

ACADEMICS & SCIENTISTS

Raising Perception of Credibility

In the eyes of various stakeholders, university professors and public sector scientists are often perceived to occupy the highest rung on the credibility ladder and are identified to be among the most trusted and sought-after information sources. University scientists and research institutes are seen to be highly concerned about public health and safety issues and are deemed capable of assessing and managing benefits and risks.

The important role of universities and research institutes in the development of agricultural biotechnology is highlighted by the fact that they become key sources of public information regarding the technology. Nisbet (2001) says that “In an increasingly complex society, the public and policy makers turn to universities and their experts for reassurances and reliable information about the unintended consequences and risks of technological development.” University scientists are often called upon to testify at government proceedings and are the most likely to be quoted or cited by the media.

Interestingly, studies confirm that trust as an attribute of credibility is related to acceptance of technology. Brossard et al. (2007) state that studies also argue that trust is more primary than information. They forward the assertion of Hansen et al. (2003) that “trust

enables individuals and organizations to act without knowledge.” The fact that university professors/scientists are rated highly as information sources, and that the trust attributed to them can be even more important than information itself show their crucial role in the biotechnology debate.

In many academic settings, professors also fulfill other tasks such as research and extension. In addition to teaching basic science courses and supervising students, they are also proponents and implementers of research activities. Stories reveal that they popularize science-based information through presentations in lectures, seminars and workshops; conduct quiz contests for students; and write publications. They spearhead efforts to enhance the science curriculum by institutionalizing a general education biotechnology course in universities, and prepare a teacher’s manual for teaching biotechnology. Professors and full time scientists prepare publications and proposals, engage the media through interviews and article rebuttal, participate in capacity building efforts, answer queries of non-technical audiences, and apply risk communication principles with clients. To do all these tasks require up-to-date science-based information obtained from publications, websites, and videos, as well as participation in seminars and workshops.



EMIL Q. JAVIER

Trail Blazing Biotech in the Philippines

By Mariechel J. Navarro

The Philippines has had a head start in biotechnology research and development and in its regulatory and commercialization system. In 2003, it became the first Asian country to approve Bt corn for planting on farmers' fields and remains to be the only one to date. Several products in the pipeline are crops such as Bt eggplant, virus-resistant and delayed ripening papaya, golden and blight resistant rice, and virus resistant abaca. "Much of this was made possible through collective leadership, a strong group of scientists who believed in transgenics for modern agriculture, and government support," says Dr. Emil Q. Javier, president of the National Academy of Science and Technology (NAST), and former president of the University of the Philippines and Minister of Science. Dr. Javier is regarded by many academics and scientists in having provided the vision and direction for science in general and biotechnology in particular. As the current head of NAST, he takes the lead in providing critical advice to the President of the country and the legislative branch of government on issues of national importance that have science and technology underpinnings.

"Science was not something I initially thought about as a field of interest in college. It was common to think that one should pursue a career as a medical doctor, engineer or lawyer. My father, a road roller operator in the Department of Public Works and Highways, could not afford to send me to college. The easiest option would have been to enter the Philippine Military Academy but I was underaged, underweight, and below the height requirement.

Help came from Dr. Dioscoro Umali, (then a professor of plant breeding at the University of the Philippines Los Baños (UPLB) and who would eventually become a National Scientist) who came to know of my plight and offered me a job as student assistant to earn my way through college."

The high school valedictorian from the rice farming community of Santa Cruz, Laguna, was a determined and a conscientious student in college. "I took up a science career by default but under the tutelage of the charismatic mentor Dioscoro Umali so that eventually I appreciated what I was taking up." Planning to be a Sugar Technology major ("It seemed to be the most popular course at that time."), he managed to take extra courses in chemistry which were not required subjects when he later shifted to plant breeding. Taking additional chemistry subjects was not a waste of time and effort as later events would show. He graduated at the head of his class with a B.S. in Agriculture (*cum laude*) in 1960.

In 1964, after a research assistant stint in UPLB, Dr. Javier took up graduate studies at the University of Illinois. "At that time there was a lot of speculations about possible breakthroughs in genetics. I was majoring in agronomy but I spent more time in microbiology and biochemistry courses. I had a feeling that these were going to be where the breakthroughs in plant breeding would take place." He attributed his well-roundedness in various fields and their interconnectedness in the choice of subjects he took. He eventually took up his doctoral degree in plant breeding at Cornell University.



Dr. Javier talks to young members of the media.

“Then President Ferdinand Marcos was very supportive of agriculture as well as of science and technology. We took advantage of his interest and proposed the establishment of the Institute of Plant Breeding (IPB). When we started IPB we organized strong laboratories for biochemistry, virology, analytical chemistry and tissue culture. Some quarters wondered about the significant bias of initial investments in these areas,” says Dr. Javier.

Laying the Foundation for Biotech

“Plant breeding draws its strength from two basic sciences – genetics and statistics. I knew that modern biotechnology was on the way and guessed that breakthroughs will come from biochemical genetics, not from statistics and quantitative genetics. At that time it was not yet possible to manipulate genes with precision. But in the end one has to know how to grow the modified transgenic cell into a whole plant. Hence our well organized tissue culture efforts, initially with mass asexual propagation as immediate practical objective. That’s why and how senior biochemist Dr. Evelyn Mae Mendoza and tissue culture guru Dr. Ramon Barba ended up leading the biotechnology efforts in IPB.”

“But the new biology had many more applications beyond plant breeding. Hence when I became Chancellor at UPLB, I made sure that these modern tools were applied in forestry, food technology, veterinary science and the rest of agriculture. I proposed the establishment of the National Institutes of Biotechnology and Applied Microbiology. Some people made fun of me because they thought the word “institutes” was grammatically incorrect as there was only one institute. But I had a vision that eventually there would be more than one institute of its kind.”

When he became UP president in 1993, Dr. Javier created similar institutes with specific niches in pharmaceutical applications, industry and energy, and marine industry in the UP campuses in Manila, Diliman, and the Visayas. He indeed had the last laugh.

Strengthening Science

Dr. Javier was also tapped by then President Marcos to be Minister of Science. “Although I had an agricultural background, I was fully aware of the other concerns besides agriculture. I became the architect of the sectoral council system, establishing research and development councils not only for agriculture, forestry and fisheries, but also for health and nutrition, industry and energy, and assigned the venerable National Research Council of the Philippines to take care of basic and social sciences.” Dr. Javier takes pride in his role in the establishment of the Science Career Service as a special branch of the Philippine Civil Service.

At the helm of the national university (UP system), Dr. Javier is credited for having a hand in the establishment of the National Graduate School of Engineering in UP Diliman, the National Institute of Health in UP Manila, and the UP Open University.

NAST, the government scientific advisory body which he presently heads, played a crucial role

in the debate about genetically modified (GM) crops. “The critics had nothing against the use of GM technology in pharmaceuticals, the opposition was in their use in agriculture. Fortunately, many members of NAST had strong backgrounds in agriculture, biology, genetics and biochemistry. They lent their names to the research on transgenic crops. As true, objective scientists, they were fully aware of the risks associated with the new technology and they themselves battled for a strong regulatory system.”

Favorable Political Environment

“The fact that the most senior and most visible Filipino agricultural scientists were in favor of transgenic crops development helped immensely to provide a favorable political environment for biotechnology. The Chancellor of UPLB and its Dean of Agriculture, the Southeast Asian Regional Center for Graduate Study and Research in Agriculture (SEARCA) Executive Director, the Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD) leadership, the International Rice Research Institute (IRRI) Deputy Director General, as well as the technology advisers to the Secretary of Agriculture were openly in favor of modern agricultural biotechnology. “It was this confluence of people that worked in favor of the use of transgenics for modern agriculture.” NAST supports the annual launch of ISAAA’s report on the global status of commercialized biotech/GM crops where Dr. Javier often gives a commentary on biotech initiatives in the country.

Past Philippine Presidents from Ferdinand Marcos including the present have supported science and technology initiatives. President Gloria Arroyo, according to Dr. Javier, has made significant investments into science and agriculture. He also mentions the important role of the International Service for the Acquisition of Agri-biotech Applications (ISAAA) in fulfilling the role of honest

“It was this confluence of people (with strong science background) that worked in favor of the use of transgenics for modern agriculture.”

broker in accessing proprietary technology and in moving it to the regulatory and commercialization phases. “The gestation period from discovery to commercialization is a long one and even longer if the support systems are not in place. This is where ISAAA is making a niche,” he says.

In addition, Dr. Javier “reads cover to cover” the e-newsletters of ISAAA and the Biotechnology Information Center in the Philippines. “I always access the news and use as leads the links to original documents or publications. If I find something interesting I ask my assistant to look up the material. This information provides me updates as NAST president.”

Aside from being NAST president, Dr. Javier continues to multi-task as chair of the Asia Rice Foundation, member of the Science Career Council in the Civil Service Commission, and the Secretary’s Technical Advisory Group of the Department of Agriculture, head advisor of the Biotech Coalition of the Philippines, and member of the Board of Directors of the Philippine Foundation for Science and Technology, and the Nutrition Center of the Philippines. For all his achievements, he has been given awards and citations by several bodies including the University of Illinois, University of the Philippines System, Third World Academy of Sciences, Phi Kappa Phi Honor Society, the Association of Southeast Asian Nations (ASEAN), and the governments of the Republic of Korea and Taiwan.

Who would have known that the student who took science by default, took the unbeaten path

by taking subjects outside his field, accepted criticisms in stride with his vision of institutional directions and priorities, established an institute with an “s”, and anticipated the developments of biotechnology before its time, would eventually

influence significantly the direction of S&T in the Philippines? Dr. Javier took the road less traveled and in doing so, he transformed visions into institutional realities. □

LYNETTE KISAKA

Taking Modern Biotechnology to Schools

By Margaret Karembu and Daniel Otunge



While genetics has been taught for decades in schools and colleges, its application in modern life has created new challenges for science teachers, especially those teaching biological sciences.

Ms. Lynette Kisaka, Head of Biology Education at the Centre for Mathematics, Science and Technology Education in Africa (CEMASTEA) admits that modern biotechnology has brought new dimensions and challenges in the teaching of subjects like biology and agriculture. Her words cannot be taken lightly for a woman who has dedicated much of her professional life to studying and teaching biology. “I studied Botany and Zoology for my undergraduate studies at Kenyatta University in Kenya. I went straight into teaching Biology after my graduation in 1987. I was back in the University in 1992 to pursue my graduate studies in Zoology, specializing in Parasitology. Upon my graduation in 1994, I continued with classroom teaching of my favourite subject - biology until 2001 when I joined CEMASTEAs,” states Ms. Kisaka.

The CEMASTEAs in Africa is an educational institution located in Nairobi, Kenya, but serving the whole of Africa. Its overall goal is the improvement of science and technology education at the secondary school level in Africa. CEMASTEAs was first established as a home of the project “Strengthening of Mathematics and Science at Secondary Education” (SMASSE), a joint initiative of the government of Kenya through the Ministry of Education, Science and Technology and the Government of Japan through the Japan International Cooperation Agency (JICA). CEMASTEAs was later adopted by the African Union’s New Partnership for Africa’s Development (NEPAD) and has membership from about 23 African countries. The Center’s main objectives and functions include: enhancing the capacity of mathematics and science educators in Africa; strengthening the networking of mathematics and science educators; enhancing dialogue between mathematics and science educators and policy makers for the betterment of mathematics and science education; and promoting analytical work in mathematics and science education in Africa.

But, even with her many years of experience in the subject, Lynette has been grappling with how to effectively teach biology or even train other teachers to effectively teach the subject with the new dimensions and challenges brought about by modern biotechnology. According to the lady teacher, many teachers are finding it extremely hard to fully comprehend issues of modern biotechnology and how they can incorporate them in their lessons. Their plight has not been helped much by polarized debates, controversies and misconceptions surrounding modern biotechnology.

Training Teachers on Biotech

CEMASTEA runs the SMASSE program - an In Service Education and Training (INSET) for teachers. Lynette explains that the program, which was initiated in 1998 on a pilot basis, initially targeted secondary school teachers but has now been expanded to include primary school teachers. "Due to the popularity of the program, a national program was rolled out in 2003, attaining national coverage in 2008. Key teachers are selected from districts countrywide, who are then trained as Trainers of Trainers (TOTs) to train other teachers at their districts." So far, the center has trained 1,500 TOTs who have in turn trained over 18,000 teachers in the 109 centers countrywide in the various science subjects – biology, chemistry, physics and mathematics. A particular emphasis is placed on practical approaches to the teaching of biology in order to help the teachers get hands-on experiences and resolve misconceptions about the subject, Lynette explains. "One of the units we teach at SMASSE is genetics where biotechnology is handled as an emerging issue and, this has been one of the areas we have really been struggling with."

However, an initiative by the International Service for the Acquisition of Agri-biotech Applications (ISAAA) appears to have responded straight to the



Lynette in the Teachers Course in Kenyatta University.

Center's dilemma as far as the teaching of modern biotechnology was concerned. In August 2008, ISAAA held a two-week intensive training for the TOTs on modern biotechnology at Kenyatta University under the Department of Biochemistry. The workshop was facilitated by local and international resource persons with expertise in different aspects of biotechnology and biosafety. The workshop's goal was to enhance the capacity of science teachers in integrating agricultural biotechnology in relevant teaching disciplines through hands-on exposure to basic concepts and global issues on modern biotechnology. Twenty-five high school biology teachers drawn from all the provincial regions in Kenya participated. These teachers were also Biology TOTs under the CEMASTE A program in their respective Districts.

Lynette was among two CEMASTE A trainers who participated in the workshop and helped in selecting the participants. The theme of the workshop fell within ISAAA's mission of building capacity of national programs and promoting knowledge, information and experience sharing on all aspects of agricultural biotechnology. Realizing the important role of teachers as opinion leaders and community role models, the workshop was designed to empower the trainees with factual information on biotechnology to

improve their classroom teaching and use their acquired knowledge to reach out to neighboring communities. This was an important step towards creating general awareness on biotechnology, besides demystifying the subject among students, ultimately trickling down to their communities.

“The workshop was highly interactive and included both lectures and hands-on practical sessions. The laboratory sessions were designed to train us on how to design simple experiments using improvised locally available materials such as extraction of DNA from plant materials, tissue culture techniques, DNA sequencing using paper cuttings and constructing lamina flow hoods using cardboards. This aspect was particularly important for ensuring replication of the same in schools where advanced scientific infrastructure is lacking. It was also meant to demystify biotechnology concepts in a way that would build our confidence in integrating it in teaching,” says Lynette.

“Besides,” Lynette continues, “we had an opportunity to visit local institutions undertaking biotechnology activities such as Genetic Technologies Limited (GTL) and the Kenya Plant Health Inspectorate Service (KEPHIS). The climax was a participation in the open forum - the Open Forum on Agricultural Biotechnology (OFAB) where Calestus Juma, a Professor of the Practice of International Development, Harvard Kennedy School and reknown scholar gave an overview of acceptance pathways of emerging technologies and how to deal with public perceptions on the same. These exposures helped us to further enhance our knowledge on the practical and commercial applications of biotechnology in Kenya and globally.”

