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Convergence in Science Communication: The Tipping Point

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Global focus is on Asia and the Pacific where four countries among the mega-biotech countries (those which grew 50,000 hectares or more of biotech crops) are located. These are China, India, Australia, and the Philippines. The first two are the most populous countries in the world and key biotech players. While not growing biotech crops at the moment, other Asian countries are fast tracking their research and development (R&D) efforts in biotechnology with the goal of eventually developing a crop for commercialization in the near future.

The road to public acceptance of crop biotechnology has not been smooth. After more than a decade since farmers started planting biotech crops, acceptance by society in general continues to be a major battleground for debate and discussion. This certainly demands a degree of sensitivity to public opinion. Despite what the science says about the technology, there is no one formula to assure acceptance of biotech crops. Thailand, for instance, was one of the first Asian countries to have biosafety guidelines and government support for research to prosper. It still has to approve a biotech crop for commercialization. India's success with Bt cotton that has seen millions of small farmers adopting the technology, has not made it easier to remove a current roadblock with Bt brinjal (eggplant). Australia, a strong investor in agricultural innovation and a quick adopter of new technologies, continues to face societal queries, not so much about the technology but more on social and political issues. The common thread linking the countries, however, is that while challenges are being experienced, efforts at fostering greater awareness and understanding through science communication are being done to pave the way towards a positive and enabling environment for the technology to thrive.

The case studies of Asia and Australia offer unique and rich examples of how countries have been able to glide through albeit with difficulty or resistance to the drama of crop biotechnology as they shepherd innovations from the laboratory, greenhouse trials, confined trials, multi-location trials, and hopefully, to farmers' fields. Asia and Australia are separate continents, and even within Asia, significant differences in culture, political situation, economic development, religious beliefs and language make it unrealistic to forward a homogenous picture of how countries address science communication issues and concerns in the context of crop biotechnology.

Despite the diversity of events, experiences, and internal conflicts, it is worth reflecting on how these countries have addressed specific challenges. By processing and synthesizing the lessons learned, it is possible to generate principles that can be used to improve communication efforts and strategies as well as to better understand the societal environment favorable for the technology. The rich experiences are also a springboard for other organizations to respond or adapt to similar events as they occur in a specific context. They help provide possible alternative solutions to situations, thus, are useful for predicting system behavior, analyzing communication problems, identifying appropriate strategies, and transforming potential impact into action.

Bridging the Divide Between Science and Society

Engaging science and society was forwarded by scholars in the late nineties when experiences proved that the one-way, top-down process of communication does not work. The assumptions that lack of understanding stems from inadequate information or that ample information can compel action were disproved. In the biotechnology sphere, the frenzy of debate and discussion of contentious issues made key stakeholders aware of the importance of science communication which calls for knowledge sharing, deliberation, negotiation, and participation among different actors. Science alone will not be able to advance the debate, rather deliberate communication strategies are needed to ensure informed discussion. Other variables beyond communication, however, also need to be addressed so as to contribute to public acceptance.

The establishment of biotechnology information centers, government and regional communication programs that address biotech concerns, and groups with information teams has brought into focus greater awareness of the importance and need for science communication. Each country has public and private sector organizations that engage in science communication and advocacy work and complement each other's efforts. The Ministries/Departments of Agriculture, Science and Technology, and Natural Resources and Environment join efforts in cooperation with universities and R&D organizations to reach out to the public. The International Service for the Acquisition of Agri-biotech Applications' (ISAAA) global biotech information network was a deliberate response to an urgent demand from Asian policy makers for an entity to facilitate and support transparent decision-making process in crop biotechnology. At present, there are 24 Biotechnology Information Centers or BICs and country nodes in Asia, Africa, Latin America, and Europe in addition to the Global Knowledge Center on Crop Biotechnology. These centers use a combination of interpersonal and tri-media communication strategies to encourage dialogue with various stakeholders on the technology. Similarly, the private sector through industry and like organizations also collaborate with government to maximize impact and avoid duplication of activities.

