1. Survey findings of the GMO 101 Course.

GMO 101 Course Concern	Comprehension of the topic (%)	Pre-test score (%)	Post-test score (%)	t-test
a) Understanding of tissue culture and GMOs	0	9.5	0	p-value = 0.003 CI = [8.770, 31.21]
	25	38.1	7.1	
	50	4.8	21.4	
	75	19	50	
	100	28.6	21.4	
b) Understanding of emerging biotechnologies (e.g. gene drives)	0	23.8	0	p-value = 0.0008 CI = [10.80, 29.20]
	25	33.3	14.3	
	50	19	28.6	
	75	4.8	42.9	
	100	19	14.3	
c) Awareness of science ethics	0	14.3	0	p-value = 0.006 CI = [7.288, 32.67]
	25	33.3	0	
	50	14.3	7.1	
	75	19	57.1	
	100	19	35.7	
d) Confidence in your country to regulate GMOs	0	0	0	p-value = 0.005 CI = [7.667, 32.29]
	25	14.3	7.1	
	50	33.3	7.1	
	75	19.0	50	
	100	33.3	35.7	
e) Knowhow of the national regulatory framework and decision-making on GMOs	0	0	0	p-value = 0.009 CI = [6.319, 33.66]
	25	28.6	7.1	
	50	33.3	0	
	75	23.8	57.1	
	100	14.3	35.7	

Overall, t-test analysis using R version 4.4.0 showed that the course led to an improvement in understanding of GMOs and issues of concern during communication (all course concerns

registered a p-value < 0.05). Also, during the post course analysis, participants also expressed reduced fears in areas where they had scored less than 50% during the pre-course analysis.

Initially, reporting on GMOs was perceived to be a challenge among those who took part in the course. Some of the reasons given for such difficulty included: conflicting information on the safety of the GMOs; lack of necessary knowledge of the GMOs among those reporting; lack of access to experts who can dissect topics on GMOs; perception of topics on GMOs in the public domain; and hinderance by scientific jargon.

Analysis of the performance of the pre-conference course participants is given in Table 2. Overall assessment of the pre-conference course showed that the course was informative (62.5%), the trainers performed excellently (50%) in equipping participants with knowledge to promote professional development and the expectations of the participants were met after attending the courses (100%). Topics that included identifying biosafety concerns (75%), developing message maps (87%) and effective media interviews (100%) were shown to be more interesting.

To improve on reporting, the participants highlighted the need for training on new and emerging biotechnologies, access to experts on GMOs, access to journals and case studies on the subject, and availability and access to timely, non-conflicting data on GMOs and genetic biocontrol technologies.

Table 2. Findings relating to the indicated items of the survey against the number of respondents.

Outcome of attending events	Assessment	Responses	Percentage
Overall assessment of the pre-conference course (1=not informative, 5 = informative)	4	3	37.5
	5	5	62.5
Pre-conference course you found interesting;	Basic science of gene drives	5	62.5
	Principles of Risk Communication	5	62.5
	Identifying biosafety concerns.	6	75
	Developing message maps.	7	87
	Effective Media Interviews.	8	100
How the trainers performed in equipping participants with knowledge to promote professional development	Very good	4	50
	Excellent	4	50
If expectations were met after attending the courses.	Yes		100

During the GMO 101 course, journalists who participated in the workshop were tested viva voce, through group reporting on a topic and through mock tv presentations with senior journalists.

To achieve this the participants were divided into four groups of five people per group to discuss innovative methods for science communication, and to assess how they deal with fast-paced environments, and what they're capable of under pressure and working within a team. Each group was given leeway to be creative on their mode of presentation in the form of a TV, radio, podcast or print and use their preferred language to determine what is best for their audiences. The objectives of this activity were to get people to talk about innovative methods for science communication; and to see how people deal with fast-paced environments, and what they're capable of under pressure and working within a team. It was hoped that by the end of the group activity, there's a high chance the winning teams(s) will have created a minimum viable method for carrying out media conversations on GMOs in future. At the very least, they will have obtained fresh new ideas and features that can take away and get to work on after the Course. A team of judges comprising the two journalists from the Kenya Guild and the Media Council, respectively, together with a regulator from the National Biosafety Authority (NBA) and a media personnel from AfIDEP and a staff from the Consortium who were part of the trainers were picked to evaluate their work. The evaluation criteria included how the groups project has communication value, realistic and whether the team(s) innovated to build this communication tool/ideas/product.

