Development of Communication Strategies for Adoption of Agri-Biotechnology in the Asia-Pacific region

Dusit Island Resort, Chiang Rai, Thailand, 28-29 September 2015

PROCEEDINGS AND RECOMMENDATIONS

Organized by

Asia- Pacific Consortium on Agricultural Biotechnology (APCoAB)
Asia-Pacific Association of Agricultural Research Institutions (APAARI)
International Service for the Acquisition of Agri-Biotech Applications (ISAAA)
Malaysian Biotechnology Information Centre (MABIC)

APAARI

Asia-Pacific Consortium
APCoAB
Agricultural Biotechnology

ISAAA
International Service for the Acquisition of Agri-biotech Applications

MABIC
Malaysian Biotechnology Information Centre

Workshop on Development of Communication Strategies for Adoption of Agri-Biotechnology in the Asia-Pacific Region

Dusit Island Resort, Chiang Rai, Thailand

28-29 September 2015

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THE ORGANIZERS

Asia-Pacific Association of Agricultural Research Institutions (APAARI) is a regional association that aims to promote the development of National Agriculture Research Systems (NARS) in the Asia-Pacific region through inter-regional and inter-institutional cooperation. The overall objectives of the Association are to foster the development of agricultural research in the Asia-Pacific region so as to promote the exchange of scientific and technical information, encourage collaborative research, promote human resource development, build organizational and management capabilities of member institutions and strengthen cross-linkages and networking among diverse stakeholders. For further details, please visit: *www.apaari.org*

The **Asia-Pacific Consortium on Agricultural Biotechnology (APCoAB)** was established in 2003 under the umbrella of APAARI. APCoAB has the mission to harness the benefits of agricultural biotechnology for human and animal welfare through the application of latest scientific technologies while safeguarding the environment for the advancement of society in the Asia-Pacific region. APCoAB's main objectives are to (i) serve as neutral forum for the key partners engaged in research, development, commercialization and education/learning of agricultural biotechnology as well as environmental safety in the Asia-Pacific region; (ii) facilitate and promote the process of greater public awareness and understanding relating to important issues of IPR, sui generis systems, biosafety, risk assessment, harmonization of regulatory procedures, and benefit sharing in order to address various concerns relating to adoption agricultural biotechnology; and (iii) facilitate human resource development for meaningful application of agricultural biotechnology to enhance sustainable agricultural productivity as well as product quality, for the welfare of both farmers and consumers. For further information, please see *www.apcoab.org*

The **International Service for the Acquisition of Agri-Biotech Applications (ISAAA)** is a not-for-profit international organization that shares the benefits of crop biotechnology to various stakeholders, particularly resource-poor farmers in developing countries, through knowledge sharing initiatives and the transfer and delivery of proprietary biotechnology applications. The major mission, the goal of ISAAA is to alleviate poverty and hunger in developing countries through the use of biotechnology. ISAAA's global knowledge sharing network and partnerships in the research and development continuum provide a powerful combination of science based information and appropriate technology to those who need to make informed decisions about their acceptance and use. In addition, an array of support services completes the holistic approach to agricultural development and ensures effective implementation and timely delivery of crop biotechnologies. These services include capacity building for policy makers

and scientists; regulatory oversight on such issues as biosafety and food safety; impact assessment, and science communication. ISAAA has two major missions. For more details, please visit *www.isaaa.org*

The **Malaysian Biotechnology Information Centre (MABIC)** is a not-for-profit organization dedicated to building public understanding of biotechnology focusing on policies, regulations, education, entrepreneurship and human capital development. In the past one decade, with its various outreach programs and a broad spectrum of target audience, MABIC has positioned itself as the sole biotechnology communicator in Malaysia. MABIC organizes a variety of activities targeted at specific stakeholders in and around Malaysia to promote mutual understanding, engage the masses and inspire the next generation to embrace the potential of biotechnology. Its strong linkages and collaboration with universities and government agencies serves as MABIC's key strength in successfully creating public understanding of biotechnology. For more details, please visit *www.bic.org.my*

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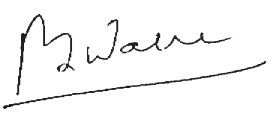
Foreword

More than 2.2 billion people in Asia and the Pacific rely on agriculture for their livelihoods. Food and feed demand will nearly double in the coming 50 years. The developing countries in this region are likely to face the highest reductions in agricultural potential in the world due to climate change and shrinking resources. There is an urgent need to increase crop productivity in an improved and sustainable manner with the use of fewer resources – less land, water, fertilizer and pesticides. It is now evident that a combination of the old and new technologies (conventional breeding, advanced biotechnology tools, Genetic Modification (GM) and new breeding technologies) are needed to achieve sustainable crop productivity on the 1.5 billion hectares of cropland globally. The global area under biotech crops has increased more than 100-fold from 1.7 million hectares in 1996 to 181.5 million hectares in 2014. This makes biotech crops the fastest adopted crop technology in recent times. However, there are still many issues and controversies surrounding biotech crops. One of the reasons is the lack of communication, public engagement and awareness among various stakeholders. Therefore, there is a need to have communication strategies in place, targeting various stakeholders who are involved in the approval, adoption and consumption of biotech crops.

The Asia-Pacific Association of Agricultural Research Institutions (APAARI) and its program on biotechnology, the Asia-Pacific Consortium on Agricultural Biotechnology (APCoAB), organized a workshop on Development of Communication Strategies for Adoption of Agri-Biotechnology in Asia and the Pacific from the 28-29 September 2015 in Chiang Rai, Thailand. The workshop was organized in collaboration with International Service for the Acquisition of Agri-Biotech Applications (ISAAA), and Malaysian Biotechnology Information Centre (MABIC) and supported by Council of Agriculture,Taiwan R.O.C.

I am pleased that international experts from nine countries participated and shared their experiences as resource persons. Twenty-four agriculture researchers from fifteen countries in the Asia and the Pacific participated and deliberated on various communication strategies. These deliberations have resulted in effective strategies in communication and the best way to approach various stakeholders, obtain public acceptance and garner political support.

I take this opportunity to thank all resource persons and participants for their active involvement. The efforts of Dr. Vilasini Pillai, APCoAB Coordinator, Dr. Randy Hautea, the Global Coordinator of ISAAA, Dr. Mahaletchumy Arujanan, Executive Director of MABIC, in organizing this workshop and compiling the proceedings are highly appreciated. I hope that the recommendations and communication strategies/framework of this workshop will help in the greater adoption of Agri-Biotechnology in Asia and the Pacific.



Dr. Raghunath Ghodake
Executive Secretary
APAARI

Acknowledgement

APAARI acknowledges the support of the Council of Agriculture (COA), Taiwan R.O.C. as well as the Department of Agriculture, Thailand.

APAARI is thankful to the secretariat support rendered by Ms. Chanerin Maneechansook, Ms. Urairat Rujirek and Ms. Khattiya Ounjai from Bangkok and Ms. Farah Nadzri and Ms. Shamira Shamsuddin from the Malaysian Biotechnology Information Centre (MABIC), Malaysia.

Acronyms and Abbreviations

ABD	Agriculture Botany Division
ABI	Agro-Biotechnology Institute Malaysia
ABLE	Association of Better Living and Education
ACB	Asian Corn Borer
ABSPII	Agricultural Biotechnology Support Project II
A-IMBN	Asia-Pacific International Molecular Biology Network
AIIM	Alignment, Influence, Interest Matrix
AIPI	Indonesian Academy of Sciences
APAARI	Asia-Pacific Association of Agricultural Research Institutions
APCoAB	Asia-Pacific Consortium of Agricultural Biotechnology
APEC	Asia-Pacific Economic Cooperation
ASEAN	Association of South East Asian Nations
ASM	American Society for Microbiology
ASRB	Agricultural Scientists Recruitment Board
AU's	Autodesk University India
BARC	Bangladesh Agricultural Research Council
BARI	Bangladesh Agricultural Research Institute
BCP	Biotechnology Coalition of the Philippines
BICs	Biotechnology Information Centers
CABI	Centre for Agriculture and Biosciences International
CGIAR	Consultative Group for International Agricultural Research
CII	Confederation of Indian Industry
CO_2	Carbon Dioxide
CoRRB	The Council for Renewable Natural Resources Research of Bhutan
CRD	Crops Research Division
CRISPR	Clustered Regularly Interspaced Short Palindromic Repeats
CSIR	Council for Scientific and Industrial Research
CSIRO	Commonwealth Scientific and Industrial Research Organization
DOA	Department of Agriculture
DOST	Department of Science and Technology

FICCI	Federation of Indian Chambers of Commerce and Industry
GDP	Gross Domestic Product
GE	Genetically Engineered
GEAC	Genetic Engineering Approval Committee
GM	Genetic modification/Genetically Modified
GMAC	Genetic Modification Advisory Committee
GMFs	Genetically Modified Foods
GMO	Genetically Modified Organisms
IBSC	Institutional Biosafety Committee
ICABIOGRAD	Indonesian Center for Agricultural Biotechnology and Genetic Resources Research and Development
ICAR	Indian Council of Agricultural Research
ICAR-CAFRI	Indian Council of Agricultural Research – Central Agroforestry Research Institute
ICATAD	Indonesian Center for Agricultural Technology Assessment and Development
IFPRI	International Food Policy Research Institute
IFS	International Foundation for Science
ILRI	International Livestock Research Institute
ILSI	International Life Science Institute
IPM	Integrated Pest Management
IPR	Intellectual Property Rights
ISAAA	International Service for the Acquisition of Agri-Biotech Applications
LIPI	Indonesian Institute of Sciences
MABIC	Malaysian Biotechnology Information Centre
MARD	Ministry of Agriculture and Rural Development
MARDI	Malaysian Agricultural Research and Development Institute
MoAF	Ministry of Agriculture and Forests
MOEF&CC	Ministry of Environment, Forest and Climate Change
NAFRI	National Agriculture and Forestry Research Institute
NARC	Nepal Agricultural Research Council
NARC	National Agriculture Research Center
NARI	National Agriculture Research Institute

