



In this issue you will find articles and several developments in the field of gene editing, GMOs and conventional agriculture. Below is the gist of few advancement made in agriculture that are mentioned in the news and research section of the newsletter.

Advancements in agriculture whether it be seed, plant, soil, food or technology, is aimed towards finding the right balance between decreasing the use of natural resources and increasing food production. But the solution is not that simple. The solution needs amalgamation of both new technologies and conventional farming practices. An additional layer to it is supplementing the climatic conditions.

Transgenics and gene editing are helping researchers tremendously to achieve desired traits in a plant however, conventional farming such as agroecology, regenerative agriculture are also helping to achieve sustainable agriculture to fight harsher weather.

The success and demand for gene editing is immense as scientists are increasingly using this technology to include desired traits and make crops more nutritious, making it tastier, disease and pest resistant, drought tolerant etc. For instance, a scientist in Ghana is working on improving the yield and beta carotene content in sweet potato by employing the CRISPR technology. Beta carotene is the main safe dietary source of vitamin A, essential for normal growth and development, immune system function, and vision.

At a webinar organised by Alliance for Science, different scientists presented their work on gene editing. A professor at the University of Chile is currently using CRISPR to breed tomato and kiwi varieties that can tolerate drought and soil salinity. A leader at International Center for Tropical Agriculture (CIAT's) Genetic Transformation and Genome Editing Platform in Colombia is improving rice, beans, cassava and cacao. The research on rice is intended to breed resistance to white leaf virus. A research professor at TEC University in Costa Rica discovered that banana has a gene that may naturally confer resistance to several plant diseases. Since the gene has low presence in the genome, he is trying to develop varieties where that gene is more pronounced.

As per a news report, a company in US is field testing two traits, C3014 and C3015, in oilseeds to produce polyhydroxyalkanoates (PHAs), a biodegradable plastic product. The Camelina oilseed plant, with the help of gene editing, could produce PHAs to substitute for plastic utensils, straws and packaging material. Further, an agricultural technology company in Beijing has successfully utilized gene editing technology to create new corn traits, including reducing the plant height, increasing growth period and chloroplast content. The center is currently evaluating the commercial value of these new traits in corn seed production.

On the other hand, conventional farming like regenerative agriculture aims at improving the soil health. These include increased soil carbon storage, greater soil resilience to flooding and drought through higher organic matter levels and improved soil structure, nutrient recycling, and soil biota that enhances plant health and supports biodiversity up the food chain. A healthy crop also increases its resistance to pathogens.

Another concept called Agroecology is based on applying ecological concepts and principles to optimize interactions between plants, animals, humans and the environment while taking into consideration the social aspects that need to be addressed for a sustainable and fair food system. By building synergies, agroecology can support food production and food security and nutrition while restoring the ecosystem services and biodiversity that are essential for sustainable agriculture. Agroecology can play an important role in building resilience and adapting to climate change. To put this concept in action, a company in Indonesia focused on circular economy where they used an edible insect to transform biomass from agro-industry waste streams into high-quality nutrients and organic chemicals. The work has been endorsed by UN's Food and Agriculture Organisation. The company has developed a process to extract oil from edible insects. Since insects require less feed, water or land and no GHGs, it is a more sustainable alternative to palm oil. In just one year, insects (*Zophobas morio* larvae) yield almost 38 times more oil than oil palms do using same amount of land. The insects can grow on biomass from agro-industry waste streams, as feedstock such as wheat husk, rice husk, sugarcane bagasse, and/or palm press cake waste. The fatty acid properties are similar to palm oil and possess an advantageous combination of rich in unsaturated fats and healthy fats including omega-3,6, and 9.

Through the above examples it is clear that we need to endorse and adopt all sustainable technologies to see agriculture to prosper. Constant research and development, encouraging adoption of products through right policy push is the key to keep scientist and researchers motivated for bringing solutions for both developed and developing countries.

We hope you find the newsletter a good read!



Shivendra Bajaj
Executive Director
Federation of Seed Industry of India

News from India and Around the World

[USask awarded \\$3.2M towards first-in-Canada engineering biology centre for ag innovation](#)

(Yorkton)

The Canada Foundation for Innovation (CFI) will invest \$3.2 million in a unique biomanufacturing facility at the University of Saskatchewan (USask) that will use cutting-edge “engineering biology” technologies to accelerate agri-food innovation and help address food security needs. Developing canola varieties more resistant to climate change, flavourings for the plant-based meat industry, and non-animal enzyme alternatives for the dairy industry are a sample of the innovations to be advanced by the new Engineering Biology Agri-food Innovation Centre within the university’s Global Institute for Food Security (GIFS).