The outcomes of the practical sessions were assessed based on the value attached to the respective communication style, how real they were, and innovativeness exuded by the participants. From this group activity, the participants were able to create communication messages and dialogue processes about GMOs applicable to various audiences. The outcomes of the practical session are given in Table 3 below.

Results from the practical session showed that the presentations were original and impactful, although a few were less innovative in their problem-solving approaches. The youth is always the forgotten group in most policies, especially in Kenya. Nonetheless, the two-way approach of social media and GM education app to reach out to them addressed a significant gap and proved its novelty and practicability. It also suggested a long-term possibility for these solutions to mutate into an all-inclusive educational programme for this group and beyond.

The radio, as a medium of communication, is broad as it is a passive way to pass out a message, ensuring it gets heard. The group disseminating their message through radio did well reaching out to their audience, but less innovative compared to the digital alternatives given that radio has always been used as a means of communication.

The group advocating for communicating through podcasts was original, clever and innovative, fostering engagement and sustainable advocacy.

Overall, all the groups showed innovativeness and offered pragmatic solutions to communicating the GMO question. However, the proposal on breaking the communication barrier using podcasts targeting the youth outperformed the rest due to its impactful nature. Although the social media modality is digital and current, the lack of specific audience can make it less impactful among older populations who are not mostly on social platforms. Notwithstanding these communication dichotomies, the collective outcomes indicate a promising future for communication strategies, effectively combining traditional and modern media to address misinformation and improve public understanding on GMOs.

Table 3. Group presentations and mode of communication after the group exercise.

Group #	Project Overview	Mode of communication
Group 1	*Coming out of the GMO Closet:* This is a story that will track the development of Bt maize all the way from the laboratory at the Kenyatta University, to the field trials in Kitale in the Great Rift Valley and to the consumers. Target: Farmers and consumers	Social media
Group 2	Breaking communication barrier to counter biotechnology misinformation in Kenya: 86% of Kenyans are aware about GMOs but 60% do now know what GMO entails while at the same time 3.5 million Kenyans are facing a hunger crisis. Misinformation about GMOs is therefore rife in Kenya and young people are often left out. Target: Gen Z	Social media and GM Educational App
Group 3	Back to the roots: The debate on GMOs is gathering momentum following Cabinet's lifting of the decade long ban. Many Kenyans from different regions are finding it difficult to accept and embrace GMO food even when it could mean an end to the country's perennial food insecurity problem. More than four million Kenyans are currently in need of relief food due to the biting shortage but people from different regions would rather face starvation rather than eat GMO maize. While there is resistance, there are a few of whom are ready to embrace GMO food, noting that it could come in handy to address the issue of food scarcity. Target: Mass audience	Radio
Group 4	Debunking the myths of GMO: We aspire to inspire champions who will counter misinformation and disinformation about GMOs and biotechnology. This champion will be from our audience and for our audience. We will also look for the most active among our audiences and reward them. Target: Farmers, the general public, The political class	Podcast

3.4 ▪ *Challenges identified on communicating genetic biocontrol technologies by the scientists, researchers, and product developers.*

With the progression of emerging biocontrol technologies, such as gene drive for mosquito control, which are currently being considered in five African countries; Burkina Faso, Mali, Ghana, Tanzania and Uganda. There is an increasing demand on scientists to communicate, to be involved in public dialogue and debate, to make science part of an integrated culture demands for which they are ill-prepared by their formal training. As highlighted by Dudo and Besley [2016], there is a need for communication trainers to help scientists select specific communication objectives for contexts and audiences.

