Agri Innovation Post **Edition 24**

Agri-Biotech News & Views November 2020

The promising future of gene editing in agriculture is recognised by experts around the world. Dr RS Paroda, the founding chairman of the Trust for Advancement of Agricultural Sciences (TAAS) and Former Director General, Indian Council of Agricultural Research (ICAR) also emphasises on the benefits of this technology through an article published in The Financial Express.

Dr Paroda says that gene-editing can have a profound impact on global agriculture through rapid development of crop varieties with diverse desirable traits. This will ensure sustainability of production systems and nutritional security for the underprevileged by enhancing productivity and nutritional quality of food and climate adaptation.

Gene editing through CRISPR/Cas9 can create desired variations more precisely without affecting other characters of a variety. This allows new varieties to be produced quicker by enabling breeders to significantly cut down on time, labour and cost.

Globally, scientists are working on different crops inluding cereals, pulses, oilseeds, fruits and vegetables and is currently being used for incorporating multiple traits that would help farmers improve both their production and incomes. These include varieties that require low inputs like fertilisers, water, insecticides, fungicides or those that have better nutritional qualities. Some examples are pest-resistant crops (resistant to citrus greening and panama disease of banana), climate-resilient crops that can grow well under higher temperatures, submergence and saline soils (wheat and rice), plants with architecture suited for efficient farming systems indoors or in the field (tomatoes and ground cherries) and crops with improved nutrition or lower anti-nutritional traits (cassava, rice, wheat, millets, mustard).

In India, the institues under Indian Council of Agricultural Research (ICAR) are involved in application of CRISPR technology for enhancing stress tolerance and nutritional quality in a number of crops. The Department of Biotechnology (DBT), Government of India has developed a draft regulatory framework and risk-assessment guidelines for genome-edited organisms. These guidelines, when cleared by the Genetic Engineering Appraisal Committee (GEAC) and approved by the government, will accelerate the process of plant breeding and provide enormous benefits to smallholder farmers. It will enable India to compete with a large number of countries and make international seed trade seamless and will be a big step towards making India a global seed hub.

Dr Paroda in his article rightly points out that awareness around this technology is vital. The public needs to be kept fully informed about the essential elements of gene-editing technology, assured of its safety and development process, and its likely benefits to the society. This step is crucial to make the technology successful in India.

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 video developed by FSII titled '**Understanding GMOs**' which focuses on what GMOs are and the safety of such crops. Hope you find it a good read.

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AgBiotech News

Kano farmers list benefits of genetically modified beans

(EnviroNews Nigeria)

Farmers in Tudun Wada in Kano State have expressed joy at the release of the new Pod Borer Resistant (PBR) Cowpea, saying it makes farming less expensive compared with the local varieties. Some of the farmers spoke with the News Agency of Nigeria (NAN) at the sideline of the Brown Field Day for the demonstration plot of the improved cowpea variety (SAMPEA-20-T) with resistance Pob Borer Insect Maruca Varata on Sunday, November 8, 2020. Malam Khalid Salihu, one of the farmers, said he was happy with the outcome of the new improved variety, pointing out that it is cost effective as it resists insects that destroy the beans. He said that he spends less planting PBR Cowpea compared to planting the local variety.

African scientists fear the continent will be left behind as gene editing transforms food production

(Alliance for Science)

Scientists in Africa are calling on their governments to ensure the continent isn't left behind as gene editing revolutionizes food production. Gene editing is a good tool that can help enhance Africa's food security, say scientists across the continent, and it shouldn't suffer the same fate that has stymied the use of genetically modified organisms (GMOs) over the last three decades. As GMOs continue to face regulatory barriers that are hampering their acceptance across the continent, scientists are convinced that gene editing offers a new frontier for introducing advanced technology to tackle food security issues in Africa.