[American Farmers Could Soon Be Growing Derecho-Proof Corn Plants](#)

(Bloomberg Green)

Farmers across the U.S. could soon be growing corn plants that are able to withstand winds as strong as those brought by the powerful derecho that hit Iowa last year. Bayer AG is developing shorter-stature plants that can resist winds without falling over, said Bob Reiter, head of research and development at the German chemical giant’s crop science division. The first new variety, introduced in Mexico in September, is expected to be launched in the U.S. in about 2023.

[Ghana’s First Gene Editing Scientist Improves Vitamin A Content in Sweet Potato](#)

(Modern Ghana)

Samuel Acheampong is the first scientist in Ghana to attempt using the Gene Editing Technique for crop improvement. Acheampong, who is also a PhD. student at the University of Cape Coast, is working on improving the yield and beta carotene content in sweet potato by employing the CRISPR technology. During a live virtual conversation hosted by the Cornell Alliance for Science on Facebook, Acheampong mentioned that he is a lover of technology and is passionate about seeing how new innovations and technology can be used to enhance food production. He noted that farmers usually face the challenge of low yield and also may have crops with low nutrient content which calls for interventions.

[Agriculture and climate change: Taking the best of all farming systems could tip the carbon scale in the right direction](#)

(GLP)

Agriculture contributes a significant portion of the world’s climate-changing greenhouse gases. In turn, changes in climate will reduce agricultural yields and make farming harder, just as increasing worldwide populations put pressure on the industry to produce more food. There are basically two ways to reduce agriculture’s impact on climate: decrease the sources of carbon, or increase the sinking of carbon (plants sequestering key compounds). New varieties of plants and animals will have to tolerate abiotic stresses like drought, salt and temperature increases, while at the same time improving yields and nutrition.

[Battling misinformation wars in Africa: applying lessons from GMOs to COVID-19](#)

(The Conversation)

For anyone who has worked on crop improvement in Africa over the last three decades, the flood of misinformation around vaccines evokes an eerie sense of déjà vu. It is reminiscent of the aggressively anti Genetically Modified Organism (GMO) campaign that has stalled Africa’s efforts to improve the productivity and nutrition of key crops over the past three decades. Those of us working in the GMO field grossly underestimated the power of the misinformation campaign against it. The failure to adopt GM crops has had a slow and degenerative effect on Africa, where farmers have not experienced the economic boons enjoyed by their counterparts in other parts of the developing world.

[An agricultural tech company utilized Gene Editing technology to create new corn traits](#)

(PR Newswire)

An agriculture technology company announced that it has successfully utilized gene editing technology to create new corn traits. Gene editing refers to editing DNA strands by introducing cuts into the DNA strands, enabling the removal of existing DNA and the insertion of replacement DNA. The Biotechnology Center of Beijing Origin Seed, Ltd. (Origin Agritech's subsidiary) established its gene editing technology platform several years ago. Through collaborations with leading universities and research institutions, the research center has developed new corn traits, including reducing the plant height, increasing growth period and chloroplast content. The center is currently evaluating the commercial value of these new traits in corn seed production.

[GMOs in the Philippines: Field trials confirm Bt eggplant highly resistant to pest attack](#)

(ISAAA)

A field study conducted by researchers from the University of the Philippines Los Baños led by Dr. Desiree Hautea, professor of genetics and crop biotechnology, produced the first publicly available data on the field performance of Bt eggplant in Asia. The results showed that Bt eggplant demonstrated high levels of control against eggplant fruit and shoot borer (EFSB) compared to non-Bt eggplant varieties over the span of three cropping seasons in the Philippines from 2010-2012. The study evaluated the value of Bt protein found in Bt eggplant in controlling the target pest, EFSB. Bt eggplant displayed a success rate of 98.6-99.3% in preventing shoot damage, 98.1%-99.7% in preventing fruit damage, and 95.8–99.3% in reducing larval infestations under the most extreme pest pressure. The results of the study were the first report to be submitted to a peer-reviewed journal in Asia. The data served as a benchmark in choosing which variety of Bt eggplant will be used for commercialization.

