



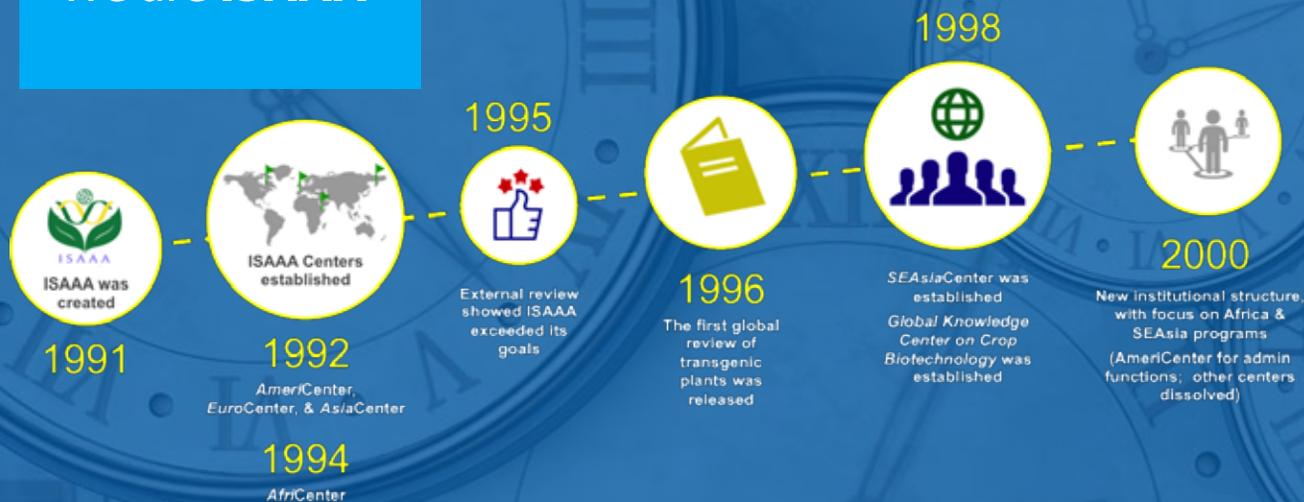
ISAAA

in

2019

ACCOMPLISHMENT
REPORT

We are ISAAA



Inception Years of ISAAA

With the advent of agri-biotechnology decades ago, there has been an unprecedented opportunity to alleviate poverty and hunger. Majority of the global population was poor, and most of the underprivileged depend on agriculture for their survival. Many of them are subsistence farmers without access to agricultural innovations. If there was no action done to include them in the agri-biotech revolution, we would have missed the opportunity to dramatically improve their lives. ISAAA was created to ensure that agri-biotech delivers its promise to these small resource-poor farmers.

Dr. Clive James, who was the Deputy Director General at CIMMYT, was commissioned by the World Bank together with Gabrielle Persley (of International Service for National Agricultural Research) to conduct a study on the potential role of the private sector in agriculture in the developing world. The study concluded that there was a need for a new institutional mechanism to forge public-private partnerships that would allow companies to share their proprietary science with small-scale and resource-poor farmers. Another feasibility study was conducted thoroughly considering the need for such service. Organizational structure, functions, and potential projects were outlined, with inputs from a Steering Committee which eventually became the founding Board of Directors. The activities were institutionalized in September 1991 under the aegis of International Service for the Acquisition of Agri-biotech Applications (ISAAA), a not-for-profit international organization.

Through the years, ISAAA shares the benefits of crop biotechnology to various stakeholders, particularly resource-poor farmers in developing countries. We target to achieve this through best practices in knowledge sharing for a global audience and holistic support to technology development.

ISAAA's global knowledge-sharing network and strong linkages with the research and development continuum lay out a robust pathway towards facilitating informed decision making on biotech crop acceptance and adoption. Bundled with an array of support services such as capacity building, regulatory oversight, and impact assessment, ISAAA's approach leads the way towards the timely delivery of biotech applications, especially in the developing countries where such technologies are needed the most.





Message from the Global Coordinator

Dr. Mahaletchumy Arujanan

Sustainable Development Goals (SDGs) adopted by UN member states in 2015 is known to all. There are 17 goals serving as blueprint for peace and prosperity for people and the planet. It is not an exaggeration to say that food and agriculture play a central role in achieving global peace and prosperity. Food security and the impact of agriculture, both positive and negative strongly influence at least 10 SDGs. This is the impact of agriculture and at the center of this is modern agri-biotechnology that offers sustainable solutions to agriculture, especially in a world that is rife with challenges brought by climate change and growing population.

It has been 23 years since the world embraced biotech crops after stringent science-based scrutiny and safety measures. Socio-economic and environmental benefits have been documented by credible and independent agencies and organizations around the globe. Biotech crops remained the fastest adopted crops in history with 70 countries adopting them in 2018 for cultivation and importation for food, feed, and processing. Out of this, 26 countries are commercially planting on 191.7 million hectares of farms and the rest importing them.

As farmers and consumers are reaping the socio-economic, health, and environmental benefits from 11 approved biotech crops, there are dozens in the pipeline ready for commercialization, yet stifled by misinformation and unfounded criticism by skeptics. This is where ISAAA as the pioneer in facilitating farmer access to modern agribiotechnology and sustainable agriculture plays an instrumental role in strengthening national capacity to develop and

implement science-based policies and regulations, and in communicating factual information on this subject to all stakeholders for informed decision-making.

ISAAA continued to produce our signature publication that is the most cited literature in agriculture – *Global Status of Commercialized Biotech/GM Crops*. Additionally, the ISAAA GM Approval Database (GMAD) provides up-to-date information on the approvals of GM traits and crops. *Crop Biotech Update*, our weekly e-newsletter reaches 24,035 readers, updating them with key developments in the area of agri-biotechnology and beyond.

With our strong forts in Asia and Africa, we continue to collaborate with governments and other national and international partners to move biotech crop approvals and appreciate the potentials of emerging technologies such as gene editing, synthetic biology, and gene drive, collectively known as new breeding technologies or precision breeding innovation. We strongly believe that food and nutrition security could be met through these technologies, combined with all other conventional breeding tools. It is important that the global population is adequately fed and not at the expense of mother earth. Last year we saw landmark decisions made in Nigeria, Kenya, and the Philippines where the latter approved Golden Rice for direct use as food, feed, and processing. The cultivation of Bt cotton and biotech cowpea resistant to pod borer were approved in Kenya and Nigeria, respectively. We are proud to be at the center of all these developments through various initiatives such as African Biennial Biosciences Communication (ABBC) Symposium, Asian Short Course on Agri-biotechnology, Biosafety Regulations and Communication (ASCA), and our capacity-building programs in Myanmar and the Philippines. All our Biotechnology Information Centers (BICs) are the go-to centers in their respective countries on agri-biotechnology.

Being a pioneer in this field also means that ISAAA needs to evolve to adapt to the changing landscape whether it is donors, new challenges in agriculture, novel technologies, communication tools or stakeholder preference. We are now in the process of rebranding ISAAA and setting new strategies and scope. We are confident that ISAAA will continue to be a strong partner and a catalyst for change to bring innovation to farmers who need it most, which will ultimately bring benefits to consumers and the environment.



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Milestones



1 GLOBAL REPORT

COUNTRY LAUNCHES



7 IN ASIA
2 IN AFRICA



2,401 SOCIAL MEDIA POSTS



10 LANGUAGES
IN **49** COUNTRIES

20 MATERIALS



165 NEWS REPORTS

REACHING
70.1 MILLION MEDIA IMPRESSIONS



Farmers from **4 REGIONS** in the Philippines learned about biotech regulations through public briefings.



Stories and updates on biosciences in Africa were shared with stakeholders through **THE DRUMBEAT**, an e-newsletter with over **3,000** subscribers across the continent.

Malaysia's science newspaper, **THE PETRI DISH**, covered science news and reached 6,000 individuals every month.



Members of the Philippine congress and judiciary took part in the national biotech dialogue.

A dictionary of biotech terms was developed and translated into **6 LOCAL UGANDAN LANGUAGES**.



CROP BIOTECH UPDATE



24,035 SUBSCRIBERS WORLDWIDE

640 ARTICLES

20,000x SHARED OVER ON SOCIAL MEDIA

13,220 LINKS

FROM OTHER WEBSITES ACCESSED

80,655x THRU **RSS**



MYANMAR was guided in the development of the biosafety framework, policy, and guidelines through a series of workshops.

>20 PHILIPPINE REGULATORS

were extensively trained on animal biotechnology through the Progressive Manpower Enhancement Program.



SCIENCE CAFE for GM crop project teams formed linkage between the teams and media practitioners to pursue more balanced and science-based reporting of biotechnology.

25 SCIENTISTS, REGULATORS, JOURNALISTS & INDUSTRY PLAYERS completed the second run of the Asian Short Course on Agri-biotechnology and Biosafety.



Around **80 JOURNALISTS** honed their science communication skills during the workshop with international scicom experts.