The underlying success of biotechnology communication initiatives in Australia was through a coordinated and strategic alliance of industry groups with government agencies. An Industry Action Plan was developed that allowed issues to be addressed by relevant experts, and for external people to become more involved. In China, academic communities and societies join forces to popularize academic exchange, promote innovation, popularize scientific knowledge, disseminate advanced technologies, and improve the public's understanding of science. Malaysia and the Philippines have strong inter-agency and inter-disciplinary activities that enable wider reach and impact. India wants to see the current individualistic approach among agencies transformed into a holistic mechanism to achieve science communication goals. It calls for an innovative and strategic communication initiative to inform, and educate stakeholders' viewpoints on crop biotech. For countries like Thailand, it took time for key stakeholders like the science and farming communities to make their voices heard particularly on policy issues that have repercussions on how R&D activities can move forward. The good point however, is that they are now working together to form a common and unified voice to address legislative issues. Also worth noting is that a key government research arm has seen the importance of playing a more visible role in science communication by actively participating in public awareness activities after years of deliberately distancing itself from such a role. Hence, countries have been witnessing a more active involvement of stakeholders in various stages and levels of decision-making.

Nevertheless, continuous work has to be done to institutionalize science communication activities particularly in government agencies where budget for information dissemination and public awareness is often limited or considered low priority. In R&D organizations, for example, bulk of financial support is earmarked for research and often little is left for communication activities. Mechanisms for orchestrating information flow among ministries and relevant offices to link them with the public through a well-crafted communication plan is also essential to avoid conflict and duplication of efforts. China, a biotech adopter, still feels the need for an institutionalized and effective process to link government, research institutions, and the public. Malaysia proposes a National Committee for Public Understanding of Science similar to that in the United Kingdom which will focus on popularizing science, enhancing science literacy among the populace, increasing public acceptance of new technology, and gaining support for public funds to be channeled into R&D.

Science communication cannot be the sole function of any one entity. It needs collaboration and interfaces between and among different entities from a multi-disciplinary and multi-sectoral environment. The Organization of Islamic Countries (OIC), for instance, consider science communication as its weakest link. Hence, it is important to build effective networks and partnerships that allow participants to build on each other's strengths, add value to combined and complementary efforts, and engage in mutually beneficial activities to meet common goals. In the same manner, countries must take the lead in rationalizing science communication as a priority concern as much as research itself so that programs and activities are sustained, do not just depend on external grants, and are owned by the proponents themselves.

Enhancing Capacity of Science Communicators

Building a strong and effective cadre of science communicators is an important concern. Science communicators are not limited to scientists and communicators, but include all stakeholders who see the need for transparent and science-based discussion and debate for decision making. Even in countries where the government takes a central role in disseminating information to its constituents (top-down communication) such as China and Vietnam, there is a felt need for stakeholders to be given adequate information to enable them to make informed decisions. Transformation of scientists in China for instance from merely doing research to individuals participating in the provision of accurate information to constituents reflect a positive development in this area.

In Vietnam, science communication is not a formal field of interest, hence, there is inadequacy of professionals committed to its development. Scientists and academics in Thailand and Malaysia are discovering an additional role for them in addition to research and instruction. Opportunities are needed to enhance their communication skills such as dealing with media inquiries, writing rebuttals to newspaper articles, answering stakeholder requests for information, popularizing technical information into concepts easily understandable to non-scientific audiences, and engaging with the media and the different publics.

Malaysia and Vietnam note the lack of science writers and their inability to understand science, translate scientific jargon, and repackage technical information into a form that is interesting and relevant to readers. To address these concerns, countries are conducting workshops among scientists, media, and other stakeholders to update them with latest science-based information and equip them with the necessary skills to impart key messages in forms specific for various audiences. As a result of these workshops and related activities such as field and exchange visits, a growing breed of science communicators are evolving from the different sectors such as media, science community, academics, and farming groups.

To successfully capitalize on the benefits of modern biotechnology, it is essential that a new breed of science communicators be trained in addition to existing experts to build up a critical mass and core dedicated to sustain activities and programs in crop biotechnology. The move of OIC to institutionalize a system to allow deliberate and focused attention on science communication initiatives is a welcome move.

