November 06, 2013

Overcoming Smallholder Challenges with Biotechnology

A new publication from the Food and Agriculture Organization (FAO) Biotechnologies at Work for Smallholders: Case Studies from Developing Countries in Crops, Livestock and Fish, asserts that biotechnologies can help smallholders to improve their livelihoods and food security. It has19 case studies from India, China, Argentina, Bangladesh, Brazil, Cameroon, Colombia, Cuba, Ghana, Nigeria, South Africa, Sri Lanka, Tanzania and Thailand. It describes realities and experiences of applying biotechnology research to smallholder production of bananas, cassava, rice, livestock, shrimp and more, in different developing countries.

Biotechnologies at Work for Smallholders offers lessons which can be used to inform and assist policy makers in making decisions on programs involving biotechnologies. On top of the list was the need for national political commitment to improving smallholder productivity and livelihoods; financial support from non-governmental sources to supplement national efforts; and, long-term national investment in both people and infrastructure linked to science and technology.

"With the right institutional and financial arrangements, governments, research institutions and organizations can help bring biotechnologies to smallholders, improving their capacity to cope with challenges like climate change, plant and animal diseases, and the overuse of natural resources," said Andrea Sonnino, Chief of FAO's Research and Extension Unit.

For more information, read the FAO news release at http://www.fao.org/news/story/en/item/202820/icode/. The book is available for downloaded at http://www.fao.org/docrep/018/i3403e/i3403e00.htm.

Raven: Biosafety Assessments Shouldn't be Burdensome

Biosafety assessments should not be overly politically-driven or a burdensome impedance to delivering biotechnology broadly, says Peter Raven, President Emeritus of Missouri Botanical Garden during his lecture at the 12th International Symposium on Biosafety of Genetically Modified Organisms in St. Louis, USA, last 17 September 2013. He discussed

that given the combined pressures of increasing human population and the continuing use of inappropriate technologies, it is not surprising that organisms are driving towards extinction rapidly. To address these concerns, agriculture must be redesigned to better contribute towards feeding people and at the same time decrease the loss of biodiversity. Raven also stressed that it is no longer acceptable to delay the use of any strategy that is safe and will help us achieve the ability to feed the world's people.

Download a copy of his speech at Transgenic Research: http://link.springer.com/article/10.1007/s11248-013-9756-x.

Africa

Grant for Soybean Research Aims to Increase Africa's Food Supply

A US$25 M grant to the University of Illinois to lead a research consortium aims to increase the food supply in Africa by improving soybean yields in five countries in the continent. The five-year grant is administered by the U.S. Agency for International Development (USAID) and will be led by University of Illinois agricultural economist Peter Goldsmith, who has 13 years of experience conducting research in similar latitudes in South America. The project is part of Feed the Future (www.feedthefuture.gov), the U.S. government's global hunger and food security initiative.

The consortium, officially named the Feed the Future Innovation Laboratory for Soybean Value Chain Research, will provide replicable research to identify, adapt and deploy soybean germplasm, educate current and future breeders, define best practices for production and seed management, and identify barriers to adoption, especially for women. The group will conduct its research in the sub-Saharan African countries of Ghana, Mozambique, Zambia, Malawi, and Ethiopia.

See the University of Illinois' news release at http://news.aces.illinois.edu/news/durbin-university-illinois-announce-25-million-federal-grant-increase-africas-food-supply.

Nigerian Agriculture Minister Urges Faster Acceptance of Biotech in Africa

Nigeria's Minister of Agriculture and Rural Development, Akinwumi Adesina has called to accelerate adoption of biotechnology in Africa. Mr. Adesina mentioned this when he delivered the keynote address during the breakfast session at the World Food Prize lecture series in Des Moines, Iowa, USA. He also noted that biotechnology provides a way to feed the world with more nutritious food, while depending less on chemicals.

"Through biotechnology, biofortified crops such as orange flesh, sweet potatoes, pro-vitamin A cassava and drought tolerant maize now hold great promise for feeding Africa," Mr. Adesina said. "Africa must not miss out on the gene revolution."

Read more at http://www.geneticliteracyproject.org/2013/10/24/nigerian-agriculture-minister-urges-a-faster-acceptance-of-biotechnology-in-africa/#.Uni0LflHJmk.