Thailand advances legislation to repeal GM crop cultivation ban for second time in 5 years

(USDA)

The production, trade, policy, and marketing for plant and animal biotechnology in Thailand has remained unchanged for several years. However, there has been significant developments towards finalizing the Biodiversity Act. The Ministry of Natural Resources and Environment (MONRE) anticipates that the draft bill will be sent to the Cabinet for approval by the end of the year. The bill will then head to the National Legislative Assembly (NLA). The Biodiversity Act incorporates many of the areas covered by the failed 2015 Biosafety Act. In 2015, the draft Biosafety Act received approval from the Cabinet before being rejected a month later by the NLA. The Thai Food and Drug Administration (TFDA) plans to implement two notifications regarding genetically engineered (GE) food and labelling in early 2021. TFDA is expected to send the two draft notifications to the Management Council by the end of 2020.

Genome editing biotechnologies: UEAA calls for a revision of European regulations on genetically modified organisms

(European Scientist)

The recent invention, gene-editing, is already being implemented in almost all continents (United States, Canada, Argentina, Japan, China, Australia, etc.), the European Union is lagging behind for regulatory reasons. Indeed, many countries have decided that for minor genome changes there is no need to apply GMO regulations, which as a result both lowers the registration costs of new genome editing products and promotes innovation. Conversely, the European Union, by the judgment of its Court of Justice (CJEU) of 25 July 2018, decided that new genome editing techniques produce GMOs. However, only large international conglomerates have a sufficient financial base to meet the regulatory requirements applied to them.

How do you make a GMO? FDA's step-by-step guide to genetically engineering a crop

(FDA)

To produce a GMO plant, scientists first identify what trait they want that plant to have, such as resistance to drought, herbicides, or insects. Then, they find an organism (plant, animal, or microorganism) that already has that trait within its genes. In this example, scientists wanted to create insect-resistant corn to reduce the need to spray pesticides. They identified a gene in a soil bacterium called Bacillus thuringiensis (Bt), which produces a natural insecticide that has been in use for many years in traditional and organic agriculture.

Expert advises farmers to adopt gene drive-based pest control technology

(National Accord)

Dr Rose Gidado, County Coordinator, Open Forum on Agricultural Biotechnology(OFAB), has advised farmers to adopt the gene drive-based pest control technology. Gidado, also Deputy Director, National Biotechnology Development Agency (NABDA), said the adoption would significantly help to restore Nigeria's food crop industry. Gene drive is a genetic engineering technology that propagates a particular suite of genes throughout a population by altering the probability that a specific allele will be transmitted to offspring from the natural 50% probability. She noted that in agriculture, gene drive was recently applied to control invasive species or eliminate herbicide and pesticide resistance.

How needless precaution kept a GMO 'superfood' off the market: Q&A with Golden Rice author Ed Regis

(GLP)

In just over 200 pages, Regis gives a crash course on genetic engineering and explains the messy history of Golden Rice, disabusing the reader of many popular myths along the way. Environmental activist group Greenpeace, for example, is often identified in the press as the primary obstacle to releasing Golden Rice. Despite all its lobbying, however, the NGO has had a relatively minor impact on the crop's development. Instead of pointing the finger at Greenpeace, Regis says the blame lies mostly with overly cautious governments, many of which regulate GMOs as if they were biological weapons. Hoping to avoid the unintended (and so far, undiscovered) consequences of growing genetically engineered crops, regulators unintentionally rob people of their eyesight and often their lives.

EU crop gene-editing rules block efforts to fight climate change, 50 science institutions argue

(Allea)

The new ALLEA report "Genome Editing for Crop Improvement" presents the state of the art of scientific evidence in the field and explores paths to harmonise EU legislation with recent scientific developments, while particularly considering relevant ethical and societal considerations. Widening public discourse on innovation in genome-editing for crop improvement is a key responsibility of the scientific community, including academies across Europe. While these new techniques offer exciting opportunities, it remains vital to see the bigger picture and to also consider public perceptions and cultural differences. This report summarises these diverse strands of research and aims to provide a comprehensive overview to European policymakers and the public.

COVID-19 pandemic may boost public acceptance of Ghana's GM cowpea

(GLP)

The COVID-19 pandemic is increasing public interest in local food production, which may boost consumer acceptance of the insect-resistant genetically modified (GM) cowpea being developed in Ghana, some scientists say. The global pandemic is making people appreciate the need for every nation to locally develop seeds and other agricultural inputs, which is likely to encourage public acceptance of technologies that are capable of helping farmers boost yields with scarce resources.

