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I wish you all a Happy New Year 2022! I want to start the Year with renewed commitments toward our shared goal of making quality seeds accessible to farmers, help them reap benefits by pushing forward for future proofing agriculture through new innovations.

While we are producing enough food to support population, inaccessibility has broadened the gap of people with malnutrition and has been further increased in this pandemic. Our role as scientists, researchers and policy makers should be to develop and provide access to technologies and innovations to help farmers produce more with less effort, food should be packed with nutrients and vitamins and most importantly make it accessible to the entire strata of people.

Escalating threats such as climate change, natural calamities, health pandemic is an indication to transform our agri-system and safeguard our livelihood through sustainable agriculture. Innovations and science such as biotechnology, gene editing have to be put at the forefront to deal with the impending challenges. There are more evidence now that these technologies work and are helping farmers worldwide. While we had several discussions, now is the time to ease all regulations and make way for science to undo the human impact that has threatened the natural resources.

We also need to focus on increasing the pipeline of research and development through public and private investments. Institutions should minimise duplication in R&D by facilitating partnerships for inclusive, efficient, resilient and sustainable agriculture. Good practices, knowledge transfer and transparent dissemination of information will also go a long way to build an inclusive sustainable agriculture. Apart from research, using big data in agriculture, natural resources and food can strengthen the decision making and gather evidence to build trust on the technology. Finally, capacity building of farmers and inclusion of youth in agriculture is paramount to make agriculture profitable and sustainable.

We believe this new year will see supportive and predictable policies and programmes, conducive regulations to help farmers get better quality inputs, help industry to keep investing in R&D and enabling healthy diets for consumers by getting access to quality food. Above all, we believe this year will see transformation in food systems that addresses malnutrition, food insecurity and hunger.

The challenges posed by Covid has pushed boundaries and now we know that decisions made in one country can have a direct impact globally. FSII and AAI look forward to your continued support in advancing innovation in agriculture, future proofing farmers' livelihood and strengthening food security.

We have covered news around several important developments on agriculture across India, globally and in the area of research in this newsletter. We hope you find it a good read!

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News from India and Around the World

Why breeders are looking at the past for tomorrow's wheats

(Farmers Weekly)

Over the past century, breeding has played a major role in improving winter wheat performance, with yields increasing from an average 5.5t/ha in 1979 to 7.8t/ha at harvest 2021. But selecting for yield over the years has come at a cost, having indirectly reduced crop robustness, leaving wheat exposed to a range of pests, weeds and disease. Now, faced with growing concerns about chemical resistance, mushrooming input costs and very small annual yield increases, where does this leave the future of wheat breeding? We take a look back at the pivotal breeding moments that shaped today's modern wheat and discover how past cultivars could help unlock a range of genetic traits to improve wheat production for the future.

Importance of Gene Editing For Food Security And Environmental Sustainability

(Krishi Jagran)

World's population is growing rapidly, and it is creating an array of challenges for food security. Fast-shrinking green cover to make ways for agriculture production has raised concerns in the wake of climate change showing its effects. There needs to be a viable and sustainable a mechanism that ensures adequate food production as well as reduces the stress on the ecosystem. We need to look for advancements in plant breeding that can support sustainability. Through various research done by scientists globally, gene editing technology has proven its usefulness in helping farmers conserve water, reducing crop inputs even as ensuring optimum and even higher crop output. Gene editing is crucial for food security and environmental sustainability.

China food security: vow to boost 2022 soybean output sets stage for leap in GM seed tech

(SCMP)

China's efforts to lift domestic production of soybeans and other oil crops could accelerate the approval of genetically modified (GM) seeds and shake up the seed industry, analysts said.

At the weekend's central rural work conference, China's top leadership pledged to keep people's rice bowls filled with domestic grain, setting a 2022 production target at least equivalent to this year's 650 million metric tonnes. "The general consideration next year is to stabilise domestic grain supplies and corn output, while expanding soybean and oil crop production," agriculture minister Tang Renjian said in an interview with the official Economic Daily.

China likely to issue first safety certificates for transgenic seeds by end-2021: analyst

(Global Times)

Chinese regulators are likely to issue the nation's first batch of safety certificates for genetically modified seeds by the end of 2021, in a bid to boost the commercialization and standardization of transgenic germplasm, an analyst said, after the central rural work conference held over the weekend stressed food security. Prior to the key policy meeting, China adopted the revised Seed Law, which will take effect from March 1, 2022. The law will boost the commercialization and standardization of genetically modified (GM) germplasm. The first batch of safety certificates for GM seed will be issued by the end of this year or in early 2022, Wang Gangyi, a professor at Northeast Agricultural University, told the Global Times.

