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Experiences in sub-Saharan Africa with GM crop risk communication

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Experiences in sub-Saharan Africa with GM crop risk communication

Outcome of a workshop

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In tackling agricultural challenges, policy-makers in sub-Saharan Africa (SSA) have increasingly considered genetically modified (GM) crops as a potential tool to increase productivity and to improve product quality. Yet, as elsewhere in the world, the adoption of GM crops in SSA has been marked by controversy, encompassing not only the potential risks to animal and human health, and to the environment, but also other concerns such as ethical issues, public participation in decision-making, socio-economic factors and intellectual property rights. With these non-scientific factors complicating an already controversial situation, disseminating credible information to the public as well as facilitating stakeholder input into decision-making is essential. In SSA, there are various and innovative risk communication approaches and strategies being developed, yet a comprehensive analysis of such data is missing. This gap is addressed by giving an overview of current strategies, identifying similarities and differences between various country and institutional approaches and promoting a way forward, building on a recent workshop with risk communicators working in SSA.

Introduction

Due to an abundance of land and water, albeit unevenly distributed, sub-Saharan Africa (SSA) has a great potential for agricultural growth.[1] In 2008, the actual agricultural growth was measured at an annual rate of 3.5%, exceeding the rate of population growth by 1.5%. This agricultural output is impressive when it is recognized that 80% of African farmers are small-holders, owning less than two hectares of land. These farmers are especially vulnerable to agricultural challenges such as pest attacks, droughts or international and national agricultural market shocks.[1] However, at the same time, approximately 30% of the population in Africa is estimated to be suffering from chronic hunger, with 38% of children in SSA affected by chronic malnutrition.[1] In pursuing food security, African agriculture faces considerable challenges, amongst which are high food prices, climate change, population growth and the human immunodeficiency virus and acquired immuno-deficiency syndrome (HIV/AIDS) epidemic.[2]

Policy-makers from developing countries have increasingly considered genetically modified (GM) crops as a potential tool for increasing agricultural productivity. Amongst the 29 countries cultivating GM crops worldwide, 19 are developing countries.[3] Yet in SSA only two countries have approved the commercial cultivation of GM crops: Burkina Faso and South Africa. Nonetheless, the interest in GM crops appears to be growing, with up to six countries in SSA currently conducting confined field trials (CFTs) of GM varieties of locally-grown crops, including banana, cassava, cotton, cowpea, maize, sorghum, sweet potato and sugarcane.[4] At least 12 countries are conducting research in contained facilities, and at least 23 are developing research and development (R&D) capacity in GM crops.[5]

Amongst new technologies and products, the adoption of GM crops has raised considerable debate, notably well beyond scientific issues. As such, apart from the potential risk to animal and human health (toxicity and allergenicity) and to the environment (effects on non-target organisms, on weediness, etc.), other concerns such as ethical issues, public attitudes, socio-economic factors and intellectual property rights have also been raised. With these non-scientific factors complicating an already controversial initiative, disseminating credible information to the public of

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the risks and benefits of GM crops, as well as facilitating their input into decision-making, is essential. The public acceptance of GM crops in countries of SSA is divided, but generally, the more familiar the public is with biotechnology, the more they tend to hold a positive view.[6-14] Even when concerns of risks abound, there is great interest in the prospects that biotechnology can bring towards food security, agriculture improvement and economic gains, and also a great interest in obtaining more information on the subject.[6,8,12,14] Yet communication concerning the potential risks and benefits of GM crops has been perceived by various stakeholders in SSA as generally poor, and one of the main factors leading to the delay in approval for GM crops throughout the sub-continent.[15]

Along with risk assessment and risk management, risk communication is one of the major components of risk analysis and represents the "exchange of information and opinions concerning risk and risk-related factors among various stakeholders concerned with risk."[16] This view of risk communication as a two-way process represents a departure from the former, and in some ways arrogant, one-way transfer of information from "experts" toward an "uneducated" and hence easily-deceived public.[17] The role of risk communication should be to provide timely information and to improve communication amongst stakeholders, towards the enabling of decisions with a wider acceptance, preventing crises, assuring a greater implementation of resolutions, involving the public in decision-makings and building trust.[18] For successful risk communication, several guiding principles have been proposed: know your audience, involve scientific experts, establish expertise in communication, be a credible source of information, share responsibility amongst risk assessors for the outcome of the risk analysis process, differentiate between science and value judgements, assume transparency and place the risk in context.[19] Further, identified barriers to effective risk communication are typically institutional and procedural in nature (such as access to information and participation in the process) when considering the decision-making process, whilst regarding communication as a whole, differences in audience perceptions and receptivity, the lack of understanding of the scientific process, the credibility of the information source and communicator, the role of the media and societal characteristics all become equally prominent.[19] Furthermore, as examples brought by risk communicators in SSA will illustrate, the very choice of words for the concepts employed can prove to be contentious. As such, "risk communication" can point towards a fear-inducing subject with an emphasis on risk, instead of a more balanced "risk-benefit communication."