During group discussions, scientists participating in the workshops and courses expressed anxieties regarding effectively communicating emerging biotechnologies. They particularly emphasized the importance of cultivating skills such as nonverbal communication, logical consistency, brevity, and lucidity to conduct interviews with finesse. In addition, they

acknowledged the value of building and sustaining relationships with journalists. Moreover, the scientists voiced a desire for support, mentoring, and training to enhance their aptitude in disseminating information about their research.

To overcome this challenge, participants recommended that there is a need for media orientation for scientists before and during media interviews. There is a need to conduct a media etiquette training for scientists on how to respond to journalists' questions. Additionally, journalists and communicators should posses the knowledge of constructing effective questions that can provide them with impartial and equitable responses from scientists, aiding them in composing a comprehensible narrative.

These findings highlight the need for greater strategic direction by the Consortium to continue providing training programmes, with greater acknowledgement of the needs of both the scientists, the journalists and science communicators.

3.5 ▪ *Challenges identified on communicating genetic biocontrol technologies by science communicators and journalists.*

During group discussions, the challenges expressed by science communicators and journalists in conveying emerging biotechnologies, during the workshop and the preconference course, included: lack of understanding of the concepts used in defining emerging biotechnologies, their potential applications, ethical considerations, and the technical aspects involved; regulatory and decision-making processes; how to develop key messages from scientific jargon; public perception and negativity to genetically modified products; and access to experts, reports, and research. They also noted that the relationship between scientists and the media is distant at best. Scientists don't trust journalists; journalists find scientists stiff and condescending. Yet they both need each other.

Observations from the Workshop participants indicated that scientists often disseminate their findings once the process is complete and as such most journalists and communicators also do not understand the scientific process. To address this gap there is need to develop a database of scientists and journalists who can communicate adequately on issues of scientific and genetic biocontrol. A database of frequently asked questions (FAQs) containing information from researchers and scientists that can reach a wider audience in Africa is also important. Translation, interpretation, such as a database with specialized science terminologies, addressing diverse cultural backgrounds and local languages is required. Addressing these challenges will strengthen understanding and inclusion of journalists in the scientific process. Increased knowledge on the science behind genetic engineering and other emerging biotechnologies, terminologies and their regulatory and decision-making processes will be useful to journalists and communicators to write better and more informed stories. Key messages originating from and an informed journalist may influence how the development of GMOs and related products take place with the agreement of communities where these products are tested or consumed, and that these communities should be able to play a role in shaping the eventual outcomes that are in line with the community needs and concerns.

The two workshops provided a platform for journalists and scientists to socialize and exchange contacts, this helped in building rapport between the two parties. At the end of the

day, it was agreed that the two groups need each other for coexistence with both parties agreeing on a mutual relationship moving forward.

3.6 ▪ *Gaps identified on communicating genetic biocontrol technologies science communicators and journalists.*

Like the scientists, there are new pressures for the media as the channels of communication through which the public gains insights into new science and technology to relay scientific information in a simplified and yet coherent manner. The demands on journalists and broadcasters are also mounting. Ashwell [2014] observes that science communicators are expected to be more knowledgeable about science but less involved; they should be more supportive and more critical.

One crucial point that came out during the Courses was the lack of beat journalism in media houses directed towards science reporting. Most journalists lack reputable sources to provide them with information that is factual to report science. Translation, interpretation, science database with specialized science terminologies, and local radio interviews may be used to solve this problem.

It was also observed that there is a lack of investigative journalism when it comes to science stories. There is a need for training in investigative journalism in science coverage. Journalists need to check all the facts before filing or publishing a story besides studying their audience before conveying the message. While echoing the National Academies of Sciences, Engineering, and Medicine [2017] finding, Humm, Schrögel and Leßmöllmann [2020] also concluded that factors such as language, cultural background, and the mode of messaging largely affects how the message is received by the audiences.