Biotechnology Center Re-established in Liberia

The Central Agricultural Research Institute (CARI) in Suakoko District, Bong County in the northern central Liberia, has re-established a biotechnology center at the institute as part of its operation to make Liberia self-sufficient in food production. The center was re-established to utilize biological processes to purely modify living organisms for specific uses at CARI and the country at large.

According to Mr. David Koffa, Research Assistant and head of the center, the process of re-establishing the biotechnology center at CARI started in 2010 after the West and Central Africa Council for Agricultural Research and Development (CORAF) willingly invited CARI to participate in a regional cassava project to build its institution capacity in the country.

"For now, we are not carrying out most of the activities as a result of lack of a proper laboratory. We are currently doing mass production of cassava planting materials, using rapid multiplication techniques." said Mr. Koffa.

Accordingly, CARI is presently multiplying sixteen yellow root cassava varieties that were brought from the International Institute of Tropical Agriculture (IITA) in the Federal Republic of Nigeria while there is a multiplication of twenty-three sweet potato varieties from the United States of America as well.

To read the full article, go to http://tnrliberia.net/index.php?option=com_content&view=article&id=2945:biotechnology-department-enhances-cari-activities-pushes-agricultural-activities-forward&catid=43:inside-liberia-&Itemid=132.

Americas

Biologists Uncover Rules that Govern Leaf Design

Biologists from the University of California Los Angeles (UCLA) have discovered fundamental rules of leaf design that underlie plants' ability to produce leaves that vary in size. In their mathematical design, leaves are the "perfect machines," said Lawren Sack, UCLA professor of ecology and evolutionary biology and senior author of the research, published in the October issue of the American Journal of Botany.

The team discovered the mathematical relationships using "allometric analysis," which looks at how the proportions of parts of an organism change with differences in total size. The biologists focused on how leaf anatomy varies across leaves of different sizes and examined plant species from around the world. They tested the underlying relationship between cell and tissue dimensions and leaf size across species, and discovered that larger cells of thicker leaves are surrounded by thicker cell walls.

The team hypothesized that these strong mathematical relationships arise from leaf development. Because light can penetrate only so many layers of cells, leaves cannot vary much in the number of cells arranged vertically. The expansion of individual cells and their cell walls occurs simultaneously and is reflected in the thickness of the whole leaf. On the other hand, the number of cells arranged horizontally in the leaf continues to increase as the leaves expand, regardless of the size of the individual cells.

For more details about this study, read the UCLA news release available at http://newsroom.ucla.edu/portal/ucla/ucla-biologists-discover-new-mathematical-249097.aspx.

International Effort to Develop Climate-Resilient Wheat

Researchers from Kansas State University (K-State) will lead a new effort to develop wheat varieties that are resilient to the warming effects of climate change. Led by K-State professor Jesse Poland, the project's collaborators include the International Maize and Wheat Improvement Center (CIMMYT), Cornell University, and the U.S. Department of Agriculture.

The initial focus of the project will be on wheat in South Asia, which produces 20 percent of the world's wheat crop. The team will use genomic selection to boost genetic gains in wheat targeted to future warmer climates with a goal to develop heat-tolerant, high-yielding, and farmer-accepted varieties for South Asia. The project builds on research already done at CIMMYT, and according to Poland, the team will incorporate genomic selection into CIMMYT's bread wheat breeding pipeline, with the specific target of increasing yield potential under extreme heat.

For more about this project, read the news release at: http://www.ksre.ksu.edu/news/story/climate_resilient103013.aspx.

Research Improves Understanding of How Plants Protect Themselves from Adverse Environmental Conditions

Research at Iowa State University (ISU) has shed new light on genetic mechanisms that plants use to protect themselves from environmental stresses. Using Arabidopsis, the researchers looked at what happens to plants at the molecular level when faced with environmental stress using a process called unfolded protein response. This acts as an alarm system when the plant senses harsh conditions.

Stephen Howell, ISU professor of genetics, development and cell biology said "Given the concerns over climate change and some of the extreme shifts in weather we've seen in recent years, one of the most valued traits in crops is stress tolerance. It's a very timely issue."

