Agri Innovation Post **Edition 23**

Agri-Biotech News & Views October 2020

Emmanuelle Charpentier of the Max Planck Unit for the Science of Pathogens Institute for Infection Biology and Jennifer Doudna of the University of California, Berkeley were recently recognized for their work on CRISPR/Cas9 genome editing — a technique routinely called CRISPR for short and often referred to as "genetic scissors."

Given the time and age, the award is very timely for two reasons – one, for the first time two female scientists have been awarded the Noble Prize for science and two, this award has brought a renewed focus on science and how the technology and innovation can overcome looming challenges. CRISPR-Cas9 gene editing has contributed to important and major developments worldwide, across multiple disciplines and applications.

The tool has made revolutionary development in the field of biomedical research. It has been used to modify the genomes of three cancer patients to reprogram the immune system to fight off cancer cells in February this year, with no side effects so far. It has also been used to eliminate HIV from infected cells and is being used to reverse congenital blindness, combat diseases such as Huntington's as well as chronic pain.

Other than in biomedical research, this tool has immense application in agriculture. The enormous potential to edit genes by this tool has opened avenues to improve agronomic performances and breeding technologies, primarily to increase plant yield, and make plants herbicide and disease resistant. Through CRISPR, researchers have created wheat plants with larger grains, generated resistance to fungal infection, designed novel tomato plant architectures, and engineered other traits in new plant varieties.

The challenges in agriculture is globally the same – depleting natural resources, more mouths to feed, climate change, demand for quality produce with enhanced nutritional benefits, fight hunger and poverty. Equally the solution is the same, trusting science and adopting advanced technologies and solutions to address these challenges.

In this newsletter, we have captured interesting developments and research work from around the world in the agri industry. We have also shared a YouTube link of a recent webinar on 'Global Impact of GM Crops' below. Hope you find it a good read.

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Executive Director
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AgBiotech News

Genome editing has the potential to reshape agriculture

(Farmonline)

While genome editing is certainly not a silver bullet for solving all agricultural challenges, in my opinion, it is the most promising and innovative technology for agricultural breeding that I have seen during the last 30 years. It has the potential to reshape how we use agricultural biotechnologies as part of conventional breeding programs, combining it with the information gained from crop and livestock genome sequencing. Because certain tools of genome editing, such as CRISPR Cas9, can be used in various species and cost less than other technologies, researchers all over the world are using genome editing technologies to develop solutions to agricultural problems, be it in Brazil, Australia, Kenya, or India. An additional advantage of genome editing is that it also has the potential to introduce characteristics that farmers need, while helping increase and protect genetic diversity in livestock and crops.

GMO and gene-edited biofortified crops weaken case for organic agriculture

(GLP)

While anti-biotech activists cling to the myth that organic food is healthier and more nutritious than conventionally grown food, genetic engineering–fervently opposed by most organic advocates–is yielding a new lineup of GMO and gene-edited crops with nutrient content organic growers simply can't replicate. One such product has already hit the market and several others are expected to follow in the next few years. This development has exposed a nutrition gap between organic and genetically engineered crops and further weakened the case for organic farming.

Southern Mallee council supports GM

(Murray Valley)

Southern Mallee District Council has resolved to support State Government plans to allow farmers and food producers to grow genetically modified (GM) crops in the district. They join the Mid Murray Council, Coorong District and Murray Bridge councils in their support for lifting the GM moratorium. Following consultation with the Southern Mallee agriculture and horticulture sectors, and the wider community, Council agreed this week not to apply to the Minister for Primary Industries and Regional Development to continue the ban on GM crops.

52% of UK consumers say farmers should have access to gene-edited crops, survey finds

(Farming UK)

The public have highlighted their worry over the fragility of the food system in the face of Covid-19, climate change and possible trade interruptions. More than two thirds (66%) of adults are worried about the impact that a second wave would have on food supplies, a new YouGov survey has shown. Fears for the food system's resilience in the face of climate change and trade interruptions after the Brexit transition period ends are also playing on public consciousness. The survey of over 2,100 adults was carried out on behalf of the Agricultural Biotechnology Council (ABC), which has called for farmers to have access to 'all the tools available' in order to fight the threats. Notably, the data suggests the public thinks more should be done to support farmers and food producers to future-proof the sector and help it remain resilient. In particular, more than half (52%) expressed support for the use of new

agricultural innovations such as new plant breeding techniques like gene editing to make crops more nutritious and resistant to pests and diseases.