NASI	National Academies of Sciences India
NCPAG	National College of Public Administration and Governance
NCSTC	National Council for Science and Technology Communication
NGOs	Non-Governmental Organizations
NIE	National Institute of Education, Singapore
NIGAB	National Institute for Genomics and Advance Biotechnology
NISCOM	National Institute of Science Communication
ODI	Overseas Development Institute
OECD	Organization for Economic Cooperation and Development
RCGM	Review Committee of Genetic Modification, India
R&D	Research and Development
rDNA	recombinant Deoxyribonucleic Acid
ROMA	Rapid Outcome Mapping Approach
SAARC	South Asian Association for Regional Cooperation
SABC	South African Broadcasting Corporation
SAUs	South Asian Universities
SEAMEO	Southeast Asian Ministers of Education Organization
SEARCA	Southeast Asian Center for Research and Graduate Studies in Agriculture
TALENs	Transcription activator-like effector nucleases
TARI	Taiwan Agricultural Research Institute
TERI	The Energy and Resources Institute
TWAS	The World Academy of Sciences
UPLB	University of the Philippines Los Baños
VAAS	Vietnam Academy of Agricultural Sciences

Workshop on Development of Communication Strategies for Adoption of Agri-Biotechnology in the Asia-Pacific Region

Background

Developing countries in the Asia-Pacific region need to accelerate their efforts towards harnessing the benefits of agri-biotechnology. Although detailed case studies on adoption, field performance, economic, and social impacts of biotech crops that are grown in China, India, the Philippines, Pakistan, Myanmar, Bangladesh and Australia have been published, there is still logjam in approving more crops that would have high socioeconomic and environmental impact. The cultivation of Bt brinjal has been halted in India and the Philippines for a number of years now. This is a lost opportunity which would result in exponential growth in terms of resource-poor farmers' income when adopted. The successful adoption and commercialization of Bt corn has benefitted the farmers in the Philippines and would also benefit millions of farmers in other corn growing Asian countries contributing significantly towards food and feed production.

Indonesia has successfully developed its own drought-tolerant GM sugarcane but approval for its commercial planting is still pending. Vietnam on the other hand has approved the cultivation of Bt corn and commercial planting started in 2015. Myanmar is commercially planting Bt cotton, however, regulatory framework is seriously lacking in this country. Malaysia has yet to plant on a commercial scale any biotech crops, although it has a legal regulatory set up in place. Malaysia, however imports biotech crops for food, feed and processing.

All countries in this region have their own specific bottlenecks in commercialization of biotech crops and even in the approval process for experimental field testing. Public acceptance of biotech crops is still a matter of considerable debate. Only 11 countries of in the region have approved biotech crops for food/livestock feed and only five actually grow them in farmers' fields. Sharply polarized views in favour of or against GM technology have re-emerged during the past few years, leading to inordinate delays in decision-making and, consequently, uncertainty in GM R&D. The complications in the regulatory framework and lack of effective communication strategies are some of the factors contributing to the slow process of approval and large scale cultivation of new biotech crops.

A number of steps need to be taken to overcome negative perceptions about GM technology and to ensure that its benefits become available to farmers and other stakeholders while ensuring safety of health and environment. Hence, the need for this dialogue to examine the issues, share experiences and recommend communication strategies that can assist in the faster adoption of GM technology in this region.

The two day Workshop deliberated on key factors that could lead to faster adoption of agri-biotechnology and identified best practices and communication strategies to overcome some of the challenges faced by some countries in adopting agri-biotechnology.

Objectives

A regional workshop for Asia-Pacific to:

- Deliberate on issues and bottlenecks in the adoption of agri-biotechnology in the Asia-Pacific region;
- Discuss policies, regulation and communication strategies that can expedite the adoption of agri-biotechnology; and
- Come up with recommendations and communication strategies that could expedite the adoption of biotech crops to harness its benefits in the Asia-Pacific region.

Participants

This workshop brought together a total of 37 participants and resource persons comprising communication experts, regulators, scientists, users of biotechnology from 15 Asia-Pacific countries and Africa.

INAUGURAL SESSION

Dr. Raghunath Ghodake welcoming the participants

Dr. Raghunath Ghodake, Executive Secretary of the Asia-Pacific Association of Agricultural Research Institutions (APAARI) welcomed the participants to the workshop in Chiang Rai.

Excerpts from Dr. Ghodake's Welcome Statement

APAARI stresses the fact that communication is an important issue to relay the correct scientific information to all our stakeholders; policy makers, scientists, lobby groups, extension workers, farmers and the general public. Generally, information is disseminated but rarely is communicated in an engaging manner with key stakeholders. Communication is very important for biotechnology as there has been a lot of progress made in the field of agri-biotechnology that needs to be effectively relayed to the stakeholders. We are very fortunate that today at this workshop, we have many experts to help us understand issues and concerns in the adoption of agri-biotechnology and the best ways to communicate the benefits of biotechnology as well as development of effective messages to all our stakeholders. We decided that in APAARI we should give importance to biotechnology to address the challenges in food security, poverty alleviation and food safety. It is known that communication is one area that scientists, research managers, and policy makers generally shy away from and to address this area, MABIC and ISAAA were invited as co-organizers to leverage on their strength in the field of biotech communication. We identified experts from eight countries – India, Bangladesh, the Philippines, Australia, Malaysia, Indonesia, Vietnam, and CABI Kenya- all these experts will help us in delivering and identifying issues and challenges in biotech communication that would help us to develop communication strategies that can be used to address various stakeholders and

issues. One of the outputs of this workshop will be a report in the form of proceedings as well as a communication strategies framework that can be used by managers, scientists and policy makers so that the technology can be better understood, communicated and used for the benefit of mankind.

Dr. Randy A. Hautea delivering his opening remarks

Dr. Randy A. Hautea, the Global Coordinator of ISAAA in his opening remarks, expressed ISAAA's appreciation for the opportunity to partner with APAARI and MABIC to co-organize this workshop.

Excerpts from Dr. Randy A. Hautea's opening remarks

ISAAA is a not for profit organization that aims to help in an enabling environment bringing the benefits of the technology to developing countries for poverty alleviation and meeting food security needs. ISAAA and its network put a strong focus on knowledge sharing and science communication for biotech awareness, acceptance and its adoption. We are grateful for the opportunity to partner with APAARI, APCoAB, and Department of Agriculture (DOA) Thailand and would like to collectively work to share the outcome of the discussions with a broader stakeholder group beyond what was represented directly in this workshop. I would like to share a quote from George Bernard Shaw – "the single biggest problem in communication is the illusion that it has taken place" as this sums up the challenge of ISAAA in generating awareness and undertaking communication activities in the region and globally to raise the understanding and acceptance of biotechnology. It is timely to have this workshop as it addresses the concerns and realizations of biotechnology and collectively the discussions on the lessons learnt, common challenges can be shared and the best practices selected to refine communication strategies for greater impact and adoption.

Dr. Mahaletchumy Arujanan delivering her opening remarks

Dr. Mahaletchumy Arujanan, Executive Director of MABIC very passionately spoke on the importance of communication.

Excerpts from Dr. Arujanan's opening remarks

Communication is not only about giving out the messages on the benefits of the scientific research but it is a tool for scientists to garner political support, enhance public acceptance, influence development of balanced regulations, and address issues related to ethics and religious aspects. Most of the concerns related to agri-biotechnology are sensitive in nature, and thus, there is a need for skilled communicators to develop effective messages that align with stakeholders' needs and values. With the huge magnitude of negative news and messages found in the internet that gives wrong perception to the general public of the potential benefits of biotechnology, scientists and policy makers should double their efforts in engaging with the public and other key stakeholders. I hope that APAARI and APCoAB will continue the collaboration with MABIC and ISAAA as we would like to have a stronger presence in this region to address communication issues so that the benefits of the technology can be realized in the developing countries in the Asia-Pacific region. I hope to see two of my wishes realized – that every Research Institute and University has a trained science communicator to be the interface between scientists and the general public and that science communication becomes a taught module in science courses in institutes of higher education.

Dr. Alongkorn Korntong delivering the Inaugural Address

The Guest of Honour, Dr. Alongkorn Korntong, Deputy Director General, Department of Agriculture (DOA), Thailand delivered the Inagural address and officially opened the workshop on behalf of Mr. Anan Suwannarat, Director General, DOA, Thailand.

Excerpts of Dr. Korntong's Inaugural Address

I would like to congratulate APAARI and APCoAB and the co-organizers; ISAAA, MABIC, support from the Council of Agriculture on the organization of this workshop.

Although new advances in science had brought improvements in the living conditions for many countries in Asia, a high percentage still lived in poverty and remained undernourished. There is a declining trend in public sector investment particularly in agricultural research and development as agencies are shifting their funding from agricultural research toward other priority areas. The importance of plant biotechnology in enhancing agriculture productivity in a sustainable manner cannot be denied, as it will have a tremendous impact on the lives and economy of the Asian region. However it will depend on a number of critical elements, such as the right combination of funding and research efforts and R&D strategies directed at clearly defined target crops and traits that will alleviate poverty, improve food security, and support environmental conservation. Other areas that need attention are creating access to agri-biotechnology for resource-poor farmers; improvement in the seed distribution and extension systems; capacity-building in biotech R&D; public awareness and education; policies and regulatory frameworks on biosafety, food safety, and intellectual property rights (IPRs); and stronger public-private sector partnerships for both international and local collaborative undertakings. It is important that agri-biotechnology is implemented through regulatory frameworks that have the public's trust and confidence.

There is negative public perception on biotechnology, biosafety and Genetically Modified (GM) crops that have been released commercially in the Asian region. Communication and education will play an important role in overcoming this negative perception. Finally, strong political will and commitment by governments, manifested by appropriate public policies and investments, will be crucial in the struggle to improve the livelihoods of millions of people in the Asian region.

