



## Agri Innovation Post

Agri-Biotech News & Views

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Asia-Pacific Association of Agricultural Research Institutions (APPARI) is an initiative of Food and Agricultural Organization (FAO) of United Nations, which regularly brings out success stories of agricultural innovation and new technologies. In March 2019 they have focused on the success of GM (genetically modified) maize in Philippines, that has been in cultivation for the past 16 years. Philippines was the first Asian country to de-regulate Bt maize in 2002 and this was enabled by a proactive collaboration between scientists, regulators and the government. The questions regarding the technology and its safety were taken up by scientists and academicians so that unbiased, correct information was disseminated. As per the Bureau of Plant Industry (BPI), 10,000 ha of GM corn was planted in 2003 and the acreage rose to 720,000 ha in 2012 with multiple events being de-regulated.

Public perception studies published in 2003 showed that most stakeholders were neutral towards biotechnology, though later studies showed a favourable perception towards biotechnology, primarily due to the positive experience of the farmers. The farmers had lower insecticide inputs and labour costs and higher yields leading to higher income. The economic success of GM corn farmers with a 34% yield advantage over non-GM corn lead to widespread adoption of GM corn as a crop of choice. The consistent success of Bt corn, to an extent is also attributed to science-based policies for Insect Resistance management (IRM) that included farmer awareness and periodic monitoring.

Philippine's story reiterates the importance of an evolving regulatory system, in-house infrastructure and capacity building, multi-level collaborations amongst

government bodies and most importantly timely evaluation and analysis of applications for making success of a novel technology.

Bt brinjal de-regulation and adoption in Bangladesh is another similar story wherein GM brinjal provided a solution to severe shoot and fruit borer infestation. Post a modest 2014 start, the cultivation spread to 7500 Bangladeshi farmers in 36 districts by 2017 with favourable socio-economic benefits. Bt brinjal varieties have been found safe for consumption, yield 13% higher than non Bt leading to 83% higher profitability for the small hold farmers. Farmers have reduced the use of pesticides with 61% cost savings and significant environmental gains.

These examples help us conclude that biotechnology can be successfully utilized in solving issues like insect and disease infestation, drought, salinity and high/low temperature stresses which do not have easy solutions through conventional breeding. They also underline the importance of enabling regulatory environment and political support to promote the science-based technologies and innovations. We hope that similar positive regulatory environment develops in India to empower the farmer with new technologies like Bt brinjal and GM mustard. Delays and ambiguity in the approval process negatively impacts the agricultural sector both commercially and in research investment. Further, unauthorized cultivation harms the farming community as well as the nation, as seen with recent reports of unapproved Bt brinjal being cultivated.

**Dr. Shivendra Bajaj**

## **Agriculture News**

### **[The Future of Patents on Genetically Modified Organisms in India](#)**

**[ipwatchdog.com]**

Earlier this year, the Supreme Court of India set aside an order of the division bench of the Delhi High Court that revoked a patent granted on genetically modified cotton, holding that the single bench of the High Court should assess the patentability of the invention after hearing arguments from both sides. This suggests a changing mindset by the Indian courts regarding patentability of genetically modified living organisms. India may now be set to join the league of various other nations that respect biotechnological inventions.

### **[Indian farm group finds traces of unapproved GM aubergines](#)**

**[Reuters]**

A crop survey has shown an Indian farmer has planted his field with an unapproved variety of genetically modified (GM) aubergines, an environmental voluntary group said on Thursday. After years of trials, India in 2010 decided not to introduce the GM eggplant, or Bt brinjal, the Indian word for aubergine, following opposition from activists. "Our rudimentary tests have established that at least one farmer in Haryana has planted Bt brinjal and we've requested authorities to ensure that the variety doesn't spread any further," Kapil Shah of the Alliance for Sustainable and Holistic Agriculture said referring to the north Indian state.

### [We'll be eating the first Crispr'd foods within 5 years, according to a geneticist who helped invent the blockbuster gene-editing tool](#)

#### **[Business Insider-India]**

Crispr's appeal in food is straightforward: it's cheaper and easier than traditional breeding methods, including those that are used to make genetically modified crops (also known as GMOs) currently. It's also much more precise. Where traditional breeding methods hack away at a crop's genome with a dull blade, tools like Crispr slice and reshape with scalpel-like precision. Want a mushroom that doesn't brown? A corn crop that yields more food per acre? Both already exist, though they haven't yet made it to consumers' plates. What about a strawberry with a longer shelf life or tomatoes that do a better job of staying on the vine? "I think all of those things are coming relatively quickly," Doudna said.