Training Course - An Eye Opener

Although Lynette had been exposed to biotechnology issues earlier (in 2002) during a

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visit to the International Rice Research Institute in the Philippines as part of an exchange program, she had never gained so much knowledge and understanding of biotechnology issues. “The two-week training course was such a big eye opener not only for me, but also for the 25 other trainees. Through the course, I gained deeper understanding of biotechnology issues and was convinced the course is crucial for all biology teachers throughout the country. Not only did it deepen our knowledge and understanding but also made us aware of where to get credible information and resources for our teaching,” states Lynette.

“It was an exposure that has even changed my perception on products of genetic engineering (GMOs). I am now deeply embedded in biotechnology debates especially with the heightened debate on the Kenya Biosafety Bill. I am now increasingly finding myself clarifying a lot of misconceptions among my peers and to my theologian spouse, Mr. Kisaka. Listening to some of the polarized debates in the mass media, I find myself calling upon the resource persons who trained us to get more engaged in participating in such debates to share the correct information and messages.” Lynette strongly believes we have an inherent ability that God gave us – to tap and expand our knowledge, which can be used to utilize environmental resources wisely. “My only caution is that application of biotechnology should be guided by ethics while safeguarding against adverse environmental and health risks that might arise,” she emphasizes.

Avenues for Sharing New Value Systems

The lady teacher is optimistic that since this first lot of trainees was drawn from highly influential and senior biology teachers, examiners and heads of biology departments, they will greatly contribute to creating appropriate public awareness and clear the misconceptions about modern biotechnology. "People are generally skeptical about the technology because they lack the knowledge about it and have been grossly misinformed."

With her newly acquired knowledge, Lynette is confident that she can contribute to the required change – change in attitude and knowledge about modern biotechnology. And she has identified various fora through which she intends to share her knowledge, shape or change opinions and entrench new value systems especially at the secondary school level. One such avenue is the Association for Development of Education in Africa (ADEA) that also serves as a forum for teachers from 31 African countries to meet and share experiences and new knowledge in science, technology and innovation.

"The ADEA is a very important network, for it can be used to disseminate information on biotechnology to teachers in the 31 countries that are members of the network," says Lynette. "I want to use the association to rally teachers around teaching biotechnology and how to make such teaching more practical for maximum understanding by students who are tomorrow's leaders."

Another avenue she believes to be important in entrenching biotechnology into societies' value systems is through the integration of modern biotechnology into school curriculum. A firm believer in the power of science and technology for development, Lynette emphasizes the need for deliberate effort to translate strong science

"People are generally skeptical about the technology because they lack the knowledge about it and have been grossly misinformed."

education at school and college levels into technological products. She laments that there is little translation of teaching science into science and technology for society. "We have very good marks and grades in sciences at schools and colleges. But there is very little output nationally in science and technology. If we cannot make a break in science and technology, we might as well forget about development as a country."

"And, one area where science taught in schools and colleges must be translated into tangible technological innovations is in agriculture, for I believe modern biotechnology will be one of the vehicles to boost agricultural productivity amid a myriad of production constraints– land pressures due to population increases, climate change, droughts, pests and disease outbreaks."

Lynette considers application of biotechnology in the food security strategy of the country a first priority given the high number of people (close to 3 million) perpetually in dire need of food aid in Kenya in any given year. The year 2008 was particularly bad with nearly 10 million people declared as food insecure. "It is only when you have satisfied the basic needs of food that people can now start thinking about other things. Once you adopt a technology that has demonstrated potential to increase productivity and achieve self-sufficiency in food needs such as biotechnology, then people will start thinking about development," states Lynette. "I am very convinced that biotechnology will help this country attain food security for its citizens." □



ANNIE CLARA AROKIASAMY

Teacher and Student of Biotech

By Mahaletchumy Arujanan and K. Cheng Liew

To ensure the development of biotechnology, it is important to formulate effective pedagogical techniques to ensure that the younger generation will have greater appreciation and understanding of the subject matter. Hence, the Malaysian government's thrust to put biotechnology into the forefront strongly relies on the very people responsible for educating the young – the teachers.

Ms. Annie Clara Arokiasamy has been a biology teacher in several national schools around the country for the past 15 years, and has been awarded by the Ministry of Education for her long and distinguished service. She graduated with a Bachelor in Science with Honors in Microbiology from Universiti Sains Malaysia (USM) and completed her Diploma in Education and Masters in Education (Science) from the same university.

"My clients are my students," says Annie. "Teaching is my core business. Though we don't teach biotechnology as a subject in school, it is taught as an important component of the biology syllabus under the topic of genetic engineering which was introduced in 1995." She recalls the uphill task in understanding the topic back then as little information was available to the public. Being a dedicated teacher, she bought related books on the subject. Today, she is comfortable expounding on the subject matter to her students. She also relies on the Internet and its wealth of information as a good source by which she could give her students a clearer view on the subject.

Biotech Workshop for Teachers

Annie was pleasantly surprised by a biotechnology workshop for teachers on "Enhancing Effective Pedagogy" organized by the Malaysian Biotechnology Information Center (MABIC) in collaboration with the Ministry of Education's Center for Curriculum Development and the Malaysian Palm Oil Board (MPOB). This workshop aimed to keep teachers abreast with the latest applications of biotechnology and provide them with teaching resources that can improve their teaching. A group of 40 teachers from Selangor and Kuala Lumpur were invited to join Dr. Ravigadevi Sambanthamurthi, head of the Advanced Biotechnology and Breeding Center at MPOB. Teachers were divided into two groups with each group going through a one-day hands-on laboratory session on DNA extraction, PCR technique, and DNA finger printing with DNA extracted from oil palm leaves. Several lectures were given such as on the applications of biotechnology in the palm oil industry which provided an insight on the various tools to increase productivity, address challenges such as diseases and pests, and produce quality planting material.

Annie mentions that it is a positive move for teachers to be educated first hand. "It is a great experience," she says. "In the past when I did my major in microbiology, I was not exposed to such scientific techniques. I learned the basics about DNA fingerprinting from books. The workshop is

“It is a positive move for teachers to be educated (about biotech) first hand.”

an eye opener as it gives me first hand experience which I am able to share with my students.”

“However, it would be better if we could bring this into the classroom so that students can experience it themselves,” she notes. “Due to financial constraints, few schools have laboratories which

are equipped to run such experiments for students. It would be a very good learning experience for them. Most students find it difficult to visualize the concepts of genetic engineering and DNA fingerprinting in their minds.”

Annie finds the activities by MABIC to be very useful for advancing science and technology in the country, particularly in providing early stimulation and interest among students. “I hope that MABIC will be able to conduct similar and more workshops in the future.” □

ANIL KUMAR GUPTA

Building Capacity on Biotech and Biosafety

By Bhagirath Choudhary and Kadambini Gaur

The G.B. Pant University of Agriculture and Technology (GBPUAT) in Pantnagar, Uttarakhand, India has a history of developing innovative products for agriculture and was the first university in the country to blend technology with agriculture. Nobel Laureate Dr. Norman E. Borlaug eulogized the university as the *Harbinger of Green Revolution* in India. Recognizing the potential of biotechnology in agriculture, the university was the first in north India to establish the Department of Molecular Biology and Genetic Engineering to impart teaching to graduate and post-graduate students in agricultural biotechnology. It is included among the ten best biotechnology schools of India. Noting the strength and sincere efforts in promoting agriculture research, India’s Department of

Biotechnology identified it as one of the Centers of Excellence in Agricultural Biotechnology. Research areas include management of biotic and abiotic stresses, improvement of nutritional quality and value addition, clonal propagation of elite planting materials, and capacity building in bioinformatics and biosafety.

The Ministry of Environment and Forests, Government of India has identified the university’s Department of Molecular Biology and Genetic Engineering as one of the four biosafety centers under the Global Environment Facility (GEF)-World Bank project to enhance institutional capacities on biosafety and help the ministry to implement the Cartagena Protocol on Biosafety.

Dr. Anil Kumar Gupta is professor and head of GBPUAT's Department of Molecular Biology and Genetic Engineering at the College of Basic Sciences and Humanities. He received his post graduation in biochemistry from GBPUAT and Ph.D in biochemistry from Rajasthan University, Jaipur, Rajasthan.

Career Journey

Dr. Anil Gupta has a rich experience of having worked in several medical institutions (All India Institute of Medical Sciences, New Delhi; MLB Medical College, Jhansi; GSVM Medical College, Kanpur; and Cancer Research Institute, Gwalior) before he joined the GBPU. His field of interest being molecular biology and biotechnology, he grasped the basic paradigms of agricultural biotechnology by attending several training programs in the field of genetic engineering. His interest in agriculture enabled him to develop transgenic Brassica harboring the *osmotin* (a pathogenesis related protein) and *annexin* (an anti-oxidative burst protein) genes for conferring resistance against Alternaria blight. Dr. Gupta is project investigator of edible vaccine development using transgenic tomato plant against Japanese encephalitis virus.

Biosafety is a key concern for Dr. Gupta. He is a member secretary of Institutional Biosafety Committees at Pantnagar and Indian Veterinary Research Institute, Izatnagar. He helped to prepare the biosafety regulations for the Government of Uttarakhand and published several research papers and co-authored several books on biotech/biosafety. Dr. Gupta is also a reviewer for several journals including the Indian Journal of Agricultural Biochemistry, Indian Journal of Experimental Biology, Indian Journal of Biotechnology and is a project reviewer of the Council of Scientific and Industrial Research of India's Department of Biotechnology. Dr. Gupta also successfully completed the first phase of the



Dr. Anil Kumar Gupta in his laboratory at the Department of Molecular Biology and Genetic Engineering, College of Basic Sciences and Humanities, G.B. Pant University of Agriculture & Technology (GBPUAT), Pantnagar.

Global Environment Facility-World Bank funded program on Capacity Building on Biosafety at the university. His sincere efforts have been appreciated at the university and state levels.

Shaping Young Minds

Dr. Gupta has made significant contributions in implementing and popularizing biotechnology in the University. He feels it is essential to guide students in areas of science and technology that will enable them to lead in the frontier areas of molecular biology and genetics. "It is vital to familiarize students with current status and future prospects of agricultural biotechnology with our acknowledged leadership to create their interest. It is essential to incorporate a course on biosafety in the curriculum and carry out quality research work in the area," he asserts. He is dedicated to impart quality education, training and research in the area and also in extension of knowledge activities. "Modern technologies, especially biotechnology, are expected to make a large impact in bringing purpose and precision to every walk of life. These technologies when harnessed properly will permit

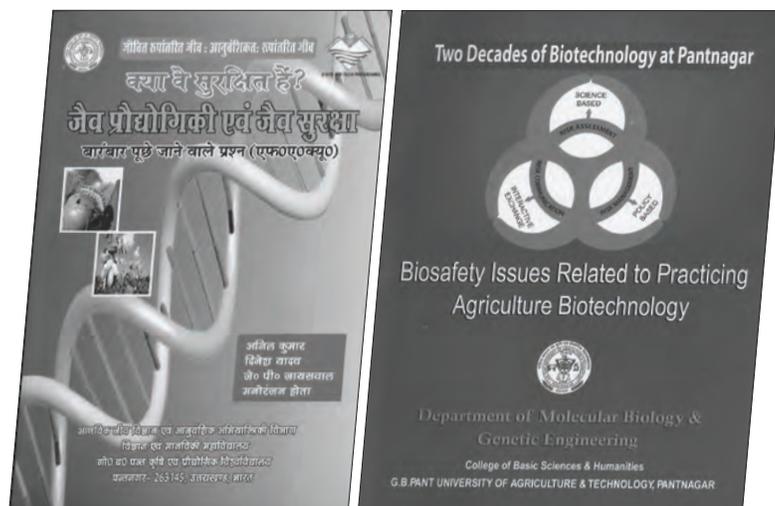
optimum utilization of natural and genetic resources for the welfare of humankind,” he tells his students who are excited to learn about the new science under his able guidance. As a scientist and as a teacher he feels the responsibility of delivering latest scientific information and sharing experience with students.

Enriching Knowledge on Crop Biotech

Dr. Gupta has a long involvement and relationship with the International Service for the Acquisition of Agri-biotech Applications (ISAAA). He finds ISAAA’s publications to be very useful in keeping his students informed about latest developments in the biotech sector. “The interesting and informative materials provided by ISAAA in the form of videos, Pocket Ks, CDs and booklets really help students, researchers and academia in understanding the emerging scenario of biotech crops. These information materials really help in answering queries of all stakeholders especially beginners opting to take a career in agricultural biotechnology. We are updating our knowledge base on the current status of biotech crops globally, in-country, and other biotech related news,” he notes.

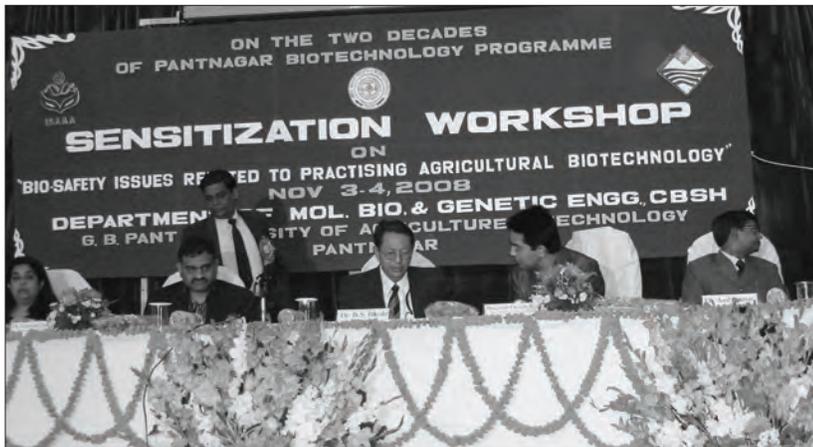
The organization of awareness workshops is essential to help in capacity building in the areas of biotechnology and biosafety. “These workshops are important to increase awareness among all

“The application of crop biotechnology offers the opportunity to alleviate marginal and subsistence farmers to get out of their dependency on government assistance and to increase agricultural productivity.”



Biotechnology publications released by GBPUAT’s Department of Molecular Biology and Genetic Engineering.

stakeholders such as scientists, farmers, policy makers, advisors, research scholars, extension officers, television and media personnel involved in scientific reporting about new technologies and developments,” he says. In November 2008, ISAAA and Pantnagar University jointly organized a sensitization workshop on *Biosafety Issues Related to Practicing Agricultural Biotechnology*. More than 150 participants from academia, state government and local media attended the workshop and government officials participated as resource speakers. ISAAA publications such as Brief 37 and its Executive Summary on the global status report of commercialized biotech crops, Pocket Ks, and Bt cotton video were distributed to the participants. “The biosafety sensitization workshops will not only help in chalking out biosafety norms in the state but also give an insight to participants about transgenic crops from renowned resource persons,” he adds. On this occasion, the Department celebrated two decades of biotechnology at Pantnagar and released various documents on crop biotech including, *Biosafety Issues Related to Practicing Agriculture*



Biotech workshop: from left, Dr. Ranjini Warriar, Director, Ministry of Environment & Forests; Dr. Rajendra Dobhal, Director Uttarakhand State Biotechnology Program; Dr. B.S. Bisht, Vice Chancellor, GB Pant University of Agriculture and Technology; Mr. Bhagirath Choudhary, ISAAA; Dr. Anil Kumar Gupta, Head, Department of Molecular Biology & Genetic Engineering, GBPUAT.

Biotechnology, Frequently Asked Questions (FAQs) on Biotechnology and Biosafety, and Q&A on Bt Cotton in India.