Identifying Key Publics and Champions

The concept of 'publics' suggests a complex entity of individuals and groups that have specific information needs and corresponding communication requirements. Generally, the key stakeholders identified for the different science communication objectives are policy makers, scientists, academics, regulators, and media. There is a need to identify and nurture champions from each of these groups since it is impossible to reach out to every individual in the sector. These are usually the people who are well-informed, have high credibility in the community, and are willing to advance the cause of the technology among their peers.

Policy makers forward opinions and make decisions that have significant influence or impact on national policies, laws, and regulations as well as the overall direction of the country's agricultural development programs. They formulate policies that support biotechnology R&D, biosafety laws, approval for the commercialization of biotech products, and even allocation of funds for biotech activities. In the same light, policy makers can promulgate policies that hinder research activities through moratorium of field trials and a complete ban on related biotech research; and delay deployment of crop biotechnology. Even their overly cautious stance in approving a regulatory system can lead to implementation difficulties. A moratorium on field testing of biotech crops was approved by the Thai government in 2001 that discontinued further work on biotech papaya. It was a cabinet decision and, thus, difficult to overturn. Nevertheless, a champion in the person of the Agriculture Minister rose up to the challenge and was able to form an alliance with other cabinet members including the Ministers from Science and Technology, and Natural Resources and Environment. The case was submitted for cabinet consideration. The ban was eventually revoked in November 2007 but the new requirements are still considered restrictive.

Studies show that stakeholders generally rate university scientists (who also double as academics) as highly credible due to perceived neutrality. Research institutions also rank highest in perceived concern about public health and safety. Since credibility is strongly correlated with technological support and acceptance, it is important to identify effective communicators among the science community. The fact that most senior and most visible Filipino agricultural scientists favor transgenic crops development helps immensely to provide a favorable political environment for biotechnology in the Philippines. The confluence of people with strong science background work in favor of the use of transgenics as they are willing to engage in dialogues and debates with other scientists, civil society groups, and most particularly, legislative leaders involved in making decisions about the technology and the regulatory system.

Malaysia suggests training workshops for scientists that are tailored to help them develop messages that could be positively presented in the media, repackage scientific information into layman language, identify news value in research, establish media contacts, and respond to interviews in a crisis situation. In addition, science desks must be established in all media houses to increase quality and frequency of science news.

Media practitioners play a crucial role in the biotech debate with countries such as Bangladesh stating that majority of its people get their information about biotechnology from newspapers and related publications. Even in countries where media is government-owned, awareness of its influence is noted. China realizes that positive promotion of biotech crops can contribute to a higher degree of consumer acceptance. India narrates the key role played by media in influencing the perception of the public on biotech crops. It is the intensity of media coverage that turns enormous public attention and in the process generate an unjustified controversy about biotech as in the case of Bt brinjal. Thailand has made efforts to link with the Agricultural Media Association to identify allies who can write accurate information about the technology. The Philippines has identified journalists who are able to write balanced and accurate articles. In collaboration with other partners, annual awards are given to journalists in recognition of their contribution to science writing in general and biotechnology in particular. Media practitioners are invited to attend media workshops to get technology updates and obtain skills in communicating with scientists. Visits to farmers' fields and field trials have been organized to give opportunities for media to see actual plantings and interview end-users of the technology. Constant information updates are provided to give writers topic leads and information sources about biotechnology. These strategies have also been found useful by India and Malaysia. Vietnam sees the need for exchange visits whereby media practitioners can visit farmers' fields where biotech crops are commercially grown.

Focusing on Public Values

Public attitude towards technology is often based on values more than information itself. These values include high trust in science and the regulatory system, credibility, freedom of choice, and in the belief that humans have control over their environment. Australia forwards the recommendation that aligning genetically modified (GM) crops with public values, and then communicating that alignment, is the single most effective way to communicate about GM crops. More effective than framing the communication around the technology is defining the communication around values, i.e., those that address environmental concerns and food security. Values that influence attitude positively towards GM food include trust, transparency, consumer consultation, regulation, and consumer benefit. Negative values are things that are perceived to be unnatural, unnecessary, and unknown. People's values related to non-confrontational, non-aggressive behavior towards others affected Thailand's response to the actions of activist groups which are perceived to be culturally unacceptable. Scientists, however, soon realize that a common voice established on a foundation of science-based information is a shield that could surmount opposition by policy makers who are pressured to make certain decisions by activist groups.