### [Annual India Symposium on ' Science & Society' – Technological Advancements in Agriculture](#)

The Annual India Symposium of Lakshmi Mittal and Family South Asia Institute (LMSAI) at Harvard University is a flagship event that concluded in Delhi on 4<sup>th</sup> April. The purpose was to see the role of S&T in society. It collaborated with the NITI Aayog and the Office of Principal Scientific Adviser to the Government of India.

#### **Ag Biotech News Around the World**

### [Bangladeshi wild variety rekindles hope for breakthrough in global rice yield boost](#) **[Dhaka Tribune]**

For the past 11 years, scientists have been trying to convert paddy into a photosynthesis-efficient plant, which would produce up to 50% more grains using the sunlight, without requiring more land and water. The idea came from

the concern that the traditional research, which results in just 1% rise in the yearly yield, would not be enough to meet the ever-growing demand. The plan was to engineer paddy in a way that its leaf anatomy permits greater efficiency in photosynthesis thereby, dramatically boosting the yields in one of the world's most consumed cereal. Now a wild rice – Uri dhan (*Porteresia coarctata*) – that grows in saline estuaries of Bangladesh rekindled hope for a possible breakthrough in changing rice plant architecture.

### [Australian OGTR Grants Permit to GM Wheat Field Trial](#)

[ISAAA]

Australia's Office of the Gene Technology Regulator (OGTR) has issued license DIR 165 to the University of Melbourne for the limited and controlled release (field trial) of wheat genetically modified (GM) for altered iron uptake, transport, and bioavailability. The field trial will take place between April 2019 and December 2023 at sites in New South Wales, Victoria, and Western Australia.

### [The quest to save the banana from extinction](#)

[Rappler Philippines]

The Cavendish banana may have had a remarkable journey from colonial curiosity to global staple. But its success has helped create a food system with a fatal flaw. Panama disease, an infection that ravages banana plants, has been sweeping across Asia, Australia, the Middle East and Africa. The impact has been devastating. However, genetic modification offers other ways to move properties between plants (and other organisms). Researchers in Australia have found that adding two different genes to the genetic code of Cavendish bananas protects the plants from the disease. But these resistant Cavendish bananas are now GM crops.

### [Generation of herbicide tolerance traits and a new selectable marker in wheat using base editing](#)

[ISAAA]

Researchers at the Institute of Genetics and Developmental Biology of the Chinese Academy of Sciences (IGDB, CAS) and China Agricultural University (CAU) generated several herbicide-tolerant wheat germplasms using base editing to facilitate weed control in wheat fields. The wheat germplasms harbouring herbicide tolerance mutations confer tolerance to sulfonylurea-, imidazolinone- and aryloxyphenoxy propionate-type herbicides by base editing the acetolactate

synthase (ALS) and acetyl-coenzyme A carboxylase genes of commercial wheat cultivar Kenong199.

## [PAKISTAN ANNOUNCES NATIONAL COORDINATED TRIALS OF 85 BT COTTON VARIETIES](#)

[ISAAA]

The Pakistan Central Cotton Committee (PCCC) has announced that 93 new cotton varieties will undergo National Coordinated Varietal Trials (NCVT) in four provinces in Pakistan. The NCVT is the near-end stage of the performance evaluation process of any crop variety before Pakistani authorities make their decision to allow commercial cultivation.

## [Researchers Use Gene Editing to Increase Nutritional Value of Cereal Grains](#)

[Innovature]

By embracing a range of plant breeding methods, from traditional crossbreeding to more innovative methods like gene editing, Holding and his colleagues at the Beadle Center, University of Nebraska-Lincoln have managed to double the lysine content – a vital amino acid – of both popcorn and sorghum, two traditionally lysine-deficient cereal grains. By enhancing the lysine content, this breakthrough could add economic value to and broaden the appeal of popcorn and make sorghum a more complete source of nutrition in the developing world, where it is a dietary staple because of its drought-resistant qualities.

## [USDA FAS REPORTS PROMISING RESULTS OF GE CORN FIELD TRIALS IN MOZAMBIQUE](#)

[ISAAA]

The USDA Foreign Agricultural Service's Global Agricultural Information Network (USDA FAS-GAIN) released their report on Mozambique's agricultural biotechnology sector status for 2018. It highlights the initial results of the Mozambican Agricultural Research Institute's genetically engineered (GE) corn confined field trials. The GE corn trials are part of the Water Efficient Maize for Africa (WEMA) program, a public-private partnership effort that aims to develop pest and drought tolerant corns using biotechnology and conventional breeding. Another highlight of USDA FAS' report is the Mozambican government's acknowledgment of biotechnology's contribution to achieve the country's food and nutritional security, as well as the importance of the having appropriate regulations to support biotechnology research and development.