In SSA, information about the various innovative risk communication approaches and strategies being used is available in isolated locations, and opportunities for risk communicators to learn from one another are scarce. This paper aims to address this gap, to provide an overview of current strategies, identifying similarities and differences between country and institutional experiences (summarized in **Table 1**), as well as promoting a way forward for risk communication in SSA, building on previously published evidence, and the information and experiences generated from the Biosafety Risk Communication in sub-Saharan Africa workshop organized by the ICGEB in collaboration with the University of Mauritius and the Food and Agricultural Research Council, June 8–10, 2011, in Quatre-Bornes, Mauritius.

Risk Communication Strategies

Participation of stakeholders in decision-making and awareness-raising. Stakeholder participation in decision-making is a requirement of international treaties concerning the governance of biotechnology such as the Cartagena Protocol on Biosafety (CPB),[20] and it is beginning to be viewed more positively for publicly-funded biotechnology research.[21] It is notable that for many developing countries, implementing the CPB has been their first experience in participatory policy-making.[22] The justification for stakeholder participation varies, including the right of people to overview the spending of tax revenue, the potential to prevent conflicts between parties overtly for and against genetically modified organisms (GMOs), the possibility to gain early input from consumers and to contribute to better product development.[23-25] Although such participation may increase the cost of decision-making, it has been argued that it can actually speed up the process and legitimize it, thus reducing enforcement costs.[24] It has also been reported that the public is more likely to accept a decision if it has been taken with wider stakeholder inclusion.[23]

Within SSA, the main governmental agency in Burkina Faso responsible for the authorization of GMOs, l'Agence Nationale de Biosécurité, has provisions for involving the public in decision-making, and it attributed the success of its insect resistant (*Bt*) cotton risk communication strategies in part to the involvement of varied stakeholders early in the adoption of the biosafety law, in the awareness-raising campaigns and in undertaking the CFTs. Tanzania and Ghana also promote stakeholder involvement in their current risk communication approaches. In Tanzania, risk communication messages were delivered more efficiently if designed in collaboration with community representatives and even delivered by them in the local language. In Eastern Africa, public awareness of GM crops is generally low, with programs initially designed to address it currently suspended for lack of funds. Public participation in decision-making remains weak, although there have been improvements in recent years.[22] Throughout SSA, the major challenges in the participation of relevant stakeholders in awareness-raising include (1) the low engagement of scientists and the initial indifference of the general public, especially in South Africa, (2) journalistic "fatigue" as in Kenya, where journalists have become weary of covering biotechnology and related stories in the absence of either new advancements or controversies and (3) the low level of literacy and access to information tools, exemplified in Tanzania.

Tailoring strategies to specific stakeholders groups. Messages have been shown to be more effective when based on communication strategies developed for specific stakeholder groups and tailored to their experiences and attitudes. The main stakeholder groups usually targeted in SSA are policy-makers and politicians, journalists, scientists, farmers, opinion leaders and students. For policy-makers and politicians in Burkina Faso, short messages were developed describing the benefits and risks of GM crops

Table 1. Risk communication strategies in sub-Saharan Africa: successes and challenges