Crop Biotechnology: Promising Future

"Crop biotechnology holds tremendous potential in increasing agricultural productivity and ensuring food security. In recent years, it has emerged as one of the most exciting, promising and

"It is imperative to create awareness and public campaign programs to educate all stakeholders including farmers, consumers, policy makers and extension officials about the benefits of agricultural biotechnology."

challenging areas of research. The application of crop biotechnology offers the opportunity to alleviate marginal and subsistence farmers to get out of their dependency on government assistance and to increase agricultural productivity. The introduction of new crop varieties with insect resistant and herbicide tolerant genes is quickly changing the landscape of agriculture at the global level," says Dr. Gupta. "However, it is imperative to create awareness and public campaign programs to educate all stakeholders including farmers, consumers, policy makers and extension officials about the benefits of agricultural biotechnology. Besides, there is need to organize programs for school children and

mobile exhibition and mimes (*nukkar natak*) about biotech crops at every nook and corner of the country so that myths circulated by biotech critics can be counteracted."

Dr. Gupta suggests that "ISAAA should conduct public awareness activities on risks and benefits of GMOs, develop information packages for appropriate target groups in the state/country, and increase GMO awareness and its implications for trade. Stakeholders must be made aware of the multiple benefits of GM crops in terms of yield advantage, reduced use in pesticides and herbicides, and decrease in farm costs as proven in cotton. The synergistic and mutually beneficial partnership between academia-industry-farmers can advance the country's agricultural biotechnology sector," he concludes. □

SONY SUHARSONO

Applying Risk Communication Principles

By Mariechel J. Navarro and Bambang Purwantara

Dr. Suharsono is a lecturer and researcher at the Bogor Agricultural University (BAU) in Indonesia which hosts about 20,000 students. He is concurrently director of the Research Center for Bioresources and Biotechnology, a university-based research center involved in the development of biotechnology, conservation and utilization of bioresources. The Center also supports graduate education, and provides scientific services.

As lecturer, he teaches basic and molecular genetics, genetic engineering, and introductory biotechnology to both undergraduate and graduate students in the Departments of Biology and Biotechnology. His research interests are soybean and jatropha for biofuels using a combination of conventional technology and biotechnology. "I look forward to the day that biotech soybean will be eventually commercialized in Indonesia as we still import 60% of our soybean requirements," says Dr. Suharsono.

The research director initially wanted to be a doctor but his family could not afford to send him to medical school. "My father is a forester but I did not want to pursue forestry. I thought that working with plants was easier than with trees. I thus decided to take up an agriculture degree," he reminisces. He obtained a two-year scholarship to complete his agriculture degree at the Bogor Agricultural University where the top 5 percent of high school students were given a 15-month stipend. This was a great opportunity for someone like him who came all the way from Central Java. On top of the scholarship, he was offered work by the University upon graduation. BAU eventually sent him to France to pursue further academic training. He got his Masters in Plant Production from *Universite de Nantes* and his Ph.D in Plant Cellular Biology from the *Universite de Bordeaux II* in France.

Dr. Suharsono is active in the biotechnology scene in Indonesia. "I am often invited by the Indonesian



Dr. Suharsono at work in his lab.

Biotechnology Information Center (IndoBIC) to be a resource person on the current status of genetically modified (GM) crops in workshops and roadshows. Roadshows are designed to bring technical experts to universities and encourage audiences to interact with them and share experiences on how the technology affects their lives. They serve as a venue for updates and technical briefing," he says. For example, IndoBIC had a workshop at the University of Jambi, Sumatra. Dr. Suharsono discussed the role of biotechnology in support of agricultural production. He also organized with the Program for Biosafety Systems (PBS) and IndoBIC, a workshop on the current status of biosafety of genetically modified (GM) crops. He was appointed as chairman of this event. "I am surprised that many students and even lecturers do not have their facts right about biotech and in the process view it in a negative light," notes Dr. Suharsono. He suggests that roundtable discussions be held not only for students but also for people like lecturers who are "highly ranked but have

limited knowledge. The strategy is to involve them in sharing and exchange of information as they can learn new things without feeling that their authority is being questioned. It is also a very good idea if the lecture on the development and safety of biotechnology especially GM crops can be given to all first year students of bioscience-related disciplines.”

Communication Workshop

In September 2006, Dr. Suharsono and eight other Indonesian colleagues were invited to attend the *Biotech Issues and Communication Workshop: Enhancing Communication Skills on Biotechnology* held in Manila, Philippines. The International Service for the Acquisition of Agri-biotech Applications (ISAAA), in collaboration with the SEAMEO Regional Center for Graduate Study and Research in Agriculture (SEARCA) and the U.S. Grains Council, managed and implemented the four-day workshop which was also attended by participants from Malaysia, Philippines, Thailand, Vietnam, Kenya, and the U.S. The workshop aimed to train key decision makers to communicate effectively issues surrounding biotech seeds and food to their local stakeholders. Specifically, it provided participants from the region with the latest information on issues surrounding biotech crops; equip participants with communication skills to enable them to respond proactively to high concern, controversial situations; share country experiences on communicating biotechnology; and identify excellent communicators in the region who will be able to assist ISAAA in public awareness work.

A combination of technical lectures, risk communication workshop, communication experience-sharing among countries, and field tour was used to meet the set objectives. Resource persons discussed the global biotech scenario, food safety, environmental safety, and socio-economic and trade issues. A risk communication expert



Dr. Suharsono (third from left) and his colleagues during the Biotech Issues and Communication Workshop in Manila.

introduced communication techniques to deal with high, concern and controversial situations through lectures and exercises. Case studies from Indonesia, Philippines, Thailand, Vietnam, and the U.S. were presented to provide the challenges and strategies in communicating biotechnology. A field tour to a farmer’s biotech corn field (Bt corn, RR corn, and corn with stacked traits), and contained trials of biotech papaya and eggplant gave a first hand exposure to biotech crops. A briefing on the Golden Rice project also provided information on the benefits of the technology.

Responding to Negative Issues

“I found the workshop very informative and useful. In particular, I learned how to react to negative newspaper articles on crop biotechnology, handle media interviews, and deal with non-government organizations that have different views about the technology,” says Dr. Suharsono. He recalls that some people were concerned about the possible allergenicity of GM crops (or foods), as reported by some articles in newspapers. “To respond to this issue I explained that all agricultural products, whether developed through conventional means or biotechnology, are potential sources of allergens. But before releasing GM crops, many tests and assays are conducted so that only safe GM crops

"I found the workshop very informative and useful. In particular, I learned how to react to negative newspaper articles on crop biotechnology, handle media interviews, and deal with non-government organizations that have different views about the technology."

are released for consumption. GM crops have to be tested for food and environmental safety before commercialization." For future workshops like the risk communication workshop, he recommends inviting more people from different disciplines especially those from the social sciences who don't have much information about biotechnology. "Efforts should be made to facilitate attendance in

workshops of scientists and researchers from the University research centers."

In addition to the ISAAA and BIC workshops, Dr. Suharsono finds the Pocket K series of articles on issues and concerns on crop biotechnology as well as the Executive Summary of the annual global status of commercialized biotech/GM crops very useful to update him on various topics. "By reading the Pocket K series, people know that GM crops are not dangerous to people as noted by some articles in newspapers. From the information on the global status of GM crops, people also get to know that biotech crops are cultivated and used in both developing and developed countries. IndoBIC should produce more publications for laymen on biotech in Bahasa Indonesia as stakeholders really need these materials to better understand the technology," he concludes. □



SHIREEN ASSEM

The Challenge of Simplifying Information for Stakeholders

By Ismail Abdel Hamid

"Plant science is a very interesting area. I have always found it interesting to explore nature and learn about living organisms and the environment. I used to live in a house surrounded by a nice garden. In this garden we used to grow flowers such as rose, jasmine and some ornamental plants, as well as some citrus trees like lemon and oranges. I think I had my first plant biology lesson there. When I was young, my mind was always busy thinking about how plants grow and how it takes its

nutrition from the environment; why some plants need to be in the shade while others need the sunlight more. As I got older, my curiosity about nature and the plant kingdom increased including my appreciation for science. All these factors inspired me to become a scientist," recalls Shireen Assem. Dr. Assem was that little girl and is now the Head of Plant Molecular Biology Department of the Agricultural Genetic Engineering Research Institute (AGERI) in Cairo, Egypt.

Not content with merely appreciating plants, Dr. Assem specialized in plant science as an undergraduate and eventually took a Ph.D in biochemistry and plant genetic engineering from Cairo University. She further honed her expertise by attending a Fulbright Postdoctoral Fellowship at the University of Central Florida in Orlando on genetic engineering of the chloroplast genome. In between her studies she availed of professional upgrading through trainings and visits to other institutions in Egypt and the U.S. on plant molecular biology, plant tissue culture, and transformation techniques. Her current research endeavors are on the development of plant transformation technologies for monocot, improvement of maize productivity, and production of plant-derived pharmaceuticals.

“Science is life. Everything around us is made by science. Scientists always think about how to make life easier and safer for people. We develop modern technologies to improve our way of living. As the environment became polluted, lands suffer desertification and diseases become severe, scientists will always work together to learn more and develop proper technologies to fight these problems. The future is for science and technology,” Dr. Assem asserts. “Many developing countries suffer from high population growth and lack of food security and affordable medicine. Agricultural biotechnology applications through the production of genetically modified (GM) crops are needed in these countries to face the challenges of food deficiency, low farm productivity, and global warming. In Egypt, crop biotechnology is not a new issue. We started biotechnology laboratory work in 1990 at the National Agricultural Genetic Engineering Laboratory which became AGERI in 1992.”

Career Foundation

Dr. Assem joined AGERI as a junior researcher. She started doing research on natural products from medicinal plants. Her supervisor encouraged her to



Dr. Assem conducting research work on maize.

attend a training course on plant molecular biology. This course was her first experience on genetic engineering and molecular biology and it served as her foundation for her career in crop biotechnology.

“Public concern about biotech crops is very high and this means more effort should be done with regard public awareness. The Egypt Biotechnology Information Center (EBIC) plays a vital role in this through its continuous activities with the media. Simplifying concepts of biotechnology and delivering simple information allows the public to make decisions about accepting biotech crops,” says the lady scientist. She had her first opportunity to attend a workshop sponsored by EBIC in 2004. “I had just published a research article entitled *Expression of hepatitis B surface antigen (HBsAg)*

“Public concern about biotech crops is very high and this means more effort should be done with regard public awareness.”

in transgenic maize (Zea mays L.) During that workshop, I presented my work which caught the interest of media people who were attending the workshop. Everybody was interested to understand how plants can work as biological bioreactors to produce some vaccines and pharmaceuticals.”

Proper Perspective About Biotech

She eventually attended several workshops organized by EBIC particularly a presentation on the annual global report on the commercialization of biotech crops. “I also participated in EBIC media workshops. It gives me as a scientist, a proper perspective on how to communicate about biotechnology. Working with the media is an important activity for scientists. A scientist should deliver scientific data in a very simple way. After attending the workshops I realized the importance of getting in touch with the media and the public since our research is mainly directed to improve the life of the poor and help us attain self sufficiency with field crops. We should work closely with the public to identify their needs and find solutions to their problems.”

Various people and school students from both Egypt and other Arab countries visit AGERI. “Those people sometimes have difficulty in understanding biotechnology when it is explained in English. The information needs to be translated and simplified. I find that ISAAA publications translated by EBIC into Arabic are a very good source to help explain our research initiatives as they are written in a very simple and easy language. They help raise public awareness about biotechnology and increase public acceptance regarding genetically modified organisms (GMOs).”

Participation in BIC Activities

Dr. Assem says that she has gotten positive feedback about her work which she attributes to her participation in EBIC activities. “I’m looking forward to more opportunities to participate in public awareness and understanding of biotechnology. It gives me a chance to simplify my work and I always think of other ways to illustrate data for kids and media for instance. It becomes part of my daily thinking when I get new data, how it could be rewritten to help others, not just for scientists.” She suggests that more workshops be conducted regularly for scientists, media, and decision makers.

“In 2008 Egypt commercialized for the first time Bt maize. It is just the start. We have to keep in mind the agricultural challenges in our country and how biotechnology can offer and contribute to their solutions. Salinity and drought are priority issues now in agriculture.” She adds that “If biotechnology offers us better crops then we have to accept it. We need to encourage our farmers to benefit from this technology. We also need to reach women and children in upper Egypt and rural areas, because most of them are uneducated and suffer from malnutrition, anemia and other diseases. Raising their awareness about biotech will help encourage them to grow biotech crops and accept GM food to fight hunger and malnutrition.”

Dr. Assem is optimistic about biotechnology. “My dream is to see the first 100% Egyptian biotech crop to be released and commercialized. I think this is not too far away since we have the knowledge, the experience and the tools for that. Our country together with other neighboring African countries should join hands and focus on developing our own technology to solve the problems based on our needs. We don’t have to rely on others, because we know better about our crops and environment,” she says. □



CHARLES MUGOYA

Communicating Modern Biotechnology within the Sub-region

By Margaret Karembu and Daniel Otunge

The nature of Dr. Charles Mugoya's work requires that he interacts and communicates with all cadres of people – from highly technical scientists, senior policy makers, development partners, journalists, to farmers - an engagement that requires very high level communication skills. To many scientists, this would indeed be a very big challenge, for communicating with the greater public and people without a science background can be a daunting task. Undeniably, scientists are largely known to “communicate” effectively only to fellow scientists who understand the technical jargon.

However, Dr. Mugoya, the Programme Manager, Agrobiodiversity and Biotechnology Programme of the Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA), is one of the few exceptions with the ability to tailor his communications to particular audiences. ASARECA, a non-political organization of the National Agricultural Research Institutes (NARIs) of ten countries - Burundi, D. R. Congo, Eritrea, Ethiopia, Kenya, Madagascar, Rwanda, Sudan, Tanzania and Uganda - aims at increasing the efficiency of agricultural research in the sub-region in order to facilitate economic growth, food security and export competitiveness through productive and sustainable agriculture. The Agro-biodiversity and Biotechnology Programme was created to subsume activities under two previous ASARECA networks: The Biotechnology and Biosafety Programme (ECA-BIO) and the Plant Genetic Resources Programme (EAPGREN). The Programme integrates agricultural biotechnology and agro-biodiversity by using biotechnology as a tool to enhance utilization of agro-biodiversity.

The EAPGREN activities which focus on capacity building in plant genetic resources are presently implemented as a project under this program.

Dr. Mugoya narrates his responsibilities at ASARECA: “I frequently find myself in situations where I am required to translate highly technical scientific information into simple messages that can easily be understood by politicians and the many other people that I interact with on a day-to-day basis such as farmers, journalists and donors. As part of my work, I provide intellectual, strategic and technical leadership to national programs of the 10-member states of ASARECA and also in the development of project proposals. I am also responsible for mobilizing resource/assistance from member NARIs, partner institutions and donor agencies for undertaking the ASARECA Biotechnology and Biosafety Programme.”

In addition, Dr. Mugoya has to synthesize and edit reports from various projects within the program and prepare periodic progress reports and technical papers for presentation to a wide range of audiences.

What then is Dr. Mugoya's secret?

While many scientists advance their professional and career paths along their scientific areas of specialization, Dr. Mugoya, a highly trained and experienced scientist, added another path to his career development path – science communication.