Key stakeholders from **16 COUNTRIES** attended the Africa Biennial Biosciences Communication Symposium in Pretoria, which led to the formation of the African Coalition for Communicating about Genome Editing.



A scicom workshop for Ethiopian biotechnology and biosafety scientists led to the **LAUNCH OF A COMMUNICATION STRATEGY** for the Ethiopian Biotechnology Institute.





Feeding the World with Knowledge



How do you truly feed the hungry?

Do you give them food or do you teach them how to make their own food?

The first option, based on physical resources, is temporary. You give them something to satisfy their hunger, then nothing follows.

The second option is based on knowledge. It may not instantly satisfy hunger, as well as malnutrition, but it will give them power to make the right decisions based on facts. It's a holistic system of care that can be given, especially to small, resource-poor farmers.

In 2000, Dr. Norman Borlaug's visit to the Philippines sparked ISAAA's knowledge sharing initiatives through its Global Knowledge Center on Crop Biotechnology (KC) with initial funding from the President of the Philippines. In 2001, experts from all over the world shared their experiences in communicating science and tackled new strategies to make biotechnology more accessible to a wider audience. This was followed by proposals and country commitments, leading to the formation of a global information network.

Today, KC continues its mission of sharing knowledge on agricultural biotechnology to the developing world. Through its publications, capacity building efforts, and other initiatives, we hope to feed the world and help them feed themselves and their future generations.



Keeping Track of Biotech Adoption

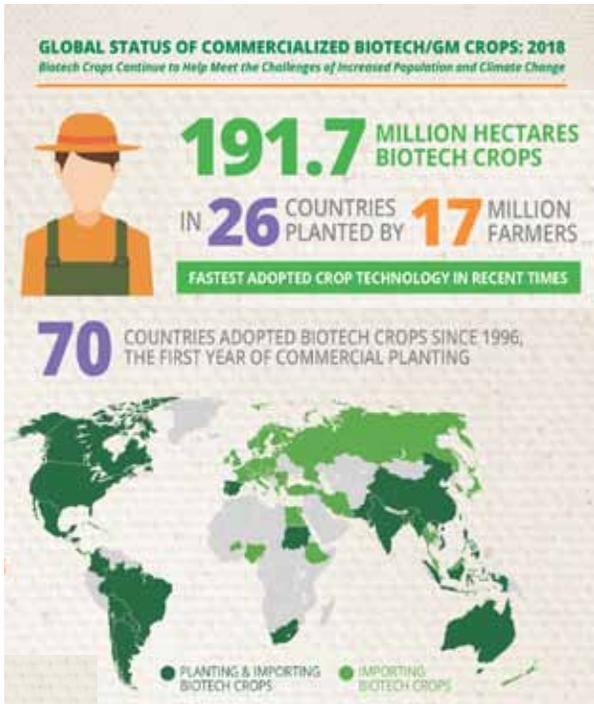
Global Status of Commercialized
Biotech/GM Crops

"It is the most reliable source of data on GM cultivation."-Flippo Rossi, Researcher, Università Cattolica del Sacro Cuore, Italy

"It is a one-stop place for authoritative details of country-wide biotech status. It has enormous value in my public affairs outreach work with officials and representatives."- David Green, Journalist and Public Affairs Advisor, Green Orange LLC, USA

"The report is extremely useful for academic research."- Ramesh Thadani, Academic staff, Universidade Federal do Amazonas, Brazil

"I am using the report for my publications of course with the necessary quotation and for my conférences/speech on GMOs. I have used it for my books as well."- Bernard Le Buanec, Academic staff, Académie d'agriculture de France and Académie française des technologies, France



ISAAA Brief 54 Impact Metrics

As of December 19, 2019*



*122 days after launch; partial count

A survey of Philippine news articles published from 2010 to 2016 shows that ISAAA is the top source of information on biotechnology. ISAAA is the only organization that monitors the global adoption of genetically modified crops since it was first commercialized in 1996. Thus, after 23 years, ISAAA has been the main source of relevant information about the topic. The *Global Status of Commercialized Biotech/GM Crops: 2018* (ISAAA Brief 54) contains data and analyses on global GM crop adoption, benefits gained, and the future prospects for each country and the regions of North America, Latin America, Asia and the Pacific, Europe and Africa. There were also sections on *Economic Benefits of GM Crops*, *Trends in Biotech Crop Approvals (1992-2018)*, and *Contributions of Biotech Crops to Food Security, Sustainability, and Climate Change Mitigation*. The report was launched in 9 countries (Japan, Nigeria, China, the Philippines, South Africa, Indonesia, Myanmar, Vietnam, and Pakistan), and reached 70 million media impressions.

Aside from the GM crop adoption report and its derivatives, ISAAA also developed other publications on agricultural biotechnology.



Reaching Out to the World in One Click

www.isaaa.org



The ISAAA website (isaaa.org) continues to be an important channel to reach the global community. Several innovations were introduced in the ISAAA website to improve the content and design as well as functionality. The most visited sections of the database are the information resources, Crop Biotech Update news, GM Approval Database, and Image Gallery.

Top Country Visitors:



Up-to-date on Crop Biotech

Crop Biotech Update

"As I am a plant molecular biologist interested in combating plant diseases, CBU helps me in knowing the latest updates around the globe in my field of research and its applications." - Raghuram Badmi, Scientist, Norwegian Institute of Bioeconomy Research, Norway

"The CBU helps me keep abreast of GM plant regulation worldwide and technical developments." - Sean Chapman, Scientist, The James Hutton Institute, United Kingdom

"The information helps me work on policy changes to enhance farmers' income through crop biotechnology and biological sciences which are weapons of growth." - Pavitarpal Singh Pangli, Farmer, Borlaug Farmers Association for South Asia, India



Over 24,000 subscribers receive the Crop Biotech Update weekly which features modern agri-biotechnology news and research highlights, including latest studies on plant breeding innovations. Aside from its main email distribution platform, the CBU news is distributed through multiple channels such as the ISAAA website and social media pages, RSS feed, and independent mailing networks of Biotechnology Information Centers.

Selected articles with relevance to specific regions were also translated into various languages to reach a wider audience. CBU translations include Bahasa Indonesia, Chinese, Japanese, Korean, Portuguese, Thai, and Vietnamese. The translated CBU articles were also picked up by foreign websites and newsletters including Conselho de Informacoes Sobre Biotecnologia (Portuguese), ArgenBio (Spanish), and Institute of Agricultural Science for Southern Vietnam (Vietnamese). Articles in scientific journals cited the CBU as their reference, as published in *Plant Biotechnology Reports*, *Biotechnology Law Report*, *Transgenic Research*, and *Plant Archives*, among others.

Trending News on Crop Biotech in 2019

Here's a glimpse of the biotech happenings in 2019, based on the most shared CBU articles on social media.

Philippines Approves Golden Rice for Direct Use as Food and Feed, or for Processing

 2,593 shares



Bacterial Blight Resistant Rice Developed thru Genome Editing



 563 shares

European Commission Authorizes 8 GM Products for Food and Feed Uses



 442 shares

Engineered Bacteria Produces BeeFree Honey



 412 shares

Gene Editing Used to Develop Vitamin A-fortified Rice



 329 shares

Research Finds Extreme Opponents of GM Foods Know the Least but Think They Know the Most



 316 shares

Genetically Engineered Plants Occur in Large Scale Naturally



 311 shares

Bt Cotton Approved for Planting in Kenya



 278 shares

FDA Approves Texas A&M's Ultra-Low Gossypol Cotton for Human and Animal Consumption