[Importance of New Technologies for Crop Farming](#)

(The Crop Site)

Adoption of technology has been important to production agriculture for decades. Through the adoption of technology and improved managerial practices, aggregate agricultural U.S. farm output in the United States tripled from 1948 to 2017 with almost no corresponding increase in aggregate input (USDA-ERS, 2021). Crop farming around the world is undergoing a profound technological transition. The management of production is moving toward increased micro-management of production activities by individual field or location within a field driven by site-specific information about environmental, biological, and economic factors that affect physical output, profitability, and soil and water quality. Increased use of monitoring technology will greatly expand the amount of information available regarding what affects plant growth and well-being. This will be made possible by innovations in sensors to use in monitoring and control systems, communication technologies, and data analytics.

[Researchers want GMO transparency](#)

(Producer)

There has long been consumer interest in genetically modified food, including criticism that there is not enough public information about GM and gene edited crops in the food supply. Now, researchers at North Carolina State University are calling for a coalition of the biotech industry, government, non-government organizations, trade organizations and academic experts to tackle the issue. They have proposed that the agencies and scientists work together to provide clearer information on crops changed by gene technology to explain how and why plants and plant products are modified.

[Facing stiff GM crop restrictions, Mexican cotton farmers may import illegal biotech seeds](#)

(LaJornada)

During 2020, cotton production fell in Mexico, as only one million bales were produced, 500 thousand less than in other years. 35 percent of the area was left unsown due to the lack of seeds, said Raúl Treviño, president of the cotton product system. In a video conference, he explained that transgenic cotton seeds have a lifespan of 5 to 7 years and they must be renewed. He warned that “desperate producers can import the seeds illegally, thereby eliminating the traceability of genetically modified organisms.” He recalled that in 1995 the country began to sow genetically modified seeds, which increased the yield, which went from three bales per hectare to seven. He stressed that the

international market for organic cotton products is small. He ruled it out as a viable option for Mexican cotton growers. “We would leave the market.”

[NSW to lift ban on use of GM crops from July](#)

(Grain Central)

The New South Wales Government yesterday announced it will lift its ban on the use of genetically modified (GM) crops by allowing an 18-year moratorium to lapse on 1 July. Minister for Agriculture Adam Marshall said this would allow NSW’s primary industries sector to embrace new GM technologies, and these were forecast to deliver up to \$4.8 billion in total gross benefits over the next 10 years. “The potential agronomic and health benefits of future GM crops include everything from drought and disease resistance to more efficient uptake of soil nutrients, increased yield and better weed control,” Mr Marshall said. He said GM technology could save farmers up to 35 per cent of their overheads and boost production by almost 10pc. “This is also great news for consumers as by lifting the ban we are empowering companies to invest in GM technology that has the potential to remove allergens such as gluten, improve taste and deliver enhanced nutrition.

[‘One more tool in our toolbox’: The case for crop biotechnology](#)

(GLP)

Agriculture scientist Channapatna Prakash offers a crash course on agricultural biotechnology on this episode of the Nothing is Rocket Science podcast, explaining what “GMO” actually means and why engineering crops promotes sustainable farming.

[Kenya Ready for Approval of Bt Maize](#)

(Kenya News)

Government is moving towards commercialisation of BT maize after the last stretch of open field trials were concluded. The TELA Bt maize variety if adopted can help farmers double their yields. Speaking during an open field trial for Bt Maize in Thika, Agriculture and Crops Principal Secretary Prof. Hamadi Boga said the country is just a step away towards commercialisation of Bt Maize. The PS noted that already the commercialisation of Bt Cotton has already gone through the field trials and approved by relevant stakeholders including the Cabinet. “We are making our case with the Bt Maize and its evident you cannot compare the Bt Maize with Non-Bt. We do not want to put farmers through the challenges and we have a good case”, he said. He explained that through this last trial that is being undertaken by KEPHIS, there is data to show it and it is the one that stakeholders will use in order to move to commercialisation of the new variety and allow farmers to earn more.

[Scientists are growing grapes in space to save Earth’s wine supply](#)

(Wired)

At approximately 8pm EST on Wednesday, January 13, a SpaceX Cargo Dragon spacecraft splashed down into the Atlantic Ocean, just off the coast of Florida. Having successfully dropped off its three tons of hardware and supplies to the International Space Station (ISS) 12 hours earlier, the capsule-like craft returned laden with a more miscellaneous cargo. Inside were stem cells, a sextant designed for emergency navigation in deep space, and tissue chips created to help treat heart conditions on Earth. And nestled alongside them, 320 snippets of Merlot and Cabernet Sauvignon grapevines, individually wrapped in small bundles of soil and carefully placed in containers, each vine nestled inside its own beehive-like cell.