The signaling pathway that allows for the response features several redundancies that made the system difficult to study at first. When one part of the system is shut down, stress signaling takes an alternate path, but blocking each component in the pathway revealed its full importance to plants. ISU scientist Renu Srivastava said the system not only impacts how plants respond to environmental stress, but is also important for reproduction and development.

Read more about this research at:
http://www.news.iastate.edu/news/2013/10/30/plantstress.

Genes in the Organelles Affects Cell Metabolism

New research from the University of California, Davis, shows that the tiny proportion of a cell's DNA that is located outside the cell nucleus has a disproportionately large effect on a cell's metabolism. Plant and animal cells carry most of their genes on chromosomes in the nucleus, separated from the rest of the cell. However, they also contain a small number of genes in organelles that lie outside the nucleus. These are the mitochondria, which generate energy for animal and plant cells, and chloroplasts, which carry out photosynthesis in plant cells.

Working with the model plant Arabidopsis, the researchers studied how variation in 25,000 nuclear genes and 200 organellar genes affect the levels of thousands of individual chemicals, or metabolites, in leaf tissue from 316 individual Arabidopsis plants. They found that 80 percent of the metabolites measured were directly affected by variation in the organellar genes — about the same proportion that were affected by variation among the much larger number of nuclear genes. There were also indirect effects, where organellar genes regulated the activity of nuclear genes that in turn affected metabolism.

See UC Davis' news release at http://www.caes.ucdavis.edu/news/articles/2013/10/outside-influence-genes-outside-nucleus-have-disproportionate-effect.

Asia and the Pacific

Australian OGTR DIR 122 - Notification of Decision on GM Wheat Field Trial

Australia's Gene Technology Regulator issued a license for DIR 122, authorizing the limited and controlled release (field trial) of wheat lines that have been genetically modified (GM) for enhanced yield stability. The release is authorized to take place at one site per growing season in the area of Horsham (VIC), between November 2013 and March 2016.

A Summary and the final Risk Assessment and Risk Management Plan, together with a set of Questions and Answers on this decision and a copy of the license, are available from the DIR 122 page of the Office of the Gene Technology Regulator's website at http://www.ogtr.gov.au/internet/ogtr/publishing.nsf/Content/dir122.

Top Rice Research Showcased in International Symposium

The world's leading experts in rice genetics are meeting in Manila on November 5-8, 2013 for the 7th International Rice Genetics Symposium (RG7). Organized by the International Rice Research Institute (IRRI) and managed by Kenes Asia, RG7 will serve as a hub for discussion on issues relevant to the science of rice genetics and how it can be used to improve food security.

Current rice genetics research not only seeks to further improve these rice varieties, but also to break new ground in developing rice that has higher yield potential, as well as healthier rice that is more nutritious. The current and most ambitious research in rice that will be shared at RG7, is C4 rice. This research aims to improve rice's photosynthesis to make it more productive and efficient in using resources such as water, light, and nutrients.

See IRRI's news release at http://irri.org/index.php?option=com_k2&view=item&id=12688:from-rice-genetics-to-better-rice-top-research-showcased&lang=en.

Philippine DA Allows Field Trials of GM Crops

Philippine Department of Agriculture Secretary Proceso Alcala said that the government does not see any problem in allowing field trials of GM crops during a press briefing. "There's a program on Bt eggplant and Golden Rice that scientists study. For as long as testing is within contained environment, it's not right for us to stop it...At the end of the day, if we don't give them a chance to prove it, we're stopping development for the future. If we didn't allow scientists to produce Diatabs (Loperamide hydrochloride), it's like saying we should only use charcoal (to cure diarrhea)," said Alcala.

Alcala also mentioned that there are farmers in various parts of the country that are open to adopting GM crops. Thus, the government gives importance to their decision because it is the farmers' call whether to adopt or not. Innovative technologies such as genetic modification have the potential to solve serious problems such as malnutrition, poverty, and hunger.

Read the original article at http://bcp.org.ph/activities/da-allows-field-trials-for-gm-crops/.

Regulators and Experts from 8 Asian Countries Train on Communicating Biotech and Biosafety

Thirty-two regulators, biosafety experts, and scientists from Cambodia, China, Indonesia, South Korea, Malaysia, Philippines, Thailand and Vietnam sharpened their communication skills and got updated on biotech and biosafety during the Regional Workshop on Enhancing Knowledge and Communication Skills on Biotechnology and Biosafety on October 29-30, 2013 at Century Park Hotel, Bangkok, Thailand. The participants were involved in biotech crops research and came from government biosafety regulatory agencies and research institutions from public and private sectors.