Nurturing public confidence and encouraging opportunities for interactive feedback are important and critical roles for science communicators. In addition, communication strategies should consider the values that mean most to stakeholders. In particular, India cites the need to address issues of public confidence and trust in a more logical and systematic manner. A robust and science-based regulatory system is the need of the hour and one that is perceived as trustworthy. By addressing the public's interests and preferences, it is easier for concerned stakeholders to take an active interest and involvement in the topic. By sharing values held by people, it is easier to arrive at a consensus in various areas of concern.

Strengthening Availability and Access to Information

Science is a difficult topic to understand especially for stakeholders with limited technical background. This is aggravated by the need to simplify technical information and transform it into a more interesting and relevant format from the vantage point of the consumer. Vietnamese radio broadcasters for instance, are constrained by their knowledge and understanding of issues, and need to broadcast an interesting topic in a manner that attracts listeners. Furthermore, they are hampered by the call to use the local language with material sources in English. The challenge of translating a material into the local language(s) is often not just about having exact equivalents for certain words and phrases. Meanings and, hence, nuances and subtleties can be changed or lost in translation as the process involves additional tasks of interpretation and organization. An example is the use of the Thai term corresponding to "vaccinated papaya" to explain cross-protected papaya. In an attempt of a scientist to explain the concept as simple and as close to the reality of stakeholders, new unintended meanings are created.

Availability of new media forms needs to be explored. “New publics” such as students have different information seeking behaviors that must be considered. It is necessary, however, to see how best to use new media without sacrificing accuracy, reliability, and objectiveness. Most of the communication materials developed include publications, videos, and websites. Is there a need for new media forms such as podcasts, webcasts, and weblogs? Malaysia recommends the creation of more science centers, science museums, and science parks. The use of interactive modules and the stimulation of emotions can be used to incite appreciation and understanding of science as well as to get people’s opinions about the technology. Each country has specific strategies for addressing stakeholders’ information needs.

Areas for Growth

The presence of regional initiatives such as those exemplified by the Organization of Islamic Countries proves the growing attempts of institutions to widen efforts in science communication so as to maximize reach and effectiveness. Inter-country programs based on common interests highlight the need for collaboration, synergy, and inter-cultural communication. There is blurring of boundaries, and dynamic interfaces are strengthened and negotiated to attain objectives. The success of these exchanges indicates much room for growth for inter-country activities and sharing of experiences. The BICs can facilitate opportunities for other organizations through a mechanism that allows sharing of information, experiences, best practices, and lessons learned. ISAAA’s information network can initiate a system by which a centralized information and database sharing platform on crop biotechnology can be freely accessed between and across countries.

Investing in capacity building programs particularly in areas such as science communication, media relations, public engagement, science popularization, and media development and production to name a few, needs to be looked at as a relevant concern. Regional workshops and short term trainings can be organized for specific stakeholders that include policy makers, scientists, media practitioners, and other sectors that stand to benefit from science communication intervention. Popularization of biotechnology is a felt need as the topic is often deemed difficult to grasp. This involves discovering appropriate and accurate analogies as well as clear metaphors, and simplifying abstract concepts particularly in countries where a biotech crop for instance still does not exist. However, communication involves the interplay of culture and language. It is important, therefore, to consider differences among countries as certain nuances and meanings are lost in the translation of concepts and technical information. Bangladesh, China, India, Thailand, and Vietnam have increased stakeholder knowledge on biotechnology through translation and simplification of concepts.

Centers and institutions doing science communication initiatives on crop biotechnology have concentrated on communication materials development and production as well as networking. An additional area that institutions should venture into is communication research to validate assumptions made, identify appropriate strategies, and respond to feedback mechanisms. Possible communication research concerns are discussed below.