Burkina Faso renews commitment to GM crops with Bt cowpea
(GLP)
Burkina Faso scientists and farmers say their country has not abandoned crop biotechnology, despite challenges that prompted it to shelve genetically modified (GM) cotton in 2016. Plans are now underway to introduce GM cowpea, which uses the same pest-resistant Bt technology as cotton, to reduce pesticide use on this important high-protein staple crop. Dr. Edgar Traore, coordinator of the Open Forum on Agricultural Biotechnology in Burkina Faso, said processes to develop GM cowpea that can resist the destructive pod borer pest have been ongoing for about half a decade now and will soon come to a successful end.

Bt Cotton Increased Farmers' Produce by 10-Fold in China
(ISAAA)
Mr. Maotang Zu, President of the Farmer Technology Association from the Gaobeidian City of Hebei Province, shared how Bt cotton improved farmers' lives by gaining an average of 10-fold increase in their produce. He said this during the webinar on the Global Impact of GM Crops hosted by ISAAA SEAsiaCenter in collaboration with PG Economics, China Biotechnology Information Center, and CropLife Asia.

Gene editing as the next gen plant breeding tool for breeders
(Hortidaily)
The basis of plant breeding is the availability of trait variation and diversity in different crops, that can be brought together into a variety or hybrid with multiple superior qualities or characteristics. Plant breeders have been collecting wild variants of different crops for transferring better traits from wild to domesticated varieties. Random genetic variation historically has also been generated by treating seeds with various agents and selecting for plants with superior traits. These breeding methods were limited to plants that could be crossed with each other. However, genetic modification gave the breeders an opportunity to incorporate genes from different species into the plants, thereby increasing manifold, the available repertoire of genetic variation.

Despite fearmongering, GMOs are the key to a healthy & sustainable future
(Queens Journal)
A lot of plant-based foods at the grocery store are labeled ‘non-GMO’—as if genetically modified crops should be avoided. In reality, we ought to embrace the technology. Genetic modification to our food is as old as agriculture itself. When humans began domesticating plants, we used selective breeding to enhance desired traits. This meant greater crop yields and bigger, tastier fruits and vegetables. With the discovery of the DNA double helix in 1953, it eventually became possible to directly transfer favourable genes from one species to another. Naturally, this has dramatically expanded the scope of what we can do when compared to traditional methods of selective breeding.

Two women share chemistry Nobel in historic win for 'genetic scissors'
(BBC)
Emmanuelle Charpentier and Jennifer Doudna are the first two women to share the prize, which honours their work on the technology of genome editing. Their discovery, known as Crispr-Cas9 "genetic scissors", is a way of making specific and precise changes to the DNA contained in living cells. They will split the prize money of 10 million krona (£861,200; $1,110,400). On being one of the first two women to share the prize, Prof Charpentier said: "I wish that this will provide a positive message specifically for young girls who would like to follow the path of science and to show them that women in science can also have an impact with the research they are performing." She continued: "This is not just for women, but we see a clear lack of interest in following a scientific path, which is very worrying.

Nutritious millet crop could be genetically improved for large-scale agriculture
(Phys.org))
A nutritious millet crop grown mainly in West Africa could be genetically improved for large-scale agriculture in Saudi Arabia. An African millet crop could be improved for growth in the dry, arid lands

of Saudi Arabia by using information about its genome. Fonio is already well-adapted to this environment but has not had as much domestication as the major cereal crops, such as wheat, rice and maize. Gene targeting could lead to higher yields and larger grains.

International anti-GMO groups wage PR war to get gene-edited crops out of Latin America
(GLP)
Imagine for a moment that you're a farmer. Genetically modified crops that could help you protect your yields from voracious insects and stubborn weeds exist, but your government denies you access to these tools because it hasn't enacted regulations to assess the environmental impact of GMO crops. Meanwhile, your country also produces genetically engineered seeds for other nations to grow—which then sell the harvested grain back to your country to be used as food and animal feed. This isn't a hypothetical scenario; this is how Chile actually regulates the cultivation and sale of GMO crops, writes biochemist Daniel Norero.

Argentina becomes first country to approve genetically modified wheat
(Bangkok Post)
Argentina has become the first country to approve the growth and consumption of genetically modified wheat. The ministry's scientific commission said in a statement released in Buenos Aires that it had approved a drought-resistant variety of wheat in the world's fourth-largest exporter of the crop. "This is the first approval in the world for drought-tolerant genetic transformation in wheat," the National Commission for Science and Technology (CONICET) said in a statement.