## [SEARCHA BIC HOLDS REGION-WIDE PUBLIC BRIEFING ON PHILIPPINE BIOSAFETY REGULATIONS](#)

### **[ISAAA]**

More than a hundred participants composed of farmers, local government officials and representatives from the private sector and academe from the provinces of Ilocos Norte, Ilocos Sur, and La Union attended the Biotechnology 101 and Joint Department Circular (JDC) No. 1, Series of 2016 Public Briefing held at Laoag City, Ilocos Norte on March 28, 2019. The participants expressed their anticipation on approval of new GM crops in the country (i.e., Bt eggplant and Golden Rice) and inquired if the approval process can be expedited. The experts affirmed the validity of the biosafety regulations as the Philippines has one of the most stringent regulatory guidelines worldwide.

## [New plant breeding technologies for food security](#)

### **[Science]**

In this perspective article published in *Science*, an international team of researchers argues that new plant breeding technologies – such as genome editing – can contribute significantly to food security and sustainable development. Future technologies need to reduce the environmental footprint and make agriculture more resilient to climate stress. Predictions suggest that small farms in Africa and Asia will suffer especially from the effects of climate change. Genome editing can be used to make crop plants more resistant to pests and diseases and more tolerant to drought and heat. Methods such as CRISPR–Cas9 can be used to make precise point mutations without introducing foreign genes. Due to their low costs, these methods can also be employed in previously neglected crops, such as pulses and local vegetables. In the article, the authors show which concrete genome–edited crops could become available within the next five years. But they stress that international cooperation, public support, and efficient science–based regulation will be important to ensure that the poorest countries and the poorest farmers can also benefit.

## [High Oleic Soybean Oil Now Available on the U.S. Market](#)

### **[Innovature]**

A small Minnesota company has launched an improved soybean oil for consumers, thanks to gene editing. This new soybean oil has similar properties to olive, sunflower and safflower oils and can be incorporated into

foods and recipes without affecting taste. The soybeans are domestically grown by farmers as part of Calyxt's identity preserved supply chain. That's good news for people and for the environment.

## **New Research**

### [LncRNA Controls Susceptibility to Cry1Ac in Pink Bollworm](#)

**[Science Direct]**

The extensive planting of insect resistant crops expressing Bt proteins contributed to the evolution of resistance in pests as a natural reaction. The globally destructive pest pink bollworm's resistance to Bt protein Cry1Ac is linked with mutations in *PgCad1* gene, which encodes a cadherin protein that sticks with Cry1Ac in the larval midgut. In a previous study, Shenyun Li from Nanjing Agricultural University in China, together with other scientists, reported a long non-coding RNA (lncRNA) which is linked with both resistance and susceptibility to Cry1Ac. In their latest study, they tested the hypothesis that decreasing the expression of the lncRNA also reduces the transcription of *PgCad1* and susceptibility to Cry1Ac. The results are published in *Pesticide Biochemistry and Physiology*.

### [Salt Tolerant Rice Variety Developed in India](#)

**[Scientific Reports]**

Scientists from Bose Institute in Kolkata, India developed a salt tolerant transgenic rice variety which, under greenhouse conditions, showed normal growth and grain yield. The significance of the new findings is important to the development of plant varieties that can survive salinity and drought as concerns and discussions about global climate change become more apparent.

### [Generation of herbicide tolerance traits and a new selectable marker in wheat using base editing](#)

**[Nature]**

A study using base editing generated transgene-free wheat with mutations that confer resistances to multiple herbicides, and developed a selectable marker that could facilitate co-editing of herbicide resistance and other target traits of interest.

## [Genetic Variant Linked to Cucumber Fruit Length](#)

[Science Daily]

Fruit size is a major determinant of yield and market value. New research describes the discovery of a key regulator of fruit length variation in cucumber. Cucumber is among the top five vegetable crops grown in the world. They are most commonly eaten fresh or preserved as pickles. An important attribute of the cucumber is fruit length. Cucumbers range in size from 5 to 60 cm, depending on the cultivar. The research report has singled out a key modulator of fruit length and sets the stage for developing strategies to manipulate fruit length in cucumber breeding.