Is plant breeding safe?
(Hortidaily)
The process of selecting superior performing plants for food, feed and fiber products dates back more than 10,000 years and has been substantially refined in the last century. While the perceived risks posed by genetically engineered crops has been extensively addressed, the existing levels of naturally occurring plant toxins in food crops has received far less attention. That's the purpose of a new scientific paper, titled: The role of conventional plant breeding in ensuring safe levels of naturally occurring toxins in food crops. Innovature recently sat down with one of the authors, Amit Dhingra, professor of genomics and biotechnology at Washington State University, to learn more. Dhingra, who has a deep passion for nutritious food, says his childhood experiences growing up in India motivated him to pursue a career in crop improvement.

South Australia rejects 11 proposals to ban GM crops, citing 'insufficient evidence' for moratorium
(GLP)
The South Australian government passed legislation earlier this year to remove the moratorium on GM crops everywhere except Kangaroo Island. It gave councils six months to apply to remain GM-Free areas, with 11 applying for such status, mostly across the Adelaide Hills and in regional districts. However, the government said it had rejected all 11 bids, on the basis of a lack of evidence of any perceived benefits.

Gene-editing could be way forward for improved crop, absence of regulatory regime holding back commercial use
(The Times of India)
India's use of technology for crop improvement might be finally catching up after years of neglect with Indian scientists making progress in using gene-editing to develop Vitamin A-rich banana and improved varieties of rice, millets, pulses and tomato even as absence of a regulatory policy prevents their release for commercial use. Though the department of biotechnology (DBT) has prepared detailed guidelines on how to use gene-editing to improve crop varieties, the regulatory body Genetic Engineering Appraisal Committee (GEAC) is yet to distinguish it from genetically modified (GM) technology and is still considering the matter solely from transgenic angle despite clarifications from top scientific academies and research institutions.

Knowledge Center Crop Biotech Update October 21, 2020 Issue Indian Farmer Confirms Socio-economic Impact of Bt Cotton
(ISAAA)
Insect-resistant (IR) cotton has impacted the lives of Indian farmers since it was introduced in 2002. This is according to Graham Brookes of PG Economics Ltd, who was one of the speakers during the ISAAA Webinar Global Impact of GM Crops held on October 15, 2020. His data for the socio-economic impact of GM crops was supported by the success story of the Indian farmer, Mr. V. Ravichandran. In 2018, 95% of Indian farmers are using Bt cotton technology. PG Economics data show that its yield impact is +29% and the average farm income gain amounts to US$ 193.56 per hectare. In terms of return on investment, a farmer earns an extra US$ 12.95 for every US$ 1.00 he spent on IR cotton seed. All these rounds up to a total farm income gain of US $24.31 billion with a production impact of 14.73 million tons of lint from 2002 to 2018.

Research

Pennycress research turns weed to bioenergy crop
(Western farmer Stockman)
Around the world, pennycress is a familiar plant, and it's often considered a weed. The plant is named for its coin-shaped, oil-rich seed pods that are unsuitable for human consumption but could be an

ideal source for biodiesel and jet fuels. This fall, Washington State University researchers are taking a closer look at the genetics and physiology of pennycress as part of a multi-institutional, $12.9 million research project. The program is funded by the U.S. Department of Energy and led by Illinois State University scientist John Sedbrook. The program's five-year goal is to develop a winter cover crop that can thrive in the Pacific Northwest, the Corn Belt and beyond. As a cover crop with a purpose, pennycress could provide an added income source if the research is successful.

Israeli company reports first ever successful genetically edited cannabis
(The Jerusalem Post)
An Israeli cannabis genetics and seeds company announced that as part of its R&D efforts to develop Powdery Mildew resistance in cannabis, it has detected the first ever successful genome editing event in cannabis. The milestone was achieved using the CRISPR-Cas9 genome editing technology. It further said that using genome editing capabilities, they will be able to develop plants which exhibit improved agronomical traits, essential for large scale, high-quality and cost-efficient cultivation.