Session 1:
Agri-Biotechnology in the Asia-Pacific: Challenges and Prospects

This session was moderated by Dr. Vilasini Pillai, APCoAB Coordinator.

KEYNOTE PAPER: TRENDS AND PROSPECTS IN AGRI-BIOTECHNOLOGY IN ASIA-PACIFIC

Professor Paul P.S. Teng, **Nanyang Technological University Singapore**

Agri-biotechnology comprises sets of technologies which may be divided into conventional agri-biotechnology (such as improved seeds of crop varieties, mushroom culture, fermentation-based technologies for alcohol, food additives, etc., tissue culture) and novel, modern agri-biotechnology (such as marker-aided selected crop varieties, GMOs (Genetically Modified Organisms), Biofermentation, Biodiagnostics, vaccines) and products from emergent technologies (such as Clustered Regularly Interspaced Short Palindromic Repeats (CRISPR) and Transcription activator-like effector nucleases (TALENs)), and synthetic food technologies. All these have relevance by meeting the needs of the Asia-Pacific region – to satisfy growing demands for quality food and feed, to improve stability in food security, to increase agricultural productivity and yields by using less fertilizer, land, water resources, and providing feedstock for bio-based fuels and chemicals. Several countries have successfully used this expanded scope of agri-biotechnology to guide their foray into creating enterprises, notable of which are Taiwan R.O.C., Thailand and Malaysia. A recent e-book published in 2015 by the Asian Productivity Organization, titled "Agricultural Biotechnology and Global Competitiveness", gives recent examples of the

applications of agri-biotechnology across selected Asian countries and is downloadable at the link — **http://www.apo-tokyo.org/publications/ebooks/agricultural-biotechnology-and-global-competitiveness/**. The demand for the products of agri-biotech make the prospects bright as societal needs are high for food (calories, protein, etc.), feed (livestock, fish), fibre, fuel, industrials and pharmaceuticals. But for each product, its successful commercialization is dependent on the business case made and in the case of public sector products, on the pathway of dissemination from laboratory to the end-user (consumer). Key trends in the environment which agri-biotechnology operates further influence its potential adoption, among which are demographics (population growth, urbanization, the growing middle class with increased income, a declining and ageing farmer population), diet changes, declining performance of agriculture (yield/unit area), environmental degradation/loss of land and water resources, climate change, finite petro-based energy/green biofuel and rapid transformation of (inclusive agri-food) supply chains. These trends act singly or often together to influence the demand for agri-biotech products. Biotechnology generally has become a global business worth about US$ 341 billion in 2014, of which biotech seeds make up only about US$ 15 billion. Ultimately, the translation of prospects to reality for agri-biotechnology depends on enablers such as policy support, Infrastructure, investment funding, human resources (in a right mix) and a science-based regulatory framework. Countries which have shown much success in commercializing agri-biotechnology have all shown strong supportive government policies and financial investments to build capacity in human resources and regulations.

CHALLENGES AND THE WAY FORWARD IN THE ADOPTION OF BIOTECH CROPS IN THE ASIA-PACIFIC REGION

***Dr. Randy A. Hautea*, ISAAA**

ISAAA's main role is to help alleviate poverty and hunger in developing countries through the use of biotechnology and this is carried out by facilitating the sharing of information and experiences on crop biotechnology through a global network. The biggest constraint is the understanding and acceptance of the technology and this resulted in ISAAA putting more effort into knowledge sharing and communication. The growing world population will be mainly in the Asia-Pacific region and this region will also be the home for 2/3 of the world's poor people. There will be demand for more diversified food and more protein. Farmers have doubled global food production over the last 50 years using the various plant science technologies to increase production to keep up with the world's demands. The phenomenon of urbanization that we see today will result in less food being produced but more food consumers. Food production must increase by 70 per cent to meet rising demand and requires greater adoption of innovative technologies like plant biotechnology to grow additional good quality safe food sustainably. Taking rice as an example, a combination of technologies has allowed the incremental improvement resulting in higher yielding varieties. The IFPRI Food Security Report states that technology has contributed to 30-40 per cent yield increases in most of the crops grown in South Asia as well as other parts of Asia. Modern Biotechnology can be harnessed in a more responsible manner to address food shortage by growing sufficient, nutritious and safe food with less inputs and safe to the environment. It can address the current demands for crops that withstand the adverse impacts of climate change. The global area with biotech crops has grown to 181.5 million hectares in 2014. The whole Asia-Pacific region is a significant grower and consumer of biotech crops, with the Philippines being the first in the ASEAN region to grow

GM corn. Vietnam has followed suit with GM corn and soon Indonesia will be the next country to commercialize GM sugarcane. Bangladesh is the first country to grow a GM vegetable crop. A recent study by Klümper W., Qaim M., 2014 has shown that the average agronomic and economic benefits of biotech crops are large and significant. Impacts vary especially by modified crop trait and geographic region. Yield and farmer profit gains are higher in developing countries than in developed countries. Biotech crops can contribute to global food security and sustainability.

A recent study by Brookes and Barfoot, 2015 have shown that the positive global socio-economic and environmental impact of biotech crops in the 18 years since it was first planted commercially. GM technology has a positive impact on farm income derived from a combination of enhanced productivity and efficiency gains. This is seen in the plantings of soybean, cotton, maize and canola. The planting of biotech crops have contributed to the significant reduction of environmental impact associated with the use of herbicide and pesticide in the areas devoted to the growing of biotech crops.

There are some continuing challenges to biotech crop adoption in the Asia-Pacific region. These challenges are on regulatory issues, opposition to the technology, public perception, “Choked” Product Pipeline and limited public sector participation in product development as well as some issues that are beyond the realm of science. There is a need to dissect these issues and understand as they indirectly influence public perceptions this is a continued challenge. There are very few examples in public engagement in the development of biotech crops and this is almost directly the cause of limited adoption of biotech crops. All the active GM work in the public sector chokes the pipeline resulting in the low commercialization. There is tremendous opportunity to improve crop production using improved technologies and innovations, including biotechnology. Demand for biotech crops is growing, particularly in developing countries, and pipelines are increasing and diversifying. International biotech crop trade is increasing but various challenges hamper a more rapid and broader adoption. The utilization of technologies requires government support and an enabling environment.

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Panel Discussion: Key Factors That Would Lead to the Adoption of Agri-Biotechnology

The panel discussion was moderated by **Dr. Craig Cormick, Creative Director of ThinkOutsideThe**

Panel members were:

1. Dr. Charudatta Mayee, India
2. Dr. Gour Pada Das, Bangladesh
3. Mr. Abraham Manalo, The Philippines
4. Mst. Dilafroza Khanam, Bangladesh

Panel Discussion: Dr. Craig Cormick (standing), from left to right: Mst. Dilafroza Khanam (Bangladesh), Dr. Gour Pada Das (Bangladesh), Mr. Abraham Manalo (The Philippines) and Dr. Charudatta Mayee (India)

The moderator of the session requested the audience to review the presentations of the panelists and started the panel discussion with pertinent questions that would identify the key factors that would lead towards the adoption of agri-biotechnology based on their own country experiences.

The Following are Summaries of the Presentations Prepared by the Panel Members:

How do we garner political support? Mst. Dilafroza Khanam
Factors that facilitated the deregulation/adoption of Bt brinjal in Bangladesh, Dr. Gour Pada Das

Agriculture in Bangladesh is an important contributor to the country's GDP. Bt Brinjal is one of the most important vegetable grown in Bangladesh but it is plagued with the fruit and shoot borer, resulting in 70 per cent loss in crop yield. Farmers use large amounts of pesticide indiscriminately to combat this problem, causing harm to human health and the environment. It also adds to the cost of production of this vegetable. It was decided that biotechnology intervention was needed to overcome the insect infestation as conventional breeding could not solve this problem. The Bt gene was incorporated into the nine local varieties and after seven years of field and greenhouse trials, four varieties was released in 2013 and more are to be released this year. The key factors that were important for this successful release were:

- The government support that was rendered to the scientists as well as the regulators. The scientists and regulators successfully rebutted the opposition of this release possessed by NGOs to the Minister of Agriculture as well as to the Prime Minister. Agriculture Minister Matia Chowdhury came down heavily on the protesters for their stance against the cultivation of Bt brinjal, adding that the GM varieties were released after ensuring all of the relevant safety measures;
- Farmers saw the benefits where they were given first-hand experience at the Bt brinjal grown demonstration plots;
- Awareness programs were conducted by organizing press releases and conferences, seminars and conferences as well as discussions and meetings with civil societies, government officials, academicians and scientists; and
- The government was ready with all the necessary regulations and policies on GM.

What is needed for public acceptance? Dr. C.D. Mayee

It is important to understand and define what is public. *"There is no single public, but different levels of public based on different levels of interest and ability"*, Aggens (1983). There are four types of public: non-public, latent public, aware public and active public. The types of public are identified by:

- Recognition of the problem of acceptance
- Reorganization of the obstacles to acceptance
- Level of Involvement in problem situation

These four types of public determine the way communication is carried out. The methods of communication range from direct debates, the use of extension network and trainings, printed material such as brochures, booklets, glossary of terms for better understanding of scientific terms, CDs and websites, educational courses and farmer's participation.

India has held eight direct debates/dialogues between Pro & Against Public which dented the opposition last year. We carried out continuous lectures on importance of biotech crop to graduates and postgraduate students, resulting in latent public becoming more aware. Farmers groups were also sensitized who added strong voices to the benefits of biotech crops. Besides this, science conferences, seminar and workshops were conducted and the latest research findings were published in the local media. To combat the active public that opposes GM technology, best course is to reach out to young minds through education targeting common misconception which will immunize the population against anti-GMO messages.

Dealing with Activism, Mr. Abraham Manalo

Advances in modern biotechnology were not fully exploited in the Philippines in the past, particularly in the area of agriculture, due to strong anti-biotech lobbying, such as uprooting of Bt corn and Bt eggplant in a field trial site, branding of commercial farms as toxic sites, hunger strike at the Department of Agriculture to force the Secretary to revoke the permit given to Bt corn, visiting supermarkets to brand foods that may contain biotech ingredients as unhealthy and poisonous and local demonstrations as outpost for domestic campaigns.