“I have worked closely with the International Service for the Acquisition of Agri-biotech Applications (ISAAA) in several of their science

“From this (media) workshop, I learned a lot about mass media operations and how to package my messages for impact. Interacting with media experts enriched my understanding of how to address tough questions from journalists and my partners. I acquired skills in public relations, networking and partnerships and would highly recommend replication of such workshops in the region.”

communication training workshops, and these have really sharpened my communication abilities,” says Dr. Mugoya. He singles out two of these – the *Inter-Agency Media Workshop on Covering Biotechnology in Eastern and Central Africa* held in Addis Ababa, Ethiopia in 2006 and the *Biotechnology and Biosafety Communication Strategy Development* workshop for COMESA (Common Market for Eastern and Southern Africa) region in 2008 in Nairobi, Kenya.

The regional inter-agency workshop on *Improving Media Coverage of Biotechnology in Eastern and Central Africa* brought together a rare mix - scientists and journalists on the same table to deliberate on biotech communication matters in the region. Hosted by the United Nations Economic Commission for Africa (UNECA) and in collaboration with the Agricultural Biotechnology Support Program (ABSP II), the United Nations Educational, Scientific and Cultural Organization (UNESCO), and ISAAA *AfriCenter*, the three-day hands-on training workshop had 29 participants, including journalists from Burundi, Cote d’Ivoire, Ethiopia, Ghana, Kenya, Rwanda, Tanzania and Uganda. Representatives of the collaborating institutions, communication experts and researchers from the region served as resource persons. Additional support came from the Program for Biosafety Systems (PBS) and ASARECA.

One unique feature of this workshop was the testing and adoption of a UNESCO Multi-media training

kit (MMTK) for the promotion of development communication. MMKT is a package of tools for journalists working in media houses as well as Information/Communication Officers in development-oriented organizations. It succinctly guides the user in navigating through the whole communication planning process to ensure balance and accuracy in reporting development issues. Key features of the MMTK include: sources of information; problems of finding new sources of information; selling the story to the Editor; reasons why Editors reject stories; getting past the Gatekeepers; developing new story angles; developing story outlines; covering both sides of the story; covering controversial issues and eventually writing the stories.

“From this workshop, I learned a lot about mass media operations and how to package my messages for impact. Interacting with the media experts diffused the suspicion I had about journalists’ “intents” and enriched my understanding of how to address tough questions from journalists and my partners. I acquired skills that I use to tailor my presentations in ways that journalists and information officers can quickly pick as information sources for their stories. As well, I acquired skills in public relations, networking and partnerships and would highly recommend replication of such workshops in the region,” states Dr. Mugoya.

These are skills Dr. Mugoya really appreciates. With his wide and deep knowledge of modern biotechnology issues, he plans to use his communication skills to become a regional biotechnology advocacy champion, a fit he hopes to achieve first by becoming a networking and capacity building expert. “I also plan to use my skills in mentoring budding scientists in modern biotechnology.”

Development of Communication Strategy

“The other interaction with ISAAA *AfriCenter* that I found most rewarding was my participation



Dr. Mugoya at the COMESA Communication Strategy Development Workshop.

in the regional workshop on *Development of a Biotechnology and Biosafety Communication Strategy for COMESA Region* in 2008. The workshop was designed to inform the development of a needs-based communication strategy for the region under the RABESA (Regional Approach to Biotechnology and Biosafety Policy in Eastern and Southern Africa) initiative. The findings of an assessment on the current status of biotechnology/biosafety policies, laws, regulations and frameworks were shared, which initiated very productive discussions on how to generate content for an effective communication and advocacy strategy. I learned about the various steps and key questions to guide development of a focused communication strategy including:

1. Purpose of communication (Why)
2. Target audience (To whom)
3. Message (What)
4. Means of message transmission (How)
5. Message conveyer (By whom)
6. Feedback and follow-up (Participatory Monitoring and Evaluation)

In a nutshell, the facilitators guided us through the practical application of these questions and the

considerations to bear in the task at hand, thus:

- a) COMESA member countries are at different levels in the biosafety development process;
- b) Some countries' biosafety laws are enabling while others are prohibitive;
- c) Low levels of knowledge exist about biosafety policies and guidelines;
- d) There is high suspicion and mistrust among countries;
- e) Varied public misconceptions on biotechnology exist;
- f) There are prejudice from interest groups such as organic farmers and activists."

Dr. Mugoya adds, "At the end of the workshop, we were able to come up with the key elements to be considered in developing the COMESA biotech/biosafety communication strategy including need for:

- Specific messages for each target audience;
- Use of appropriate communication channels for specific target audiences;
- Audience research to obtain credible information for strategy development;
- Both regional and national advocacy and outreach plans;
- Sustained advocacy and outreach campaigns; and,
- Use of multiple communication channels to meet the needs of the strategy.

At the COMESA Ministers of Agriculture meeting in Khartoum in March 2007, implementation of RABESA-II was endorsed to hasten the harmonization process. This was in recognition of the benefits that a harmonized approach to biotechnology development would offer including: capacity building support through designated regional centers of excellence, synergized regulatory approval procedures, mitigation against potential impacts of genetically modified organisms

(GMOs) on trade, access to emergency food aid, and, enhanced information sharing. An important milestone in a harmonized approach would be consolidated templates with minimum acceptable requirements in the form of guidelines and procedures for fast tracking commercial growing and trade in agri-biotech commodities and access to food aid with GM content. The communication and advocacy strategy is aimed at catalyzing the harmonization process within this largest trading bloc in Africa, COMESA.

“Besides acquiring skills in effective communication, ISAAA has also enriched my knowledge on trends in modern biotechnology. Information and data from ISAAA’s annual global status of commercialized biotech/GM crops reports have been useful background information for instance in preparation of workshop presentations and project proposal literature.”

He, however, feels ISAAA should also provide separate global reports on available biotechnologies relevant for developing countries and crops undergoing field trials especially in public institutions from developing countries. This, he feels would build confidence among public sector researchers, farmers consumers and policy makers.

Regional Authority

These kinds of resolutions and recommendations can only come from a man with a deep passion for science and technology. Indeed, inspired into the world of science out of curiosity in unraveling the secrets behind life especially in the biological sciences, and in a strong belief in the power of science to positively impact human welfare, Dr. Mugoya has never looked back.

Through relevant training in biological sciences - BSc. in Botany and Zoology from Makerere University, Uganda, MSc. in Agricultural

Entomology from University of Nairobi, Kenya and Ph.D in Applied Entomology from Rivers State University of Science and Technology, Port Harcourt in Nigeria, coupled with relevant work exposure both regionally and internationally in science and technology issues, Dr. Mugoya has gained deeper knowledge of the subject, thus becoming an authority in the region.

After his Ph.D in 1991, Mugoya worked as a resident scientist for the International Centre for Insect Physiology and Ecology (ICIPE) in Zambia up to 1995, to join the National Council for Science and Technology in Uganda from 1996-2004. Here he worked as an Associate Executive Secretary and Regional Coordinator for the Swedish International Development Cooperation Agency (SIDA)-funded BIO-EARN Programme. In 1998, he was appointed as Project Coordinator of the UNEP/GEF Project to guide development of the Uganda National Biosafety Framework. In 2002 he coordinated a second project of the UNEP/GEF programme on the implementation of the National Biosafety Framework.

He sees the role of science and technology in Uganda from a much broader perspective - for meeting Uganda’s felt needs toward realization of short and long-term national development goals through technological innovation and scientific advancement. “These can be achieved through fostering creative basic research to promote scientific advancement and expanding sources of technological innovation. It can also contribute to increased agricultural productivity, ensuring food security and social stability and improvement of the quality of life. Another role of science and technology in sustaining the growth of the national economy and to improve its efficiency is through the development of key technologies to increase the national competitiveness of existing industries,” Dr. Mugoya concludes. □

MUHAMMADI

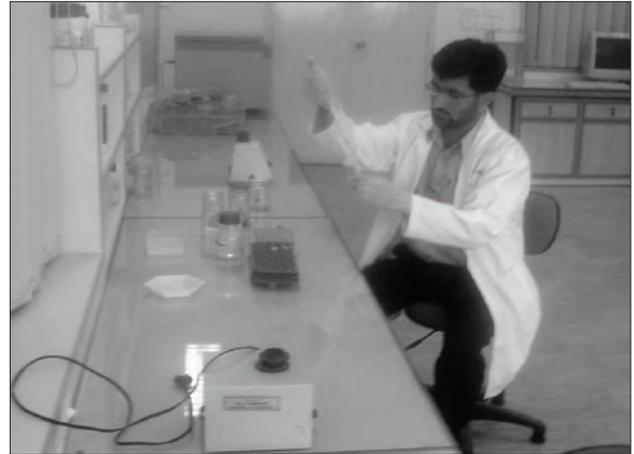
Library Visit Reveals Rich Source of Biotech Information

By M. Iqbal Choudhary

Pakistan is an agricultural country covering a total area of 19,671.63 million acres, of which 5,411.49 million acres are cultivated. Agriculture forms the largest sector of the national economy because it is strongly linked with food security, poverty alleviation, income and employment-generation, and rural development. At the national level, Pakistan's policy is to harness the potential of biotechnology as a key contributor to the development of the agricultural sector. Agricultural biotechnology is perceived to offer efficient and cost-effective means to produce a diverse array of novel, value-added products and tools for promoting the efficiency of crop improvement and food production.

Dr. Muhammadi is a research officer at the Biotechnology Wing of the International Center for Chemical and Biological Sciences, University of Karachi, Pakistan. He has a doctoral degree in molecular genetics from the University of Karachi's Department of Genetics where he did his research on the genetics of biopolymer production by indigenous soil bacteria. After working as a lecturer in biology at the Ghazi Foundation College for six years, he is now into full time research that covers industrial microbiology and biotechnology, particularly on the production of bioproducts by bacteria such as polymers, organic acids, antimicrobial compounds and bacteriocins, as well as their molecular genetic basis and their manipulation.

"I believe in the use of science and technology to develop new technologies especially for developing countries. Pakistan, as an agricultural country, needs new technologies and resources to address current and future challenges," says Dr. Muhammadi. "Applications of S & T should address needs of people. I look forward to greater development and



Dr. Muhammadi at work in his lab.

use of new emerging sciences to enhance people's welfare. The tremendous scientific research all over the world in both developed and developing countries suggests a brighter and fruitful future."

Dr. Muhammadi adds that crop biotechnology is directly contributing to the alleviation of poverty and malnutrition. "After the success of the Green Revolution, the Gene Revolution, or the use of biotechnological interventions, plays a vital role by not only increasing crop productivity but also taking care of the increasing threat of biotic and abiotic stresses on crops. It has the potential to increase food production, reduce dependency on chemicals, and lower cost of raw materials in an environmentally friendly way."

At the end of the 20th century, Pakistan had few public institutions working on biotechnology. Currently, there are 28 public organizations and a sufficient number of well-trained manpower working on different aspects of crop biotechnology – from plant tissue culture to genetic manipulation of resistant species and transformation. Dr.



PABIC's Library.

Muhammadi says that since 2002, the Higher Education Commission, National Commission on Biotechnology, Pakistan Agriculture Research Council, Pakistan Atomic Energy Commission and other public sector organizations have been sponsoring a number of national projects, international cooperation and trainings, enhancement of manpower and higher education in crop biotechnology. "The sincere and successful continuation of these efforts may lead Pakistan to an era where hope for self-sufficiency in crop production may be met," opines the Pakistani researcher. "Various crop varieties (cotton, rice and chickpea) have already been developed but none have been commercialized so far despite the issuance of the National Biosafety Guidelines in 2005. Nevertheless, the Government continues to encourage cutting-edge research in biotechnology."

Information Updates

Dr. Muhammadi learned about the International Service for the Acquisition of Agri-biotech Applications (ISAAA) from its website. "I get

information on approved guidelines, rules and regulations for the legal exchange and transfer of biotechnology especially in development countries. This information is important to build capacity for managing modern biotechnology. I also learn about the different activities and services that ISAAA conducts for developing countries, such as facilitating the safe transfer and sharing of crop biotechnology applications. I suggest that ISAAA hold short term trainings for scientists and organize more educational opportunities for farmers and consumers on the applications of crop biotechnology."

The molecular geneticist's initial familiarization with the activities of the Pakistan Biotechnology Information Center (PaBIC) happened when he visited its library. "I had the opportunity to go through the various information resources such as publications and workshop reports. Public awareness is critical for acceptance of biotechnology. PaBIC has made some basic work toward this end through the translation of booklets into the local language. It has also developed an active linkage among the biotechnology institutions in Pakistan. It provides a common forum for academic scientists to share their scientific views among themselves and with other stakeholders. It also conducts seminars and workshops on different aspects of biotechnology."

Dr. Muhammadi is tapped by PaBIC to share his research activities on bacteria and their biotechnological potentials. This effort, he believes, is an attempt to convince stakeholders in his country about the need for biotechnology. "I hope that my sincere devotion and dedication towards research and active participation in ISAAA activities will generate positive feedback. Being a young molecular geneticist/biotechnologist of a developing country, it is my responsibility to utilize my abilities to advance biotechnology in Pakistan. To learn and share, there is much to do in science and technology," says Dr. Muhammadi. □



MD. AMZAD HOSSAIN

Research Updates from Seminars and Workshops

By Khondoker Nasiruddin

Dr. Md. Amzad Hossain, principal scientific officer of the Biotechnology Laboratory, Bangladesh Sugarcane Research Institute (BSRI) in Pabna, has been working in the field of sugarcane research and stress physiology for the last 22 years. He completed his undergraduate course in agriculture at the Bangladesh Agricultural University (BAU) in 1984. After completing his Master of Science degree in agriculture, major in crop botany (stress physiology) from BAU in 1989, he was awarded a biotechnology fellowship under the World Bank Supported Agriculture Research Management Project. He obtained a Ph.D degree in biotechnology specializing in micropropagation somaclonal breeding from the Agricultural Biotechnology Division, Shinshu University, Nagano, Japan. Immediately, he joined the Biotechnology Laboratory of BSRI in 2001 and has worked as a sugarcane biotechnologist since then.

Dr. Hossain is one of many distinguished scientists in Bangladesh who have dedicated their lives to the search for greater scientific advancement. He is involved in planning, programming and implementing biotechnology and frontier research at BSRI. Research on *Agrobacterium*-mediated genetic transformation and DNA fingerprinting of sugarcane, development of drought and salt tolerance sugarcane through tissue culture techniques, regeneration of plants for somaclonal variation, and rapid multiplication of elite sugarcane varieties, and Stevia (an elite sweetening medicinal herb) are being done in his laboratory.

Challenges of Biotech Research

Resource poor farmers in a country such as Bangladesh inspire Dr. Hossain to use the tools of biotechnology to better their lot. Due to lack of sophisticated equipment and costly chemicals, however, DNA-based research that uses tools such as genetic fingerprinting for identification of crop varieties, molecular characterization of varieties and germplasms, QTL (quantitative trait loci) determination, genetic mapping and MAS (molecular marker assisted selection) are not yet being used. I am challenged to develop easy and efficient methods of quality DNA isolation using locally available and simple equipment and low cost chemicals without liquid nitrogen."

Apart from his busy research hours he is engaged in teaching and academic activities. He started as a teaching assistant for a laboratory course for fourth year undergraduate and Master's course students at the Faculty of Agriculture, Shinshu University. He is currently an external examiner in biotechnology and genetic engineering and supervises MS and Ph.D students in different national universities in Bangladesh. He also trains officials of the Department of Agricultural Extension, sugar mills, and non-government organizations as well as farmers on sugarcane production technologies. Dr. Hossain has published over 75 peer reviewed articles in local and international journals as well as booklets and leaflets on sugarcane production and by-product utilization technologies.