Country	Lessons learned/ What worked	Challenges
Burkina Faso	Involvement of cotton producers and corporate sector in the field trials and Bt cotton adoption; involvement of all the stakeholders in Biotechnology and Biosafety during the adoption of the law and its revision; involvement of the policy-makers during the awareness-raising campaigns. Using experts creates credibility; communication specialists in meeting with the media. Developing skills, such as remaining calm and collected, and being able to reply to difficult questions by another question; constant dialogue among stakeholders.	Until commercialization, it was perceived that cotton producers were the main target groups of the communication process, to the detriment of other groups. Not a lot of information made available through wider dissemination tools (websites). Low educational level of many of the recipients. Insufficient use of champions.
Ghana	One-on-one strategy for key persons in positions of influence. Delegations from a pool of resource person periodically sent to Ministers; requests to Ministers accompanied by briefs; avoiding unwarranted bureaucratic set-up in information dissemination. Use of agricultural information centres, radio, TV, information vans, emails and SMS texting as communication media. Appreciating the importance of "non-science" constituencies; keeping records of proceedings; Standardising messages to avoid possible contradictions; use of professional communicators.	Misconceptions; inappropriate terminology; poor communication between and among stakeholders; packaging the message; low budgetary and institutional support; non-science group values; role separation; embellishment of information for political purposes and media gains; need to adapt materials to context; keeping up with activists.
Kenya	Interaction between scientists and the media has made it possible for scientists to be able to differentiate between media instruments and when to use TV, radio, print media, social media and online publications for different kinds of information. There are now specialized publications for science communication in Kenya.	There were no incentives for journalists to cover biotechnology stories, since there is no official cultivation of GM crops in Kenya; Journalistic "fatigue" (always the same stories about biotechnology); Lack of science writers; High turnover of journalists. Lack of valid data to support claims made about GMO risks; Differing perceptions amongst risk managers about what is important to communicate; The use of jargon that results in the provision of confusing and distorted information. Jurisdictional disputes that inhibit information gathering and dissemination efforts; the continually changing political climate; Questionable credibility of the message and/or messenger; non-disclosure of risk-related information due to business confidentiality and legal considerations Information not provided in a timely manner; Limited access to communication technology and/or lack of technology integration; Lack of incentives to perform long-term risk planning studies.
Mauritius	Consultancy team members were of varied expertise. High level of interaction of participants (though small in number) was noted in workshop. Participants in workshop were able to develop their knowledge and understanding of the issues.	Major constraint in the participation of main stakeholders was the large absence of representatives from media, and policy makers; Some participants misunderstood of the aim of the workshop-misconception (2009 workshop); Not enough time to internalize the message; Low participation.
Nigeria		Lack of proper public understanding of biotechnology concepts and activities; Poor knowledge and limited access to scientists, media and the public; Limited knowledge and capacity of risk communication processes and procedures of regulatory authorities; Inadequate funds for the implementation of annual work plans of organisations that may take the lead in communication issues.

A summary of information presented during the workshop.

Table 1. Risk communication strategies in sub-Saharan Africa: successes and challenges (continued)

South Africa	Agricultural magazines to bring information to producers, farmers, regulators contributing to the approval of GM seeds.	A large percentage of the population have no knowledge/ indifferent on the subject; Low levels of education/literacy; 11 official languages; Communication on issues by experts; A communication gap between key players; Lack of instant reactions from communicators; Lack of personal relationships with journalists; Scientists engagement in communication is low.
Tanzania	Understanding the social environment and landscape, and having an engagement strategy with the relevant stakeholders. Involvement of farmer communities who, based on their indigenous knowledge systems, are more likely to trust their own, and in their language. Designing communication messages in collaboration with community representatives. Linkage to existing value and supply chains; Rural farm communities are sensitive and cautious to change initiated from outside the community. Information transmitted by traditional elders posters, village notice board, launches and trade fairs.	Low level of literacy and/or understanding of the proposed biotechnology interventions. Low level of interest. Perception problem; potential for misinterpretation. Resistance to changing to a new paradigm. Majority of the population live in rural settings, lacking electricity and access to sources of information. Ineffective communication channels: audio-visual-based communications, especially radio, TV, newspapers, websites, internet campaigns, newsletter and advertorials, publications in scientific journals, booklets and books.
Uganda	Project specific Questions and Answers (Q&As). Understanding the function of institutions with whom to communicate e.g. different communication strategies may be required for different groups. Limit communication at the early stages of GMO development in order not to raise expectations unnecessarily and to prevent "biosafety fatigue". Design messages to clearly designate research from products. Use national relevance as much as possible. Spread the communication across sectors, e.g., health and pharmaceuticals, environment and industry.	
African Agricultural Technology Foundation (AATF)	Reputation is key. Individuals/organizations involved in communication should do so from a position of trust. Effective communication is a two-way process. Accurate and consistent messaging is vital. Teamwork is critical for success. It is useful to communicate in local languages. Advocacy should be used where needed. Outreach should be timed to project progress and developments. There should also be accountability. Consultation and early on-boarding helps with buy-in. Use of experts. OFAB-facilitated meetings between member states; Increased awareness closed gaps between scientists and journalists.	