A response to counter wrong information about the technology and identify experts/ champions on biotech was the formation of **the Biotechnology Coalition of the Philippines (BCP), a civil society organization registered at the Philippines in 2002**. It is a multi-sectoral coalition of advocates for the safe and responsible use of modern biotechnology for the economy and its members are from the science community, academic and research institutions, religious authorities, media, local farmer organizations and industry.

Its Mission statement is to contribute to domestic development goals of:

- eradicating poverty,
- achieving food security,
- improving health, and
- sustaining the environment by harnessing the actual and potential benefits of modern biotechnology through its safe and responsible use.

Some lessons to share on Science Communication:

- Form working partnerships, networks and coalitions. Partnership with like-minded industry groups, trade associations, professional organizations and networking with organizations that share common interest for safe and responsible use of modern biotechnology, e.g. associations of food companies, livestock raisers, traders and grain handlers, doctors and allied professionals, and practitioners in the field of molecular biology, microbiology, and biotechnology;
- Identify effective communicators: farmers as part biotech crop planting, they become the best spokesperson for the technology;

- Make use of scientists who are known experts in their field and committed to the safe and responsible use of modern biotechnology to support the economy as a tool for the attainment of domestic development goals.
- Highlight locally developed biotech crops and success of biotech adoption in other countries; and
- Provide support to core domestic biotech activities, e.g. annual journalism awards and Biotech Week.

Key messages: (Summary of the Panel Discussion)

Adoption of biotechnology is a wicked problem as it is too complex to understand and solve. There has been a perception that Bt is the only biotechnology in India. As public awareness on the other biotech crops in India is quite low there is a need to develop customized communicate strategies for various stakeholders. Direct dialogue with activists can clarify their concerns and make them understand the science behind the development of biotech crops. There is negative perception of biotechnology and government tends to reacts towards public perception, so there is a need to educate the public to be open to new technologies. This will be easier and faster for adoption of agri-biotechnology. Another lesson learned is that if the first biotech crops commercialized in India were developed by the public sector the whole scenario could have changed in this country. This would have led to lesser resistance to the adoption of biotech crops.

A government that believes in the technology and sees the benefit for the end users will not bend or be pressurized by the lobbyists.

The panel members were asked about the **one thing that happened in your country that could have been done differently:**

- Should have first promoted a public research institute product before bringing in the multinational product;
- Improve regulations to remove doubt from the public;
- Show that the biotech crops are addressing a problem and not causing one;
- Show that different farming systems can co-exist, e.g. organics and biotech crops;
- Government officials must also see first-hand the benefits it brings to the people, farmers and the environment. The need to convince all levels of government that the technology is needed; and
- Engage with academicians, extension workers as they are civil society members and the government listens to them.

What are the main factors to get political support in your own countries?

- Regulatory framework that can facilitate the adoption of the biotech crops;
- Strong biosafety framework;

- Make known the research that is happening in the country at the early stages, before it enters the commercialisation phase and show the politicians the results and benefits of this research; and
- Target the youths as they are the leaders of tomorrow. Moreover they are can also be loudest voice of the day.

What are the key factors for the faster adoption of biotech crops?

- The establishment of the department of biotechnology in India is seen as an important milestone. This helped promote biotechnology in the country. To date there are several active institutions participating in biotechnology research. Public trust is in a public derived product. There are quite a few of them in the pipeline and that will help in the adoption of these crops;
- Strong biosafety framework that demonstrates that all aspects of safety are taken care off;
- Build trust between public and scientists by continuous communication;
- Youth is an important force and young graduates are positive thinkers of biotechnology. Very low opposition among the youth. Targeted programs to the youths of today as they will be the leaders of tomorrow. If they are made aware of the benefits of technology there will be less opposition in the future. Have NGOs to cater to the younger group and urban socialites. The concerns are not about the technology but about the technology being in the hands of multinational companies; and
- Have biotechnology incorporated in the school syllabus including the success stories like Bt Brinjal.

Session 2:
Agri-Biotechnology Communication Strategies and Challenges in the Asia-Pacific

This session was moderated by Mr. Abraham Manalo, Executive Secretary of the Biotechnology Coalition of the Philippines (BCP)

KEYNOTE PAPER: THE EVOLUTION OF AGRI-BIOTECHNOLOGY COMMUNICATION IN ASIA

Dr. Mariechel J. Navarro, **ISAAA, The Philippines**

Like many scientific breakthroughs, agri-biotech applications continue to undergo public scrutiny, debate, and discussion despite the documented benefits and pronouncements of safety by various agencies and organizations. An overview of the last 10 years of genetically engineered (GE) crop safety research published in the *Critical Reviews of Biotechnology* in 2013, for instance, reveal no significant hazards directly connected with the use of GE crops. However, debate about it is still intense. The researchers noted that "an efficacy of scientific communication could have a significant impact on the future of agricultural GE." Indeed, much attention is now in biotech communication – involving knowledge sharing, deliberation, negotiation, and participation of various actors to facilitate and encourage informed decision-making.

In the eighties and early nineties, there was not much interest in agri-biotech communication aggravated by the lack of tangible products in the market and absence of direct value to the public. However, much of this has changed over time. In two recent international events held in Nairobi, Kenya, and Manila, Philippines, delegates called for the need to work collectively to improve the communications environment to build consensus and common understanding among stakeholders; and reaffirm the importance of public engagement in the decision-making process. However, to get to this paradigm shift requires an understanding of the process and phases of getting to this mindset.

The changing public mood toward science requires the need to try different models of public engagement to earn public trust, increase credibility, and encourage interest in this field. The dominant perspective for more than a decade was Phase 1 referred to as public understanding of science. The basic mission was to inform about scientific findings based on the perceived idea that people did not know much about the science. Basically one-way communication prevailed. Its limitation and inadequate understanding of the public necessitated Phase 2, identified as a stage from deficit to dialogue. Questions about public values arose and had to be addressed through stakeholder interaction. More questions that were beyond the realm of science from the public called for Phase 3 or upstream engagement. The focus is now on an exchange in decision-making to encourage a more honest and reflective mode of listening and interaction.

Communication challenges in Asia are many but the following are often mentioned: continued presence of technology critics, influence of media and critics in policy making, and incoherent communication efforts. Biotech perception studies in Asia also note low information seeking behavior, mass media as primary source of science information, and high trust in university scientists. Hence, efforts are being done to analyze the role of mass media in forming opinion and setting the tone and agenda on agri-biotech. It is also important to see how best to encourage and increase greater involvement of scientists in communication activities and address problems such as the need to popularize the technology, lack of management support, and inadequate engagement skills.

Experiences in public engagement show the necessity of identifying key publics and champions, fostering stakeholder dialogue and consensual discussion, and encouraging country visits by media practitioners, policy makers, and government representatives in areas where biotech crops are being planted.

Biotech communication has indeed evolved over time considering environmental changes/ context, audience profiles and interests, and socio-political perspectives. We are now seeing a strengthened relationship between science and society where values and impact are given attention and where the different publics are in a dynamic relationship with each other. In the process, new perspectives can arise leading to further debate and new areas of policy, strategies for adoption, and networks to forge a common purpose.

GMO COMMUNICATION: A PARADIGM SHIFT

***Dr. Mahaletchumy Arujanan*, MABIC, Malaysia**

While biotech crops or GM crops have years of accumulated evidence in increasing crop productivity, conserving biodiversity, reducing agriculture's eco-foot prints and mitigating climate change, there is a large movement that actively scaremongers and spreads pseudoscience to halt the progress of these crops.

Their success in shaping public opinion and putting pressure to governments to ban biotech crops is largely due to their emotional campaign that touches the values of the public. However, scientists are still employing the deficit model in their engagement with the public, where they provide overwhelming scientific information, facts and figures which are too abstract to the public. Another glaring contrast between critics of the technology and scientists is that the work of activists is easily available on the internet which makes it accessible to the public. However, the research carried out by scientists is confined to journal papers, scientific conferences, proceedings and university websites.

Scientists and science communicators should embrace new strategies and approaches in communicating and engaging with the public by understanding why people oppose new technologies, their risk aversion and values. Understanding cultural cognition will help scientists to develop their messages. Cultural cognition refers to the tendency of individuals to form risk perceptions that are congenial to their values. A strong understanding of sociology is important as values are largely shaped by behavior, social and cultural aspects, background, upbringing, beliefs and ideology, where scientific background and knowledge takes a backseat.

It is important to understand the following:

- Science appeals to our rational side of us but our beliefs are motivated largely by emotions;
- We believe in scientific ideas not because we have truly evaluated all the evidence but because we feel an affinity for the scientific community; and
- Science presentations are abstract and disconnected in our lives.

Thus, there is a strong need to repackage scientific information with emotions and values that touch the hearts of the audience, and merely providing scientific information will not sway public opinion and increase acceptance towards GM technology. In fact, bombarding the audience who oppose the technology with more technical information will only sway them further as they will tend to reinforce their values by referring to their "trusted sources" which are often the critics of the technology. This phenomenon is called cognitive dissonance.

Citizen journalism might be effective approach to minimize cognitive dissonance as the public tend to trust their peers. Expert voice has higher tendency to widen the views on risks. Exposing young children to science and its potential is another effective way to create more support for newer technologies.

It is heartening to know that there is an emerging trend among young people where *technogianism* is growing fast. This refers to a new form of environmentalists who actively support research, development and use of emerging and future technologies to help restore the environment. *Technogians* are largely young and tech-savvy and these are the people who will change the way GM technology is perceived. Scientists should leverage on them and be part of the *technogianism* movement.