The Bangladeshi scientist and teacher is a member of professional organizations such as the Bangladesh Association for Plant Tissue Culture and Biotechnology, Bangladesh Association of Biotechnology and Genetic Engineering, Bangladesh Association for the Advancement of Science and Bangladesh Society of Sugarcane Technologists. He serves in various capacities in professional bodies such as the Federation of Asian Biotechnology Associations and Bangladesh Association for Biotechnology and Genetic Engineering (BABGE).

Attendance in Workshops

Dr. Hossain attends workshops, trainings, and seminars on development and field trial of genetically modified crops, biosafety

related aspects and molecular techniques of biotechnology organized by the International Service for the Acquisition of Agri-biotech Applications (ISAAA) and similar organizations. “Updates on crop biotechnology are very useful to keep us abreast with research developments. I become aware of research results from biological as well as social scientists on crop biotechnology through these activities. This information is always valuable in my research.”

“Crop biotechnology is one of the remedies to problems of food shortage, pests and diseases, malnutrition, and health issues,” says Dr. Hossain. “I look forward to the day that products of advanced crop biotechnology are commercially available in Bangladesh.” □

CYNTHIA HEDREYDA

Molding Students into Future Scientists

By Mariechel J. Navarro

The passion and commitment for teaching, research, and extension is difficult to explain. Dr. Cynthia T. Hedreyda, professor and scientist, and concurrent director of the National Institute of Molecular Biology and Biotechnology of the University of the Philippines (UP) Diliman, says “I just found myself enjoying both teaching and microbiology research. After graduate school, my desire to be able to help train young students to be future teachers and researchers inspired me to involve students in my research with the goal of not just helping them fulfill the requirements of the degree program



Dr. Hedreyda (right most) talks about biotechnology at a local workshop.

but encouraging them to publish and pursue a career in science.” In addition, Dr. Hedreyda works with teachers and high school students to promote popular awareness of biotechnology in the Philippines.

“Updates on crop biotechnology are very useful to keep us abreast with new developments and to enhance our lectures.”

Dr. Hedreyda majored in biology and genetics in UP Los Baños, and pursued her Ph.D in microbiology at the University of Georgia, USA. A faculty member of UP Diliman for the last ten years, she teaches students in molecular biology and biotechnology and has supervised 58 undergraduate students and eight masteral and doctoral students. These students have merited international publication awards, best paper awards, and best oral research presentations in various scientific fora. Aside from teaching about three to four courses per semester, she is active in research. Her research endeavors span a wide array of interests such as industrial enzymes, bioremediation, and wildlife conservation. In recognition of her research work, the National Research Council of the Philippines gave her an achievement award in biological science, while the UP designated her as Scientist under the University’s Scientific Productivity System.

On top of her academic and research commitments, Dr. Hedreyda’s foray into popularizing biotechnology is worth mentioning. “My involvement is through the undergraduate and graduate courses I teach and through the extensive seminar and laboratory training workshops I spearhead to promote awareness of biotechnology in the country.” She conducted nationwide seminar series for teachers on biotechnology in cooperation with the Philippine Society for Microbiology, Inc. and supported by the Philippine Department of Agriculture, U.S. Department of Agriculture, and the International Service for the Acquisition of Agri-biotech Applications (ISAAA) in 2001-2002. Since 2007 she has been spearheading the conduct of the National Biotechnology Quiz



Dr. Hedreyda welcomes participants during the National Biotechnology Quiz Contest.

contest for high schools in cooperation with the Philippine Society for Microbiology, Inc. the Biotech Coalition of the Philippines, and with the support from ISAAA. The quiz contests consist of regional contests held in six provinces with the winners vying for grand final awards in Metro Manila. “We have witnessed young high school students who are so enthusiastic not only to win but to learn more about biotechnology. We were so impressed that high school students could answer tough biotechnology questions meant for college students,” Dr. Hedreyda says.

In addition, she conducts regular hands-on laboratory workshops at her institute for teachers, students, and people from the industry and government agencies. “Participants always give excellent evaluation to our resource persons and our young research associates and graduate students who serve as laboratory facilitators. They really commend these young future scientists for their expertise in teaching and performing experiments as well as for their patience and willingness to teach beginners.”

Integration of Biotech in Curriculum

Noting the importance of biotechnology in national development, the lady professor took the lead in

implementing a project to encourage and train teachers and administrators of Philippine State Universities and Colleges (SUCs) to institute a general education (GE) biotechnology course or to integrate extensively, topics on biotechnology in currently offered biology subjects in cooperation with the Department of Agriculture and the Commission on Higher Education. "While there is limitless information on biotechnology, there is not enough popular awareness on the subject," explains Dr. Hedreyda. She prepared a teacher's manual or syllabus for teaching the biotechnology course complete with Powerpoint presentations, held a workshop for representative teachers from the SUCs, and assisted the schools in conducting echo seminars to other teachers who will be assigned to teach the course. As a result of this endeavor two state universities, the Cavite State University and the University of Southern Mindanao now offer a 3-unit biotechnology course to their respective college students. The University of Rizal System is also set to start a GE biotech course in the second semester of school year 2008-2009.

"Updates on crop biotechnology are very useful to keep us abreast with new developments and to enhance our lectures. I have become aware of research results of biological as well as social scientists that are relevant to crop biotechnology. This information is always valuable in providing students with the best training and education in biotechnology," notes Dr. Hedreyda.

As sources of updates, she finds the "workshops organized by ISAAA as always informative and well managed. Workshop materials and kits are adequate and useful and the activities are participatory. We also use ISAAA publications such as Pocket Ks (pamphlets on biotechnology issues and concerns) and Briefs, and videos in teaching the GE biotechnology course entitled *Biotechnology and You*; as materials in

training workshops on molecular microbiology for beginners and specialized topics; in the institutionalization of a GE biotechnology course in state universities and colleges; and as review materials for high school students who participate in the National Biotechnology Quiz contest. They are all extremely useful."

Biotech Popularization Activities

Feedback on her popularization efforts has been positive with students and participants of workshops appreciating the videos and publications. ISAAA videos on the experiences of developing countries capture years of research and development from the perspectives of different stakeholders in less than 20 minutes.

"ISAAA should continue supporting colleges and universities who are involved in teaching biotechnology and those who are involved in extension activities for the popular awareness of biotechnology in the Philippines," Dr. Hedreyda suggests. "Products of advanced crop biotechnology are crucial in solving problems of increasing population everywhere. Crop biotechnology is one of the remedies to food shortage, appearance of more potent pests and disease causing organisms, problems of malnutrition and decline in animal and human health in our country. Educating people about the processes and products of new technology is important."

Dr. Hedreyda sees herself actively promoting awareness of biotechnology in the country in the years to come because there is still much to be done. "I will support the teaching of a GE biotechnology course even to non-science majors in public and private universities. I will also continue to conduct basic and applied research in biotechnology and will always support research activities of colleagues on crop biotechnology," commits the lady professor. □



MUHAMMAD HERMAN

Keeping Biotech Research “Alive” in Indonesia

By Mariechel J. Navarro and Bambang Purwantara

Many young children dream about becoming a medical doctor one day. Perhaps it is the positive experience of a child’s visit to a doctor or the thought of being also able to cure people and make them well that inspires this dream. Muhammad Herman shared this dream while growing up – he eventually became a doctor but instead of specializing in the treatment of people he now works with plants and indirectly helps people benefit from biotechnology research. “I applied at the University of Gadjah Mada, Yogyakarta, Indonesia thinking I would study for a medical degree,” Dr. Herman reminisces, “but I got admitted to the Faculty of Agriculture instead. I rationalized that if I could not become a doctor who treats people, I would work with plants instead and still be useful by sharing technology.” Today, the 59- year old Dr. Herman is a noted research scientist and head of the Molecular Biology Research Division, Indonesian Center for Agricultural Biotechnology and Genetic Resources Research and Development (ICABIOGRAD), under the Indonesian Agency for Agricultural Research and Development (IAARD), Ministry of Agriculture in Bogor.

“In Indonesia, there are not many players in crop biotechnology research and efforts are scattered,” says Dr. Herman. “Yet, there is a future

for biotechnology in the country – it can play an important role in improving crop productivity and crop quality which are not achievable by conventional technology alone. Biotechnology complements the use of conventional technology and contributes to protecting the environment by using less pesticides and fertilizers.” Dr. Herman is thus a key player in the biotechnology arena in the country and assumes an important role in helping to provide a positive environment for the technology and in fostering greater awareness of this field.

During Dr. Herman’s final year as an undergraduate at the University of Gadjah Mada where he majored in entomology and specialized in nematology, a senior scientist from the former Central Research Institute for Crop Foods (CRIFC), visited their school and selected him to receive a six month incentive allowance to guarantee his acceptance of a research position with the Institute in Bogor after graduation. He started with the Plant Pathology Research Division of the Bogor Research Institute for Food Crops under the CRIFC, Ministry of Agriculture in 1977 which he joined upon graduation. Dr. Herman rose through the ranks and has remained loyal to his institute. He obtained his MS and Ph.D degrees in plant pathology from the University of Georgia, Athens,



Dr. Herman (second from left) talks about the status of biosafety regulations in Indonesia during an international biosafety workshop.

USA in 1987 and 1990, respectively. He took up a postdoctoral fellow on genetic engineering of sweet potato at the Michigan State University from 1993-1995. To widen his expertise, he also attended trainings in Japan, the Philippines, India, United States, and Canada, on such topics as nematology, rice biotechnology, biosafety, food safety, and intellectual property rights.

Biotech Activities

As head of the Molecular Biology Research Division of ICABIOGRAD, Dr. Herman supervises 50 employees of whom 27 are research scientists. ICABIOGRAD has three other divisions (Cellular Biology and Tissue Culture, Biochemistry, and Genetic Resources). The MolBio division uses two approaches - genetic engineering and the application of molecular markers. Eight on-going research activities funded by the Government of Indonesia include efforts to develop tomato resistant to cucumber mosaic virus (CMV) and tomato leaf curl virus (TLCV); potato resistant to leaf blight; rice and corn that utilizes nitrate more efficiently; soybean tolerant for aluminum toxicity

using molecular markers; rice tolerant to drought, resistant to bacterial leaf blight and blast diseases; mapping of jatropha using molecular markers for high oil content; and gene isolation for insect resistance derived from nematodes.

As a scientist, Dr. Herman's research project activities include the development of transgenic soybean resistant to pod borer, sweet potato resistant to feathery mottle virus and late blight disease; transgenic papaya for delayed ripening; and transgenic tomato resistant to tomato leaf

curl virus and cucumber mosaic virus. From 1996-2002 he was also the country coordinator of the Agricultural Biotechnology Support Project (ABSP), Phase I; and country coordinator of ABSP, Phase II from 2003-2007.

"Among our research activities, rice resistant to bacterial leaf blight and blast diseases developed through the application of molecular marker techniques, transgenic potato resistant to late blight, and tomato resistant to multiple viruses will have the greatest potential to develop a product in the next few years. Recently, ICABIOGRAD initiated collaboration with the private sector to develop a public-sector crop. ICABIOGRAD has been developing rice resistant to bacterial leaf blight and blast diseases using molecular marker techniques, and the private sector continues to grow the rice in several locations for seed multiplication and conducts multilocation tests for varietal release and registration," explains Dr. Herman.

With his expertise and experience, Dr. Herman holds concurrent positions such as coordinator of plant group of biosafety and food safety technical team; vice chair of the Indonesian Society of Agricultural Biotechnology, and Secretary of National Committee on Genetic Resources, and member of the Biosafety Working Group under the Ministry of Environment. He was a member of the draft team of regulations and law, e.g. biosafety regulation in the Ministerial Decree, biosafety and food safety regulation in Joint Ministerial Decree, Plant Variety Protection Law, ratification for Cartagena Biosafety Protocol, government regulation on Biosafety of Genetically Engineered Products, the Accession of the International Treaty of Plant Genetic Resources for Food and Agriculture Law, and the bill on the Conservation and Utilization of Genetic Resource Law.

Biotech Awareness

“We should be engaged in greater awareness and understanding of biotechnology so that a greater number of people, especially the youth, will know more about it,” Dr. Herman explains. He gives short lectures to high school and college students. His institute has an immersion program where students spend 1 (for high school) or 3 months to one semester in the case of undergraduates. They also have a week long exhibition and open house where the public can see activities such as demonstrations and facilities, especially to encourage students to know more about biotech. It is during these sessions that he gives half to one day lectures on biotechnology.

“We should be engaged in greater awareness and understanding of biotechnology so that a greater number of people, especially the youth, will know more about it.”

Among the publications published by the International Service for the Acquisition of Agri-biotech Applications (ISAAA), Herman finds most useful the Pocket Ks (Pockets of Knowledge) or series of packaged information on crop biotechnology issues and products produced by the Global Knowledge Center on Crop Biotechnology. “The Indonesian Biotechnology Information Center (IndoBIC) has translated these materials into Bahasa Indonesia and these are distributed during the open house and exhibition for the public. They are handy and easy to understand,” Dr. Herman elaborates. In particular, he likes the general biotech topics such as frequently asked questions and answers about crop biotech. He also finds useful the CD videos on biotechnology developed by IndoBIC which he shows during sessions with elementary to middle and high school students. “It is easier to relay concepts or give information in a form which the audience prefers such as video. Simple information about DNA is clearer to a general audience when presented in a video format.” He also wrote a brochure for laymen on issues and facts about biotechnology and two book volumes on genetically engineered plants and its regulation in Bahasa Indonesia published by the Department of Agriculture. Among his references are ISAAA Briefs on the global status of commercialized biotech/GM crops, and the first ten years of GM crops – global socio-economic and environmental impacts.

Collaboration with IndoBIC

Dr. Herman has a collaborative exchange with IndoBIC. His institute either co-sponsors activities with IndoBIC or invites IndoBIC to its activities. He is invited by IndoBIC as a resource person in its seminars and workshops. For example, in a workshop with media to build positive perception toward biotechnology applications in Indonesia, Dr. Herman oriented practitioners from the tri-media on local research initiatives in the

“It is easier to relay concepts or give information in a form which the audience prefers such as video.”

country and toured them to confined field trials of transgenic crops, and Institute laboratories. Through this collaborative endeavor, several articles on crop biotechnology were written and published in various newspapers such as the *Radar Bogor*, *Media Indonesia*, *Republika*, and *Pakuan Raya* and featured in television programs. In a risk communication workshop organized by IndoBIC, Dr. Herman was again a resource person where he discussed agricultural products that local scientists are working on as well as issues often raised about crop biotechnology. The workshop tackled these questions: What biotech crops are being researched on in Indonesia? What are the common issues raised about biotechnology? What communication techniques should stakeholders such as scientists, university faculty, and government officials use to enable them to be effective biotech communicators? The workshop enabled participants to be updated on biotechnology and at the same time be equipped with skills to effectively communicate with the media through sessions on message mapping, popular science writing, doing recorded interviews, and writing written statements for media.

In like manner, ICABIOGRAD organizes its own activities and invites IndoBIC staff to participate and be a resource person. One such activity was a national seminar on agricultural bioethics in Indonesia where the BIC head made a presentation

on various bioethical issues related to research, development, and commercialization of agro-biotechnology products; and a technical working group meeting on biosafety where IndoBIC was a participant.