## [How Plants Defend Themselves](#)

[Science Daily]

Like humans and animals, plants defend themselves against pathogens with the help of their immune system. But how do they activate their cellular defences? Researchers at the Technical University of Munich (TUM) have now discovered that receptors in plant cells identify bacteria through simple molecular building blocks.

## [Scientists Develop Methods to Validate Gene Regulation Networks](#)

[Science Daily]

A team of biologists and computer scientists has mapped out a network of interactions for how plant genes coordinate their response to nitrogen, a crucial nutrient and the main component of fertilizer. The work, published in the journal *Nature Communications*, offers a potential framework and more efficient methods that can be used to investigate a wide-range of vital pathways in any organism.

## [No Effect of \*Bt\*-transgenic Rice on the Tritrophic Interaction of the Stored Rice, the Maize Weevil \*Sitophilus Zeamais\* and the Parasitoid Wasp \*Theocolax elegans\*](#)

[Nature]

During *Bt* transgenic rice storage, *Bt* Cry1Ab/Cry1Ac fused protein is exposed to the maize weevil *Sitophilus zeamais* and the parasitoid wasp *Theocolax elegans*. A long-term risk assessment for *Bt* rice to these non-target organisms in the storehouse was carried out. Effects of *Bt* rice on *S. zeamais* and *T. elegans* were carefully detected in a laboratory experiment of over 5 years. It was found that although *Bt*Cry1Ab/Cry1Ac fused protein exists in the *Bt* rice grains and *S. zeamais* digestive tracts, *Bt* rice is not harmful to the maize weevil *S. zeamais* and its parasitoid *T. elegans*.



## [Wheat mitochondrial respiration shifts from the tricarboxylic acid cycle to the GABA shunt under salt stress](#)

### **[New Phytologist]**

Scientists from the University of Western Australia (UWA) have discovered two enzymes that explain the sensitivity of wheat plants to salty soils.

The UWA research describes the two wheat enzymes, which are especially sensitive to salt and appear to be the weak link leading to plant death in saline soils. The researchers also discovered wheat has a natural defence system that can bypass one of the sensitive enzymes, partially protecting against salt.

## [Plants Grow Less in Hotter Temperatures](#)

### **[Technology networks]**

A new study led by scientists at the Nara Institute of Science and Technology (NAIST) reports that two transcription factors, ANAC044 and ANAC085, are critical for this response in the flowering plant Arabidopsis.

## [Drought-Resistant Maize Crops](#)

### **[Science Daily]**

Researchers identified a relationship between crop yield in the maize plant and activity of the RAMOSA3 gene. Better understanding of the mechanics in this relationship could further knowledge of plant architecture and help scientists create higher yield, drought-resistant maize crops.

## **Upcoming Events**

**May 2019**

**Bioassays – Scientific Approaches & Regulatory Strategies**

**Date:** 05–07 May 2019

**Venue:** Gaithersburg Marriott Washingtonian Center, Gaithersburg, USA

**Swiss Biotech Day**

**Date:** 7 May 2019

**Venue:** Basel, Switzerland

**Genome Editing & Co-located Transgenic USA Congress**

**Date:** May 14–15, 2019

**Venue:** Boston, USA

**World Biotechnology Congress**

**Date:** May 20–21, 2019

**Venue:** Shepton Mallet, UK

**CRISPR & Genome Engineering Conference**

**Date:** May 21–23, 2019

**Venue:** Boston, USA

**June 2019**

**ISF World Seed Congress 2019 – International Seed Federation**

**Date:** June 3 – 6, 2019

**Venue:** Nice, France

**International Seed Testing Association Congress (ISTA Congress)**

**Date:** June 26 – 3 July, 2019

**Venue:** Hyderabad, India

**Biotech France**

**Date:** June 26 – 28, 2019

**Venue:** Issy-les-Moulineaux, France

**PHOTOSYNTHESIS CONFERENCE 2019**

**Date:** June 30 – July 3, 2019

**Venue:** Brisbane, Australia

**July 2019**

**International Conference on Plant Transformation & Biotechnology (PTB)**

**Date:** July 03 – 04, 2019

**Venue:** Vienna, Austria

**Plant Genome Editing & Genome Engineering**

**Date:** July 05 – 06, 2019

**Venue:** Vienna, Austria

**International Conference on Agricultural and Biological Science (ICABS)**

**Date:** July 24 – 25, 2019

**Venue:** Sydney, Australia