 270 shares

New Plant Breeding Technologies Designed to Help Attain Food Security



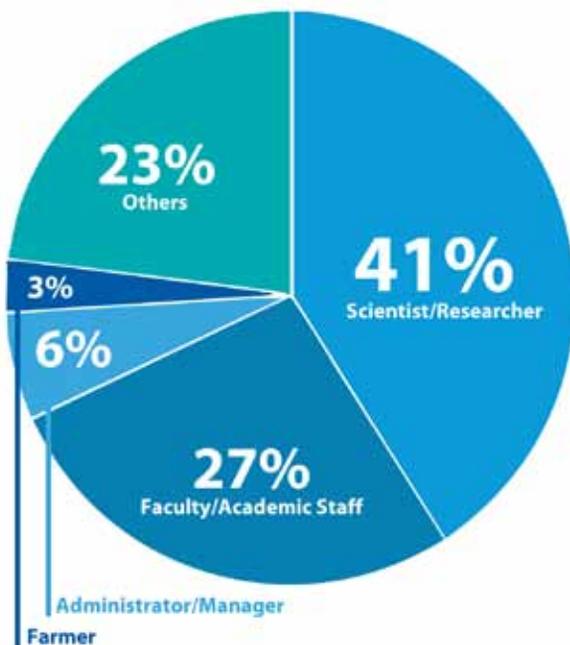
 260 shares

Survey Says

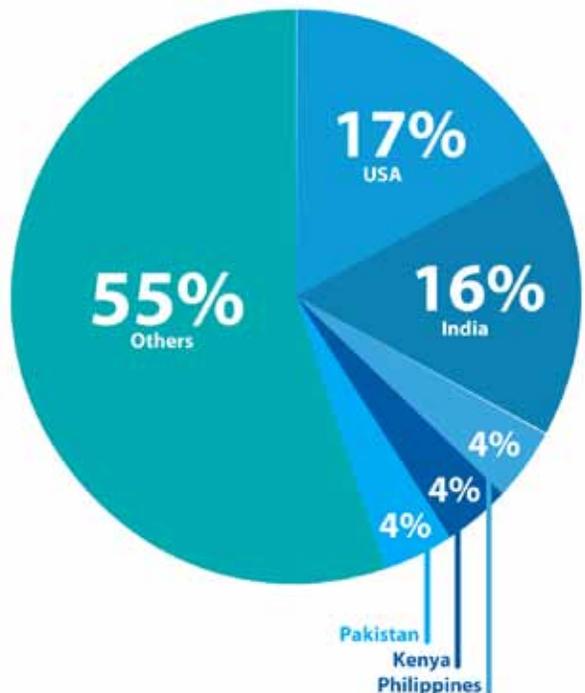
A subscribers' survey was conducted to measure the impact of the CBU and solicit suggestions for improvement. Results showed that the majority (69%) of the subscribers were scientists, researchers, and academic staff coming from 370 institutions/companies and representing 75 countries, who expressed positive comments about the newsletter. The major sections of the CBU (Global Updates, Research Highlights, and Plant Breeding Innovations) were rated by most of the subscribers as useful (rating

of 5). The subscribers indicated that the CBU helped them in their work by delivering news and research updates on crop biotech. Based on the subscribers' suggestions, the CBU has been redesigned to be easier to share on social media, with links to related articles/publications, visually appealing design, with mobile-friendly interface, and more focus on topics that are of interest to the subscribers (such as gene editing).

Designation



Countries



GM Crop Events in One Space

GM Approval Database

"It is a good source for relevant information on the use, legal status, approval, and new discoveries in agricultural genetic crops."

Robert Zimdahl, retired professor, Colorado State University, USA

"Being a quarantine scientist, I use GMAD to know approved GM crops/events in other countries." -Celia Chalam Vasimalla, scientist, ICAR-National Bureau of Plant Genetic Resources, India

"It aggregates GM approvals to help me determine market direction and forecast." -Jim Robinson, Product manager, Rob-See-Co, USA



The ISAAA GM Approval Database is one of the top online resources on GM crop event approvals worldwide. It has a simple and easy-to-navigate user interface, featuring the biotech/GM crop events that have been approved for commercialization/planting and importation (food and feed). Entries in the database represent the majority of the GM crop events approved worldwide, based on publicly available English (and translatable) decision documents of each approving country, Biosafety Clearing House of the Convention on Biological Diversity, and peer-reviewed scholarly articles. A new section, GMAD Citations, was added to summarize how it has been used cited in reports, articles, and documents.

STATUS OF APPROVED EVENTS FOR BIOTECH CROPS USED IN FOOD, FEED, PROCESSING, AND CULTIVATION



2,603 FOOD USE

1,461 FEED USE

825 CULTIVATION

USA HAS MOST NUMBER OF APPROVALS
544 APPROVALS

MAIZE HAS LARGEST NUMBER OF APPROVED EVENTS
137 APPROVED EVENTS IN **35** COUNTRIES

HERBICIDE TOLERANT MAIZE EVENT NK603 HAS MOST APPROVALS
61 APPROVALS IN **28** COUNTRIES

Source: ISAAA, 2018

Changing the Image of Biotechnology

ISAAA Image Gallery

To provide real images of biotechnology and replace fear-mongering images that are widespread in the media, the ISAAA Image Gallery was made available for public use in 2018. Over 100 images of biotech crops on field trial and in the market are available for download including Bt corn in the Philippines; Bt cotton in China, India, and Kenya; Bt eggplant in the Philippines; drought tolerant sugarcane in Indonesia, virus-resistant cassava, and more. Some images are donated by ISAAA Biotechnology Information Centers and partners.



Science-based and Social



To maximize the reach of biotech information, ISAAA has several social media initiatives under different platforms—Blogspot, Facebook, Twitter, and Instagram.

The ISAAA Blog features stories surrounding biotechnology in a conversational style. The topics covered in 2019 were women in science, a science communication guide book, new ISAAA global coordinator, biotech gameboards, and infographics developed by a communication student and biotech champions, among others. The most read entry was entitled *5 Questions with Dr. C.D. Mayee, the Farmer's Son Who Became India's Champion of Biotech*. Most of the blog readers were from the United Arab Emirates, Canada, USA, Netherlands, India, Ukraine, Russia, Argentina, Germany, and France.

The ISAAA Facebook Page is the top referring site of the ISAAA website, according to Google Analytics. The followers are from over 45 countries, and most of them are from Bangladesh, Indonesia, and India, which are all biotech crop planting nations. With the changes in the algorithm implemented by Facebook, ISAAA devised new strategies to reach more audiences. The average daily reach of the posts was 3,871, which is 55% higher than the old average reach of 2,500/day. The new strategies increased the reach of ISAAA not just on Facebook, but also outside the social media platform. These include the use of Messenger bot to increase engagement with stakeholders.

Twitter is the top platform for conversation on ISAAA based on Mention's statistics. The followers of @isaaa_org came from 121 countries, the top 10 are the United States, Kenya, India, the United Kingdom, Nigeria, Canada, South Africa, Argentina, Germany,

and Spain. ISAAA Twitter followers include national academies, universities, scientific associations and societies, foundations, private companies, and media agencies, and popular scientists.

ISAAA conducted a short survey among scientists who are Twitter influencers and asked them why they think the platform is an effective tool to promote science. The top answers were from ICRISAT Research Program Director, Dr. Rajeev Varshney, and UC Davis animal biotech specialist, Dr. Alison Van Eenennaam. Dr. Varshney said they use Twitter at ICRISAT to disseminate scientific knowledge and research across the world and to make stakeholders understand science. Dr. Van Eenennaam finds Twitter useful in spreading information and said it helped her reach journalists. Others said Twitter is useful for sharing science with those already engaged and for building and reaching communities.



Instagram

Snapshots of ISAAA publications and videos are posted through ISAAA's Instagram account, which reaches an audience of over 2,000 per month.



The social media campaign for ISAAA's annual report on GM crop adoption with official hashtags #ISAAAResult2018 and #GMCrops2018 reached 10.7 social media impressions in just 5 months since its release.

Empowering Women in Science

ISAAA and its network of Biotechnology Information Centers (BICs) aim to empower women in science through the Science and She social media campaign. Women from the network share their stories and aspirations for science and society with the hope that their journey would help bridge the gap between science and the public. In 2019, the campaign was opened for volunteer curators who wish to participate in the initiative. With a total of 34 curators, the campaign has reached a total of 411,927 impressions on Facebook, Twitter, and Instagram.

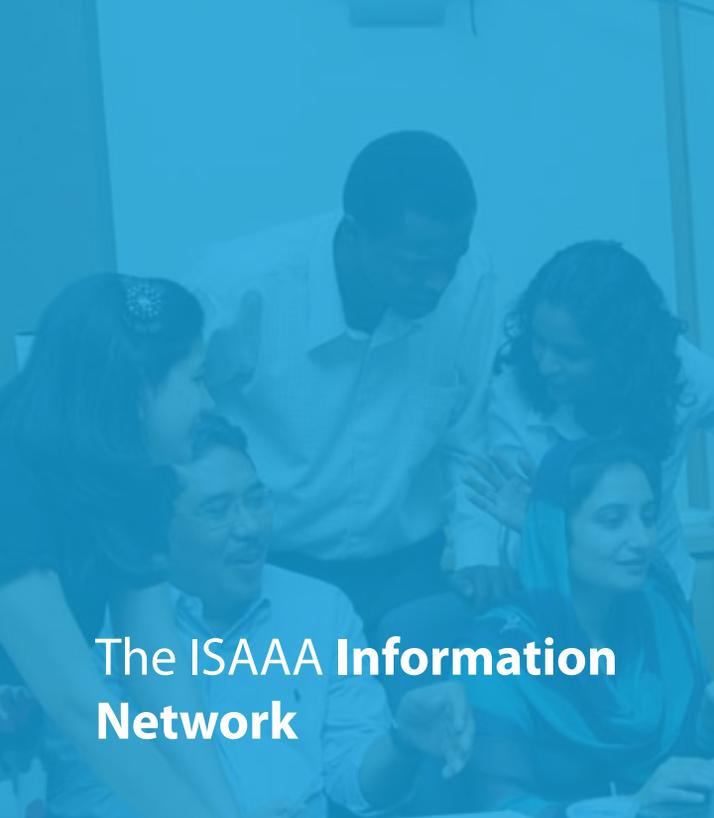
A publication summarizing the stories of women in science who participated in the campaign was released during the Philippine celebrations of the National Biotechnology Week. An excerpt from the publication was part of the NBW exhibitions. Science and She was also featured in the special issue of *Biolife Magazine*.