THE CHALLENGES THROUGH THE LENS OF SCIENTISTS

***Prof. Antonius Suwanto*, Bogor Agriculture University, Indonesia**

Genetically Modified Foods (GMFs) refer to food or food ingredients derived from GMOs. Genetic modifications have been performed through sexual recombination, which is the hallmark of conventional breeding in agriculture. Although it has probably been conducted since the birth of human civilization, it only relies on random rearrangement of genetic material. In addition, advances in molecular biology and genetic engineering have allowed us to directly and more precisely alter genetic materials of essentially any organisms. Recent technologies in metagenome, epigenetics, and CRISPR genome editing even provide us with many more alternatives to modify genetic material and its expression. Genome editing will also create grey area between conventional breeding and genetic engineering. These powerful techniques will be paramount importance in addressing our limited and often unpredictable resources. Therefore, GMOs will continue to be part of our strategy to secure sustainable supply of our food. However, as happened with other technologies, their abuse or overuse of can lead to negative perception or even real disaster from an otherwise promising and powerful technology. Therefore we should provide better education and communication on sciences to all stakeholders such as religious leaders, policy makers, private sectors, and extension staffs. This can be conducted through social media (Facebook, twitter), newspaper, radio, television, or online courses. In addition, it is also equally important to create communication to foster critical thinking in all level of education.

CONVINCING THE FARMERS

***Ms. Rosalie Ellasus*, Biotech Corn Farmer, the Philippines**

Rosalie started as a farmer in the year 2000 by undergoing an integrated pest management course and a farmer's field school, studying rice, corn, livestock, vegetable and farm mechanization and other important aspects of farming. In 2002, San Jacinto corn farmers were invited to a GM/Bt Demo Field. After the trial, Rosalie volunteered her farm for a GM/Non-GM Corn Demo Field Trial. The results showed the differences of non-GM corn and GM corn. GM corn had no Asian Corn Borer (ACB) which is one of the worst corn pest in Western Asia-Pacific region. Growing GM corn also resulted in reduced manual labor, fuel and water consumption, chemical spraying and less monitoring. The yield was also higher as compared to the non-GM corn. GM/Bt Corn was approved for commercialization in 2003 and San Jacinto Corn farmers were one of the first to grow Bt Corn in the Philippines. After ten years of growing Bt Corn commercially, the advantageous can be seen: improved productivity and farmers' income, protection of biodiversity, better environmental impact with reduced chemicals, less CO_2 emission, and less use of land and water. The social impact could be seen in the poverty alleviation of small resource farmers. It helped close the gap between local corn feedstock demand and supply. However there is still concern about the effects and safety of GM food consumption although the Bt Corn is widely grown and consumed daily. The farmers are waiting for more biotech crops to be commercialized as they have seen the benefits of growing biotech crops. As a grower of Bt corn and firm believer of the benefits of biotech crops, she has been recognized with several awards as well as represents the farming community in several Board of Directors. She has been

a science communicator since 2004 and has visited several countries talking about her experience and the benefits of growing Bt corn.

Discussion

It was thought provoking to realize the need for a paradigm shift in the way we communicate agri-biotechnology. It was also a wakeup call for scientists who have been practicing the traditional methods of communication. While employing full time science communicators at universities, research institutes, relevant ministries and government departments is a good suggestion, it will take some time before it becomes a reality as restructuring of the organization needs to be carried out.

The biggest challenge faced by scientists in communicating agri-biotechnology is that most of the public issues and concerns are not science-based but are beyond the realm of science such as trade monopoly, ethics, religion and futuristic imagination and hypothetical situations. Addressing these concerns requires a set of different understanding such as socioeconomics, ethics, trade and cultural values. This brings about the need to develop a toolkit for communication that addresses non-science issues.

There are untapped opportunities such as the social media, employing non-traditional communication approaches such as storytelling, school-based competitions and using local language to widen the target audience.

Segmenting the public into different groups based on their opinion, knowledge and background and developing customized messages for the different segment is a big challenge. This requires excellent communication skills, cultural and societal understanding, and understanding sensitivities of the target audience. This often possesses a problem as the public surveys are not often reflective of their position and opinion.

Session 3:
Best Practices in Effective Communication of Agri-Biotechnology

This session was moderated by Dr. Mahaletchumy Arujanan

KEYNOTE PAPER: COMMUNICATION FOR BIOTECH PLANNING AND IMPLEMENTATION

***Dr. Deborah Romney*, Global Director, Development, Communications and Extension CABI, Kenya**

CABI's global mandate is to promote the advancement of agriculture and allied sciences through the provision of information, scientific and related services on a world-wide. A key area of technical competence is in plant health, pest and disease. Development of communications activities cover broader areas including soil health and seed systems while the CABI Knowledge business also addresses human and animal health.

In developing communication strategies, one has to think of the kind of information material, and the methods that will be used to deliver these messages. Delivering information is necessary but not sufficient – it is also important to facilitate new ways of working, acquiring new skills, develop improved policies for system change to take place.

The presentation did not put forward a position in the debate around biotechnology and GMOs, but proposed generic approaches to communication with a focus on communicating

with scientists, politicians, policy makers and regulators. Development of communications strategies and frameworks are essential for planning biotechnology programs and should recognize and understand competing views and the controversial aspects of the debate. For a simple framework, Why, Who, What and How concepts can be used together with tools from ROMA (Rapid Outcome Mapping Approach), an approach developed by the Overseas Development Institute (ODI) to improve policy engagement processes and influence change amongst target audiences http://www.roma.odi.org/.

Actions can be considered in three key steps (Diagnosis of the problem; Development of a strategy and Development of a plan for learning and evaluation).

1) Diagnosis of the problem

WHY? Define the objectives or vision of the communication strategy. It helps to express the vision in terms of the ideal behavior that might be expected in an ideal world. Carry out a context analysis that seeks to understand the key issues and background for the country/countries where the work is being planned.

WHO? Using the AIIM tool (Alignment, Influence, Interest Matrix), one can identify the various stakeholders on the matrix according to their alignment with the specific goals, their level of interest and influence that they have. Then engage with the most important audiences to understand cultural, political and economic factors that determine their current behavior and that will influence choice of communication strategies.

2) Development of a strategy

HOW? There can be two dimensions to approaches in influencing policy. Firstly the basis of the approach – whether it is evidence/science based or interest/values based. Secondly, is whether it is cooperative or confrontational? For example activist approaches can be considered to be interest/values based, using a confrontational style.

There are many different kinds of actions in communication: field visits, public events, private meetings, mass media (radio, television, and social media) and print media (newspaper/magazine, scientific publications etc.).

In development of a communications strategy it is useful to borrow from the outcome mapping strategy that considers strategies that target specific individuals or groups or the environment in which those individuals or groups operate. There are three kinds of strategies that can be used with the individual or environment:

- Causal – where you have control over the outcome, for example paying people to attend an event (individual), developing a policy (environment) etc.;
- Persuasive – promote new thinking for example through workshops or trainings (individuals) or disseminating information to the general public through mass media (environment); and

- Supportive – creating a situation that facilitates debate and change, for example engaging an individual that can facilitate interactions and piloting new ways of doing things (individual) or establishing multi-stakeholder or regional networks that can support learning and change (environment).

3) Development of a plan for learning and evaluation

Whatever strategy is adopted, it is important to take a reflective approach, taking time to evaluate whether the strategy is having the desired effect in the way the targeted audience is thinking or behaving, whether the key messages are still valid and on-track and if not adjust the strategy accordingly.

THE AUSTRALIAN EXPERIENCE: A DEEPER UNDERSTANDING OF CONSUMER ATTITUDES TO GM FOODS AND HOW TO USE THEM TO DEVELOP EFFECTIVE COMMUNICATION STRATEGIES

Dr. Craig Cormick, **ThinkOutsideThe, Australia**

Deeper analysis of public attitudes reveals several key things that need to be incorporated into agri-biotechnology communication strategies to improve their effectiveness.

Firstly, simply asking Yes or No questions about attitudes to GM foods and crops does not adequately represent the breadth of public attitudes. However, the questions asked along a broader scale of support or rejection show there are minorities at the polar extremes of for and against (Polar Bears) with the bulk of the population in the middle (Penguins). It is important to know whether you are talking to a Polar Bear or a Penguin in public engagements, as Polar Bears will not shift their position, yet dominate debates and often appear as a larger proportion of the public due to the 'noise' they create.

A second key finding is that people's values influence their attitudes, and when they are segmented by similar values there are four key segments:

Segment 1 – the Concerned and Disengaged: Segment 1 is the least enthusiastic about the benefits of science and technology. They had the highest agreement that "the pace of technological change is too fast to keep up with" and were the most likely to agree that "science and technology creates more problems than it solves".

Segment 2 – the Risk Averse: This segment tended to be less positive towards the benefits of science and technology generally, and biotechnology specifically. They were also more concerned with related risks. But in contrast to Segment 1, they had relatively high awareness of the term "biotechnology".

Segment 3 – the Cautiously Keen: Segment 3 was defined by relatively high interest in science and agreement that "the benefits of science are greater than any harmful effects". In relation to GM, this segment was the second most positive, but they felt strongly that "children should be protected from all risks".

Segment 4 – the Science Fans: This group was the most positive towards science and technology. They expressed greater agreement that "science is such a big part of our lives that we should all take an interest", that "new technologies excite me more than they concern me".

When the four segments are mapped out, it shows that Segment 4, the Science Fans, are further away from the center-point of the public than any other segment – which means that if a communicator belongs to this segment, he/she probably won't easily understand the perspectives of the other segments, and they probably won't easily understand the communicator.

However, understanding people's value allows for framing of messages that align with those values, and are more likely to be accepted.

Key points:

- When information is complex, people make decisions based on their values and beliefs.
- People seek affirmation of their attitudes and beliefs and will reject any information or evidence that is counter to their attitudes or beliefs.
- Attitudes that were not formed by scientific information are not influenced by scientific information.
- Public concerns about contentious science or technologies are almost never about the science and scientific information therefore, does little to influence those concerns.
- People most trust those whose values mirror their own.