Director of the Global Knowledge Center on Crop Biotechnology of ISAAA Mariechel Navarro and Dean of University of the Philippines Los Baños-College of Development Communication Dr. Ma. Theresa Velasco conducted exercises and delivered lectures on

effective science communication. The activity also aimed to enhance the participants' knowledge on biotechnology and biosafety in the global and regional contexts and build their capacities on biosafety and environmental assessment. ISAAA Global Coordinator and SEAsiaCenter Director Dr. Randy Hautea talked about the adoption and future prospects of biotech crops while Agricultural Biotechnology Support Project II (ABSPII) Director Dr. Frank Shotkoski shared the public sector initiatives and experiences in biosafety and development of biotech products.

Researchers and regulators from Indonesia, Thailand, and the Philippines involved in field trials of biotech crops shared their experiences and best practices in its implementation and management. The workshop was organized by ISAAA, Southeast Asian Regional Center for Graduate Study and Research in Agriculture (SEARCA), Program for Biosafety Systems Philippines (PBS Philippines), ABSPII, Indonesian Biotechnology Information Center (IndoBIC), Biotechnology Alliance Association (BAA), and Biosafety and Biotechnology Information Center in Thailand (BBIC).

For more information about the workshop, visit SEARCA Biotechnology Information Center's website at www.bic.searca.org or send an e-mail to bic@agri.searca.org.

Europe

EU Prepares Draft of New GM Maize Cultivation Approval

The European Union is on its way to approve cultivation of a new type of genetically modified maize for the first time in more than a decade, according to a draft proposal from the bloc's executive. The proposal was drawn up after Europe's second highest court last month blamed the European Commission for lengthy delays in the approval process for the insect-resistant maize, developed jointly by DuPont and Dow Chemical.

The Commission is expected to send the proposal to EU ministers next week for approval. Even if some governments fail to decide, as is expected, the Commission will have the power to grant approval by the end of the year.

See the original article at http://www.scientificamerican.com/article.cfm?id=eu-prepares-new-gmo-maize-cultivation-approval.

Study Shows New Technologies Not Perfect but Very Beneficial

Institut économique Molinari (IEM) in Paris released the results of a study conducted by Hiroko Shimizu which showed that most people have acknowledged and accepted the importance of genomics in the field of medicine but they are reluctant about its application in agriculture. Shimizu said that they should not be afraid because the benefits of new technologies are real. The fear of stagnation and burdensome regulation have caused growing regulatory costs and delays such as:

Average development and registration times for new pesticides in 2005–8 were up 15% since1995.

Average cost reached US$ 256 million, 11 times what it was between 1975-1980.

From 2008 to 2012, the world average cost for commercializing a new GE crop was US$ 136 million, about US$35 million of which served to meet regulatory constraints.

In 2011-13, a total of 842 million people (about one human in eight) were thought to suffer from chronic hunger.

Shimizu concluded that while no innovation can never be perfect, our primary concern should always be whether or not a specific innovation creates lesser problems than those that existing before. The role of innovation is to find better, less damaging ways of doing things, a process which is hindered by the precautionary principle.

Read the press release at http://www.institutmolinari.org/new-technologies-not-perfect-but,1737.html and the study at http://www.institutmolinari.org/IMG/pdf/note1113_en.pdf.

Research

Pyramiding of the HVA1 and mtlD in Maize Confers Drought and Salt Tolerance

Researchers from Michigan State University combined Hordeum vulgare HVA1 from barley and the bacterial mannitol-1-phosphate dehydrogenase (mtlD) to confer abiotic stress tolerance in maize plants. Stable expressions of the transgenes were observed up to the fourth generation. The transgenic plants exhibited higher leaf relative water content (RWC) and greater plant survival compared with plants with single transgene and control plants exposed to drought conditions. When exposed to different salt concentrations, the transgenic plants with pyramided genes exhibited higher fresh and dry shoot and dry root matter compared with single transgene and non-trangenic plants. Based on the results, coexpression of the two abiotic stress tolerance genes is effective in conferring stress tolerance in maize. Thus, the authors recommend field trials to further test the application of the research.