A summary of information presented during the workshop.

and supplemented with cultivation data and field visits. Since researchers and academics enjoyed a higher public trust than policy-makers, the tailored communication strategies also assisted in transforming the recipients into biosafety communicators themselves. To this end, scientists and academics in Burkina Faso and Ghana benefited from participating in multiple biotechnology and biosafety trainings, workshops and regional and international discussion fora. In other settings, scientists are usually the stakeholder group with the highest level of awareness concerning biotechnology. For example, they are very good at acquiring any information they need, usually through scientific journals, the internet, periodicals, and in discussions with colleagues, all usually without active efforts from risk communication specialists, as shown in Nigeria.[6] Journalists, on the other hand, who are often highly trusted by the public, rely on developing personal connections and upon training in scientific writing to replace scientific jargon with more familiar terminology (discussed below). Opinion leaders benefit from more targeted strategies involving one-on-one communication, as seen in Ghana. For students, emphasis is placed on strategies such as the inclusion of material on biotechnology in curricula, discussions with experts, and interactive theater performances (such as in Burkina Faso and South Africa). For farmers, materials in a number of formats such as audio, text, and cartoons were translated into vernacular languages, and public discussions were held to clarify issues, as in Burkina Faso.

Table 2. Communication indicators in SSA

Country	Daily newspapers per 1,000 people 2000-07 (for a review, see ref. 37)	Percentage of households with (for a review, see ref. 38)			
		Radio 2007	TV 2007	PC 2007	Internet access at home 2007
Burkina Faso	-	69.5	16.9	1.6	-
Ghana	-	-	38.8	5.1	0.3
Kenya	-	-	-	5.5	2.2
Mauritius	77	-	96.4[a]	30[a]	20.2[a]
Nigeria	-	72.4[a]	39.3[a]	12[a]	6[a]
South Africa	30	-	71.6[b]	-	8.8[b]
Tanzania	2	58.4	7.8	-	0.6
Uganda	-	-	-	-	-

[a]Data from 2008; [b]data from 2009.

Employing and training communication specialists. A shortage of biosafety communication specialists is acutely felt in SSA. Most training activities are being targeted towards scientists and journalists. These two groups have been identified as key to the risk communication process in Kenya, however they must overcome quite different difficulties in training to become communication specialists: scientists are often unable to present their scientific knowledge in terms commonly used by laypeople, whilst journalists often create misrepresentations or alarming accounts in their pursuit of sensationalism.[26,27] Filling a communication gap between the two groups is the goal of several current training programmes. In South Africa, a media roundtable initiative called "Wine and GMOs" brought scientists and journalists together, enabling the latter to acquire a better understanding of the science and extra-scientific issues concerning GMOs. Efforts in Egypt, Kenya, Nigeria, Tanzania and Uganda with similar objectives are being carried out through the Open Forum for Agricultural Biotechnology (OFAB; www.ofabafrica.org), a regional initiative for public engagement, while in South Africa AfricaBio has conducted regular workshops for training communicators. These efforts have raised levels of awareness, and are helping to close communication gaps between scientists and journalists. The cultivation of personal connections between scientists and journalists helps further reduce their communication gap, yet developing such relationships can be hindered by the high turnover of journalists.[28]

In Burkina Faso, risk communicators employed to interact with the media have learned with experience to remain calm and collected when answering, even for those questions showing a lack of understanding of the issue, and to maintain the course of the discussion within the boundaries of scientific evidence. In Kenya, the communicators quickly learned to match the appropriate language to the media types selected to disperse the message; thus, different approaches were used for communications via TV, radio, print or social media.