BEST PRACTICES IN EFFECTIVE COMMUNICATION FOR AGRI-BIOTECHNOLOGY: INDIAN EXPERIENCE

Dr. Charudatta Mayee, **Agricultural Scientist, Consultant, India**

Generally science communication in India prior to independence did not receive due attention which resulted in several dogmatic views, practices and blind faiths to prevail on several biological phenomena. There were no formal channels of science communication especially for the 80% general public living across villages of the country. Soon after India's independence, this gap was filled and the Government established several channels of communication and improved upon them to reach the masses. In 1952, National Institute of Science Communication (NISCOM) was established to spread science in local languages. National Council for Science and Technology Communication (NCSTC) started with a focus on training in 1980. Vigyan Prasar, an initiative of Department of Science and Technology was setup to coordinate the efforts of Institutions http://www.vigyanprasar.gov.in/. Thus, communication of science became top priority of the Government to remove the dogmas prevailing issues about nature. Currently, print media, audio-visual media, radio, science magazines, folk media, Interactive media, exhibition, seminars, workshops, lectures, science conferences, digital software and social media have revolutionized science communication. While information on new sciences particularly biotechnology and nanotechnology, have reached most of the city dwellers, it has its own share of woes despite its positive impact and equally dominant negative communication has held up their development. Biotechnology is a dry and boring subject to many who have absolutely no knowledge of basic biology and this science has its limitation when local language is used for communication.

Notwithstanding the shortcomings, the Government of India, along with several science entrepreneurs like seed companies, non-Government Bio-Science Associations, National Science Academies has taken the initiative to communicate with all the stockholders. Government Organizations such as the Department of Biotechnology (DBT), Ministry of Environment, Forest and Climate change (MOEF&CC), Ministry of Agriculture, Science and Technology, Public Sector Institutions; Indian Council of Agricultural Research (ICAR), Council for Scientific and Industrial Research (CSIR), South Asian Universities (SAUs), Non-Government Organizations, Biotech Consortium, The Energy and Resources Institute (TERI), ISAAA, International Life Science Institute (ILSI), Consultative Group for International Agricultural Research (CGIAR), South African Broadcasting Corporation (SABC), Industry Associations like National Academies of Sciences India (NASI), Association of Better Living and Education (ABLE), Federation of Indian Chambers of Commerce and Industry (FICCI), Confederation of Indian Industry (CII), Seed Companies have all been very actively involved in biotech communications to differing stakeholders. Through these organizations, several key challenges are addressed. Series of trainings, awareness workshops on regulations, Cartagena Protocol, biosafety measures particularly in the decade that followed the release of Bt cotton; the first biotech crop, were held for many stakeholders. Farmers were engaged in series of group meetings, field days demonstrations, and rallies that were organized not only for the cultivation practices but to explain to them the nitty-gritty of the science behind the biotech crop. Local language literature, films, street plays, cartoon competitions, science days in schools were organized and now they are part of biotech communication strategies. Farmers who accepted the Bt cotton whole heartedly have become voice in demanding similar agro technologies which could save them from routine spraying of the crop. They have also been exposed to the technological growth occurring all over the world due to the revolution in Information Technology.

The Government of India made accessible to all, its deliberations of the regulatory bodies; Review Committee of Genetic Modification, India (RCGM), Institutional Biosafety Committee (IBSC), Genetic Engineering Approval Committee (GEAC) and specifically involved the State Governments for the open and confined field trials. Websites especially devoted to biotechnology have made available to the public, the science behind biotechnology, from rDNA technology to product development and from regulatory protocols to approval mechanisms. Information through printouts, handbooks, project guidelines, capacity building was circulated from time to time as well as through conducting regional workshops. Public acceptance of biotech crops is a complex subject as public is a heterogeneous group and there is a long list of stakeholders. It is commendable in India that efforts are being made to engage with those who oppose the technology. Current direct dialogues between the opponents and proponents of the new technologies, prompted by Government are yielding fruitful results.

THE VIETNAM EXPERIENCE

***Dr. Le Huy Ham*, Agricultural Genetics Institute, Vietnam**

Vietnam is one of the major exporters for many agricultural products such as rice, coffee, cassava, tea, shrimp and furniture. However, Vietnam needs to import almost one hundred percent of soybean for domestic consumption and also maize, wheat and high quality rice for urban consumption. As a result of the decline in agriculture land due to increasing population and the rise of sea level from climate change, seventy to eighty million tons of food will have to be produced by the year 2050.

New technologies that can result in higher productivity is urgently needed to address the demand for food. The Vietnamese government is highly committed to the use of Biotechnology to help solve some of these problems. From 2006 to 2010, field testing of three biotech crops (maize, soybean and cotton) were carried out. The target is to achieve 30-50% of the total area under agriculture to be planted with biotech crops. The government's policies and regulatory system are in place to support Biotechnology especially the development, commercialization and safe use of biotech crops. With the cooperation of all the relevant Ministries, biotech crop projects, right from research to the commercialization and monitoring were launched. The need to repeat expensive and time consuming food safety tests of biotech crops is avoided by recognising its safety if the crops are commercialised in five Organization for Economic Cooperation and Development (OECD) countries. This measure helped to speed up the release process of these biotech crops in Vietnam. It also assisted the members of the Food Safety Committee to deal with confidence any opposition from the public, as well as get public trust on the safety of these GM products.

Exclusive permission from the Prime Minister was obtained to carry out the field trials on maize, soybean and cotton. In 2010, six maize varieties were approved for field trial (herbicide resistance, insect resistance and stacked) and will be commercialized in 2015.

Public resistance was gradually overcome with communication and public awareness on the need for more agricultural products in the future for human consumption and animal feed. Strong political will and International cooperation also provided helpful information and support for GM crop projects in Vietnam. By the end of year 2015, Vietnam is expected to summarize the productivity data on the comparison of non GM maize and GM maize. This will further help and promote public awareness on the benefits of biotech crops. Vietnam's experience and success in commercialization of biotech crops can be used as reference for the adoption of agri-biotechology in the Asia-Pacific region.

GROUP DISCUSSIONS

Communication Challenges Faced by the Various Stakeholders and Development of Communication Strategies for Different Stakeholders

Two group discussions were held during the workshop. The participants were divided into five stakeholder groups representing the private sector or industry, policy makers and regulators, politicians, media, and farmers. The first Group Discussion was moderated by Dr. Mahaletchumy Arujanan, MABIC and the five groups were asked to discuss on the **Communication Challenges** faced by scientists when dealing with the respective stakeholders they represented.

Group Presentations

These Groups then came up with the challenges faced by the different stakeholders:

Private Sector or Industry

- The interests of both the private sector and public sector do not overlap; and
- Private sector has low credibility while the public sector has high credibility and working together can increase public trust. However, this varies from country to country.

Policy Makers and Regulators

- It is quite challenging to convince policy makers and regulators as they differ in knowledge level, background and more importantly their focus area and objectives are different;
- NGOS have a heavy influence in shaping policy makers' and regulators' opinion. The decision of policy and regulators are normally biased towards the position of the Government of the day; and

- Insufficient interaction with policy makers and regulators by the scientists. Scientists are challenged with the right kind of approaches to increase awareness of policy makers and regulators.

Politicians

- Scientists have a difficult time to draw the attention of politicians to biotech crops and technology. If the farmers see the advantage then probably the politicians will see the benefits as this is associated to getting more votes from the public;
- Return of investment must be shown to the politicians and scientists need to convince them with advantages like monetary profit or popularity otherwise getting their support will be a challenge. Moreover the negative comments made by certain NGOs counters the efforts of scientists in convincing the politicians on the advantage of biotech;
- There is a lack platform for scientists to engage with the politicians. These platforms need to be developed and actively employed on a regular basis; and
- There is bureaucratic divide between politicians and the scientists as the scientists need to get clearance before interacting with them.

Media

The group came up with six problems for scientists to communicate with the media

- Scientific language or technical terms are difficult to be translated into layman language that leads to miscommunication or scientists being misquoted;
- The evolving media format approaches and culture makes it difficult for scientists to keep up with the pace and have active interaction with the media. Scientists are often not up to date current developments in social media like Facebook and twitter;
- Institutional mechanism for dealing with media is not conducive as not all scientists are good communicators. There might not be a skilled person within an organization who can communicate well with the media;
- Speed of communication is seen as a challenge as media wants to publish news everyday but scientists are more cautious when they want to release information regarding their research;
- Scientists and media have different interests. Scientists promote the truth with reliable information from their experiments, whereas the media look for sensational news to print to get impact and draw attention from the public. This might result in distorted scientific information; and
- Some media publish false or distorted information which they have obtained from unreliable sources. They do not check with the scientists to verify the news.

Farmers

- Farmers have different issues and challenges – pest and disease, insufficient capital to expand their farm, low productivity, and high cost of pesticides. One cannot push new seeds or new technologies without demonstrating the benefits of adopting these technologies; and
- Before talking to the farmers, there is need to understand their specific issues as these can be location specific.

The second Group Discussion was centered on **Developing Communication Strategies** to deal with the different challenges identified in the first group discussion. This session was moderated by Dr. Mariechel J. Navarro, ISAAA.

Group Discussion

STRATEGIES AND RECOMMENDATIONS

Private Sector or Industry

The group identified key principles when dealing with industry. The factors that define the different companies need to be understood:

- ✓ Their profits are short-term or long-term;
- ✓ What is their business plan;
- ✓ What is their reputation;
- ✓ What is their investment profile;
- ✓ What are their corporate social responsibility programs;
- ✓ What is their attitude to technology; and
- ✓ Do they collaborate or are they a competitor with other people around them.

- Once this is done, the communicator needs to align the objectives of communication with the chosen industry;
- The government has to play their part and provide a conducive environment to facilitate industry engagement and collaboration with researchers;
- The medium of collaboration or interaction can be done through trade shows, industry visits, lab visits, conferences, field trials visits, exhibitions visits, meetings, media, training sessions;
- A need to build long-term relationship. This is crucial for communication and effective relationship. evaluate feedback from these relationships and regularly review the feedback and carry out necessary adaption; and
- Understand the clear goal or objectives of industry engagement from the beginning.