Due to budgetary constraints at ICABIOGRAD, money often goes to research and hardly to communication activities such as development of popularized publications for laymen. “There is an institute division on research collaboration and publications but we give more priority to research rather than media-related activities. There is need for more biotechnology activities to continuously increase awareness of different stakeholders about the technology. Housewives and members of Parliament should be updated about biotechnology. As major government decisions are decided by Parliament, relevant members should be briefed about biotechnology. IndoBIC can play a greater role in conjunction with other research institutions,” Dr. Herman suggests.

Optimism for Biotechnology

Support to biotechnology research is not given much attention by the government and the President has not given any strong statement of commitment. Nevertheless, Dr. Herman remains optimistic about the technology’s role in Indonesia. “We need to convince policy makers to allot additional funding for research and development as Indonesia cannot be left behind. A question from policy makers is always “Where is the product after doing years and years of research?” Only a clear product such as those being studied by the research institutes will hopefully change the biotech landscape in Indonesia in the near future”. □

IEKHSAN OTHMAN

From Toxins to Biotech

By Mahaletchumy Arujanan and K. Cheng Liew



The academic profession in Malaysia is one that is vibrant yet strongly competitive. Rare are the academicians that despite their busy teaching schedule, manage to maintain their research output while also trying to educate society on the various intricacies of science. Professor Iekhsan Othman is one such individual, whose dedication to teaching and research has seen him rise to become one of the foremost science educators in Malaysia. Currently a professor of biochemistry he is also head of the Department of Biomedical Sciences at Monash University Sunway Campus. He is academic coordinator for the School of Pharmacy and also chairperson of the School Research Committee. Since July 2006, he has been one of the Fellow Directors for the Malaysian Biotechnology Information Center (MABIC) and thus, part of the vibrant local biotechnology community.

Prof. Iekhsan is a neurotoxicologist with substantial experience with Malaysian toxins. He specializes in the isolation and characterization of the mechanisms of toxins from Malaysian snakes such as the *Naja naja kaouthia* (Indian cobra), *Ophiogagus hannah* (King cobra), *Bungarus candidus* (Malaysian kraits) and *Bungarus fasciatus* (Indian kraits). Professor Iekhsan is also the only scientist in Malaysia who is carrying out research on marine toxicology especially on jellyfish toxins, pufferfish toxins and saxitoxins from dinoflagellate. Toxicology is the study of natural toxins produced by living things and how such toxins end up killing its victims. Research in the area typically involves isolating specific active molecules in the venom,

discovering the mechanisms by which they bind to tissues and cause death.

Humble Beginnings

“My involvement in science was just by default from being exposed to the science stream after completing my Lower Certificate of Education. It just developed into something for me to apply and pursue at a higher level,” recalls Prof. Iekhsan. “After completing my A-levels, I was able to actively commit to the sciences by taking up a Bachelor’s degree in Biochemistry from the University of Bristol.”

After obtaining his undergraduate degree, a hunger for knowledge and a desire to know more at a higher level made him specialize in neurotoxicology at Imperial College of Science, Technology and Medicine, London University. He was involved in looking at the application of neurotoxins as probes for the study of neurotransmitters. Upon his return to Malaysia, he continued his toxin research on local snakes and animals, an area of research which did not extensively involve many scientists.

In 1988, during his first sabbatical, he was awarded a grant under the prestigious Fulbright Scholar programme to carry out research in the United States. For nine months, Prof. Iekhsan was the Visiting Scientist to the Dermatology Laboratory in the University of Maryland, School of Medicine under the supervision of Professor Joseph Burnett who had been working with jellyfish toxins. The interest in working with jellyfish started with a

referral addressed to University Hospital regarding a jellyfish sting that a tourist got on vacation in Batu Feringghi. This begun his involvement in marine toxicology and jellyfish research. At that time, no Malaysian scientist had been involved in the study on marine toxicology in general, and Malaysian jellyfish in particular, although many studies have been done by researchers overseas.

In addition to looking at the nature and mechanisms of actions of these toxins, Prof. lekshan carried out research to seek antidotes against these toxins so as to neutralize and relieve the painful effects. He has successfully identified several Malaysian plants that are useful for treating snake venom poison and jellyfish stinging.

Assuming the Role of Teacher and Student

Aside from his academic involvement in poisons, Prof. lekshan has been actively involved in promoting science and technology, and biotechnology in Malaysia, particularly through information and education.

“The root to discovery is through new findings in various subjects. I believe that there is no other way to know more, and it is imperative to understand and do our own research,” he comments.

“However, as scientists we have a commitment to impart knowledge and through teaching and informing, we become more knowledgeable ourselves - it is a wonderful experience. This is important as we play a pivotal role in contributing to science and technology innovation by increasing the interest of the general public. This is the reason why I chose to become an academic, because I like teaching. Especially more so in a higher learning environmental setting, we have a tremendous value added impact as students know what they would want to achieve in such settings.”

It is through this willingness to learn and teach, being both the teacher and student, that Prof.

“It is critical for people that have been involved to also provide their input, share their experiences, and apply the lessons they've learned.”

lekshan has managed to involve himself in various other projects that are not related to his field of research. He is a committee member in the management panel of the National Biotechnology Directorate where he is involved in the approval process of project grant applications. He is not hesitant to help good grants get the support of the directorate, especially in the field of crop biotechnology where it is at the forefront of providing technology for food.

“I believe that such technology is more significant for the overall well-being of the country, and the impact of such projects on productivity as well as food quality. However, we have to be vigilant in looking at food safety as we are an agri-based country.”

Communicating Risk: Understanding the Issues

Prof. lekshan has also been working with the Malaysian Biotechnology Information Center and The International Service for the Acquisition of Agri-biotech Applications (ISAAA) on various issues on biotechnology. Most significantly, he participated in several workshops dealing with crop biotechnology and risk management. In 2006, he joined MABIC in attending a risk management workshop organized by ISAAA in Los Baños, Philippines. The various techniques and issues raised during the workshop have allowed him to bring back such lessons to Monash University, and apply the various methods into his field.

“Thanks to the lessons learned from the risk communication workshop it was possible to adapt the various techniques into a medical school



Professor Lekhsan viewing a corn thresher.

setting. A risk communication workshop addressed issues of medical care, whereby participants learn techniques to cope when dealing with patients with chronic disease and the terminally ill,” he says. “It was possible to impart risk communication factors in patient care and healthcare, such as through techniques in explaining disease in terms of life quality.”

Prof. Lekhsan commends MABIC for being instrumental in organizing the workshop and assisting in various aspects. He believes that through the many activities being organized on various aspects of biotechnology, MABIC and ISAAA play a crucial role in involving the different stakeholder groups in understanding science. He acknowledges that such involvement is critical in allowing society to get a better understanding of the current state of scientific advancement.

“I hope that MABIC and ISAAA continue to play more central roles in the development of science and technology in the region,” he says. “It is important for the goodness of things that we as scientists are able to educate and inform people. Through the activities conducted, I hope to see past events being revisited, updated and enhanced, as I believe that the learning process is never-ending and never static. It is critical for people that have been involved to also provide their input, share their experiences, and apply the lessons they’ve learned.” □

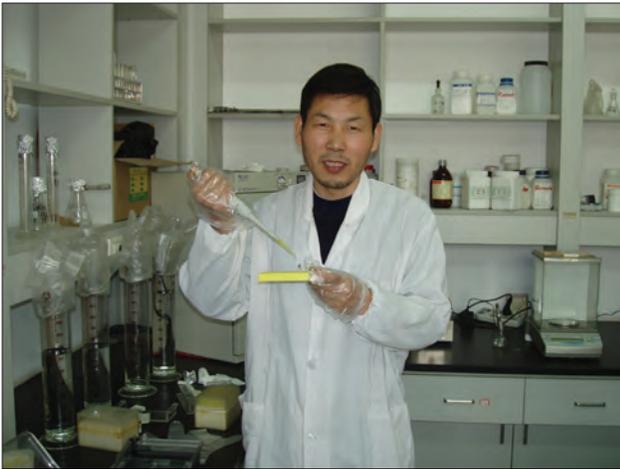
ZHENGBIN ZHANG

Using Chinese Crop Biotech Update as Reference

By Zhang Hongxiang and Tian Zhang

Zhengbin Zhang is a researcher at the Center for Agricultural Resources Research, Institute of Genetics and Developmental Biology, Chinese Academy of Sciences (CAS). Concurrently, he is a peer reviewer of *China Biotechnology*, a leading scientific journal. The journal is published by CAS in partnership with the China National Center for Biotechnology Development (CNCBD) and the Chinese Society of Biotechnology (CSBT).

Dr. Zhang holds a doctoral degree in plant physiology from the Northwest Sci-Tech University of Agriculture and Forestry in China and did his post-doctoral research at the Institute of Crop Science, Chinese Academy of Agricultural Sciences. He has been engaged in plant genetics and breeding as well as anti-drought and anti-stress physiological-biochemical research for 25 years with focus on wheat anti-drought genetics and



Zhengbin Zhang at his lab.

breeding. Dr. Zhang has published several books on wheat research, one of which is *Drought Resistant Breeding in Wheat and Wheat Breeding Science*. As a professor he teaches students about water management in wheat.

Dr. Zhang believes that agriculture is progressing along with today's rapid scientific and technological development, and the appearance of transgenic technology has brought about a significant evolution in the crop cultivation history. "It is very important to improve the quality of wheat, a grain crop with the biggest cultivation area in the world." He says that China's genetically modified (GM) wheat has witnessed substantial progress in theoretical and basic research thanks to scientific and technological projects such as the National "863" Program, a national high-tech R&D program under the Ministry of Science and Technology; and the National Transgenic Plant Research and Industrialization Program supported by the State Council. However, much work is still confined in the laboratory. Dr. Zhang adds "Research in anti-drought GM organisms is slow, and the country should offer more support. With specific intellectual property rights and the discovery of important functional genes, more efforts at transgenic research in China are anticipated."

As the peer reviewer of *China Biotechnology* and a member of CSBT, Dr. Zhang is pleased to witness the cooperation between CSBT and the International Service for the Acquisition of Agri-biotech Applications (ISAAA). CSBT is a non-profit organization that aims to promote academic communication and biotechnology commercialization. He believes that the cooperation will help CSBT to further promote development of agricultural biotechnology research and commercialization and exchange of local and international information.

"After receiving the Chinese version of the weekly e-newsletter Crop Biotech Update (CBU), I found out that it can be a reference for my work since it has a lot of comprehensive information. I hope my students can also receive such information so that they can view science and crop biotechnology issues more comprehensively. In addition, I think the Chinese translation of the CBU can also be



The Crop Biotech Update Chinese translation.

a valuable reference for officials and staff of the Agricultural Management Department, Ministry of Science and Technology, and the National Development and Reform Commission.”

Dr. Zhang is not only concerned about scientific research but also pays attention to the promotion of transgenic technology. Recently, he published an article titled *Transgenic Wheat Progress amidst Disputes in Life World*, a magazine published by the Institute of Botany, CAS. He notes in this article that wheat is a major nutritional source of

people but the public has given more attention to whether the wheat should be produced through transgenic means or not. Dr. Zhang says “Disputes about transgenic wheat go beyond science to include economic and trade issues. However, the public should recognize genetic engineering from a scientific basis. Social scientists and biologists or members of the science and technology sector should create more opportunities to communicate with the public, so that the public can have a correct understanding of what a transgene is.” □



NAGLAA ABDALLAH

Keeping Up-to-Date with Biotechnology

By Ismail Abdel Hamid

Dr. Naglaa Abdallah is a professor at the Department of Genetics, Faculty of Agriculture, Cairo University and a senior scientist at the Agricultural Genetic Engineering Research Institute, Agricultural Research Center, Egypt. She obtained her Ph.D in molecular genetics from Cairo University in 1986 and has been a genetics professor since 1996. In school year 1998-1999 she received the Genetic Engineering award from Cairo University for her cloning and molecular studies on *Bacillus thuringiensis* (Bt) genes, and the Biotechnology State award for scientific research in agricultural biotechnology in 2000-2001 for her work on molecular characterization of geminiviruses.

In addition, Dr. Abdallah is the editor-in-chief of *GM Journal* (Landes Biosciences, Austin, Texas, USA) and a member of the editorial board of the *Arab Journal of Biotechnology*. Since 2005 she has been a member of the National Committee on Genetics which is composed of 30 scientists who are tasked to build a database for scientists in that field, organize workshops, and propose solutions for consideration of the Ministry of High Education, among others. She is also a member of the special committee for academic curricula development, Faculty of Agriculture, Cairo University.

“Biotechnology is one of the latest advances in the biological sciences; it can revolutionize our understanding and utilization of facts of life,

all forms of life. Biotechnology can help tackle agricultural problems, clean our environment, contribute to solving our health problems, increase our income and make our life easier. In the past few decades, biotechnology has accelerated its pace in improving all aspects of human life,” says the lady professor.

The lady professor took several fellowships in the USA and Germany in the field of genetic engineering. “Exposure to the Western culture through fellowships encouraged me to work on biotechnology in 1986 after receiving a fellowship at the Ohio State University to work on molecular cloning and gene transfer.” She now also teaches undergraduate and post-graduate courses and conduct workshops, in addition to supervising several research thesis advisees in that field.

Dr. Abdallah is project investigator/co-investigator in several joint scientific projects involving transgenic plants resistant to biotic stresses (virus, fungi and insects) and abiotic stresses (heat and salt). Specifically, she is working on pest and stress resistance to tomato, sugarcane, fig, and melon. “Based on my experience, biotechnology plays an important role for both developed and developing countries. It has the capability to help developing countries face the challenge of food insufficiency. I work on Tomato Yellow Leaf Curl Virus which can destroy tomato farms. This problem encouraged me to find a suitable solution using biotechnology tools to help tomato farmers in Egypt and other countries. Tomato is only one example. Cereal crops are also worth focusing on – by improving its productivity we can help in poverty alleviation,” Dr. Abdallah explains.

Egypt supports the use of modern technology as one of the strategies to solve agricultural challenges. Dr. Abdallah notes that the country has invested in human capacity building such that it has now trained scientists to use modern



Dr. Abdallah is project investigator of research involving transgenic plants.

biotechnology tools to develop plants that face biological and abiotic challenges. “Increase in farm productivity through enhanced crop varieties and better insect and disease management is a top agricultural priority. I believe in the positive future for agricultural biotechnology in my country,” says Dr. Abdallah.

Biotech Developments

Keeping up to date with the fast developments in biotechnology is important for this lady professor. “I attended several workshops organized by the International Service for the Acquisition of Agri-biotech Applications (ISAAA) through the Egypt Biotechnology Information Center (EBIC). EBIC organized several activities on national, regional and international levels that helped me in my teaching and laboratory work. Undergraduate and graduate students always ask about the risk of using genetically modified (GM) crops and I use the information in the ISAAA website and publications to answer their questions.”

She adds that “The annual global status report on the commercialization of biotech crops is a landmark publication for all agricultural

biotechnologists. The Arabic translation of the report summary and the PowerPoint presentation of key figures and tables are used in most of my presentations and lectures. My students visit the EBIC website frequently to download useful information for their reports.”