The credibility of the trained risk communicators was of high priority and essential to successful message transmission. In Burkina Faso for example, the use of experts to convey specific messages known to be within their recognized area of competence gave the message credibility in the eyes of the public. In Ghana, scientists were encouraged to replace policy-makers as active communicators, as the latter were perceived as lacking in credibility. However, where government sources are highly trusted, they can contribute substantially to a positive perception of biotechnology, especially when working together with specialized science writers to deliver a well-informed media coverage.[28] This is echoed by the experience in Uganda, where public trust in governmental organizations is higher than for scientists and the private sector, which are viewed with suspicion.[10] In Tanzania, it is the media that is most trusted by the people, yet conflicting and heavily-biased messages (i.e., either strongly in favor or strongly opposed to GM crops) are transmitted, as the reporters usually have little or no scientific background.[29]

Employing various communication tools. In SSA, the recognition of the necessity to have a two-way communication process came with the acknowledgement of the limitations in the use of radio as an information tool for wide dissemination. Although radio is the main communication tool available in SSA (**Table 2**), it does present limitations in that it is incapable of sustaining dialogue and thus often perpetuates misunderstandings. Other tools include more traditional sources such as newsletters and public debates, as well as mobile libraries and interactive theaters, whilst e-mails, mobile phones and social media are becoming more prominent. Although radio is "king," it is being used in combination with other complementing and reinforcing tools to help deliver more effective messages, as presented below.

In Burkina Faso and Kenya, radio is the main communication tool for conveying information concerning agricultural biotechnology.[30] Yet, while providing a plethora of information, only a limited number of broadcasts involved the input of experts. Still, radio is a major source of information on biotechnology for Kenyans, supplemented by efforts from educational institutions and the food industry.[8]

Generally, beyond the wide-reaching media, local efforts in risk communication can be more relevant and better coordinated. In Burkina Faso for example, information on biosafety has been published in widely-disseminated monthly newsletters, broadcast on radio stations with rural coverage, distributed through motorcycle-based mobile libraries and has been the focus of local awareness-creation activities. Also, communication on a personal level benefits from greater trust, with friends and acquaintances being an important source of information, even the main source of information regarding GMOs as reported in Ghana and therefore remains an opportunity for inclusion in risk communication strategies.[9]

The success of local communication tools in disseminating information concerning the risks and benefits of GM crops did not diminish the importance of wider-reaching communication tools. Often, a combination of wider reach and local impact communication tools can give better results than the use of the two separately. As such, radio has played a significant role in the adoption of new plant varieties by Nigerian farmers, yet it also presented limitations by not facilitating interactions and discussions between farmers and experts or by alienating laypeople by not conversing in local languages.[31] In response, workshops can help disseminate information and increase awareness by providing a forum in which open discussions can take place with experts, thus helping relieve public fears, as in Tanzania.[29,32] Key players in disseminating knowledge in this manner are the Nigerian Agricultural Extension Services and other services of Ministries of Agriculture throughout SSA.[33] Within these networks of experts, agricultural scientists play a major role. A recent survey showed that the level of awareness amongst these scientists is quite high, and that they support the commercial approval of GM crops in Nigeria; their major sources of information are scientific journals, the internet, periodicals and other colleagues.[6]

In South Africa, radio is not as important a communication tool as in the rest of the African study countries listed in **Table 2**. Risk communication strategies generally employ a mixture of communication tools. Use is made of printed media, radio and TV by a range of stakeholders and extends to brochures and presentations at conferences. The PUB project of the Department of Science & Technology has employed both playhouse techniques for school children and students, and full page reviews in newspapers. AfricaBio uses farm demonstration trials plus a range of brochures for local farmers and politicians, as well as for visiting farmers and politicians from other parts of Africa. In addition, annual media conferences organized by the International Service for the Acquisition of Agri-biotech Applications (ISAAA) generate extensive media coverage. Elsewhere, Biosafety South Africa issues brochures and secures funding for projects. Although some of the finer detail may be lost, as Cooke and Downie argue (for a review, see ref. 34), the main messages of risk communication do seem to reach the public as shown by the awareness levels displayed by farmers and urban populations in surveys.[13,14]

Although most efforts in experience-sharing with biotechnology are reliant upon indirect written and verbal channels, the strategy of "seeing-is-believing" is being adopted more often for risk communication in SSA, with reports that field trial visits are becoming a more decisive factor in influencing farmers to cultivate GM crops.[35] As a result, tours and field trips, field days, farm walks, exchanges of real life stories with farmers already cultivating GM crops have been employed in Nigeria, Tanzania and Uganda.

Increasingly, recent developments in communication technology such as the Internet and mobile phones can be tools of wider dissemination and of inter-personal communication. With their increasing availability in SSA, the electronic media have quickly been included amongst the tools employed in the dissemination of information in Ghana, Nigeria and Uganda.