GMOs A Tool Of Colonialism? Debunking A Popular 'Social Justice' Myth
(American Council on Science and Health)
Today, many scientific discussions are shot through with social justice rhetoric, and the debate over food security in the developing world is no exception. Battling hunger isn't just about raising living standards, in part, by giving farmers access to important technologies like biotech crops but confronting “colonial legacies” and embracing “Indigenous knowledge systems.” Those of us who challenge this narrative have embraced a technocratic version of reform that “is colonial in its reliance upon and perpetuation of the logic of conquest.”

China could approve more GM corn produced domestically
(Feed Strategy)
China plans to approve more genetically modified (GM) corn varieties produced in the country, according to a Reuters report. China said in November that a regulatory overhaul of the seed industry could lead to market availability for recently approved GM seed traits developed by Chinese companies. The new corn products that could receive approval include ND207 produced by China National Tree Seed Corp. and China Agricultural University, Zheda Ruifeng 8 made by Hangzhou Ruifeng Biotech Co. and DBN3601Tfrom Beijing Dabeinong Biotechnology Co., according to the website of the Ministry of Agriculture and Rural Affairs. In this year’s annual rural policy document published by the State Council, China said it wanted to increase its grain yields by 2025 and gain support for its domestic seed industry, with the aim of greater food security. The policy document, known as the No. 1 document, put new priority on the seed sector and aims for faster implementation of scientific advancements in breeding, as well as “industrial application of biological breeding,” which includes genetically modified crops.

What prices do countries pay by failing to adopt genetically modified crops?
(Farmers Review Africa)
Two new papers aim to quantify the social welfare and economic costs that countries inflict upon themselves by restricting the use of biotechnology in agriculture. Though the global production of GM crops generated an estimated $57 billion in farm-gate revenues in 2016, widespread cultivation of GM crops could have generated an additional $65 billion, with developing countries reaping most of those gains, asserts a paper published by the Council for Agricultural Science and Technology (CAST). Extrapolating similar insights, a paper published in the Journal of Student Research (JSR) notes that GM crop production has resulted in increased farming efficiency, lower production costs due to the reduction of agricultural inputs such as pesticides and rising incomes for developing countries. Despite widespread and compelling literature on the potential of GM crops to increase farming efficiency and spur economic growth, the researchers cite various market and regulatory factors that encumber the full realization of these benefits. They note that trade barriers targeted at GMOs reduce access to food, limit farm revenues and increase overall prices.

Plant Based Protein Market Worth $23.4 Billion By 2028
(GlobeNewswire)
Scientists and the rice sector are ready to use the new gene editing tools to develop rice varieties more adapted to climate change, although they fear that European legislation will put a brake on transgenic rice. This has been expressed by more than a hundred international experts in rice genetics who have met in Barcelona (Spain) in the framework of the 18th International Symposium on Functional Rice Genomics.

The USDA's new labeling for genetically modified foods

(Seattle Times)

Labels at the grocery store are getting a makeover on foods that have been genetically modified. The goal was to get rid of the patchwork of different labels for foods and ingredients that have been scientifically tinkered with, according to the U.S. Department of Agriculture. However, the move, which started Jan. 1, also puts a greater burden on consumers to do their homework to understand what the labels mean, food advocates say. Foods that previously were labeled as containing "genetically engineered" (GE) ingredients or "genetically modified organisms" (GMOs) will now be labeled as "bioengineered," or come with a phone number or QR code guiding consumers to more information online.

Gene editing legislation to focus on crops - UK minister

(Reuters)

Britain's farming and environment minister George Eustice said that government legislation to ease the regulatory regime for gene editing after breaking away from EU rules would initially focus on crops, not farm animals. The minister announced last year that regulations related to gene editing in agricultural research would be eased following a public consultation, but more widespread use of the technology would require primary legislation. Gene editing is subject to the same rules as genetic modification in the EU but differs in that it does not result in the introduction of DNA from other species. "If we want to reduce our reliance on synthetic chemical pesticides in order to improve the environment, if we want to be able to breed crops that are more drought resilient and can help us deal with the effects of climate change, we need to have some of these tools in the box," Eustice said, without setting out a timetable for the legislation.

Scientists now have advance tools for plant breeding

(Deccan Chronicle)

All living organisms are the reflection of the genes they are born with and genes evolve over generations. The basis of evolution is variation and natural selection of the better variant. Agriculturists have been using this phenomenon for selecting variants with desirable traits in crop plants. The panicle of rice, cob of maize, watermelon or tomatoes consumed today are a far cry from their ancestors that were smaller, hardier, fatty, fibrous and not so flavourful. The natural changes that occurred over generations are the foundation of plant diversity, drive evolution and continue to provide opportunities for adaptation to new environments and changing climates. As farmers learnt more about the biology and genetic basis of traits, they were able to produce variations using chemicals and select for the desirable features. Thus, expediting the process of crop improvement.