Building networks and capacities

It is part of ISAAA's mission to expand the capacity of biotech stakeholders and maintain collaboration among like-minded organizations. Thus, ISAAA staff served as resource speakers in various capacity building activities such as Training Workshop on Biosafety for Philippine Regulators, Global Status of Biotech Crops for S&T Media and Bloggers, Forum on Agricultural Biotechnology and Biosafety, Storytelling AgInnovations on Social Media Workshop, and Public Speaking and Communicating Biotechnology. ISAAA staff served as resource persons and workshop coordinator in drafting the national biosafety framework of Myanmar.

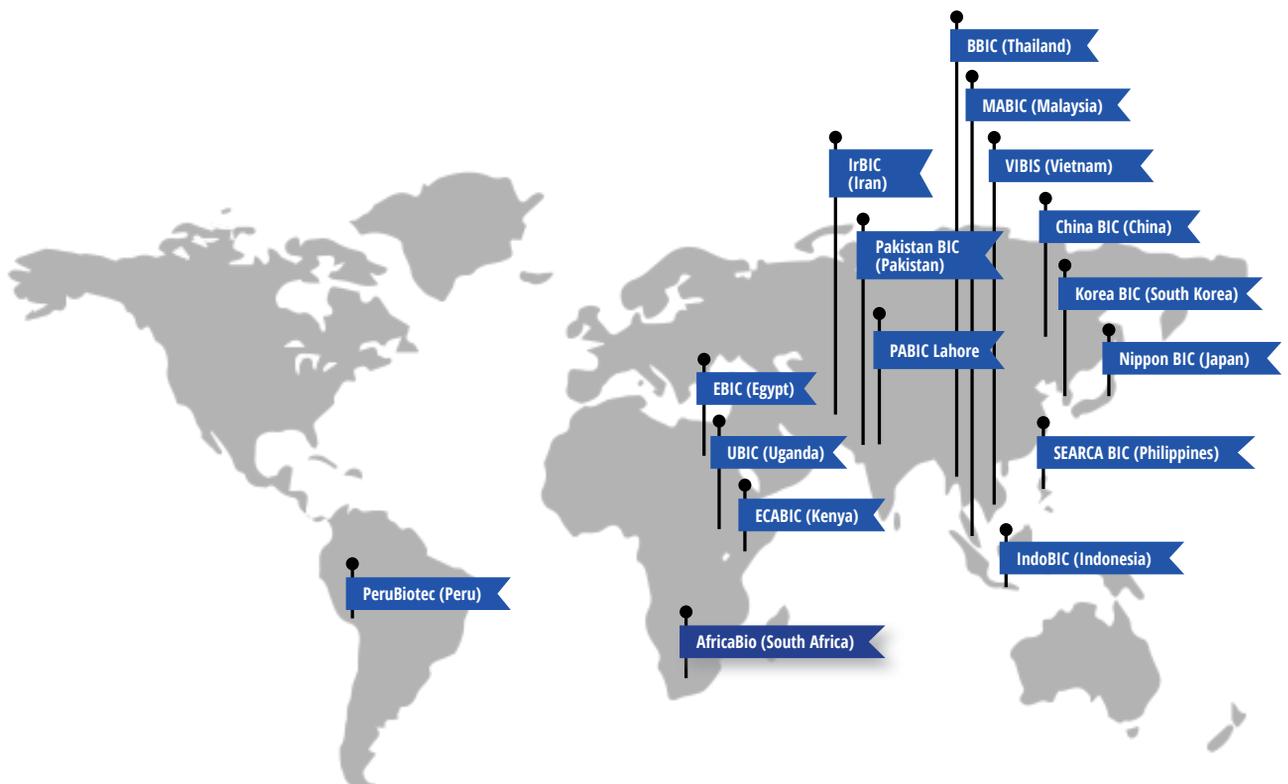




The ISAAA Information Network

The resources developed by the Global Knowledge Center on Crop Biotechnology (KC) is transferred to a web of recipients worldwide through the Biotechnology Information Centers (BICs). To date, 16 BICs are at the forefront of addressing specific science-based information needs, and in broadening public understanding of crop biotechnology in their respective countries. Best practices on science communication are also shared among the network to learn from the experiences of each other and make a collective effort to advance the acceptance and adoption of biotechnology. Together, the KC and the BICs have become vital players in the biotech arena where the debate has transcended technological issues into societal concerns.

The following section presents the highlights of BICs' activities in 2019.



Indonesian Biotechnology Information Center IndoBIC



IndoBIC was founded in 2003 by three Bogor-based organizations: Indonesia Institute of Sciences, Agency for Agriculture Research and Development, and Southeast Asian Regional Centre for Tropical Biology (SEAMEO BIOTROP). The main objectives of IndoBIC are to support national programs on agricultural biotechnology by providing strategic decision making and to act as a center for information dissemination for various stakeholders through coordination with regional and national network nodes on the exchange, processing, synthesizing, packaging, as well as distributing science-based agricultural biotechnology information using appropriate formats for various stakeholders. While focusing on effective communication strategies to bring across information on biotechnology, it hopes to explore further other tools to widen its reach and maintain its credibility so that it can be truly the regional hub of relevant and accurate information on agricultural biotechnology.

In 2019, IndoBIC became instrumental in the development of the roadmap for research and commercialization of GM crops for 2020-2045. The map provides a reference for relevant agencies and stakeholders to develop, produce, and utilize GM seeds for the country. IndoBIC and the Ministry of Economy (MoE) conducted a series of focused group discussions, meetings, and workshops to formulate the roadmap. The completed roadmap is being communicated to other ministries under MoE coordination.

IndoBIC also conducted a risk communication workshop to provide the members of the biotech potato partnership program with updates on the

status of GM potato research, biotech regulations in Indonesia, and knowledge on communicating the risk of GM potatoes. Through this effort, the BIC hoped to equip the participants in biotech communication to help foster acceptance of biotech crops in the country.

Realizing the importance of engaging the youth, a biotech outreach activity was held for the youth and other stakeholders. Biotech experts discussed agricultural biotechnology, bioprocess in agriculture, and global status of GM crops.

For the upcoming years, IndoBIC targets to broaden its scope of work by communicating and promoting not only crop biotechnology but also in animal and medical biotechnology through collaborations with various institutions both nationally and internationally.

For more details about this BIC, contact:
Dr. Bambang Purwantara

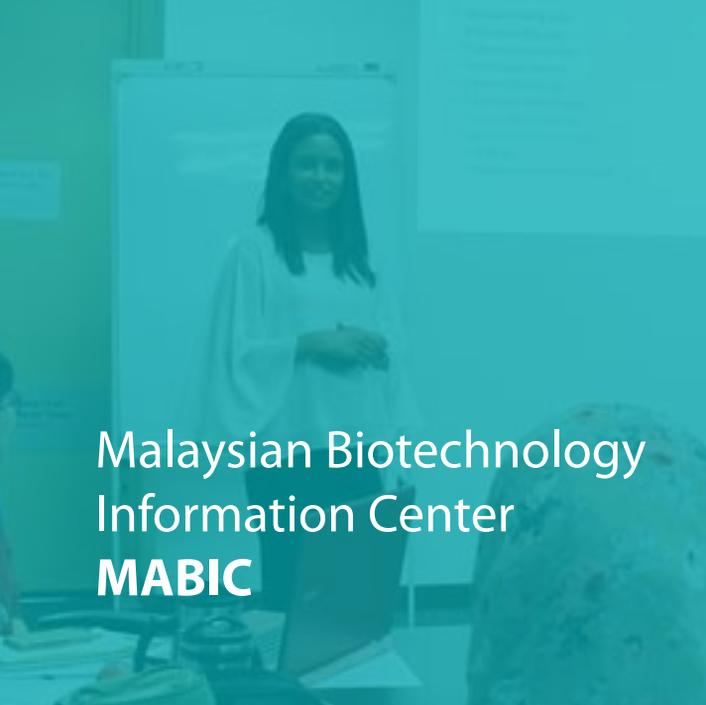
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Malaysian Biotechnology Information Center MABIC



The Malaysian Biotechnology Information Center plays a broad role in advocating science-based policies and regulations. This covers medical, industrial, marine, food and environmental biotechnology. MABIC finds it important to promote public literacy in all these fields as one is intertwined with another. Genetic modification and gene editing play key roles in medical biotechnology and these examples could resonate well with the public to make them accept agri-biotechnology. For this reason, MABIC founded the first science newspaper in Southeast Asia, The Petri Dish, in 2011. It grew from a circulation of 2,000 in 2011 to 6,000 in 2018 and projected to reach 10,000 in 2020. The newspaper aims to shape public opinion on biotechnology and also in promoting science, technology, engineering, and mathematics (STEM) courses to students and science literacy among the public. The Petri Dish reaches decision-makers such as policymakers and political leaders and also scientists, investors, industry players, students, and the public.