A long-standing bottleneck to science communication has been journalist's and communicator's lack of understanding and inclusion in the scientific process [Canfield & Menezes, 2020; Royal et al., 2020]. It has also pointed out that misinformation on science topics can happen due to lack of information or lack of access Medvecky and Leach [2019]. Journalists who attended our workshops argued that scientists rarely communicate their findings to journalists and when they do, it is either too late, or the news has perished, or there is scarce information to go by or come up with a news item, or the journalists do not know where to access these findings. These gaps affects the message outcome on reporting research findings by journalists and communicators in the long run.

3.7 ▪ *Recommendations from science communicators and journalists towards improvement in communicating genetic biocontrol technologies.*

The challenges and gaps observed during the trainings highlight the need for greater strategic direction by the Consortium and other stakeholders to continue providing training programmes, with greater acknowledgement of the needs of both the scientists, the journalists and science communicators. Therefore, increased knowledge of the science behind genetic engineering, and other emerging biotechnologies, and terminologies through the Consortium and other stakeholders will be useful to journalists and communicators to write better and more informed stories.

3.7.1 ▪ *The need for building networks*

One of the objectives of both the workshop and the preconference course was to establish networks as one participant remarked; *"Being able to have created networks that will allow me to engage more stakeholders within the conversation, then that would make my stories more complete and allow me to tell quality stories to my audience"*.

Considering the aforementioned workshop events, the participants committed to work towards the establishment of a Forum that will promote continuous engagement and partnerships between journalists, scientists, science communicators and other stakeholders. Towards this goal the Science Communication (SCICOM) Forum housed by the Consortium was established. This will create a common approach to providing a better understanding on GMOs and their regulation, and on emerging biotechnologies which include gene drives/editing and synthetic biology techniques; promote and advocate for an increase in funding at national and regional towards training journalists and science communicators with a focus on existing and emerging biotechnologies.

It is also crucial to focus on advancing public engagement, effective communication on biosafety measures, awareness, and sensitization programs concerning GMO issues amongst assorted stakeholders. This approach will ensure that coverage is peer-reviewed, inclusive of positive stories while attempting to steer clear of any sources that might potentially create misinformation regarding GMO issues, which could be detrimental to public understanding.

3.7.2 ▪ *Involving more scientists in science communication trainings*

Through the workshops and the preconference course, it was clear that most scientists do not know how to address questions asked by the public and journalists as well. 15 out of the 20 (75%) scientists who participated in the preconference course indicated that they were ill equipped to communicate the science in a simplified manner that the public can understand. One of the other challenges that came out in communication was the use of science jargon that affect how the message is relayed to the public or the journalists themselves. Consequently, it is imperative that communication training be integrated into the early stages of a scientist's career. To avoid misconceptions resulting from misleading information, it is crucial that publications and key messages from the scientists are presented in a simplified manner. This will go a long way in bringing understanding of the scientific process and avoiding myths that come with fake news and misleading information. Scientists should also be willing to carry out interviews to clarify information from journalists and other communicators.

To address this gap there was a strong recommendation for the Consortium to develop frequently asked questions (FAQs) in several languages to address diverse backgrounds and local languages.

3.7.3 ▪ *Providing access to journalists on science database and information*

A major recommendation coming out of the preconference course focused on bridging the gap on information. Lack of access to scientists among themselves and a science database should be a priority to help science communicators and journalists report the correct information. One of the recommendations and findings that came out was to have a

database of contacts from scientists who would be willing to participate in radio and tv interviews for science-based news and publications. A database of scientists and their areas of expertise should be made accessible to science communicators and journalists. To address this gap there was a strong recommendation for the Consortium to develop a registry on the website featuring a database of scientists with their contacts and an update of new peer-reived publications and other information.

3.7.4 ▪ *Lack of sufficient knowledge from the public regarding the benefits of genetically modified organisms*

A lack of sufficient public knowledge regarding the benefits of GMOs.Given that GMOs are relatively new technologies, it was clear from the GMO 101 workshop and the preconference course that the awareness levels are low not just for the journalists relay the information to the pubic but also to the consumers who should be aware of the modern biotechnology tools they interact with daily. To overcome this, the participants recommended that there is a need to provide objective information about GMOs through TV documentaries, feature stories, podcasts, and online platforms.