Dr I. D. K, Atokple Explains Myths And Misconceptions About BT Cowpea And The Right Explanations
(Modern Ghana)
A retired scientist of CSIR-SARI and the first Principal Investigator (PI) of the Bacillus thuringiensis (Bt) cowpea project at CSIR-SARI, Dr I. D. K, Atokple, schooled about 100 participants at a field day organised at a confined field trial site of the project on myths and misconceptions about (Bt) cowpea, in Upper East Region. He said, before the Bt cowpea, just like any Genetically Modified (GM) crop, is released, it is intensively analyzed for human, animal and environment safety. Despite their historical high safety record and popularity with farmers, there are diverse groups of people opposed to biotechnology and GM crops. They claim GMO crops are not as safe as any other food crop. Speaking to the media, Dr Atokple debunked it saying before any genetically modified (GM) crop is released, by law it undergoes intensive safety evaluations. GMO food and feed have more than two decades of safety record. During these over twenty years, each day hundreds of millions of people consume GMO derived food in the USA, Canada, Brazil, China, Australia, Argentina, Japan, Korea, South Africa, and even in Europe.

Nigeria must use gene editing technology to improve food production – OFAB Coordinator
(National Accord)
Dr Rose Gidado, Country Coordinator, Open Forum on Agricultural Biotechnology (OFAB), says Nigeria must take advantage of gene editing technology to be able to produce enough food for its growing population. Genome editing or genome engineering or gene editing is a type of genetic engineering in which DNA is inserted, deleted, modified or replaced in the genome of a living organism. She said that gene editing technology was capable of reducing the need for chemical fertilisers and other chemical sprays that enhance release of greenhouse gases. Gidado cited an instance where the technology had been applied by scientists to produce tomatoes with longer shelf life, thereby ensuring steady supply of the vegetable all year round.

EU is stifling gene editing tools, plant breeding firms warn
(Farming UK)
Potential investment in new breeding techniques such as gene editing is being stifled by current EU rules, plant breeding firms say. The survey of 62 European and UK companies confirmed very strong commercial interest in using new techniques across a wide range of crop species and traits. However, it also showed the negative impact on EU-based research and investment of a July 2018 European Court ruling which classified varieties developed using these techniques as GMOs. Regulatory costs and timelines under the current EU GMO legislation stifled firms, as did uncertainty over future regulations including timelines for product approval. The survey showed the EU ruling may also hit

smaller breeding companies the hardest because they were less able to move research activities outside the bloc

Gene editing expected to gather momentum after Brexit
(Farmers Weekly)
Moves to facilitate the development of gene editing once the UK is free from EU regulation at the end of the year will provide a real boost to researchers and farmers, says the British Society of Plant Breeders (BSPB). The government is due to launch a consultation on the subject in the next few weeks, but recent comments from Defra secretary George Eustice suggest he is keen to encourage such new breeding techniques (NBT).

Can Gene Editing Save The World's Chocolate?
(Technology Times)
Cacao trees grow in tropical environments, within about 20 degrees north and 20 degrees south of the equator. Unfortunately for World's chocolate lovers, fungi also flourish in tropical conditions and can easily infect entire cacao tree farms, causing harmful conditions such as frosty pod, black pod and witch's broom, according to a 2016 report from the National Oceanic and Atmospheric Administration. "Cacao can be afflicted by several devastating conditions," says Brian Staskawicz, a professor in the Department of Plant and Microbial Biology at the University of California, Berkeley. "We're developing CRISPR editing technologies to alter the DNA in cacao plants to become more resistant to both viral and fungal diseases." Human-caused climate change is also putting the trees at risk, as rising temperatures caused by greenhouse-gas emissions may alter climatic conditions where cacao trees typically grow, mainly in West Africa and Indonesia.

Greenpeace-funded study backfires, undermining case to treat gene-edited crops as GMOs
(GLP)
In August, John Fagan, organic food champion, biologist and "Raja of World Peace" in the Maharishi organization, led a Greenpeace-funded study claiming that gene-edited crops developed with new breeding techniques (NBTs) like CRISPR can be "detected." This may seem unimpressive to most people, but the result is a big deal to anti-GMO activists like Fagan. Gene-edited crops may be essentially identical to conventionally bred plants; the only difference is that gene editing dramatically speeds up the breeding process, saving time, money and getting enhanced seeds into farmers' fields much more quickly than was previously possible—all without inserting "foreign" DNA into the crop's genome. This is the primary distinction between gene editing and transgenesis (GMO in the vernacular).

Are we over our GM-food phobia?
(Feed Leader)
GM food was a key concern throughout the 1990s, but studies show that the fear seems to be dying down. According to The Telegraph, the younger generation is nowhere near as worried about consuming GM foods as their parents or grandparents. The study showed that two-thirds of Millennials were perfectly happy to see technology advance farming techniques, and only 20% were worried about GM crops. This shift in attitude follows numerous studies that have failed to find a link between GM food and any sort of threat. Studies have been carried out by the National Academies of Science, Engineering and Medicine, as well as the University of Perugia, for example, and neither were able to find any notable link between GM crops and any risks.