Policy Makers and Regulators

It is important to engage with policy makers and regulators as they are the final authority in decision making.

The policy makers and regulators can be divided into three categories:

- Technocrats- they have the knowledge and sit on various decision making boards;
- Bureaucrats- involved in the administration of the government; and
- Politicians- involved in policy making, they formulate the policies by taking into account the views from the public.

These three groups are pro-technology, anti-technology or neutral and therefore have to devise customized strategies for each group separately.

Pro-technology

- Maintain constant communication with them via positive literature, publications and showing evidence of benefits of the technology; and
- Involve them in workshops, dialogues, interviews with press, print media, electronic media, keep them in the network of social media.

Anti-technology or the neutral group

- Organize frequent meetings for anti-technology groups that involve the pro-technology participants as the interaction between these two groups can shift negative opinion Organizing workshops to inform them about biotech crops and biotechnology. At these meetings or workshops, they could ask questions and clarify their doubts. Need strong support from scientific community to carry out these events;

- Continuous supply of literature to create awareness of benefits of technology;
- Arrange field visits locally or overseas to convince them of the benefits of biotech crops;
- Expose them to the success stories from all over the world;
- Bring to light that technology can alleviate poverty and hunger and solve nutritional problems;
- Show them that national prestige can be improved and the country can be in the world map;
- Continuously prepare handbooks, CDs and resource materials with the latest information on the technology; and
- Government personnel have to keep within certain boundaries. So use national academies or the various professional societies to engage with them as these groups are seen as neutral and independent.

Politicians

The best way to get the attention of politicians is through the farmers or industry.

- Have continuous interaction with the politicians at the local or the national level;
- Meet with the politicians and do it continuously through talks and dialogues;
- Take them to visit areas where there are problems or take them to countries where biotech crops have been successfully grown and commercialized;
- Scientists or the science communicators to work continuously with the office of the politicians to pass on the relevant information to the politicians;
- Build a platform for communication;
- Politicians are very reactionary to direct feedback from the public and so scientists must counteract immediately the negative messages from NGOs and media so that the public will be equipped with the true information and make their own decision; and
- Farmers must also be given the opportunity to talk about how the technology that they have adopted is benefiting them.

Media

- Choice of language is very important so that information is available in local dialects;
- Have subject matter experts to address the difficult terms. Customize the material for the different stakeholders;
- There are new media formats and approaches. Scientists have to deal with these by constantly monitoring information on the public domain so that can react quickly when something negative is posted online;

- There must be in place an institutional mechanism to deal with the media. A person specialised in science communication must be the interface between the scientists and the media. Speed of communication is fast nowadays so scientists need to be equally fast to counteract negative information quickly before it becomes viral;
- Need to allocate special funds for media outreach programs;
- Need to make the technical stories more newsworthy;
- Leverage on those that are science fans to spread the benefits of the technology;
- Take the risk averse media personnel for field, lab visits. Let them also talk to the farmers for them to be convinced;
- Have brand icons or ambassadors that can support the technology so media will capture these as well;
- Build good relationship with the media and build up databases of media personnel that are pro technology; and
- Editors of newspapers have to be convinced. Each paper has their own kind of thoughts/position. Have to work with the editors first as they play an important role in deciding if that technology is newsworthy or not.

Farmers

Farmers can be neutral, pro or anti-technology. The anti-technology groups among the farmers are the minority and so convincing the majority will help to sway the views of the minorities.

- Farmers are very pragmatic so to convince them show them the economic and environmental benefits if the new technology;
- Approach the leaders of the farming community who might be extension staff, leaders of ethnic or religious groups. Inform them of the benefits and this will have a multiplier effect to the farming community; and
- Farmers are also consumers. They are also concerned about food safety. So educate the extension staff to explain the safety issues to the farmers.

Conclusion

There are numerous challenges when faced with the successful adoption of agri-biotechnology for the benefit of not only farmers but also of the general public. Taking into consideration these challenges, one has then to design the most effective and implementable strategies to convince the various players or stakeholders. The challenges of dealing and convincing the key stakeholders were discussed at this workshop and the participants have drawn up some very innovative ways of communicating, collaborating and cooperating with the stakeholders. One group identified was the youths as they will be the leaders of tomorrow and are very engaged and convinced with technology and believe technology is the answer to a sustainable world.

Youths are very impressionable and if the benefits of the technology can be communicated to them early enough and in ways that they can relate to, they can help amplify the message to other peer groups, parents and social media friends.

Persuasive communication and perseverance in communication efforts are one of the key take away messages of this workshop.

A broad communication framework is being prepared and this will serve as a guide to communicators to develop the relevant strategies when dealing with the different stakeholders in the Asia and Pacific region.

Development of Communication Strategies For Adoption of Agri-Biotechnology in the Asia-Pacific Region

Dusit Island Hotel, Chiang Rai, Thailand
(28-29 September 2015)

PROGRAM

28 September 2015

08.30	**Registration**	
09.00-09.30	**Opening Ceremony**	
	Welcome Statement	Dr. Raghunath Ghodake, Executive Secretary, APAARI
	Opening Remarks	Dr. Randy A. Hautea, Global Coordinator, ISAAA
		Dr. Mahaletchumy Arujanan, Executive Director, MABIC
	Inaugural Address	Dr. Alongkorn Korntong, Deputy Director General, Department of Agriculture, Thailand
	Session I **Agri-Biotechnology in the Asia-Pacific: Challenges and Prospects** **Moderator: Dr. Vilasini Pillai, APCoAB Coordinator**	
09.30	**Keynote Paper:** Trends and Propspects in Agri-Biotechnology in Asia-Pacific	Prof. Paul P.S. Teng, NIE
10.15	Challenges and the Way Forward in the Adoption of Biotech crops in the Aisa-Pacific region	Dr. Randy A. Hautea, Global Coordinator, ISAAA
10.45	**Photo Session and Tea break**	
11.15	**Panel Discussion** **Key factors that would lead to the Adoption of Agri-Biotech** Moderator: Dr. Craig Cormick, Consultant ThinkOutsideThe	
	How Do We Garner Political Support?	Mst. Dilafroza Khanam, BARI
	What is Needed for Public Acceptance?	Dr. Charudatta Mayee, Consultant
	Dealing with Activism	Mr. Abraham Manalo, Biotechnology Coalition of the Philippines
	Factors that Facilitated the Deregulation/ Adoption of Bt Brinjal in Bangladesh	Dr. Gour Pada Das, ABSPII
13.00	**Lunch Break**	

Session II **Agri-Biotechnology Communication Strategies and Challenges in Asia-Pacific** Moderator: Mr. Abraham Manalo, Biotechnology Coalition of the Philippines		
14.00	Keynote Paper: The Evolution of Agri-biotechnology Communication in Asia	Dr. Mariechel J. Navarro, ISAAA
14.30	GMO Communication: A Paradigm Shift	Dr. Mahaletchumy Arujanan, MABIC
14.50	The Challenges Through the Lens of Scientists	Prof. Antonius Suwanto, Bogor Agricultural University
15.10	Convincing the Farmer	Ms. Rosalie Ellasus, Municipal Councilor, The Philippines
15.30	**Tea Break**	
16.00	Group Discussion: Communication Challenges Faced by the Various Stakeholders (5 Groups)	Moderated by Dr. Mahaletchumy Arujanan, MABIC
17.00	Group Presentations	
19.30	**Official Workshop Dinner hosted by ISAAA**	

29 September 2015

Session III **Best Practices in Effective Communication of Agri-Biotechnology** Moderator: Dr. Mahaletchumy Arujanan, MABIC		
08.30	Keynote Paper: Communication for Biotech Planning and Implementation	Dr. Deborah Louise Romney, CABI
09.00	The Australian Experience	Dr. Craig Cormick, Consultant
09.20	The Indian Experience	Dr. Charudatta Mayee, Consultant
09.40	The Vietnam Experience	Dr. Le Huy Ham, MARD
10.00	**Tea Break**	
10.30	Group Discussion: Development of Communication Strategies for Different Stakeholders	Moderated by Dr. Mariechel J. Navarro, ISAAA
12.30	Tropical Agriculture Platform: Facilitating Capacity Development (CD) for Agricultural Innovation Systems (AIS) in the tropics – a G20 initiative	Ms. Chanerin Maneechansook, Program Assistant, APAARI
13.00	**Lunch Break**	
14.00	Group Presentations and Discussion	
15.00	**Way Forward, Closing and Certificate Presentation**	

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Prof. Dr. Antonius Suwanto is a professor of Microbiology and Genetic Engineering in the Faculty of Science and Mathematics at Bogor Agricultural University, Bogor, Indonesia; and an adjunct professor in Atma Jaya Indonesia Catholic University. He is currently a member of the Indonesian Academy of Sciences (AIPI). He graduated from Department of Agricultural Product Technology (BSc Cum Laude) from Bogor Agricultural University; and obtained his MSc and PhD in Molecular Microbiology from University of Illinois at Urbana-Champaign, USA. Currently he serves as an American Society for Microbiology (ASM) Ambassador for Indonesia; a member of the Asia-Pacific International Molecular Biology Network (A-IMBN); and Co-chairman for the Indonesian Society for Microbiology (Permi). During his career, he received a number of excellent research and academic awards, such as Rockefeller Research award, International Foundation for Science (IFS), Indonesian Toray Science and technology Foundation Award, Indonesian Biodiversity (KEHATI) Award, and the Indonesian Institute of Sciences (LIPI). A patent has been granted for his work on the formulation of an effective probiotics to prevent bacterial diseases in crop plant. Prof. Antonius Suwanto is known scientifically as the first to report the presence of more than one chromosome in prokaryote, which was achieve through his work on genome mapping of a photosynthetic anoxygenic bacterium, *Rhodabacter sphaeroides* in 1989. Prof. Antonius Suwanto is interested in Molecular Genetics and Metagenomic study of Indonesian traditional fermented foods (especially Tempeh), biotechnology of plant-bacterial interactions; and enzyme bioprospecting from extremophiles. Some of his researches have been applied for the development of effective probiotics and prebiotics in agriculture, and aquaculture.