1. **Benchmark studies**
   These are needed to determine perception and attitude changes of specific audiences toward crop biotechnology. Knowing one's audience is a basic communication tenet. Australia, Philippines, and Indonesia have conducted studies that have allowed them to monitor and understand major changes in support of biotechnology applications over time.
2. **Environment scanning**
   This should be done to take stock of the current environment for biotech taking into consideration scientific developments, political support, role of key players, and influence of stakeholders in the decision making process. Other concerns include identifying issues that stakeholders deemed important, key information sources, and barriers and opportunities to technology acceptance.
3. **Media monitoring**
   This helps determine how best media can be tapped as a partner rather than a source of inaccurate information. Efforts by the

Philippines and Bangladesh to monitor how media has covered crop biotechnology in a decade of reportage have provided insights on how the topic has been put on public's radar screen.

4. **Pretesting and output monitoring**
   Pretesting and constant monitoring help ensure that strategies meet the information needs and requirements of specific stakeholders as well as "value for money" for materials produced for dissemination.
5. **Process documentation**
   To find out the appropriateness of approaches and impact areas of communication strategies, process documentation would be of value.
6. **Adoption patterns and uptake pathways**
   Studies on these would help to determine processes that a farmer goes through when s/he adopts biotechnology. Such an analysis can refine the extension and communication strategies that are currently used.
7. **Project monitoring and impact evaluation**
   They are meant to determine the progress made and how objectives are being attained. Feedback about project implementation provides useful insights on how to improve the process while an impact evaluation determines the overall effect of interventions to determine the degree of success or failure.

Public awareness activities need to be sustained to maximize the participation of the public in discourses about biotechnology. Even in countries such as Bangladesh, China, and Vietnam where social acceptance of the technology is not a major issue and where the environment is considered pro-biotechnology, public awareness is still deemed essential. Changes in actors in the political arena where opinions may sway for or against the technology as experienced by India and Thailand suggest that sustainable communication plan for crop biotechnology is an imperative.

In like manner, new communication strategies must be conceptualized and developed to enhance the value of information. Malaysia has made a good start in introducing the concept of a biotechnology carnival which targets the "general public" of students, consumers, and non-technical audiences whose opinions also count in the discourse on the technology. The idea has attracted new audiences to appreciate science as one that has a pragmatic, rather than an ivory tower, perspective. In the process, it has moved biotechnology from the pages of science to front page attention as a field with practical benefits.

Country experiences highlight the effective public-private partnerships in science communication that have commenced. The dynamic relationship allows complementation of activities, maximization of resources, and smooth interfaces between experts among the different sectors. Realizing a common voice on crop biotechnology despite the plurality of opinions, differing attitudes and perspectives is indeed attainable. In addition, the collaborative activities on a regional scope highlight the fact that there is much room for inter-country and inter-sector initiatives.

Quo vadis?

Times have changed, says Castillo (2003), from a time where technology basically moved itself to farmers fields without much effort to one where many publics have emerged. Stakeholders now assert their rights to know and right to participate in science-related decision which affect their lives. In a world of many persuasions, causes, and conflicts, crop biotechnology is one 'defining' technology which has changed the relationship between science and society. As Castillo puts it, it is no longer a case of Science *then* Communication but Science Communication.

Individual efforts of countries and regional activities have contributed towards institutionalizing science communication as a key component in the science arena. Perhaps it is only in the last few years that deliberate attention has been given to the crucial role of communication in crop biotechnology. In particular, the intensified use of various communication channels, both traditional and new media; the increasing number of sources on the topic; and greater involvement of different sectors in knowledge sharing initiatives highlight the recognition given to the field.

The development of a cadre of science communication practitioners may well be a noble cause at this point. Centers and institutions doing science communication work need to expand the number of participants in their respective area of interest, community, and regional scope. This is much like ripples formed by throwing a pebble on a body of water, the impact of such efforts can make a significant change not only on the development of crop biotechnology but on the way of thinking towards any technological approach. A holistic, synergistic perspective of the science continuum from development to commercialization rather than merely a science-based orientation assures a dynamic pathway for a technology's growth and acceptance.

Gladwell (2000) advances the concept of tipping point which refers to a magic moment when an idea, trend or social behavior crosses a threshold, tips, and spreads like wildfire. He brings up this phenomenon to describe how little things can make a big difference; how it is a reaffirmation of the potential for change and the power of intelligent action as well as how small ideas can change the world. Each country and regional initiatives are making their own individual impacts, and together, collective and collaborative efforts converge to form a consensus on crop biotechnology.

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