'Genetic scissors' of CRISPR in the spotlight
(Duluth News Tribune)
Yes, Dan Voytas is using CRISPR in his research. And, yes, he's optimistic that the important and evolving technology — sometimes known as the "genetic scissors" — holds great potential to improve agriculture and the world. "It's an exciting tool," said Voytas, a professor in the College of Biological Sciences and director of the Center for Precision Plant Genomics, both at the University of Minnesota. He also is the chief scientific officer of Calyxt, an agricultural biotechnology company focused on developing crops that provide consumer benefit. The company's projects include a high-fiber wheat, which is said to be the world's first gene-edited, consumer-focused wheat product. The high-fiber wheat is expected to go into commercial planting in 2022.

Biofortified GM crops may be a long-term solution to global micronutrient deficiencies
(Nature)
One measure is so-called biofortification, i.e. the breeding of staple food crops with higher micronutrient contents, which smallholders can then plant and propagate themselves. In the past 20 years, international agricultural research centers have developed various biofortified plants using conventional breeding methods, including corn and sweet potatoes with vitamin A or rice with a higher zinc content. These crops are now grown in numerous developing countries with proven nutritional and health benefits. However, conventional breeding methods have certain limits. In the article, the scientists explain how genetic engineering can help to further increase the effectiveness and usefulness of biofortified plants. "With genetic engineering approaches, significantly higher micronutrient contents can be achieved in the plants than with conventional breeding methods alone. We have already shown this for folic acid in rice and potatoes, "says first author Prof. Dr. Dominique Van Der Straeten from Ghent University. "We have also succeeded in significantly reducing the vitamin losses after the harvest."

Cibus advances gene-edited crops
(C&EN)
Signalling progress for a new kind of crop engineering, the biotech crop trait firm Cibus says it will move forward with field trials for 14 gene-edited crops including canola with a seedpod-shatter reduction trait it says will give farmers more flexibility in when they harvest. The crops are part of this year's batch of 70 gene-edited plants that the US Department of Agriculture says will not require the same level of testing and controls as traditional genetically modified organisms (GMOs). Last year, the first full year for current USDA guidance on gene-edited crops, only seven such crops got the green light. According to the USDA, crops with traits that are created without using transgenes—which are genes borrowed from other species—do not meet the definition of a regulated GMO. Instead, non-transgenic gene-editing is considered a plant-breeding technology. The precision afforded by new gene-editing techniques such as CRISPR has made it possible for many more companies to create and commercialize traits compared to older GMO practices, which require large investments and long timelines.

In the future the bananas you eat may be the result of this year's Nobel winners

(The Times of India)

At Mohali-based National Agri-food Biotechnology Institute (NABI), researchers are using the gene editing technology to improve the nutritional quality and yield of crops such as bananas, rice, wheat and soybean. For instance, Dr Siddharth Tiwari is working on enhancing the beta-carotene content (which is converted to vitamin A in the human body) in the fruit pulp of bananas. “Vitamin A deficiency is a major problem in India, especially among children,” says Tiwari. “So we figured we could work on biofortification of bananas, which are cheap and widely available.”

Genetically engineered bacteria lead to better crops

(New Scientist)