3.7.5 ▪ *Misinformation on biotechnology, especially about GMOs*

A major part of the preconference course was the opportunity to explore the barriers to good science communication, coverage, and representation in the media. Most of the issues identified around media coverage of science include: a) reporting of fake news surrounding science; (b) misinformation on science topics due to lack of information or lack of access; (c) lack of professional investigative journalism around science matters; (d) understanding the basic science and field trials; and (e) lack of capacity to understand and critique science; (f) lack of transparency between scientists and journalists; (g) how to humanize science stories for the publics; (h) lack of a dedicated database on science findings and research process.

While some of the issues raised above require much more than a single intervention, there are some activities that can help improve the quality of communication and information dissemination through training journalists, science communicators and scientists in Kenya and Africa as a whole. Some of the interventions identified include: (a) making curriculum available to guide training on topics that include basic science, principles of journalism, key messaging and ethical standards; (b) providing guidance on interpretation of data science; (c) providing background policies, laws and regulations; (d) working with schools of journalism to incorporate science modules in their curricula (the materials and findings for this course could easily be adapted for such activities); (e) providing journalists with access to good science communication resources including scientists who explain the basics of the scientific process; (f) providing training in investigative journalism and its relationship to science; and (g) supporting networks for science journalists to share skills, challenges and experiences.

3.7.6 ▪ *Myths surrounding GMOs*

Attendees acknowledged a significant public misunderstanding of science and its reporting, typified by the proliferation of fake news pertaining to scientific matters, inaccuracies in

scientific information resulting from insufficient information or limited access, and inadequate investigative journalism in this domain. These issues with exacerbated by other factors including a flawed public and media comprehension of fundamental scientific principles and trial processes, as well as a deficiency in the capacity for media and science communicators in Africa to interpret and scrutinize scientific developments effectively. To address this gap, participants called for greater precision and continuous training to equip media and science communicators with the basics of science needed to report adequately.

3.7.7 ▪ *Establishment of Science Communication (SCICOM) Forum*

Following the workshop and the preconference course, the Consortium has established a Science Communication Forum (SCICOM). The objective of SCICOM is to provide a platform for interaction among journalists and scientists, to enhance opportunities for knowledge exchange and deliberation on issues related to genetic biocontrol technologies. This platform aims to ensure that accurate information reaches wider stakeholders in an efficient manner. SCICOM seeks to encourage, support, and promote the training of scientists, journalists, and science communicators to strengthen their skills towards performing their role in informing the public on science and science technology matters, especially on genetic biocontrol projects. Membership to this Forum is open to all professionals which include scientists, researchers, journalists, communicators, policymakers and regulators from the media industry, government, academic institutions, and the private sector and non- state actors that are interested or currently engaged in the areas of media, emerging biotechnology, biosafety, and related fields in Africa.

4 ▪ Discussion

This study sought to identify issues surrounding communicating uncertainties associated with genetic biocontrol approaches in Africa during workshops. The subject of genetic engineering is a highly technical one, and is also highly charged, due to the polarized communication around this subject. Early studies on the public understanding of biotechnology, prior to or contemporary with the commercial deployment of transgenic crops, showed a lack of information about it, especially regarding food and agricultural biotechnology, resulting in a negative reaction to the technology [Harlander, 1990; Frewer, Shepherd & Sparks, 1994].

Our study showed that the journalists and science communicators who attended the GMO 101 course indicated that they were driven by their need for effective communication, and an opportunity to connect with scientists and to develop effective media communication in science related matters. On the other hand, scientists who attended the courses wanted to effectively reach many people with their research, while others wanted to understand how to bridge jargon during communication. On completion most of the participants felt that the course was able to help them to improve their understanding of GMOs and emerging biotechnologies, awareness of ethics and on regulatory issues. Furthermore, all the attendees thought the courses met their expectations. Importantly, the courses were seen as useful and interesting by all participants, which is a positive finding of these trainings. These observations indicated that there is need for more awareness and understanding on all matters relating to communicating GM biocontrol tools and products amongst both the scientists and the journalists.