MABIC pioneered capacity building programs for scientists to improve their public communication and engagement. The first series of structured science communication modules were developed in 2018 and launched in 2019 with more than 150 scientists, regulators and post-graduate students trained to effectively communicate science to various stakeholders. MABIC is planning to extend its capacity building efforts in science communication internationally, especially in developing countries. With more science communicators among scientists, it is expected that science literacy, acceptance, and appreciation among the public will improve.

MABIC established the Asian Short Course on

Agri-biotechnology, Biosafety Regulations, and Communication (ASCA) in 2018 to develop institutional memory on international biosafety regulations among Asian institutes. This is aimed at building a sustainable capacity building program in these areas in Asia for policymakers, regulators, and scientists. The 2018 ASCA was conducted as a pilot workshop and its success led to ASCA2019 which was held in the Philippines in December 2019. This was attended by 25 scientists, regulators, industry players and journalists from 8 countries. ASCA will support the development and implementation of science-based regulations in Asian countries.

MABIC has been organizing Asian preparatory workshops on Conference of the Parties - Meeting of the Parties to the Cartagena Protocol on Biosafety (COP-MOP) where country representatives and others who work on national biosafety systems discuss country positions and emerging topics, and attempt to harmonize national biosafety systems. A virtual debriefing session on COP-MOP2018 was held in December 2019 as part of ASCA2019. Key agenda that were discussed at COP-MOP2018 in Egypt was revisited together with upcoming agenda items for COP-MOP2020 to be held in Kunming, China.

For more details about this BIC, contact:

Dr. Mahaletchumy Arujanan

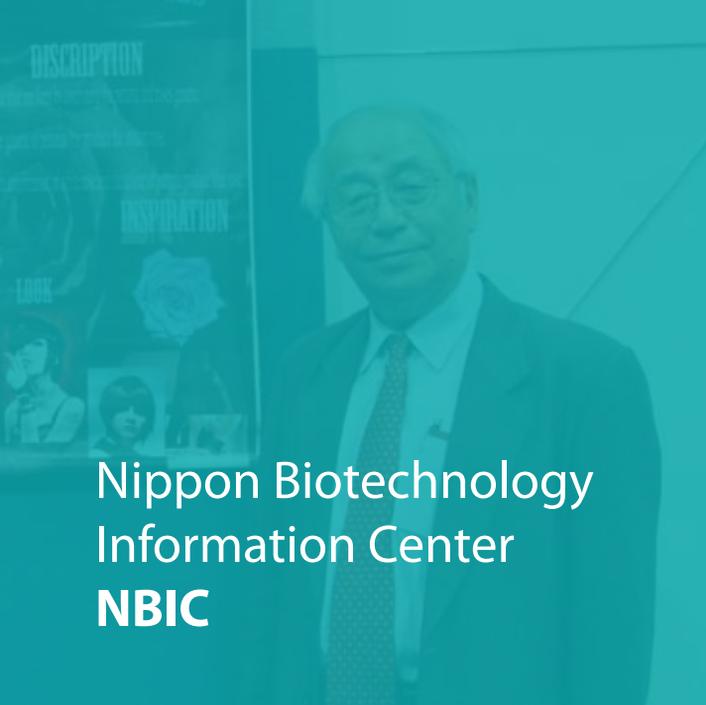
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 /MalaysiaBIC



Nippon Biotechnology Information Center NBIC

Through the years, NBIC has been linking ISAAA to various farmer groups in Japan. In 2019, NBIC hosted the global launch of ISAAA report, Global Status of Commercialized Biotech/GM Crops: 2018, in collaboration with Japan BioIndustry Association. The event was attended by over 90 stakeholders, including farmers, scientists, and private sector representatives.

Aside from the seminar launch, three meetings were conducted with Hokkaido farmers with the aid of Hokkaido Bio-industry Association in order to understand the current status of GM crops. Meetings to promote the understanding of current status of GM crops and genome editing were also held.

To promote understanding of GM crops among students, NBIC organized the yearly drawing contest. The winning pieces were printed on calendars which were distributed to the public.

NBIC also translates ISAAA publications and articles from the Crop Biotech Update.

For more details about this BIC, contact:
Dr. Fusao Tomita

✉ ftomita@hitbio.com

🏠 NPO Hokkaido Bioindustry Association (HOBIA)
c/o Hokkaido Collaboration Center
Kita-21, Nishi-12, Kita-ku, Sapporo
Japan 001-0021



Pakistan Biotechnology Information Center PABIC



PABIC was established at Latif Ebrahim Jamal National Science Information Center, the University of Karachi under the patronage of the National Commission on Biotechnology. PABIC aims to initiate multidisciplinary biotechnology research and enhance the awareness and appreciation of the technology at the local and international levels.

A seminar on agricultural biotechnology adaptability was organized to inform the media about the issues of food security and the role of biotechnology in attaining food security and alleviating malnutrition. The event garnered over 1 million media impressions and the Regional Secretary of Food Security and Research as well as the Chairman of Pakistan Agriculture Research Council committed on behalf of the government that special focus is given to improve and address the problems of the farmers.

To encourage more students to be involved in the biotech dialogue, an essay contest and a poster making competition were conducted focusing on CRISPR and Artificial Intelligence for agricultural production and environmental protection.

The BIC aims to continue to help other countries, especially in the Organization of Islamic Conference, to facilitate the promotion of biotech crop adoption.

“PABIC has been pivotal in creating awareness on agri-biotech adoption in the country. The PABIC team has been able to provide requisite impetus to the biotech regulatory advancements in the country through engagements with key regulators, media, farmers, and researchers.

Based on these activities, we are hopeful that the regulatory system in the country will move towards maximizing adoption of agri biotech technology enabling our farmers to increase their productivity and contribute to meet food and feed challenges of the country. Regulators are currently contemplating to develop food, feed, and processing guidelines in the country which is critical to growing the oil extraction and feed industry. We need to continue the momentum created during the past few years to make sure that critical regulations are enacted and implemented in true letter and spirit. “

-Mr. Tallal Hakeem, Regulatory and Stewardship Lead, Corteva Pakistan

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Pakistan Biotechnology Information Center - Lahore Chapter **PABIC Lahore**



PABIC Lahore is a one-stop resource hub on biotechnology in Lahore, Pakistan and nearby areas. The main objective of PABIC Lahore is to create public awareness, especially in the educational and industrial sectors using the latest learning technologies that can be emulated by educational institutions. They aim to achieve these objectives through methodology and policy development in biotechnology related to health, agriculture, and the environment.

In 2019, PABIC Lahore worked on the frontlines of capacity building on biotechnology through organizing several initiatives in collaboration with various institutions. A workshop on science communication was conducted in Forman Christian College (FCCU) to educate the community of journalists in Pakistan and encourage them to portray the positive image of biotechnology to the public. Around 80 journalists from print and electronic media participated and discussed their concerns. International science communication experts tackled understanding biotech critics, finding sources for science stories; interviewing scientists; humanizing science, among other topics. The event garnered great media coverage. After the workshop, PABIC Lahore became the go-to source of information of the journalists when reporting about biotechnology. PABIC Lahore aims to conduct similar activities to continuously improve the communication between journalists and scientists, which can be helpful in elucidating the misconceptions.

PABIC Lahore helped develop a 6-months interdisciplinary Postgraduate Professional Diploma Program on Food Security Management together with the Departments of Agriculture, Food and Livestock, the World Bank, CropLife Pakistan, and

United Nations agencies. PABIC Lahore will continue to push key stakeholders, especially regulators, to participate in the program to hone their knowledge and skills in managing food security concerns.

To address the issues regarding biosafety regulations and commercialization of GM crops, a national dialogue on agri-biotech and capacity building of biosafety regulators was organized by PABIC Lahore. Experts from the Philippines shared the success of GM corn from the perspective of researchers, developers, and farmers. The dialogue provided an opportunity to all stakeholders to tackle their efforts and find points of collaborations and come up with strategies to improve the regulation of GM crops.

The BIC plans to conduct massive science communication initiatives in the coming years as an answer to the lack of public engagement on scientific issues. Linkages with the government will be enhanced through capacity building of regulators about the benefits and potential of biotechnology. Social media and other advanced communication tools will be used to improve public engagement, especially online. Such efforts could lead to greater acceptance and adoption of biotech crops, which could alleviate food insecurity in the country.

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SEARCA Biotechnology Information Center SEARCA BIC

SEARCA BIC was established in 2000 and took the main function of conducting science communication activities for better awareness and understanding of biotechnology in the Philippines. It is one of the three pioneer centers of the ISAAA information network in Southeast Asia.