A context-appropriate message. To deliver a message that will resonate with the recipient, two main factors need consideration: language and timing. Language refers here not only to the actual dialect or language spoken but also to the information content. With respect to the former, although there is a widespread understanding of English and French in SSA, farmers are more likely to listen to vernacular radio programmes, which necessitated the development of glossaries of agricultural biotechnology terms in local languages or dialects of Burkina Faso and Kenya.[30] In addition, scientists have often been reluctant to communicate scientific results to a wider audience, particularly due to a lack of confidence in translating their knowledge into terminology familiar to laypeople, along with an unwillingness to have unpleasant heated discussions with anti-GMO NGO representatives.[30] In Ghana, since scientific jargon was a serious impediment in risk communication, experts in communication assisted with the development of messages with more appropriate content. Scientific terms were replaced with explanatory phrases, contentious terms were replaced with more neutral ones, positive examples of the technology were provided, negative statements were avoided and the message was standardized. A particular challenge in risk communication encountered in Burkina Faso and Tanzania concerned the illiteracy or low educational level of many of the recipients. This may potentially be a general issue in other countries in SSA.

The second factor to consider when delivering a message is timing. In Uganda, it was discovered that the release of information too early in product development negatively impacted the efficiency of the communication, probably since it concerned more abstract knowledge, unlike the later provision of more practical information when requesting authorisation to place on the market. This was consistent with opinions of farmers, seed company representatives, scientists and non-governmental organizations representatives across SSA, where the involvement of farmers early in the process of R&D for a GM crop can create high, unrealistic expectations, while their involvement too late can lead to low adoption of certain GM crops.[36]

Of great importance is countering rumours and false statements in real-time, ideally attempting to prevent communication crises by being proactive. For example in Ghana, a "no communication" stance was not acceptable for dealing with misconceptions, and it became the responsibility of all involved parties to help dispel them. Moreover, when confronted with false statements, the strategy was to involve credible journalists, preferably with a background in science communication, to encourage scientists to reply and counter with true stories and to offer resources for further information on the subject. In trying to prevent the appearance of false statements, records of meeting agendas and discussions were kept for reference, training in biotechnology was provided before releasing information on particular events, and a pool of science journalists was prepared. To further avoid a "no communication" situation, it was important to improve the relationship amongst stakeholders through meetings with scientists, the media, farmers and NGO representatives. Such meetings provided recommendations on how to improve communication amongst the different groups.

Addressing administrative challenges. For many countries in SSA, the administrative frameworks for biotechnology are still under development, slowed by a lack of funding and of trained personnel, as well as complex bureaucratic issues.[29] In Ghana, GM crops were highly politicized by the opponents of agricultural biotechnology, which severely challenged the ability of communicators to respond collectively to false statements. In Kenya, the main challenges for risk communication were administrative: different communicators could not agree on which were the most important points of the message and what was the responsibility of each communicator. In addition, the political climate was unstable, which probably influenced the lack of incentives to implement long-term strategies. Overall, the main administrative challenge is funding, particularly for Ghana, Nigeria (**Table 1**) and Tanzania.[29] To address the shortage of funds in Ghana, the objectives for risk communication are designed and pursued according to their priority.

Discussion and Conclusion

Despite limitations, sub-Saharan African countries have developed a rich experience of risk communication, with cases displaying many similarities but also differences, as demonstrated by the workshop presentations and discussions, as well as the additional information compiled in this article. Common effective risk communication strategies as well as challenges throughout SSA are presented in **Tables 3 and 4**, respectively.

As shown above, risk communication in SSA is no longer a blank slate, with a substantial amount of expertise now generated, albeit widely and unevenly distributed. The major needs now focus on capacity building: the generation of biosafety communication experts, funds and institutional support. There is an awareness of the need to provide credible, knowledgeable, contextualized and timely information, along with the dire need for capable people to deliver it. People who would obviously fill this role are biotechnologists and journalists. Yet, agricultural scientists may be a more appropriate target for grass-roots initiatives due to their familiarity with agricultural practices and problems and their direct contact with farmers through extension services. Training in risk communication associated with agricultural biotechnology should focus on forming experts with scientific and public relations knowledge and tailored for specific groups.