Dr. Abdallah also says that EBIC meetings with agricultural extension workers are very important. “It needs more effort to simplify difficult scientific data for them but I am happy to cooperate with EBIC in such activities. It is the right of extension people to know the scientific basis of what they hear about and may eat one day, and it is our duty as scientists to deliver clear and transparent information. EBIC plays a pivotal role in gathering us in one meeting. I have also participated in some EBIC meetings and conferences with media specialists. These meetings are different from those

with agricultural specialists. With media I have to further simplify the information and deliver some of it in a written format. Scientists are always wary to communicate with media but EBIC facilitates interaction and builds our confidence with them.”

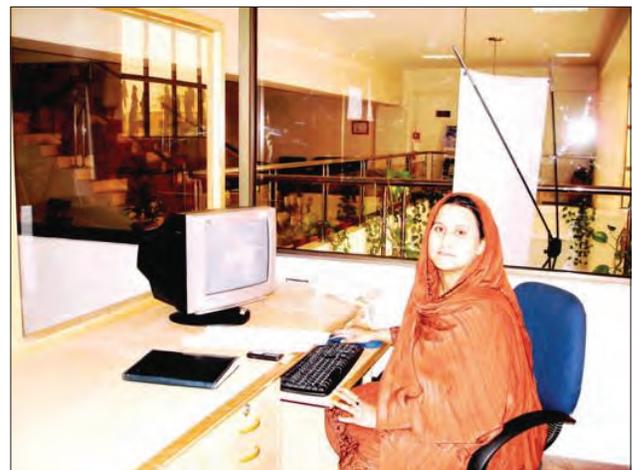
“Being acquainted with ISAAA and EBIC activities through workshops, publications and email, I am able to use published information as examples in my teaching. Also, I distribute the ISAAA publications to my colleagues and students. Students are excited about the field of biotechnology and want to participate in discussions with experts to get their opinions. I rely on ISAAA and EBIC publications because they are based on scientific evidence and are very credible. It also provides me with updated, simple, and user friendly information on global agricultural biotechnology.” □

SADDIA GELANI

Future is in Plant Research

By M. Iqbal Choudhary

“Plant research is vital for the world’s future where mankind has to reach a balanced and sustainable relationship with the rest of nature and its environment. We are increasing in population and this means a rapid growth in the demand for food, feed, fiber, and fuel. On the other hand, we are rapidly depleting our fossil fuel reserves, and there are severe limitations on the amount of land and water available for agriculture. In addition, political problems and distribution costs suggest that we need, as far as is possible, to enable the bulk of food to be produced close to where it is



Dr. Gelani looks forward to the day Pakistan will introduce GM crops.

needed. Eventually, if that does not happen, the hungry will move in large numbers to where there is food. Enhancing agricultural productivity in developing countries requires new approaches

“As a researcher, new information is necessary to engage in meaningful discussion.”

that provide incentives and funding mechanisms that will translate new innovations in plant science into concrete benefits for poor farmers.” Dr. Saddia Gelani articulates these thoughts as she ponders on how scientists like her can contribute to solving food problems.

As a research officer of the Research Institute of Chemistry, International Center of Chemical and Biological Sciences, University of Karachi in Pakistan, Dr. Gelani believes that her work on tissue culture and genetic transformation of crops such as sugarcane, rice, and banana will address food issues. A main focus of her work is on stress physiology and various stress tolerance mechanisms of crop plants.

The lady scientist obtained her undergraduate degree in biology from the Government College for Women, Madina Town and her advanced degrees from the University of Agriculture, Faisalabad. After a brief stint as a biology lecturer in a government college for women, she moved on to a research career. “My exploring nature always leads me to discover new ways to ensure food security so that my countrymen will not suffer from starvation.”

Country’s Prosperity and New Technologies

Dr. Gelani says that a country’s prosperity depends on the discovery of new technologies. “The future of science and technology looks brighter because there is continuous chain of inputs from scientists,

research scholars and students.” She adds that “In Pakistan, there is a future for crop biotechnology. It can play an important part in improving crop performance, yield potential, stress tolerance (especially on marginal land), and nutrition.”

People are now more aware about biotechnological knowledge and trends. Dr. Gelani explains that knowledge about developments in the field is crucial for various stakeholders. As a researcher, new information is necessary to engage in meaningful discussion. “I visit the Pakistan Biotechnology Information Center and use many of their publications to enhance my research. It provides links to biotechnology-related articles. I also visit their virtual library and download many related materials.” To widen PaBIC’s reach, the lady scientist suggests that it should have more workshops to be conducted in different locations in Pakistan to bridge the communication gap. “PaBIC is playing a key role in disseminating information and facilitating the exchange of ideas about biotechnology.”

Dr. Gelani looks forward with excitement to the time that Pakistan will eventually introduce genetically modified crops in the country. In particular she thinks that transgenic cotton is promising with its built-in resistance to pests. The cotton variety will reduce the use of chemical pesticides and lower farming costs. She notes that there are now ten genetically modified crop plants that have been submitted to the National Biosafety Committee for evaluation and approval.

“I feel that I am young in the biotech field that still needs nourishment and care. But dedication and hard work will see me through,” opines Dr. Gelani. □



UMI KALSOM ABU BAKAR

Learning About IPs, Biosafety, and Commercialization

By Mahaletchumy Arujanan and K. Cheng Liew

Since its conception from an act of Parliament in 1969 with the primary objective of developing and promoting new and improved appropriate technologies in agriculture, the Malaysian Agricultural Research and Development Institute (MARDI) has managed to maintain itself at the lead of Malaysian agro-technology. The technologies being produced by the Institute increase productivity and efficiency, while modernizing the agricultural sector as well as maximizing income from farming. MARDI has been identified as one of the Centers of Excellence in agricultural biotechnology under the National Biotechnology Policy. In the Ninth Malaysia Plan (2006-2010) the government will inject funds of up to RM300 million (US \$84.7 million) into the institution.

One of the key centers to benefit from the large windfall of research funding is the Biotechnology Research Center of MARDI (BRCM). Located at the top of a hill overlooking the vast hectares of MARDI, the Biotech Research Center building seems to be the ideal setting for the desert home of a wealthy landowner. On the way up, the roads are lined with various plots used for field trials dotted with a variety of local fruits. More interestingly, there are several isolation green houses for biotech plants. Once inside the research building, one is greeted by a cool sterile setting, with a view through large glass windows of a laboratory buzzing with activity as technicians and scientists pace the floor. On the right is a large exhibition room, showcasing the various pride and joy of the Center, the culmination of much sweat and toil in research.

In a corner near the entrance, an inconspicuous glass door bears the sign, Dr. Umi Kalsom Abu Bakar, Director.

Pioneer as Molecular Biologist

A humble woman dedicated to science and the development of the BRCM, Dr. Umi has been conducting research in MARDI for about 22 years. On July 15, 2006 she was appointed Director of the BRCM. Graduating with a Masters degree from Southern Illinois University in molecular biology in 1985, Dr. Umi returned to the country and began her career up to her stature today from being a research officer in MARDI. She later obtained her Ph.D in plant molecular biology from the University of Nottingham, United Kingdom in 1995.

“I remember the time I first joined MARDI. I just came back from the U.S. and there was an ad in the newspaper for a molecular biologist with MARDI. At that point in time, I knew that MARDI was dedicating itself to the development of biotechnology and I decided to apply,” she reminisces. “It was daunting at first, as I came from a non-agriculture setting, and didn’t really have much experience in agriculture. Moreover, I was the only molecular biologist around, and found it hard to communicate with most people as nobody knew what I was talking about. Only a couple of years later, when we had people coming back with degrees in molecular biology did I begin to have people I could share my science with, and we have been close research companions since.”

That spark back in 1985 set off what would be the bonfire that would power MARDI’s



Dr. Umi shares her experiences in papaya research.

biotechnological aspirations. Looking around the exhibition room, it was evident that the “investment” has paid off with the shelves and display cases showcasing the recent innovations of the scientists in BRCM as well as various commercialized products in the fields of plant, food and diagnostic biotechnology. Among MARDI’s earlier breakthroughs are tissue culture and its application in plant breeding, and in the production of elite planting materials. Dr. Umi adds that the BRCM is currently applying cutting-edge research in the area of molecular biology, genetic engineering, bio-processing and diagnostics, with the vision to modernize and transform the agricultural sector.

Reaching Out to the Public

The outreach of the science community towards the general public is one responsibility that can not be ignored. This is even more so, since the conception of the National Biotechnology Policy connotes a strong push for its development. Dr. Umi has been actively pursuing various avenues in spreading the word so as to improve understanding and enhance the general public’s perception of the fast-paced field of science. This is manifested in various activities

including school visits, public lectures, and media interviews. “In essence, this generally means that we explain and provide information whenever we are asked about biotech,” she says. “We highlight the potential of the technology, explain how it works, and address the questions of various stakeholders in hope that by educating the public, they would be more willing and more responsive to biotechnology.”

Interfacing with MABIC

“We also collaborate closely with the Malaysian Biotechnology Information Center (MABIC) in organizing public lectures and workshops,” she elaborates. “We are constantly in close contact in actively setting up events whereby we can have an avenue to communicate our science. Whenever we are invited by MABIC to conduct workshops, we participate happily as I believe that spreading the word on science is in line with the government’s policies and we hope to be able to facilitate the development of the industry through our endeavors.”

True enough, Dr. Umi has been one of the major supporters of MABIC activities in Malaysia in her capacity as a distinguished fellow of MABIC, and one of the forefront science communicators in the country. She also participated and organized countless workshops, seminars and talks on biotechnology. Under her guidance, MARDI has also released an illustrated guide to the basics of biotechnology aimed at secondary school students. They also have an open door policy towards schools visits, and MARDI has constantly been visited by secondary school students.

Not one to rest upon her laurels, Dr. Umi still devotes much of her time to her research work despite the various requirements expected from her management position. She is currently involved with plant gene discovery and bioinformatics initiatives. In addition, she is part of

“We now need to learn how to protect our technology, then opt whether to charge for its transfer. Only then, would we be able to push our products to new markets while establishing our branding.”

the Papaya Biotechnology Network of Southeast Asia, a regional initiative among Indonesia, Malaysia, Philippines, Thailand, and Vietnam, organized to address two major constraints to papaya production (the papaya ringspot virus and significant post-harvest losses) while also serving as a regional benchmark in the acceptance and policy-making process of biotech crops through ISAAA. MARDI is also an integral part of the ISAAA network and has cooperated on many major projects, and attended various project and coordination meetings, as well as supported internships within their facilities. Through their involvement with ISAAA, the institute has focused strongly on the commercialization of biotech products.

“It has been an eye-opener for us. If we had not been involved with ISAAA, we would not have been exposed to many issues like biosafety, public acceptance, intellectual property (IP), and commercialization,” she comments. “We wouldn’t be able to understand and address these issues sooner, especially in terms of biosafety. By not addressing these issues, it would have been virtually impossible to commercialize our products, as we wouldn’t have been able to understand the various aspects involved.”

Striving Onwards: The Future

“We are currently looking at new trends where we hope to generate partnerships with various companies. From the beginning we have always been generating technologies to benefit target groups. Currently, we hope to place more emphasis on the commercialization process through our Business Unit at MARDI and MardiTech Corp Sdn. Bhd.,” says Dr. Umi. “As we now know that research can be spelled into IPs for our researchers, we need to utilize available implementation mechanisms and make sure that they are available in full force. We now need to learn how to protect our technology, then opt whether to charge for its transfer. Only then, would we be able to push our products to new markets while establishing our branding.”

Today, Dr. Umi’s passion in biotechnology has not waned, and she constantly updates herself on the various issues in the field through the Crop Biotech Update, a weekly e-newsletter published by ISAAA. In fact, she constantly delights in forwarding articles that catches her interest to her acquaintances to update them on happenings in the industry. Her zeal stems from the strong potential science has to offer in improving society and the economy. According to Dr. Umi, “Biotechnology has the potential to provide ways to generate more income for entrepreneurs to drive the growth of the local biotechnology industry. We see biotech as a tool in creating more quality products from local agriculture and rich biodiversity. It allows us to produce food that is cheaper, with a higher quality and is competitive in the global market. Biotech is the improvement of the process along the value chain of agriculture, from farm to plate.” □

M. SHAHIDUL HAQUE

Contributing to Biotech Education and Research Development

By Khondoker Nasiruddin



Dr. M. Shahidul Haque is a professor at the Department of Biotechnology, Faculty of Agriculture, Bangladesh Agricultural University (BAU). He joined BAU as lecturer in the Department of Crop Botany after obtaining an undergraduate degree in agriculture from the same university. He eventually finished his masters and doctoral degrees at the Graduate School of Bioagricultural Sciences, Nagoya University, Japan. He was encouraged by his Japanese supervisors to engage in the study and research of biotechnology.

Dr. Haque returned to Bangladesh and continued his research on virus elimination and development of virus resistant crops. He was offered a postdoctoral position in his previous laboratory in Nagoya University to continue his research on genetic engineering for virus resistance in garlic. Virus elimination using shoot meristem is well established and is being practiced in many plants. However, Professor Haque proved that virus free plants can be produced from root meristem and established a novel method of producing virus-free garlic plants.

Dr. Haque was awarded the MONBUSHO and the Japan Society for the Promotion of Science fellowships in Japan in the field of biotechnology and genetic engineering. During his stay in Japan, Dr. Haque attended and presented papers in several national and international scientific conferences and workshops.

Together with other colleagues at BAU, he helped establish a Biotechnology Department. After his

postdoctoral research, Dr. Haque joined the newly established Biotechnology Department where he has been teaching since 2005. He is also engaged as project investigator (PI) or Co-PI in several joint scientific projects involving transgenic plants resistant to biotic and abiotic stresses. Specifically, he is working on garlic plants resistant to viruses such as onion yellow dwarf virus, leek yellow stripe virus, garlic common latent virus, and virus resistant cucumber plants. He is a member of BAU's Academic Council and a member of the Editorial Board of Progressive Agriculture and Biotechnology, and Molecular Biology Journal of Bangladesh.

Dr. Haque worked as a national consultant for the establishment of the Biosafety Framework for Bangladesh. He made valuable contributions in developing a layman's booklet and posters in Bangla on biosafety. As a member of this group of 12 scientists, he was also tasked to build a database for scientists in the biotechnology field, organize workshops, and contribute to the preparation of a Biosafety Framework, among others. He is a fellow of the National Science and Technology in Bangladesh.

Bangladesh and Biotechnology

Bangladesh is an agricultural country with 140 million people. There is food shortage and arable land is decreasing at a rate of above 1 percent every year due to the construction of roads, highways, houses, river erosion, flood and salinity. "Biotechnology is one of the latest advances in the biological sciences that can revolutionize

“I use the information in the ISAAA website and publications, especially the Pocket K booklets, to be able to answer and provide examples to those who make any query.”

our agriculture. It can help tackle agricultural problems, clean our environment, contribute to solving our health problems, increase our national income, and make our life easier,” says Dr. Haque. “Biotechnology research started in Bangladesh during the 1980s and in the past few decades, it has accelerated its pace in improving all aspects of human life. Development of crops resistant to abiotic stresses like salinity and drought and biotic stresses like insect, virus and fungi and improvement in the productivity and nutritional status of crops can help in poverty alleviation in Bangladesh,” Dr. Haque explains.