New Research

Inside the Project to Genetically Modify Rice to Emit Fewer Greenhouse Gases

(Time)

A cup of tea in 2006 changed genetic engineering forever. Jill Banfield, a University of California at Berkeley ecosystem scientist and 1999 MacArthur Foundation fellow, had become curious in 2006 about mysterious repeating DNA sequences that were common in microbes that live in some of the planet's most extreme environments, such as deep-sea heat vents, acid mines and geysers. She just needed a biochemist to help explain what the sequences known as Crispr/Cas9 were, and ideally somebody local. The best scientist-location tool available to the highly decorated PhD researcher—a web search—recommended a Berkeley RNA specialist named Jennifer Doudna. The two met for tea at a campus lunch spot. Doudna hadn't heard of Crispr, a kind of microbial immune system, and was intrigued. So much so that over the next few years she would go on to solve the sequence's structure, which turned out to be something of a miraculous cut-and-paste tool for DNA. The discovery heralded a new era of genomics that is revolutionizing science and multiple industries and earned Doudna half the 2020 Nobel Prize in chemistry.

CRISPR technology could improve corn's nutritional profile

(Baking Business)

Origin Agritech Ltd. is developing nutritionally enhanced corn using CRISPR technology. The Beijing-based agricultural technology company is developing new corn varieties that have been genetically engineered (GE) to have balanced amino-acid content. Maize (corn) protein contains fair amounts of sulphur-containing amino acids methionine and cystine, but it is deficient in the essential amino acids lysine and tryptophan, according to the Food and Agriculture Organization of the United Nations. CRISPR gene editing does not introduce foreign DNA into corn and more closely mimics gene mutations that frequently occur in nature, according to Origin Agritech. It also costs less money and takes less time to develop GE corn using CRISPR than using traditional GMO technology. “We are very excited to be working on this industry leading application of CRISPR in agriculture,” said Gengchen Han, PhD, chairman of Origin Agritech. “Our nutrition balanced corn trait would not only significantly reduce the need for costly additives in animal feed, it will also pave the way for many more applications of CRISPR technology.”

Heat-Proofing Plants for Food Security May Bank on Ancient Defenses

(Gen News)

Earlier studies showed a steroid hormone called brassinosteroid, which promotes plant growth, plays a role in heat stress signaling but the underlying mechanism was not known. In a new study published in The EMBO Journal titled, “Transcription factor BES1 interacts with HSFA1 to promote heat stress resistance of plants,” researchers at TUM claim to have discovered what contributes to the protective ability of brassinosteroids. The activity of brassinosteroids is controlled by a sub-family of DNA binding transcription factors called BES1/BZR1 that can flip the switch for decoding the genetic code from off to on and vice versa. In this study, Poppenberger’s team used a small flowering plant model that grows in temperate climates (Arabidopsis thaliana, thale cress) to provide evidence that BES1 contributes to heat stress signaling, clarifying how brassinosteroids protect against heat stress. The researchers showed BES1 interacts with another class of DNA binding transcription factors called heat shock factors to increase synthesis of heat shock proteins. Therefore, when BES1 activity increases, plants become more resistant to heat stress, and when its activity decreases, they become more sensitive to rising temperatures.

Nutritionally charged lettuce developed with CRISPR/Cas gene editing tech

(Food Navigator)

A scientist in Israel is ‘tricking’ lettuce into producing nutrients in higher quantities thanks to gene editing technology CRISPR/Cas. FoodNavigator hears how. Yarin Livneh, a PhD student at the Hebrew University in Israel under the supervision of Professor Alexander Vainstein is backing new plant breeding techniques - otherwise known as gene editing - to help overcome global challenges. 'I am a great enthusiast when it comes to the applications of plant genome modifications, "she explained. "I believe a lot of the challenges our world is facing today - such as climate change, malnutrition, pollution, and disease risk - could be tackled with the aid of genetically improved research." Livneh's most recent research is leveraging gene editing technology CRISPR/Cas to do exactly this, we were told: to improve the nutritional quality of an agricultural crop.

The tomatoes at the forefront of a food revolution

(BBC)

At first glance, it looked like any other plant that can be found growing in the corners of offices or on the windowsills of university laboratories. But this particular tomato plant, grown in 2018 at the University of Minnesota, was different. The bushy tangle of elongated leaves and small red fruits were characteristic of a wild species of tomato plant native to Peru and Ecuador called Solanum pimpinellifolium, also known as the red currant tomato. A closer inspection, however, made the plant's uniqueness more apparent. This particular plant was more compact, with fewer branches but more fruits than the wild tomato. Its fruits were also a little darker than was usual, a sign of increased lycopene – an antioxidant linked to a lower risk of cancer and heart disease. It had, in fact, been designed that way. The plant was created by geneticist Tomas Cermak and his colleagues with the use of Crispr gene editing, a Nobel Prize-winning technology which works like a "cut and paste" tool for genetic material. The technique is now revolutionising agriculture and helping create crops for the future.