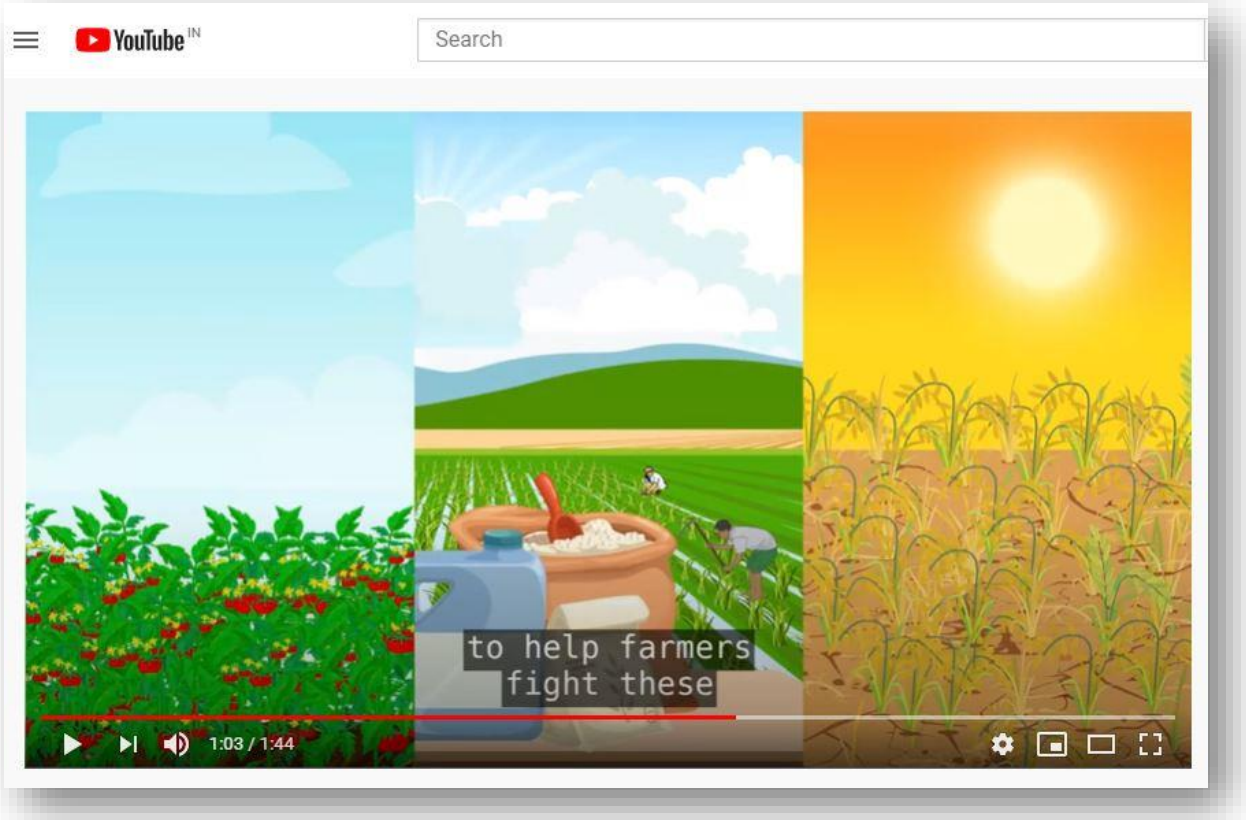
Our crops can be improved faster and easier than we previously thought, Utrecht scientists demonstrate. We can manipulate the genes of bacteria that live around plants. This insight offers opportunities for global food security. Plant breeding - a method of selecting plants from a group that have the desired properties - is central to the debate on how to keep feeding all the mouths in the world responsibly . To date, scientists have focused on the genes in the plant itself, a process known as GMO . This process is very time consuming. Researchers at Utrecht University recently found a faster way to breed crops.

Safeguarding a global seed heritage from Syria to Svalbard

(Nature)

Crop diversity underpins food security and adaptation to climate change. Concerted conservation efforts are needed to maintain and make this diversity available to plant scientists, breeders and farmers. Here we present the story of the rescue and reconstitution of the unique seed collection held in the international genebank of International Center for Agricultural Research in the Dry Areas (ICARDA) in Syria. Being among the first depositors to the Svalbard Global Seed Vault, ICARDA managed to safety duplicate more than 80% of its collection before the last staff had to leave the genebank in 2014 because of the war. Based on the safety duplicates, ICARDA since 2015 have rebuilt their collections and resumed distribution of seeds to users internationally from their new premises in Morocco and Lebanon. We describe the multifaceted and layered structure of the global system for the conservation and use of crop diversity that enabled this successful outcome. Genebanks do not work alone but in an increasingly strengthened and experienced multilateral system of governance, science, financial support and collaboration. This system underpins efforts to build sustainable and socially equitable agri-food systems.

Understanding GMOs



YouTube Link - https://www.youtube.com/watch?v=4KCCynOhXoA

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