SEARCA BIC conducted a wide array of initiatives for various stakeholders not just for the Philippines, but also for the Southeast Asia region. One of the most important accomplishments of SEARCA BIC in 2019 was involving policy makers in the biotech dialogue through various activities. Two fora on the global status of biotechnology were held for the members of the Philippine congress and judiciary. SEARCA BIC along with ISAAA, Biotechnology Coalition of the Philippines, and US Embassy in Manila, believe it is particularly important to engage staff and legislators at the Philippine Congress, where pending bills could impact the ability of Philippine food producers to employ modern agricultural biotechnology. The fora were part of a series of activities which aim to cultivate an evidence-based understanding of modern agricultural biotechnologies, highlight the role of agricultural biotechnology in increasing food security, address barriers to trade, and promote agricultural entrepreneurship. Twenty legislators and more than 100 of their staff from the Philippine House of Representatives joined the forum. International biotech experts and a biotech corn farmer shared their knowledge and experiences on biotech applications. A similar forum was held for selected members of the Philippine Judicial Academy (PHILJA) and Philippine Association of Law Schools (PALS).

PHILJA's Chief of Office for Research, Publications, and Linkages Office, Dean Sedfrey Candelaria of the Ateneo Manila College Law, shared that they are currently revisiting the curriculum of law schools to include not just traditional subjects but also current trends, particularly science-based issues such as biotechnology.

To spark renewed interest of the youth in agricultural sciences, most especially in the field of biotechnology, SEARCA BIC holds an annual agri-biotech boot camp for senior high school students and teachers. Thirty-three students and teachers from seven provinces across the Philippines attended the boot camp in 2019. They had hands-on learning experiences through series of lectures, study tours, and interactive games. The camp's participants had the opportunity to interact with young agriculture advocates as well as the country's leading scientists at the University of the Philippines Los Baños and at the International Rice Research Institute. They also had the chance to meet national scientists. The boot camp made the participants realize the importance of their contributions towards public acceptance and understanding of the technology. Some are planning to re-echo their learnings to their schools and adopt the different strategies that were done in the boot camp.

SEARCA BIC organized a day-long Farmers' Forum where farmers can gain better understanding of biotechnology and other good agricultural practices. This gives them access to unbiased science-based information that can enable them to adapt new

technologies and make sound farming decisions. The event gathered more than a hundred vegetable farmers from the provinces of Laguna and Quezon in order to introduce them to agricultural biotechnology and its products like Bt eggplant. The farmers expressed their support for biotechnology and the immediate release of Bt Eggplant. They also had a renewed appreciation of the applications of biotechnology in their everyday lives and the importance of sharing science-based information on biotech to their fellow farmers.

SEARCA BIC also conducted seminars, public briefings on the Philippine biotechnology and biosafety regulations, social media workshop for information officers, exhibitions, media interviews, and more.

SEARCA BIC will continue to work with their partners in the region to actively reach out to various

stakeholders through different knowledge sharing and capacity building initiatives. SEARCA BIC takes on a proactive role in creating an enabling environment that will unleash the potential of biotechnology for agricultural development in the Philippines and even beyond.

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“Our partnership (the Research and Extension Division of Institute of Plant Breeding) with SEARCA BIC is very important. We have built a rapport or strong linkage with SEARCA BIC together with other agencies and farmer groups. We have a healthy and warm partnership with SEARCA BIC.”

Dr. Lourdes D. Taylo
Study Leader
Bt Eggplant Project
University of the Philippines - Institute of Plant Breeding



“SEARCA BIC has been very instrumental in providing valuable references on science-based and evidence-based reporting as well as compelling contents on biotechnology. We’ve been using the materials from SEARCA BIC, both online and in print, as our reference material in packaging IEC materials for the farmers and media partners in the Davao Region. It’s very important that we have this partnership with SEARCA BIC so that we could also inform our stakeholders (i.e., farmers, media) on the importance of having access to biotechnology.”

Mr. Noel T. Provideo
Chief, Regional Agriculture & Fishery Information Section
Department of Agriculture Regional Field Office 11



Vietnam Biotechnology Information Service VIBIS

VIBIS was established by ISAAA and the Institute of Agricultural Genetics (AGI) in Vietnam, which is the country’s premier institution conducting and applying technologies for the management of genetic resources and biotechnology for sustainable socio-economic development. With the goal of contributing to better awareness, understanding, and acceptance of biotechnology and their implications to food, feed, and fiber supply, VIBIS conducts various activities geared towards achieving the common goals of ISAAA and AGI.

In 2019, VIBIS organized a workshop in Hanoi on genome editing for regulatory officials from the government, scientists, and other stakeholders to discuss the current data on new breeding techniques and the appropriate regulatory approaches for such technologies. A conference was also conducted in Hanoi for scientists, medical doctors, and other key stakeholders to tackle updates and accurate scientific information on biotechnology. At the end of the conference, the participants had a consensus about the importance of biotechnology in ensuring food security, economic stability, and a sustainable environment. The participants agreed that the acceptance and adoption of GM crops continue to rise in Vietnam. In a seminar held in Dak Lak province, the global status of research, commercialization, and prospects for GM crops was discussed by experts.

Knowledge sharing on biotechnology in Vietnam is promising because of the absence of prominent environmental groups that oppose GM crop adoption. Researchers from government institutions and private

companies show support for biotechnology, as well as for new breeding techniques such as genome editing. VIBIS envisions conducting more communication initiatives for wider audiences in the coming years.

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Eastern and Central Africa Biotechnology Information Center **ECABIC**



The initiatives of the ECABIC are in parallel with the activities of the ISAAA *AfriCenter* located in Nairobi, Kenya.

In 2019, the Center initiated and spearheaded a dialogue on genome editing in the continent. *AfriCenter* and partners organized the Africa Biennial Biosciences Communication Symposium (popularly known as ABBC2019) held in Pretoria, South Africa. It provided an opportunity for regulators, scientists, policy makers, science communicators, and media editors from 16 countries to share their experiences and discuss how best to advance the progress of genome editing on the continent. A resolution to establish an African Coalition for Communicating about Genome Editing was adopted. *AfriCenter* has been tasked to spearhead the establishment of the Coalition. Since then, the Center has taken part in different genome editing workshops.

To seek increased support for commercialization of Bt cotton in Kenya, several consultative engagements with Kenyan policy makers were organized. These efforts hastened the country's commercial approval of Bt cotton, which is projected to save the collapsing cotton farming industry in Kenya.

Science cafes were held for GM crops communication teams and media practitioners to serve as a platform for deeper discussions on biotechnology, especially on synergizing efforts for more impactful support towards biotech projects' success. It also provided a massive opportunity

for widespread media reporting about Brief 54. The reporting garnered over 4.5 million media impressions. Nigerian media had the highest coverage of Brief 54 launch with 21 news articles featuring the report. The reporting of Brief 54 was key in creating awareness and knowledge on biotech crops in Africa.

For more details about *AfriCenter's* activities in Africa, see pages 33-34.

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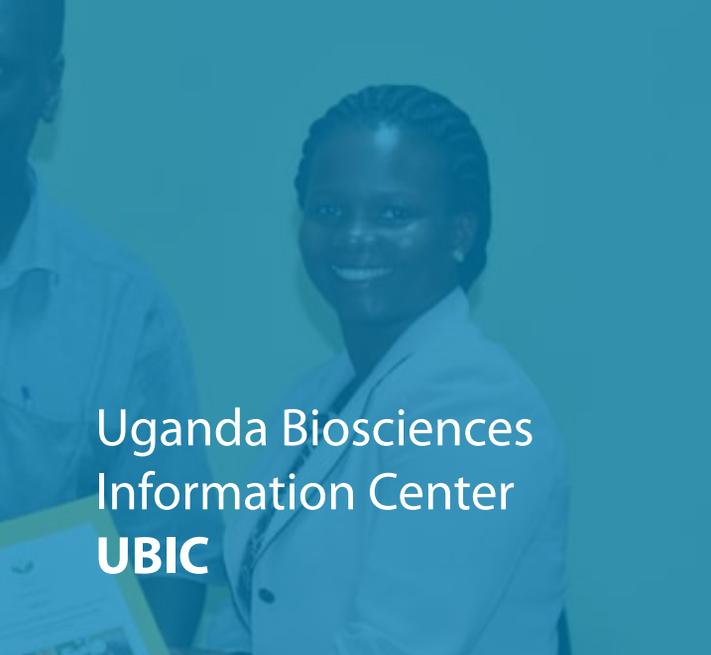
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Uganda Biosciences Information Center UBIC



Uganda's National Agricultural Research Organization established the Uganda Biosciences Information Center in 2013. UBIC is hosted at the National Crop Resources Research Institute (NaCRRRI) in Namulonge. It serves as a designated reference center for biotechnology and biosafety communication for the national agricultural research system in Uganda.

Through the years, UBIC has pioneered unique efforts to promote public engagement with biotechnology. These include the conduct of agricultural boot camps for Miss Uganda contestants, teachers' training workshops, facilitating the integration of biosciences in the country's formal education system, mass media campaign to educate Ugandans on modern agricultural technologies aimed at improving food production, among others.

In 2019, UBIC focused on supporting biotech research and commercialization pathways to ensure a positive policy environment and functional regulatory system for biotech products' development and commercialization. To achieve this, UBIC trained biotech champions including government communication officers, members of the parliament, and representatives of grassroots communities. This led to increased support for a positive policy environment by decision-makers in government bodies and heightened demand for biotechnology products by farmers and consumers.