This Practice Insight indicates that there is a strong call to the Consortium and other partners to consider in order of priority to initiate more elaborate training programmes to both journalists and the scientists on emerging biotechnologies which are relatively new in the African region. Individuals who attended the GMO 101 and the preconference course centred around comprehending the fundamental scientific principles, regulatory and decision-making processes, risk communication, field experiments, and deployment of genetically modified organisms (GMO) were primarily motivated by personal development. Motivation is key to the success of training [Reece & Walker, 1997] and the fact that trainees undergo training with personal motivation is a positive sign [Silva & Bultitude, 2009]. Furthermore, all the attendees said the courses met their expectations. Importantly, the courses were seen as useful and interesting by all participants, which is a positive finding of these trainings.

Science conversation persists around the world over the development and use of GMOs. This study provides additional information to knowledge on how to bring scientists and science communicators together. Other studies analyzing the science communication views and practices of African researchers, and academics at the National University of Science and Technology (NUST) in Zimbabwe has been done [Ndlovu, Joubert & Boshoff, 2016]. Similarly, this study documented that science communication geared towards the public in sub-Saharan Africa is gaining ground and increasingly getting the attention of university administrators as well as research financiers

It has also been observed that bringing research and communication practitioners together is no easy task [Fischer et al., 2024]. Both fields are diverse, face their own challenges and are confronted with manifold developments in today's societies. As observed by Fischer et al. [2024], it is important to further reflect on how research and practice might come together in a way that is mutually beneficial and enriching to both alike. Through such conversations, the media will be empowered to continue playing a pivotal role in shaping and moulding public opinions on GMO issues related to health, science, and policy development [Du & Rachul, 2012; Ojanji & Otunge, 2017; Lukanda, Namusoga-Kaale & Claassen, 2023].

As observed in our study, discussions on GMOs have also been driven by emotions, misinformation, and conspiracy theories despite the availability of definitive scientific evidence [Pradhan et al., 2015; Querci, Van den Bulcke, Žel, Van den Eede & Broll, 2009]; that journalists and science communicators in media outlets, including those in institutions as well as social media, continue to be polarised on modern science matters worldwide including GMOs, gene drives, gene editing and synthetic biology techniques [Iyengar & Massey, 2018]. It has also been noted that the traditional approaches in journalism and science communication have been largely ineffective in navigating public perceptions towards more scientifically informed views [Varner, 2014], like vaccination, seed systems and climate change. Therefore, disagreements in the media are testimony to the fact that science has a role in determining the way society is governed [Lukanda et al., 2023; Horst, 2005]. Hence, the apparent dichotomy between scientists, journalists, and science communicators demands that novel approaches and tools are developed to report, interpret, and promote public acceptance of scientific findings.

As observed in our study, the media serves as an important platform for disseminating, reflecting, shaping public perceptions, and influencing policy developments about new technologies such as GMOs [Ojanji & Otunge, 2017]. However, viewpoints expressed by

African journalists indicate that GMO issues are under-reported compared to politics, health, economics, and art coverage, contributing to the general public's limited understanding of the subject [Ojanji & Otunge, 2017]. Media can 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.

The media has a key role in creating this awareness, education and understanding of modern agricultural biotechnology [Maeseele, 2007]. There is a consensus that although the mass media cannot unilaterally bring about change in knowledge and opinion, they are important agents in the process of reinforcing public perceptions and, ultimately, influencing and shaping public attitudes. For this to happen, the National Academies of Sciences, Engineering, and Medicine [2017] concludes that the reporting must be satisfactory, impartial, objective, and scientifically accurate. The media has not only been recognised as the primary source of information on science and technology but also the preferred information source by consumers [Rubin, Chen & Conroy, 2015]. The media shapes the public's comprehension of technology, and at the same time provides the environment by which public opinion is formed, about what is often perceived as a controversial, if not a contentious issue.