From the workshop discussions, language emerged as an important focus points for future risk communication strategies. The need to develop appropriate messages for different groups of stakeholders by using a simple, clear, common vocabulary developed through liaison amongst a variety of institutions was emphasized. Actions requiring immediate attention were set: replace words and phrases which implicitly emphasize danger in current communication strategies; use of images rather than words to communicate can potentially lead to misinterpretation and therefore should be avoided; use well-established sources (e.g. the Food and Agriculture Organisation has developed dictionaries for biosafety-related terminology in several languages)

Table 3. Most common risk communication strategies deemed to have been successful in SSA

Aspects	Strategies
Decision-making	Openness and transparency in decision-making
	Collaborations with other agencies for risk communication
Media	Training science journalists
	Developing a partnership with the media representatives
Message	Simplifying information dissemination
	Standardizing the message, that needs to be clear and consistent, yet in the same time adapted to local contexts
	Credibility of the communicator
Stakeholders	Involvement of various stakeholders early in the process

Table 4. Most common identified challenges to risk communication in SSA

Aspects	Challenges
Communication channels	Low education level High turnover of the journalists
Message	Making scientific information available for a wider audience Lack of credibility of the communicators Not adapted to context
Resources	Lack of biosafety risk communication specialists Insufficient funding

which would also result in the prudent use of resources. It was also concluded that all stakeholders should be involved in message transmission, and not rely solely on GMO developers.

At the government administrative level, the importance of risk communication within biosafety frameworks is generally not acknowledged. Governmental initiatives in risk communication are sporadic, under-funded and usually developed in response to a crisis. Ideally, clear project plans should be prepared, with identified time-lines, objectives and tools which are regularly assessed and involving trustworthy institutions in disseminating the messages, with risk communication teams coordinating the processes. The lack of funds may be dealt with by pooling resources, for example through the collaboration of different public institutions in translating and formulating context-appropriate messages, or collaborations with other stakeholders, including members of the target communities. In addition, to gain more institutional support, risk communication programs and practitioners need to increase their visibility, which may be achieved through radio and TV biotechnology programs, maintaining close contact with the press to communicate significant developments in biotechnology R&D, developing a pool of science writers, maintaining close contact with the agricultural services and relying on highly-regarded experts. Implemented programs for risk communication should be monitored and the efficacy of the various tools employed periodically assessed. Biotechnology awareness discussions should be organized in collaboration with agricultural extension services, and biotechnology education should be directed not only towards adults but also to the end-users of tomorrow. As such, relevant topics should be included in school curricula and/or interactive programs with a biotechnological theme should be organized.

Pooling resources and collaboration at the regional level can also make a big difference. The possibility of working with regional bodies [e.g. the Common Market for Eastern and Southern Africa (COMESA), the Economic Community of Central African States (ECCAS), the Economic Community of West African States (ECOWAS), etc.] was discussed by the participants at the workshop, but the conclusion was that a system in which individual communication programs coalesce around a bigger communications plan would be more practical, due to political reasons. Yet, there is a great potential for countries in SSA to learn from one another in terms of biosafety data, initiatives, tools and interactions with stakeholders. On the question of how best a project to enhance risk communication in Africa would proceed, it was reported during workshop discussions that a similar attempt had been made by AfricaBio (www.africabio.com), whereby a needs assessment and stakeholders consultation was carried out and interventions for implementation were designed. The latter included: using workshops to develop key tools, developing messages, such as frequently asked questions (FAQs) and newsletters, building the personal capacity of communicators and regulators, developing communication networks, addressing knowledge gaps, building a critical mass of scientists to spearhead communication networks and identifying ways to build media resources through journalist training. As an immediate workshop outcome, an information-sharing platform to enable access to information and, hence, promote informed decision-making was proposed.

In circumstances where cooperation proves difficult, a more informal network for information exchange composed of risk communication practitioners should be created, beginning with the participants of the workshop. Together, a web page, on-line discussions and conferences could facilitate the development of the network, while not requiring extensive funding. However, meetings such as workshops and conferences with specific foci should be organized periodically. Examples of topics include "Language in risk communication," "Communication tools," "Training of journalists for biotechnology reporting," "Community involvement in risk communication" and "Improving communication amongst stakeholders." In addition, regional communication networks should be created to facilitate information exchange amongst same-level experts, such as agricultural scientists, science journalists, GM crop R&D scientists, etc. Such networks would not necessarily need to be built from scratch but could instead be built within existing wider frameworks. Supporting funds may be available from international organizations or via partnerships amongst public-private institutions within SSA.

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No potential conflicts of interest were disclosed.

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