To further reach out to the public and facilitate informed dialogue on modern biotechnology, UBIC solicited the expertise of scientists, journalists, and other stakeholders to laymanize biotech jargon. A dictionary with simple and easy-to-understand biotech concepts was developed and translated to six local languages for use by science communicators.

Furthermore, UBIC helped draft a national biosafety communication strategy for the Ministry of Science Technology and Innovation. The strategy is expected to increase the public's appreciation of biotech applications in various sectors, and the need for regulation.

UBIC empowered the youth to appreciate and pursue careers in modern agriculture. This was done by integrating biotech and biosafety into the agriculture course curriculum. Internships and essay-writing contests on biotech were conducted to increase the youth's appreciation of the technology. This led to an increased number of students pursuing biotech-related courses in tertiary institutions.

UBIC is committed to consolidating the gains made in supporting a positive policy environment, a science-based regulatory framework and commercialization pathways for biotechnology products. They will relentlessly support this process through their champions, and outreach and capacity building programs. UBIC will also continue to grow its strategic partnerships to leverage expertise and mobilize resources to support the BIC agenda. Ultimately, UBIC seeks to define a new era across various sectors for embracing new STI knowledge and approaches to maximize their outputs towards national development.

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Brian Kibirige is a farm manager and Agriculture teacher at Gayaza High School (GHS)—one of the top girls only secondary schools in Uganda. He is also an advisor with Youth Farmers of Africa (YoFFA) GHS chapter. Brian has widened his professional network through UBIC’s activities especially her schools’ outreach and capacity building program including initiatives like the National biotechnology essay contests. He has also built better teacher-learner relations with his students. “I will tell you that working with UBIC has helped me become a better farmer, better teacher and better advisor.” Brian has been an active participant, mobilizer and partner with UBIC on various schools’ outreach programs for over four years. He has won several accolades for exceptional performance as a collaborating teacher, guiding some of the top performers in UBIC’s National biotech essay contest over the years. He has also taken part in essay evaluation and school seminars on biotech. “We need to scale out the mobilization to get more schools engaged in UBIC activities like the essay competition. Importantly, the more applicants we get the higher the number of individuals reached, and these can help shape favorable policies for science,” he suggested.

Aside from these BICs, some country nodes conduct biotech awareness activities through translation of CBU articles selected ISAAA materials, distribution of print and online publications, and submission of news articles about recent happenings on crop biotechnology in their country. These country nodes are located in Thailand, Iran, China, South Korea, South Africa, Burkina Faso, Egypt, and Peru.



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Strengthening Skills in Asia

Our efforts in Asia are focused on capacity building on biotechnology regulation and related institutional support and public information and outreach.

Guiding Developing Countries in Biosafety Regulation

Drafting Myanmar's biosafety framework, policy, and guidelines. Myanmar is one of the countries in Asia where the agriculture sector is the backbone of its economy. It has been recognized for its progress in combating hunger and achieving the Millennium Development Goal target of halving the proportion of hungry people or bringing it below a five percent threshold. To date, Myanmar looks at various agricultural innovations to continue its progress in the sector. To assist the country's regulators and policymakers in developing a biosafety framework, ISAAA held a series of workshops. Members of the parliament, high-level officers from various departments of the Ministry of Agriculture, Livestock, and Irrigation (MoALI), and representatives from other concerned ministries were led by ISAAA and international biosafety experts into a comprehensive review and revision of the National Biosafety Framework and biosafety guidelines.

Integrating research, effective communication and science-based regulation in agri-biotech.

To harness the full potential of agri-biotechnology to fuel sustainable agricultural development, SEAsiaCenter, MABIC, SEARCA BIC, and Monash University Malaysia organized the 2nd Asian Short Course on Agri-biotechnology, Biotechnology Regulation, and Communication (ASCA). The program's objective was to enable participants to have a better understanding of the entire value chain of living modified organisms (LMOs), as well as national and international legal instruments regarding LMOs. Effective communication of agri-biotechnology and biosafety regulation was also discussed. A total of 25 participants from China, Indonesia, Malaysia, Pakistan, the Philippines, Taiwan, Thailand, and Vietnam completed the week-long course.



Equipping Philippine regulators on biosafety.

Regulators from various Philippine government agencies involved in ensuring the biosafety of biotech crops were gathered to learn from the experiences of developed countries in regulating biotech crops. Biosafety experts from Michigan State University, US Department of Agriculture Animal and Plant Health Inspection Service, and other esteemed institutions tackled the necessity of functional regulations, environmental risk assessment, and a comparative analysis of regulatory systems in developing and developed countries. Discussions on science communication, biotech adoption, and socio-economic benefits were also included in the training. The regulators were exposed to the various molecular biotechnology tools for varietal improvement by visiting the research facilities at the International Rice Research Institute. Hands-on tasks were executed such as developing a conceptual model on risk assessment for various GM crops that can be used to trace pathways to potential harm.





Analyzing international regulations of New Breeding Techniques. A team of experts was commissioned to review and analyze the regulatory status of new breeding techniques. The resulting policy discussion paper will be used as a guide on how NBTs should be treated under the existing Philippine biosafety regulations on how technology can be used to ensure food security.

Briefing the public on Philippine biotech regulations. To inform the public about the existing biosafety regulatory guidelines in the Philippines, the science of biotechnology, food and environmental safety of biotech crops, biotech crops in the pipeline, and potential benefits of biotech crops, a total of 4 public briefings were held in various regions of the country. Participants to the briefing were mostly farmers, members, and officials of local government units, and representatives from the academe and non-government organizations.



Providing Institutional Support and Related Capacity Building

Seminar-workshops, technical assistance, and knowledge sharing initiatives were organized by ISAAA and partners to capacitate vital institutions on biotechnology.

Progressive Manpower Enhancement Program.

ISAAA and DA Biotechnology Program Office developed a series of training to strengthen the human resources of the Department to undertake research and development (R&D), manage R&D outputs, communicate the science, and regulate activities involving the use of modern biotechnology. Two training events have been completed by over 20 regulators.



Risk Assessment for Research and Development. Rautaki Solutions conducted a workshop on risk assessment for the technical staff of the Plant Biotechnology Center of Myanmar. The two-day workshop provided participants with the technical knowledge on the safety assessment of GMOs intended for contained use and R&D based on best practices and international guidelines.

Reaching out to the Public

SEAsiaCenter, together with SEARCA Biotechnology Information Center and other partners, initiated biotech information and outreach activities to raise the public awareness on biotechnology, regulations, adoption of commercialized biotech crops, and the status of biotech products in the pipeline.

National Biotechnology Week in the Philippines.

A forum on the development and adoption of biotech crops for food and feed in the Philippines was organized by SEARCA BIC and ISAAA, together with the Biotechnology Coalition of the Philippines and International Rice Research Institute. The forum provided consumers with updated science-based information on the benefits and the long history of safe use of biotech products. Around 50 participants from different food manufacturing companies, technology developers, and members of the academe had the opportunity to interact with the country's leading technology developers to discuss the government's regulatory process. They also discussed GM crops that are close to commercialization such as Golden Rice and Bt eggplant. ISAAA also joined the exhibitions at the Senate of the Philippines and National Kidney and Transplant Institute highlighting biotech crop adoption in the Philippines and Science and She campaign, respectively.



Biotech-on-air program. Biotechnology becomes the center of discussions on radio through the program “Napag-uusapan Lang Po” on Noon Break Media (NBM), an online TV station. The radio program also features current events and local scientific research and projects, presented in news magazine format.

Strengthening partnerships for biotechnology advocacy. ISAAA, SEARCA BIC, and other lead agencies in promoting the benefits of biotechnology gathered for a workshop to facilitate the exchange of information on the individual agency’s/organization’s communication strategies and identified areas of potential convergence and information gaps for biotech communication and outreach activities.

Know the Science through Social Media.

To educate the Filipino public about crop biotechnology, social media platforms were used to disseminate news, feature stories, and science-based information. The number of followers and reach continues to increase, indicating a growing appreciation of biotechnology among Filipino netizens.



Video: The Bt Eggplant Story. A video documenting the development of Bt eggplant in the Philippines was produced by Feed the Future South Asia Eggplant Improvement Partnership, ISAAA, and SEARCA BIC, in partnership with Greenbug Media Productions. Potential farmer-adopters from selected provinces were interviewed about their experiences and challenges in eggplant farming. Researchers involved in the development of Bt eggplant, as well as other stakeholders, were also interviewed giving their insights on the development and commercial release of Bt eggplant.





Uniting Voices in Africa

Eighty-five participants from different African nations gathered in Pretoria, South Africa, for the Africa Biennial Biosciences Communication (ABBC) Symposium 2019. Various regulatory options and their implication on adoption of genome editing were discussed, in line with the right strategies in communicating the technology to the public. At the end of the symposium, the participants released a joint declaration to work together for the adoption of genome editing. An African coalition on communicating genome editing was also formed.