[EU’s refusal to permit GMO crops led to millions of tonnes of additional CO2, scientists reveal](#)

(Alliance for Science)

Europe’s refusal to permit its farmers to cultivate genetically engineered (GE) crops led to the avoidable emission of millions of tonnes of climate-damaging carbon dioxide, a new scientific analysis reveals. The opportunity cost of the EU’s refusal to allow cultivation of GE varieties of key crops currently totals 33 million tonnes of CO2 per year, the experts say. This is equivalent to 7.5 percent of greenhouse gas (GHG) emissions from the entire European agricultural sector, or roughly what might be emitted each year by 10-20 coal-fired power stations. Given that farmers in North and South America adopted GE crops from the late 1990s onward, this analysis implies that over subsequent

decades the additional carbon emitted due to the EU's opposition to genetic engineering will likely be in the hundreds of millions of tonnes.

New Research

[Purdue team predicts next-generation microbiome research promises agricultural advances](#)

(Purdue University)

For thousands of years, humans have altered — often negatively and inadvertently — microbial communities in a quest to improve agricultural crops. In recent years, knowledge about the roles microbes play in these systems has grown rapidly but is not yet to the point at which farmers and society have reaped benefits. That's primed to change, according to a group of Purdue University scientists who authored a review of agricultural microbiome work for the journal *Nature Plants* published this week. This is the first review of agricultural microbiome research that comprehensively combines knowledge about plant, soil and insect microbiome work to develop an integrated portrait of the complex interactions that will come into play as scientists attempt to harness microbes to improve crops.

[Latin American researchers use gene editing to breed hardier crops](#)

(GLP)

Latin American researchers are using gene editing to breed hardier varieties of staple crops and fruits, according to an Alliance for Science Live webinar. Among them are Claudia Stange Klein, a professor in the Department of Biology of the Faculty of Sciences at the University of Chile, who is currently using CRISPR to breed tomato and kiwi varieties that can tolerate drought and soil salinity. She is also editing apples to increase their nutritional profile with a higher content of carotenoids and resist the oxidation that causes browning after they are cut.

[Amid Changing Climate, Drought-Tolerant Cactus Pear Could Become Invaluable Source for Sustainable Food, Biofuel: Study](#)

(The Weather Channel)

As climate change is dramatically altering crop varieties grown across the world, the need for water-efficient and climate-resilient crops has increased more than ever. To meet this need, researchers from the University of Nevada, Reno have recently published a study that shows that Cactus pear, due to its high heat tolerance and low water use, may be able to provide fuel and food in places that haven't been able to produce sustainable crops. With climate change drastically affecting the rainfall patterns across the world, many climate models predict an increase in the intensity and duration of droughts in the years to come. This will not only result in extremely high temperatures but would also lead to a depletion of the water table. As traditional crops like soybeans, rice, and maize require an intensive source of irrigation to provide high yields, a shift to water-efficient crops is crucial for the future.

[A plant gene may help crops resist heat stress](#)

(University of Hawaii)

As global warming threatens to decrease crop yields, a newly discovered gene may help plants resist heat stress, strengthening our agricultural response. The findings are part of a new study from the University of Hawai'i at Mānoa College of Tropical Agriculture and Human Resources Department of Molecular Biosciences and Bioengineering (MBBE). One enzyme stands out: protein disulfide isomerase-9, or PDI9, which the researchers discovered can provide heat protection during pollen development, one of the most heat-sensitive processes in plants. "The PDI9 enzyme is involved in folding the enzymes that control the construction of the pollen cell wall, and therefore plays a central role in the cellular and metabolic mechanisms that facilitate heat stress acclimation and 'thermotolerance' in plants," explained lead researcher David Christopher.

[Gene editing reduces burnt toast risk](#)

(Producer)

Burnt bread contains a compound known as acrylamide, a chemical that can cause cancer. The darker the toast, the more acrylamide in the bread. While most people toss black toast in the trash, some do

like dark brown toast. However, plant scientists in England have found a way to reduce the cancer risk from toasted bread. The scientists used gene editing to design a type of wheat that produces less acrylamide when bread made with it is toasted. "Acrylamide has been a very serious problem for food manufacturers since being discovered in food in 2002," said Nigel Halford, a plant scientist with Rothamsted Research. Wheat doesn't contain acrylamide, but it does have a natural chemical called asparagine, which turns into acrylamide during baking, toasting or processing at high temperature. A wheat cracker would contain some amount of acrylamide. The cancer risk from brown toast or Ritz crackers is probably very low, but the Rothamsted scientists used genome editing to "knock out" the gene that produces asparagine in wheat. In one type of wheat, they were able to reduce the amount of asparagine by 90 percent.