Read more at http://www.hindawi.com/journals/ija/2013/598163/.

GE Sweet Potato with Multiple Virus Resistance Developed

Several viruses cause a destructive synergistic disease complex to sweet potatoes in KwaZulu-Natal, South Africa. These viruses include Sweet potato feathery mottle virus (SPFMV), Sweet potato chlorotic stunt virus(SPCSV), Sweet potato virus G (SPVG) and Sweet potato mild mottle virus (SPMMV). To address this concern, researchers from University of KwaZulu-Natal developed transgenic sweet potato plants with broad virus resistance.

Coat protein gene segments from each of the four viruses mentioned were used to induce gene silencing in transgenic sweet potato. The apical tips of the sweet potato was transformed using Agrobacterium tumefaciens. Polymerase chain reaction and Southern blot analyses showed that the transgenes were present in 6 out of 24 transgenic plants and that all plants seemed to correspond to the same transformation event. Further analyses showed virus presence in the transgenic plants but all exhibited delayed and milder symptoms of leaf discoloration as compared with the untransformed plants.

Read the abstract at http://link.springer.com/article/10.1007/s11248-013-9759-7.

Beyond Crop Biotech

Research Shows Slow Development of Drugs for Neglected Diseases

Of the 850 new drugs and vaccines approved over the past decade, only 37 were for neglected diseases such as malaria, tuberculosis, chagas, sleeping sickness, and other diseases of poverty, according to a study published in The Lancet Global Health. Dr. Belen Pedrique and other authors called this as a "fatal imbalance" in the research and development of treatments for the world's poorest patients. Furthermore, there is only a few on going clinical trials on drugs for neglected diseases. They said that this can be attributed to the little financial incentive in investing in R&D of finding treatments for neglected diseases.

Read the original article at http://www.voanews.com/content/drug-development-lags-for-neglected-diseases/1776184.html and the research article at http://www.thelancet.com/journals/langlo/article/PIIS2214-109X(13)70078-0/fulltext.

"Flipping" Genetic Switch Reveals New Compounds with Antibiotic Potential

Oregon State University researchers have discovered that a gene in common fungus acts as a master regulator, and deleting it has opened access to a wealth of new compounds. These compounds have never been studied before and have the potential to be identified as new antibiotics.

The scientists succeeded in flipping a genetic switch that had silenced more than 2,000 genes in the cereal pathogen Fusarium graminearum. Until now, this had kept it from producing novel compounds that may have useful properties, particularly for use in medicine but also perhaps in agriculture, industry, or biofuel production.

The gene that was deleted, kmt6, encodes a master regulator that affects the expression of hundreds of genetic pathways, and regulates the methylation of histones, the proteins around which DNA is wound. Creating a mutant without this gene allowed new expression, or overexpression of about 25 percent of the genome of this fungus, and the formation of many secondary metabolites.

For more information, read the news release at: http://oregonstate.edu/ua/ncs/archives/2013/oct/%E2%80%9Cflipping-switch%E2%80%9D-reveals-new-compounds-antibiotic-potential.

Announcements

Global Forum for Innovations in Agriculture

Thousands of scientists and innovators around the world are employing game-changing technology to create innovative agriculture solutions. In February 3-5, 2014, these innovators are being brought together for the first time at the Global Forum for Innovations in Agriculture 2014. Hosted by United Arab Emirates' capital city Abu Dhabi, GFIA 2014 will present the world's largest collection of sustainable agriculture inventions and pool together the highest level of expertise, investors and suppliers to show the world how big ideas can be used to substantially increase food production in both arid and semi arid climates and solve the world's ever increasing food needs.

For more information, visit http://www.innovationsinagriculture.com/.

Document Reminders

Transgenic Technologies in Agriculture: From Lab to Field to Market

CIBTech Journal of Biotechnology publishes a review article presenting the overall perspective on the acceptability and commercialization of transgenic technology in agriculture. It covers the scientific merits of the technology as well as the uncertainties attached to the adoption of the technology. Download the paper at http://cibtech.org/J%20Biotechnology/PUBLICATIONS/2013/Vol-2-No-3/CJB-03-006-GUPTA-TRANSGENIC-MARKET.pdf.