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Mr. Abraham Manalo, Executive Secretary, Biotechnology Coalition of the Philippines, is a Policy and Planning Specialist. His work includes biotechnology and biosafety policy, environment and climate change policy, reorganization and governance, and formulation of national development plans. He took his political science undergraduate course and graduate (Masters) course in statistics and in public administration from the University of the Philippines Diliman, and is currently pursuing his doctorate at the National College of Public Administration and Governance (NCPAG). An Associate Professor at the New Era University, he teaches major political science subjects, statistics and research methods. Manalo is the current Executive Secretary of the Biotechnology Coalition of the Philippines (BCP), Inc., a non-profit organization working for the safe and responsible use of modern biotechnology in the Philippines to serve national development goals.

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Dr. Craig Cormick is the Creative Director of ThinkOutsideThe, a science communications consultancy. He has previously been the Manager of Public Engagement for Biotechnology Australia and the National Enabling Technologies Strategy, and has represented the Australian Government at OECD and APEC working groups on communicating biotechnology. He is widely published in academic journals, including *Nature* and *Cell,* on drivers of public attitudes towards new technologies and is a regular speaker at conferences on trends in public attitudes. He has taken part in biotechnology communication workshops in many countries including in Malaysia, Singapore, Japan and Thailand. As a science communicator he has worked at the Commonwealth Scientific and Industrial Research Organization (CSIRO) and Questacon – the National Science and Technology Centre, in Australia, and in 2014 he was awarded the Unsung Hero of Science Communication by the Australian Science Communicators. As an author he has published over 20 books, and was a writer in residence at the University of Science in Penang, Malaysia, and participated in the inaugural Kuala Lumpur International Literary Festival. He has also travelled to Antarctica as a science communicator.

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Dr. Deborah Louise Romney is currently Global Coordinator for Development, Communications and Extension, one of CABI's four themes that support activities designed to get research into use in Africa, South and South East Asia as well as in Latin America. Work under this theme includes: Developing communication materials tailored to scale-up approach and target audience to support partners to scale out new technologies and options including in integrated soil fertility management; building capacity for integrated crop management, institutionalizing integrated pest management approaches targeting education, policy and extension; building capacity to control movement of pests and diseases and facilitate trade through training diagnosticians, developing response plans, facilitating networks and linkages; strengthening seed systems to deliver new seed varieties of non-hybrid, niche varieties (e.g. Nerica rice) and high value under-utilized crops (e.g. African Indigenous vegetables) and rolling out the Plantwise approach to strengthen Plant Health Systems delivering knowledge based, demand driven services to farmers and other plant health system stakeholders. Deborah has lived in Africa for 16 years and worked with smallholder farming systems in Africa, Asia and Latin America for 27 years. Before joining CABI in 2007 she worked for seven years at the International Livestock Research Institute (ILRI), looking at nutrient recycling and feed resources with a focus on smallholder intensive dairy mixed crop-live-stock systems. For the final one and a half years at ILRI she worked as the Acting Director for the ILRI Innovation Systems theme.

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Dr.Gour Pada Das is Agricultural Biotechnology Support Project II (ABSPII) Country Coordinator for Bangladesh. His main responsibilities are to facilitate all ABSPII related activities in Bangladesh. Das holds a PhD from the University of the Philippines Los Baños (UPLB). Prior to joining ABSPII, he worked with the Bangladesh Agricultural Research Institute (BARI) for about 25 years. He was involved in a number of projects aiming at the development of the Integrated Pest Management (IPM) strategies against the major insect pests of tuber crops. Biopesticides, among others, were components of this IPM. Other experiences include the full responsibility of research management in the context of a donor funded (DANIDA) project as well as teaching at the University level. He also worked with the Bangladesh Agricultural Research Council (BARC) as the Director of the Agricultural Information Centre. He has over 35 years of experience including senior research scientist, university teaching, extension approaches, Director of BARC, project management, etc. Das has over 50 publications in referred journal of national and international origin. He has also authored two books and supervised several PhD and MS students. He is a member of over 20 professional societies at home and abroad.

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Assoc. Prof. Dr. Le Huy Ham, Director of the Agricultural Genetics Institute, Vietnam, is an expert in the fields of plant biotechnology, genetics and breeding. He received his Bachelor and Doctor Degree in biology from the University of Chisinau National University ò Moldova, Former Soviet Union. With more than 30 years' experience in the area of plant biotechnology, he is leader of numbers of national and international projects. Ham holds the following positions: Director, Agricultural Genetics Institute (www.agi.gov.vn) since 2005; Office Director, Agricultural Biotechnology Program of the Ministry of Agriculture and Rural Development; Vice-chairman of Biosafety Committee of biotech crops in the Ministry of Agriculture and Rural Development; Vice-chairman of National Biotechnology Program KC04-15 (www.kc04.vpct.gov.vn) and Chairman, the Biosafety of GM Food and Feed Committee. In these positions, Ham has been actively involved in the development of biosafety regulatory framework of biotech crops in Vietnam, contributing significantly to the commercialization of biotech crops in Vietnam.

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Dr. Mahaletchumy Arujanan is the Executive Director of Malaysian Biotechnology Information Centre (MABIC) and Editor-in-Chief of *The Petri Dish* – the first science newspaper in Malaysia. She has a degree in Biochemistry and Microbiology from Universiti Putra Malaysia, Masters in Biotechnology and PhD in science communication from University of Malaya. Maha is listed as the world's 100 most influential people in biotechnology by Scientific American Worldview 2015. She is also listed in the honorific list of Women in Biotechnology Law and Regulation as part of Biotechnology Law Report 2015 published by Mary Ann Liebert Inc, among 23 other women scientists and lawyers. Maha won the 2010 Third World Academy of Science Regional Prize for Public Understanding of Science for East, Southeast Asia and Pacific Region. She is actively involved in public understanding of biotech since 2003 where she enjoys excellent working relationships with various ministries, government agencies, research institutes, public and private universities, industries, and various international organizations. Maha serves on a number of committees, both local and international, serving as member of university advisory panels, project evaluation committees, animal ethics committees, and public awareness working groups. She also serves as a Sessional Lecturer at School of Science, Monash University Sunway Campus. Maha is also known for her non-traditional approaches in communicating biotechnology such as fashion show and carnivals. She has published chapters, papers and articles on science/biotech communication and biotechnology development. She currently is involved in various social activities that inspires young people to have dreams and in unlocking their potential.

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Dr. Mariechel J. Navarro is Director of the Global Knowledge Center on Crop Biotechnology (popularly known as KC) and oversees ISAAA's global network of Biotechnology Information Centers (BICs) in Asia, Africa, and Latin America. These centers provide science communication support to their respective countries and to varied audiences (scientists, policy makers, academe, private sector and media) to enable engagement and transparent decision making on crop biotechnology. She co-edited and contributed 5 chapters of a book on *Communication Challenges and Convergence in Crop Biotechnology*. Her other major publications include: *Voices and Views: Why Biotech?; Adoption and Uptake Pathways of GM/Biotech Crops by Small-Scale, Resource-Poor Farmers in China, India and the Philippines* (Brief 48); *From Monologue to Stakeholders Engagement: The Evolution of Biotech Communication; Communicating Crop Biotechnology: Stories from Stakeholders; and Bridging the Knowledge Divide: Experiences in Communicating Crop Biotechnology.* She co-wrote chapters in *Viewpoints: Africa's future...can biosciences contribute?* (2014) and a second book *Analysis* published by the Biosciences for Africa based in Cambridge, United Kingdom (2015); and *The Public, the Media, and Agricultural Biotechnology* published by CAB International, UK (2007). She also co-authored articles on media framing, media representation of science, and biotech communication in *Journal of Science Communication, Journal of Media and Communication Studies, Asia Pacific Journal of Molecular Biology and Biotechnology, The Philippine Agricultural Scientist, and Philippine Journal of Crop Science.* Navarro obtained her tertiary and graduate degrees in Development Communication from the University of the Philippines Los Baños (UPLB) where she was awarded as outstanding college alumni in 2006 and UP distinguished alumni in 2014. In addition, she attended trainings on managing an internet-based information system, science communication, bioinformatics, and biotechnology-related concerns in the United Kingdom, USA, Austria, Australia, Korea, and Thailand.

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Dr. Randy A. Hautea is concurrently the Global Coordinator and Director of the Southeast Asia Center of the International Service for the Acquisition of Agri-Biotech Applications (ISAAA). Prior to joining ISAAA in 1998, he served as Research Associate Professor (Plant Breeder) and Director of the Institute of Plant Breeding, and Research and Extension Coordinator of the College of Agriculture, University of the Philippines, Los Baños. Hautea completed his PhD in Plant Breeding from Cornell University, Ithaca, New York, and his MSc and BS degrees in Agronomy and Plant Breeding from the University of the Philippines, Los Baños. He was also a Visiting Scientist in Agronomy and Plant Genetics at the University of Minnesota. His extensive research and professional experience has been in crop breeding, agricultural research and development management and technology transfer.

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Ms. Rosalie Ellasus is a farmer and municipal councilor of San Jacinto, Pangasinan, the Philippines. She started with zero knowledge in farming having graduated with a BS Medical Technology degree. She spent a few years as an overseas worker in Canada and Singapore until she came back to the Philippines after her husband died and was left with three growing sons. She tried farming and her successful venture into *Bt* corn was recognized such that she became the first recipient of the Kleckner Trade and Technology Advancement Award in 2007. The award is given for "exemplary leadership, vision and resolve in advancing the rights of all farmers to choose the technology and tools that will improve the quality, quantity and availability of agricultural products around the world." She is a much sought out speaker representing her fellow farmers both in the country and in the global community. In addition, she is also engaged in policy and planning

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