The Government of Bangladesh is in favor of the use of modern technology as one of the strategies to solve agricultural challenges in the country. The country is trying to develop human resources and train scientists to use biotechnology tools to develop plants that face biological and abiotic challenges. “The Ministry of Science and Information and Communication Technology is always giving top priority to agricultural research and granting research funds to agricultural research institutes. I believe in the bright future for agricultural biotechnology in my country, says Dr. Haque.

Acquiring and disseminating information has been always a top priority. “During the last few years, I attended several workshops, seminars and trainings organized by the International Service for the Acquisition of Agri-biotech Applications (ISAAA)

through the Bangladesh Biotechnology Information Center (BdBIC). BdBIC organized several activities on national, regional and international levels that updated me in my teaching and research work. As a head of the Department of Biotechnology, I had several opportunities to chair many national and international seminars organized by ISAAA. The workshops related to risk assessment and management of GM crops and contained trials of GM crops are the most notable among those I attended. I use the information in the ISAAA website and publications, especially the Pocket K booklets, to be able to answer and provide examples to those who make any query.”

He also adds that “The annual global status report on commercialized biotech/GM crops is a landmark publication for all agricultural biotechnologists. I use the report summary and the PowerPoint presentations in some of my presentations and lectures and have seen others doing so. My students visit the ISAAA website frequently to download useful information for their reports.”

Prof. Haque always gives top priority to educating students about modern biotechnology. He adds that “ISAAA and BdBIC activities through workshops, publications, and emails update me and I am able to answer students’ questions and in classroom teaching. I often distribute to my students ISAAA publications which I find very credible. Materials provide me with updated, simple and user- friendly information about global agricultural biotechnology. Students and journalists are excited about biotechnology. ISAAA and BdBIC also arrange trainings and workshops for journalists and agricultural extension workers and I had the opportunity to attend as a resource person. Discussions between ISAAA personnel with journalists and extension experts are very effective for biotech development in Bangladesh”. □

KODISWARAN KANDASAMY

Promoting the Adoption of Cutting-Edge Technology

By Mahaletchumy Arujanan and
K. Cheng Liew

Scientists have long been the innovators and advocates of biotechnology, churning out cutting-edge research outputs.

Dr. Kodiswaran Kandasamy is one of many distinguished scientists in Malaysia who have dedicated their lives to the search for greater scientific achievement. Heading the Plant Tissue Culture Laboratory (PTC lab) of the Forest Research Institute Malaysia (FRIM), Dr. Kodiswaran has devoted much of his efforts in establishing a niche in the local research community while developing the strengths of the PTC lab to complement the local industry. He has also been actively involved in developing the human capital of Malaysia by training students, R&D personnel, and scientists in his laboratory as well as lecturing in several local institutions.

“What we are doing is mainly promoting biotechnology, especially in establishing plantations for the timber industry,” says Dr. Kodiswaran. “Such techniques are standard for oil palm and rubber plantations, however it is not yet being readily taken up by the timber industry. We are promoting the establishment of plantations to also assist in environmental conservation as we hope to prevent vast tracts of land being clear-felled.” By introducing plant tissue culture plantlets of forest species, Dr. Kodiswaran hopes to address the lack of planting material that is stalling the timber industry from utilizing plantations as a main source.

“We are targeting the various industries that use timber, particularly the furniture industry,” he states. “However, for such technologies to be taken up, the industry needs to be convinced of its returns. By providing quality planting materials, maximizing its quantity per hectare, while introducing new varieties, we hope that we shall be able to kill two



Dr. Kandasamy explains tissue culture techniques to workshop participants.

birds with one stone by helping the government in its push for the timber industry, while protecting the environment from further degradation.”

The Scientist's Roots

Dr. Kodiswaran's long involvement with the scientific world has been illustrious, to say the least. He is known to be one of the foremost plant tissue culture specialists in the country. This involvement began in his childhood, where he grew up being curious of the world around him, and by satisfying that curiosity by experimenting with all sorts of plants, insects and animals found in the rubber plantations of his childhood. Through such devotion to detail, he matured into a student of excellent caliber while developing his interest in biology. After one year of medical sciences training at the National University of Malaysia (UKM), he was determined to return to the subject of his passion, botany. He went on to do his Masters and Ph.D at the Unit for Advanced Propagation Systems (UAPS), Wye College, University of London. Upon completion of his degree, he was hired as an academic staff of Wye College, before returning home to serve the country in 1997.

“As a scientist, it is important to be able to get the message across by allowing them (people of non-scientific backgrounds) to understand what we’re doing.”

It was as though the completion of a circle, he remembers, for during his undergraduate days, he queried the then dean of life sciences in the Malaysian National University (UKM) on what were the job prospects of a botany student. The answer was “you can plant trees along the roads.” When he returned, he was involved in a project that produced 1,000 plants of each of the 10 different varieties of caladiums for the street beautification of Kuala Lumpur during the visit of Queen Elizabeth II in 1998.

Communicating Science

Dr. Kodiswaran attended and participated in various events of the International Service for the Acquisition of Agri-biotech Applications (ISAAA) and Malaysian Biotechnology Information Center (MABIC). These events included the organization of a media workshop for journalists in plant tissue culture technology and its commercial application in August 2007, and another for secondary school science teachers in August 2008. Both events were conducted to allow the various stakeholder groups to obtain a first-hand view on the widely-utilized technology. As a researcher, he believes that “the transfer of knowledge to the various stakeholder groups is imperative for the advancement of science in the region as it helps boost public acceptance of this form of technology while stimulating more interest in the sciences.”

For the 45-year old researcher, it was an eye-opener to observe the perception and understanding of non-scientific audiences towards technology. He finds that it is a great challenge

to be engaged in providing accurate information so that correct perception and understanding is created. However, he is not daunted by the uphill task as he holds on to his strong belief that the need to translate scientific and technical knowledge to a suitable level for easy comprehension by non-scientific audiences is vital for the growth of society.

“As a scientist, it is important to be able to get the message across by allowing them (people of non-scientific backgrounds) to understand what we’re doing,” he says. “We’re letting them look and see for themselves. Let them understand that we’re not doing Frankenstein science. When they go back and show that they are beginning to understand how scientific research works, it is immensely gratifying.”

Since the first media workshop, there have been multiple requests by various parties, including teachers, which are deemed to be an encouraging sign by Dr. Kodiswaran. Even several secondary schools have been contacting him to let them have a feel around the laboratory through basic training, and even help them set up similar facilities. In addition, a number of articles were published in the local press following these activities stimulating great interest from the general public and industry towards taking-up the tissue culture technology as a commercial venture. “We have been getting calls from industry people who mentioned that they have read articles on FRIM, whereby they find that there is great commercial potential in the work we do, and would like to collaborate, in terms of providing planting material, and getting our expertise in setting up a tissue culture laboratory.”

Peering into the Future

With his breadth of experience, Dr. Kodiswaran is well-versed in industry trends, and he considers science and technology as being vital for the survival of both the human race and the

environment. It is the only sector that is involved in the creation of new and useful products and services. Hence, he strongly advocates that “S&T should be the essence of all government policies regardless of its developmental status, especially in ensuring sufficient human capital development in this sector.”

Looking at the state of biotechnology in the country, Dr. Kodiswaran acknowledges that crop biotechnology is still very much in its infancy stage. This is partially due to the past emphasis on industrialization. However, “with current support and government policies underway, the local agricultural industry is poised to bank on the support of crop biotechnology applications, in particular agro-biotechnology tools.” Examples raised include the use of plant cell, tissue and organ culture technology in producing elite

planting materials, genetic engineering technology to value add crop production, and optimize farm inputs and outputs. He believes that the application of crop biotechnology, coupled with the combined effort through private-public partnership, will potentially be able to address the global food crisis.

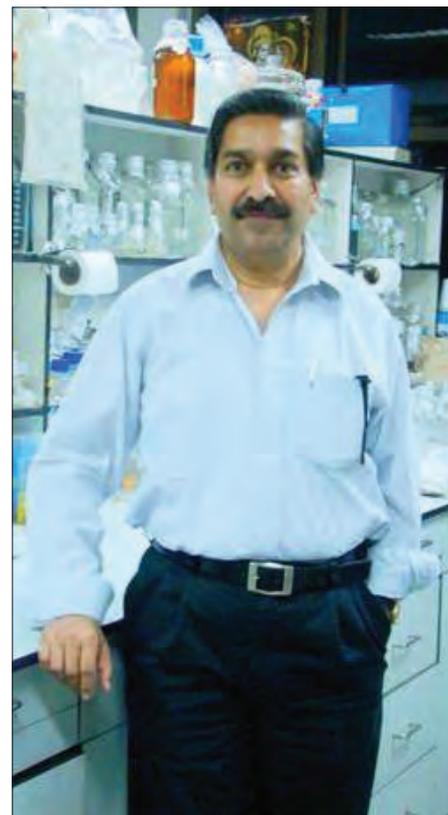
“I look forward to leading a bigger and a more dynamic team of researchers in pushing such technologies towards developing value-added crops to address the current and future food shortage. Simultaneously, I hope to actively involve myself in greater human capital development through teaching and supervisory activities with the local universities.” By continuously developing technologies and products relevant to the industry, Dr. Kodiswaran hopes to play a crucial role in promoting the adoption of cutting-edge technologies such as crop biotechnology. □

KAILASH CHANDRA BANSAL

Dedicated to Biotech Research

By Bhagirath Choudhary and Kadambini Gaur

Prof. K.C. Bansal is Professor of Molecular Biology and Biotechnology, and the Coordinator of the Indian Council for Agricultural Research (ICAR) Network Project on Transgenic Crops at the National Research Centre on Plant Biotechnology, Indian Agricultural Research Institute (IARI), New Delhi. His research interests include functional genomics and transgenic development through nuclear and chloroplast transformation for abiotic stress tolerance and nutritional enhancement in crop plants. He developed crop genotypes with enhanced tolerance to abiotic stresses. He indigenously cloned several novel genes and promoters, and developed useful gene constructs for the development of improved crop genotypes. He shared these gene constructs with various institutions in the country for improving abiotic stress tolerance in different crops. Prof. Bansal’s research



group developed transgenic wheat, mustard, and tomato with enhanced tolerance to drought, salinity and cold stresses. In addition, he developed transgenic tomato with extended shelf life to save post-harvest losses that runs into millions of dollars. For the first time, he also developed chloroplast transformation systems in brinjal and mustard to develop improved genotypes. "I believe in helping my countrymen through science, particularly through modern science and the tools of biotechnology," he says.

Prof. Bansal, who has about 100 publications in reputed national and international science journals, believes that "Science and technology has a great potential in shaping the life of people especially of the poorer population. In a country like India where in the early days, people experienced famines, the science-led growth of agriculture and development of high yielding crop varieties saved people's lives."

From Hisar to Harvard

Prof. Bansal completed his Masters of Science from Haryana Agricultural University, Hisar and Ph.D. from Indian Agricultural Research Institute, New Delhi, with a Gold Medal. He did his post-doctorate in Harvard University, Cambridge, USA. "When I was at Harvard University in 1990, I saw a video film on Bt tobacco, which clearly demonstrated the power of plant genetic engineering. Thereafter I decided to come back to India, and started developing transgenic crops with improved tolerance to abiotic stresses, and enhanced nutritional quality," he says.

A recipient of several national and international awards and honors, he was awarded the prestigious Rockefeller Biotechnology Fellowship in 1996 to work at Rutgers University, USA. He is a recipient of Professor Hira Lal Chakarvarty award of the Indian Science Congress Association, conferred on him by the Honorable Prime Minister of India. The



Prof. Bansal chairing the Q&A session during the two-day sensitization workshop on "Biosafety Issues Related to Practicing Agricultural Biotechnology" organized by GBPUAT and ISAAA.

numerous rewards and recognition did not slow him down as he feels that a lot more needs to be accomplished for promoting research and agri-biotechnology in India. "If we continue using this technology in a much more precise and effective manner to help our farmers produce more with less input and with better quality, this will lead to higher income and better economy build up in the nation as compared to other developing nations," notes Prof. Bansal.

The scientist was a member of the Indian delegation to participate in joint seminars on agricultural biotechnology to Tunisia and Argentina. Recently, he headed the Indian delegation to Washington DC for a joint study program on biosafety of GM crops.

Passionate Teacher: Inspiring Young Future Scientists

Prof. Bansal's sincere efforts resulted in many stories of student achievement and success. He has been instrumental in human resource development in the National Agricultural Research System by providing training and guidance to more than 200 young scientists and teachers.

“It is a moral responsibility to make sure that accurate information is provided to the public and for that scientists need to work with media as well.”

“Right from my childhood I believed in reasoning. I had a concern to help my fellow colleagues and people around me,” says Prof. Bansal who fosters the same in his students. He has guided 10 M.Sc. and Ph.D students who have won national awards including the Jawaharlal Nehru Award of ICAR for best thesis work. Understanding the importance of crop biotechnology, he inspires young research associates and students to learn more about this promising field. “The International Service for the Acquisition of Agri-biotech Applications (ISAAA) Briefs and the weekly Crop Biotech Updates are extremely useful. This information is helpful in providing students the latest development in the area of biotechnology,” he explains.

Effective Communication/Disseminating Scientific Information

Scientific research is not the sole focus of Prof. Bansal as he believes it is equally important to communicate with the public. He is instrumental in communicating science to the public so that correct messages reach society. He has been actively involved in campaigns to raise public awareness regarding GM technology. Prof. Bansal has been involved with ISAAA activities in India for a couple of years now. He was a resource speaker in media workshops, press conferences and various programs organized with public sector institutions. In 2005, he coordinated a media workshop in the local language organized by the Indian Agricultural Research Institute, International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), and ISAAA.

Expressing his concern over the negative media coverage he feels “it is a moral responsibility to make sure that accurate information is provided to the public and for that scientists need to work with media as well.” He emphasizes that scientists and media need to work together so that significant contribution can be made towards generating public interest in the technology. “We need to inform people about the potential of the technology by which we can develop improved crops, which were not possible with conventional tools of breeding, such as Bt cotton.” He adds, “With modern science it is now feasible to increase crop production to meet the demand of an ever growing population. It is possible to have a clean environment and at the same time mitigate the adverse impacts of global climatic change.” □

REFERENCES

- Brossard, Dominique, James Shanahan, and T. Clint Nesbitt. 2007. Perspectives on Communication about Agricultural Biotechnology. *In* The Media, the Public and Agricultural Biotechnology. CAB International, United Kingdom. Pp. 9-11.
- IndoBIC Quarterly Reports, 2007-2008.
- Indonesia Conducts Risk Communication Workshop. 2006. ABSP II Southeast Asia Newsletter. Vol. II, No. 4. October 2006. Los Baños, Laguna, Philippines.
- Indonesia Holds Media Workshop. 2006. ABSP II Southeast Asia Newsletter. Vol. II, No. 3. July 2006. Los Banos, Laguna, Philippines.
- International Service for the Acquisition of Agri-biotech Applications (ISAAA). 2006. Report on the Biotech Issues and Communication Workshop: Enhancing Communication Skills on Biotechnology. Los Baños, Laguna, Philippines. 29 pp.
- Nisbet, Matt. 2001. Caught in the Ag Biotech Crossfire: How U.S. Universities Can Engage the Public About Scientific Controversy. <http://www.scicop.org/genx.agbiotech/>. (Accessed October 22, 2008).
- Research Center for Bioresources and Biotechnology. http://www.rcbio.org/index.php?option=com_content&task=view&id=59&Itemid=88. (Accessed November 5, 2008).