Activities of the *AfriCenter* are centered on equipping the key stakeholders with science communication skills, sharing knowledge to the public, guidance in policy development, and support to technology transfer.

Equipping Key Stakeholders with Science Communication Skills

AfriCenter conducted a science communication workshop for Ethiopian biotechnology and biosafety scientists to help them engage effectively with non-technical audiences. This led to the launch of a communication strategy for the Ethiopian Biotechnology Institute.

In Nigeria, *AfriCenter* organized a Science Cafe for GM crop project teams, particularly those involved in communicating the projects, together with journalists who report about GM technology. The participants were updated on the progress of biotech R&D and commercialization in the country. A linkage between the GM project teams and the media practitioners was established to pursue more balanced and science-based reporting of biotechnology in the country.



A series of science communication training was conducted in partnership with various institutions. The objective of such activities was to build the capacity of bioscience experts and early-career scientists to effectively communicate research findings to a broad range of non-technical audiences.



Sharing Knowledge for Public Engagement

The ISAAA report, Global Status of Commercialized Biotech/GM Crops in 2018, was launched in Nigeria to share the latest updates and trends in the global adoption of biotech crops. This garnered several media reports reaching 2.3 million media impressions.

One of the main strategies of *AfriCenter* to reach out to the public is through the Open Forum on Agricultural Biotechnology in Africa. In Kenya, OFAB to get the attention of the public on technology through various activities. This has contributed to the policymaking processes and formed strategic alliances for agri-biotech advocacy, while also enhancing the communication capacity among biotech stakeholders.

Stories and updates on biosciences in Africa are distributed through *The Drumbeat*, an e-newsletter with over 3,000 subscribers across the continent.



AFRICA BIOSCIENCE TRENDS

Experts in biotechnology shared their knowledge on biotechnology and public engagement through the National Dialogue on GM Foods.



Leaders of faith-based groups were invited to visit a Bt cotton National Performance Trials site to expose them to agri-biotech and empower them to be champions of the technology. This led to their endorsement of Bt cotton commercial cultivation as a means to improve the livelihood of smallholder farmers in Kenya.

Guidance on Policy Development

An expert consultation was organized to develop guidelines for genome editing research and development in Kenya. In another activity, a stakeholders' meeting was organized together with the Ministry of Environment and Natural Resources to initiate the process of resolving a miscellaneous regulation categorizing GMOs as "high risk", thus requiring the submission of environmental impact assessment study reports.



Support to Technology Transfer

To build a critical mass of GM cassava champions in Kenya, *AfriCenter*, together with Virus-Resistant and Nutritionally Enhanced Cassava for Africa (VIRCA) Plus established the Improved Cassava Stakeholders Committee (ICSC). The committee is designated to pitch improved cassava at the highest policy level as part of the Government's development agenda, with the hope of mitigating policy and regulatory hurdles and form an enabling biotech environment.





2019 and Beyond

2019 ended with a triple bang in the biotech area. Nigeria commercialized its first GM food crop, the pod borer resistant cowpea. Kenya approved insect resistant cotton for planting. The Philippines gave a green light to Golden Rice for food, feed, and processing, following the same approval given by the US, Canada, New Zealand, and Australia. These approvals are instrumental not just for the consumers and farmers who gained access to the technology, but to the wider public who have been unsure about the potential benefits of biotech crops. The approvals, granted by esteemed government institutions with guidance from their respective national research capacities, give a clear message that GM crops are safe and beneficial.

According to data collected and reported by ISAAA, major biotech crops have reached close to 100% adoption rates in top five biotech crop-producing countries. The U.S. was the top GM crop producer worldwide with 75 million hectares of biotech crops planted in 2018. The average adoption rate for the major GM crops (soybeans, maize, and canola) in the U.S. was 93.3%. Brazil planted 51.3 million hectares of biotech crops, mostly soybeans, maize, and cotton. These major biotech crops had an average adoption rate of 93%. Argentina planted a total of 23.6 million hectares of GM soybean, maize, and cotton, with an average adoption rate of ~100%. Canadian farmers grew 12.75 million hectares of biotech crops, wherein the major crops had an average adoption rate of 92.5%. India, which planted biotech cotton on 11.6 million hectares, which was 95% of the total cotton plantings in the country. The high adoption rates indicate that crop biotechnology meets some of the vital needs of consumers and producers.

Improvement of crops continues because farmers' and consumers' needs continue to increase. Biotech cotton with ultra-low gossypol developed by Texas A&M was approved by the US Food and Drugs Administration, addressing food safety while maintaining normal gossypol levels in the rest of the plant for its protection. Drought tolerant soybeans was also commercialized in Brazil, which was initially approved in Argentina and the US. Several studies have shown favorable results and promising benefits. These breakthroughs include iron-rich GM wheat, blight-resistant potato, salt-tolerant rice, spicy tomatoes, and non-browning lettuce. There were also developments in the study on self-fertilizing crops and zero-waste plants. Healthful oils from GM plants were analyzed and were shown to be as effective as fish oil. With a study confirming that genetic engineering occurs on a large scale of monocots and dicots naturally, it shows that such techniques provide effective ways to combat stresses in the environment.

New breeding techniques such as gene editing have led to the development of bacterial blight resistant rice, Vitamin A-fortified rice, wheat with safe gluten, fire blight-resistant apples, and canker tolerant citrus. Experts have released reports that plant breeding innovations are designed to help attain food security, and solve many global challenges. The biotech expert panel of the Food and Agriculture Organization of the United Nations declared that gene editing can transform agricultural production. According to geneticists from the University of Queensland, Australia, genome editing and speed breeding can feed 10 billion, which is the projected world population by 2050.



With the promising benefits of both genetic engineering and genome editing, uncertainties of the future such as food availability, evolution of pests, and the impending effects of climate change can be addressed. There is just a need for the public to understand the purpose and potentials of these technologies to guide decision-making process related to these technologies. A study showed that extreme opponents of GM foods know the least but think they know the most. Thus, it is essential to keep the public informed through best practices in science communication.

We, at ISAAA, continue to see more breakthroughs in research, regulation, and public engagement in years to come. With our massive efforts in shaping sound policy and regulations, together with the research endeavors around the world, deployment and adoption of biotech crops is expected to move forward. We envision that our strong support for the transfer of appropriate biotech applications and initiation of science-based conversations will make a collective outcome of bringing the benefits of biotechnology to over 20 million farmers in 40 countries, mostly in the developing world.

Partners and Donors

- African Agricultural Technology Foundation (AATF)
- African Union NEPAD
- Alliance for Commodity Trade in Eastern and Southern Africa (ACTESA) of COMESA
- Alliance for Science - Cornell University
- Australian Centre for International Agricultural Research (ACIAR)
- BASF Corporation
- Bayer Kenya - Crop Science
- Biosafety South Africa
- Biosciences eastern and central Africa (BeCA-ILRI Hub)
- Biotechnology Coalition of the Philippines
- Biotechnology Society of Nigeria (BSN)
- Corteva Agriscience
- CropLife Asia
- CropLife International
- CropLife Philippines
- Department of Agriculture, Philippines
- Department of Agriculture, Plant Biotech Center, Myanmar
- Department of Agriculture, Myanmar
- Department of Planning, Myanmar
- Donald Danforth Plant Science Center
- Emerging Ag
- Federal Ministry of Science and Technology, Nigeria
- FuturaGene
- ILSI Research Foundation
- International Livestock Research Institute (ILRI)
- IPBO – Ghent University
- J.R. Simplot Company
- Kenya Agricultural & Livestock Research Organisation (KALRO)
- Kenya National Academy of Sciences (KNAS)
- Kenyatta University
- Maharashtra Hybrid Seeds Company Limited (Mahyco)
- Michigan State University (MSU)
- Ministry of Agriculture, Livestock and Fisheries Kenya
- Ministry of Industry, Trade and Cooperatives Kenya
- Ministry of Innovation and Technology, Ethiopia
- Monash University Malaysia
- National Agricultural Research Organization (NARO), Uganda
- National Commission for Science, Technology and Innovation (NACOSTI)
- National Committee on Biosafety of the Philippines (DOST NCBP)
- National Curriculum Development Center, Uganda
- Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development (DOST-PCAARRD)
- Pioneer Hi-Bred RSA (PTY) Ltd
- Program for Biosafety Systems of International Food Policy Research Institute (IFPRI)
- Ram and Rashmi Charitable Foundation of the St. Louis Community
- Rautaki Solutions Pty Ltd
- Science Development for Livelihoods (SCIFODE), Uganda
- Science for Democracy
- Society of Crop Agribusiness Advisors of Kenya (SOCAA)
- Southeast Asian Regional Center for Graduate Study and Research in Agriculture (SEARCA)
- The African Seed Trade Association
- The Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA)
- Uganda National Council for Science and Technology (UNCST), Uganda
- U.S. Agency for International Development (USAID)
- United States Department of Agriculture
- UPLB Foundation, Inc.
- VIB-International Plant Biotechnology Outreach (IPBO)



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