An analysis of biotechnology coverage in Kenyan and global newspapers between 2010 and early 2014 revealed a tendency for Kenyan news articles to highlight perceived benefits of the technology over risks. However, when risks were mentioned, there were more references to them than to benefits. As observed, issues of perceived risks and benefits, as noted by the Séralini study [Resnik, 2015], increased the likelihood that perceived risks are reported in Kenyan news, but not in international newspapers [DeRosier et al., 2015].

This practice insight also suggests that the media plays an indispensable role in providing people with the information necessary to make decisions about policy options and the potential risks and benefits associated with agricultural biotechnology. In addition, the media allows citizens to gauge the climate of opinion around them and facilitates consensus building. The intensity of media coverage on the topic, for example, can influence public opinion [Cantril, 2015]. Hence, media practitioners are key stakeholders in biotech communication as they set the agenda and tone for what the public deems interesting or important [Guenther & Joubert, 2017]. How the media portrays science in general and biotechnology, in particular, can have an adverse impact on how the public understands the topic and how policymakers craft policies.

5 ▪ Conclusions

Overall, our analysis suggests that although uncertainty exists about whether genetic approaches for malaria control and strategies will work, efforts to enhance the understanding of genetic engineering and biotechnology are needed, to assure that accurate information about this technology is disseminated in the media by science communicators including the journalists and the scientists.

This practice insight identified the gaps and provided valuable insights on how communicators can address some of the basic challenges of developing effective communication and decision-making for genetic biocontrol approaches in Africa. From this perspective, it can be concluded that, there is an increasing demand on scientists to

communicate, to be involved in public dialogue and debate, to make science part of an integrated culture demands for which they are ill-prepared by their formal training. On the other hand, increased knowledge on the science behind genetic engineering and other emerging biotechnologies, terminologies and their regulatory and decision-making processes will be useful to journalists and communicators to write better and more informed stories.

One of the observations from this practice insight is that the relationship between scientists and the media is distant at best. Scientists don't trust journalists; journalists find scientists stiff and condescending. Yet they both need each other. It can be concluded that these two groups need each other for coexistence with both parties agreeing on a mutual relationship moving forward.

Overall, this practice insight demonstrates that a network of scientists, the journalists and the public may contribute communication tools and practices to a variety of stakeholders and collaborators that advance best practices and informed decision-making for development of genetic biocontrol technologies in the African continent.

These findings highlight the need for all partners and stakeholders to continue providing training programmes, with greater acknowledgement of the needs of both the scientists, the journalists and science communicators. Increased knowledge of the science behind genetic engineering, and other emerging biotechnologies, and terminologies through the Science Communication (SCICOM) Forum established by the Consortium will be useful to journalists and communicators to write better and more informed stories.

Further research is necessary to consider the participation of the public that includes farmers and traders who support the value chain in future trainings. This will help to identify biosafety concerns and how their issues may be addressed from these stakeholders.

It is hoped that efforts to train scientists and journalists will lead to an increase in the number of people with sufficient knowledge and understanding to be able to communicate genetic biocontrol. They will, in turn, promote communication tools and practices to a variety of stakeholders and collaborators that advance best practices and informed decision-making for development of genetic biocontrol technologies to improve public health in the continent.

6 ▪ Limitations

The two events failed to consider some of the stakeholders. Representatives of the public that includes farmers, and traders who support the value chain did not participate. Challenges in communicating science would require diverse public representation. This will help to identify biosafety concerns and how their issues may be addressed from these stakeholders.

7 ▪ Recommendations for future research

The events conducted by the Consortium adds immense value to understanding concepts about emerging biotechnologies. It is therefore important to reinforce such approaches for an even greater impact and at the same time stakeholders should consider the following: Firstly, more events should be organized between the researchers and the public. The

researchers would be able to listen and understand the social context within which they operate, what people worry about, and what they need from science. Therefore, effective training in key communications skills is critical for successful public engagement. Secondly, as a culture ingrained in the society, provide formal and integrated platform, and equip scientists to communicate directly with the public through platforms such as debates and dialogues. Finally, empower journalists and communicators to be more supportive and critical by making them understand scientific information which they can then disseminate effectively.

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