[Clemson researcher seeks to make peanuts and wheat easier to digest](#)

(SC Now)

Peanuts and wheat are nutritional powerhouses, but they contain protein allergens that can be detrimental for some people. However, a Clemson University researcher believes that if he can target these proteins, he can breed for safer, low-allergenic varieties. "Wheat and peanut are primary sources of energy and proteins, specifically to populations in the most populated areas of the world," Sachin Rustgi told scientists during the recent online meeting of the American Society of Agronomy, the Crop Science Society of America and the Soil Science Society of America. "On the flip side, these crops are listed among the 'Big 8' major food allergens by the U.S. Food and Drug Administration." Rustgi and his colleagues are using plant breeding and genetic engineering to develop less allergenic varieties of peanuts and wheat. Their goal is to increase options for people with allergies to these foods. His research is conducted at Clemson's Advanced Plant Technology Program housed at the Pee Dee Research and Education Center. "Our research primarily focuses on the development of genetic resources to breed safe crops for people experiencing these foodborne disorders," said Rustgi, an assistant professor of molecular breeding for the Department of Plant and Environmental Sciences.

[Hotter, drier, CRISPR: Editing for climate change](#)

(Phys Org)

Gene editing technology will play a vital role in climate-proofing future crops to protect global food supplies, according to scientists at The University of Queensland. Biotechnologist Dr. Karen Massel from UQ's Centre for Crop Science has published a review of gene editing technologies such as CRISPR-Cas9 to safeguard food security in farming systems under stress from extreme and variable climate conditions. "Farmers have been manipulating the DNA of plants using conventional breeding technologies for millennia, and now with new gene-editing technologies, we can do this with unprecedented safety, precision and speed," Dr. Massel said. "This type of gene editing mimics the way cells repair in nature." Her review recommended integrating CRISPR-Cas9 genome editing into modern breeding programs for crop improvement in cereals.

[Study uses CRISPR gene editing to study function of insect salivary enzyme](#)

(Hortidaily)

Like a scene from a horror movie, tomato fruitworm caterpillars silence their food plants' cries for help as they devour their leaves. That is the finding of a multidisciplinary team of researchers, who said the results may yield insights into the abilities of crop plants—such as tomato and soybean—to withstand additional stressors like climate change. "We have discovered a new strategy whereby an insect uses saliva to inhibit the release of airborne plant defenses through direct manipulation of plant stomata," said Gary Felton, professor and head of the Department of Entomology at Penn State, noting that stomata are tiny pores on plant leaves that regulate gas exchange, including plant defensive emissions and carbon dioxide, between the plant and the environment.

[Kochi firm develops yellow tomato](#)

(The New Indian Express)

A group of scientists at AgriGenome Labs, Kochi, has successfully demonstrated the application of the CRISPR Cas9 technology in plants. The result was developing a tomato that is yellow in colour which contains higher levels of pro-lycopene, the precursor to anti-oxidant lycopene. The team achieved this by editing the gene that codes for CRTISO, an enzyme responsible for making the red pigment

lycopene (all trans-lycopene). The research led by Dr George Thomas and Dr Boney Kuriakose was held in collaboration with SciGenom Research Foundation and SciGenom Labs.

The global seed industry has come together to sign a Declaration committing to support achievement of the United Nation's Sustainable Development Goals (SDGs) and proactively demonstrate its extensive and diverse contributions towards sustainable food systems, while calling for more urgent public private cooperation.



The illustration shows four green seedlings of increasing size growing from a layer of brown soil. In the background, a semi-circular rainbow wheel is partially visible, set against a gradient sky transitioning from blue to yellow. The ISF logo is in the top left corner.

We, the actors of the private seed sector, representing its diversity, acting as individuals or as representatives of co-operatives, family-, small-, medium sized- or multinational companies, based around the world, are committed to a future where enough affordable, safe and nutritious food is produced for all without compromising the economies, societies or environments of future generations.

"SEED AS THE STARTING POINT"
Seed Sector Declaration ahead of the UN Food Systems 2021