Research

GMO insect-resistant Bt cotton 'as safe as' conventional counterpart, study finds
(Science Direct)
Genetically engineered crops expressing insecticidal and herbicide-tolerant traits offer a new strategy for crop protection and enhanced production; however, at the same time present a challenge in terms of toxicology and safety. The current experiment presents the findings of a 90-day feeding study in Sprague−Dawley rats with transgenic cottonseed which is expressing insecticidal Cry proteins (Cry1Ac and Cry2A), and tolerant to the herbicide glyphosate. There were 100 rats in this experiment divided into 5 groups of 10 rats/sex/group. Cottonseed from transgenic and control (near-isogenic) lines was

formulated into standard diets at levels of 10% and 30% (w/w). All formulated diets were nutritionally balanced. Overall appearance, feed consumption, body weight, organ weight, haematology, serum chemistry and urinalysis were comparable between control and treatment groups. In addition, there was no treatment-related difference in findings of microscopic histopathology and gross appearance of tissues.

Harmonised LUCAS in-situ land cover and use database for field surveys from 2006 to 2018 in the European Union
(Nature)
Accurate, timely, and representative in-situ observations across large areas have always been needed to report statistics on land use, land cover, and the environment. Precise geo-located in-situ information is also indispensable to train and validate algorithms that characterize the Earth's surface based on remotely sensed observations. Comprehensive and thematically rich in-situ data can lead to better classifiers and more accurate multi-temporal land surface mapping. This is especially true since increasingly frequent and detailed Earth Observations are being made, for instance by the fleet of Sentinel satellites of the EU's Copernicus program. These developments are opening avenues to better combine classical statistical surveying and Earth Observation (EO) derived products in the domains of land use and land cover change and environmental monitoring.

Multiplying the efficiency and impact of biofortification through metabolic engineering
(Nature)
Ending all forms of hunger by 2030, as set forward in the UN-Sustainable Development Goal 2 (UN-SDG2), is a daunting but essential task, given the limited timeline ahead and the negative global health and socio-economic impact of hunger. Malnutrition or hidden hunger due to micronutrient deficiencies affects about one third of the world population and severely jeopardizes economic development. Staple crop biofortification through gene stacking, using a rational combination of conventional breeding and metabolic engineering strategies, should enable a leap forward within the coming decade. A number of specific actions and policy interventions are proposed to reach this goal.

Strategies to revise agrosystems and breeding to control Fusarium wilt of banana
(Nature)
The recent emergence of the fungus Fusarium oxysporum f. sp. cubense tropical race 4 (Foc TR4), the deadly strain that causes Fusarium wilt of banana, has put the banana production chain for export under threat. Here, we propose research priorities and complementary strategies and challenges for effective and efficient mitigation management of Fusarium wilt. Our strategies include diversifying the agrosystems to increase crop resilience, as well as using precision breeding approaches to rapidly assess and introduce disease-resistance genes to develop stable and complete Foc resistance in commercial banana cultivars.

A scoping review of adoption of climate-resilient crops by small-scale producers in low- and middle-income countries
(Nature)
Climate-resilient crops and crop varieties have been recommended as a way for farmers to cope with or adapt to climate change, but despite the apparent benefits, rates of adoption by smallholder farmers are highly variable. Here we present a scoping review, using PRISMA-P (Preferred Reporting Items for Systematic review and Meta-Analysis Protocols), examining the conditions that have led to the adoption of climate-resilient crops over the past 30 years in lower- and middle-income countries. The descriptive analysis performed on 202 papers shows that small-scale producers adopted climate-resilient crops and varieties to cope with abiotic stresses such as drought, heat, flooding and salinity. The most prevalent trait in our dataset was drought tolerance, followed by water-use efficiency. Our analysis found that the most important determinants of adoption of climate-resilient crops were the availability and effectiveness of extension services and outreach, followed by education levels of heads of households, farmers' access to inputs—especially seeds and fertilizers—and socio-economic status of farming families. About 53% of studies reported that social differences such as sex, age, marital status and ethnicity affected the adoption of varieties or crops as climate change-adaptation strategies. On the basis of the collected evidence, this study presents a series of pathways and

interventions that could contribute to higher adoption rates of climate-resilient crops and reduce dis-adoption.

ISAAA Webinar on Global Impact of Biotech Crops Economic and Environmental Effect (1996-2018)

YouTube Link - https://www.youtube.com/watch?v=uvgpIBuOG2s&t=432s

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