



Farmers are the front liners and the first crucial point in the entire food supply chain. It is their tireless commitment towards growing food which is keeping the entire world running. Unfortunately, when it comes to respecting their choice of adopting any innovation or technology in the field, it is the naysayers whose voices are mostly heard. With the ongoing pandemic, climate change, growing demand for food owing to the rise in population, farmers need tools like GM technology to produce enough food to feed the billions of people.

While after the success of Bt Cotton, Indians have not been able to share their next agricultural revolution, however, the country has tremendous potential in Agricultural biotechnology. It is a sector where global collaborations by both private sector and public institutions can have significant positive impact on the sustainable productivity improvement. GM technology can tap into the vast pool of genetic resources to improve crops to provide economic benefits to farmers, nutritional benefits to consumers and make a positive impact to the environment. The best-known example of such improvement in India is insect resistant Bt cotton. Since its adoption in 2002, India from being net importer, became an exporter of cotton and the largest producer of cotton in the world. Insect resistant cotton alone, has contributed a 43% reduction in the total volume of active ingredient used on GM crops (-249.1 million kg active ingredient, equivalent to a 27.9% reduction in insecticide use). With over a decade of its adoption, several socio-economic studies have proved the benefits this technology has brought to our country.

We are the largest importer of pulses (4 million tons/annum) with an approximate value of INR 14000 crore per annum and the consumption is growing every year. Agricultural biotechnology can help us to produce sufficient volume of pulses and oilseeds to meet our domestic demand thereby bridging the production gap and saving valuable foreign exchange for the country. Pulses are attacked by lepidopteran insects and introduction of insect resistance in some of the pulses, rice and vegetables will significantly help in increasing the production. It is estimated that introduction of Bt chickpea alone can result in increasing production by 2 million tonnes per annum, reducing imports worth Rs INR 6000 crore per year. India being one of biggest producer of Rice, utilises high amounts of insecticide with an estimated market size of INR 2500 crore. Pest and disease resistance rice will see a major reduction in the use of pesticides with the associated environmental benefits. Introduction of insect resistant trait in vegetable crops like brinjal, okra, cabbage and tomato will reduce huge crop losses and result in lesser pesticide residues. Vegetables utilize an estimated Rs. INR 1200 crore worth

of insecticides. It is to be highlighted that Bangladesh has been growing Bt Brinjal for the last four years, reaping all its benefits with no adverse effects.

More than 12 food and non-food crops have been grown and consumed worldwide. However, the critics of the technology often state that countries in the European Union (EU) do not grow or consume GM crops. However, EU has approved record number of research field trials and it is the largest importer of GM products from countries like USA, Canada, Brazil and Argentina. Most of the maize and soybean imported into EU is genetically modified. Other western economies such as USA, Canada, Australia are growing GM crops and many of the Asian countries such as Japan, Korea, China, The Philippines, Indonesia, Bangladesh, Malaysia, Pakistan either grow or import GM crops. In Philippines, the introduction of GM maize has resulted in cost advantage of 10% to the farmers over a decade. In 2011, total benefit of GM corn in the Philippines was around USD 400 million. Countries like Vietnam, Indonesia and Pakistan have also commercialized the GM maize technology.

GM crops are safe to grow and consume. This technology is the one of the most regulated technology in the world. The Indian regulatory agency Genetic Engineering Appraisal Committee (GEAC) consists of experts from all relevant organizations to review the biosafety of these crops. Interestingly, Bangladesh government accepted the review of biosafety of Bt Brinjal by the GEAC and approved its commercial cultivation. Finally, people around the world have been consuming products of biotech crops for more than 20 years and there is not even a single verified case of any concern on human health. It is estimated that more than 3 trillion meals have been served which contain products of biotech crops.

We are one of very few developing nations that has the human resource and capability to develop this technology on our own. Instead of losing this talent and capability, India can set an example and become the world leader in biotechnology.

In this newsletter, we have captured interesting developments such as USDA's relaxation on some gene-edited plants, need for innovative technology in agriculture in India, Bolivia speeding up the evaluation of genetically modified events of five crops etc and research work from around the world in the agri industry. We hope you find it a good read.



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AgBiotech News

[United States relaxes rules for biotech crops](#)

(Science Mag)

A major change to U.S. regulation of biotech will exempt some gene-edited plants from government oversight. The new policy, published in the Federal Register today, also calls for automatic approval of variations of established kinds of genetically modified (GM) crops, easing their path to market. Industry groups are welcoming the new rule, whereas opponents are decrying the reduction of government oversight.

[Will a new USDA rule on GMO plants affect consumer sentiment?](#)

(Food Dive)

It comes as no surprise that regulations are being streamlined on plants produced through genetic modification. Although the technology and its use are still controversial, it's something that's been done, developed and improved for 30 years. That's more than enough time to build a base of

knowledge and find ways to make regulation more efficient. Through this rule, USDA puts its focus on plant and crop safety, and which policies and procedures make sense for both those developing crops and individuals who actually do the regulating on the government's end. In a Q&A document published by USDA in conjunction with the new rule, it states this rule is intended to help spur agricultural innovation and development.

[Need for innovative technology in agriculture - Dr Shivendra Bajaj, FSII](#)

(ANI)

The uniqueness of the region lies in agriculture being more than just a profession, it provides sustenance and livelihood and is entwined with social and cultural beliefs. Ironically, agriculture has seen the least modernization in India than any other sector. There are many aspects that can be modernized in India and be up to date with the rest of world such as mechanization, post-harvest, logistics but everything starts with a better seed. Plant breeders in India have been improving crops and keeping up with the demand by developing new varieties either with the existing gene pool within the country or by bringing new germplasm from across the world and testing its suitability for India either as such or by crossing with existing Indian germplasm. The later part is very important to understand that we are constantly bringing new germplasm from outside India to improve our existing varieties. The breeding tools available to scientists have also undergone a major overhaul over the last few years with some tools only being available to Indian scientists

[SA moves step closer to growing GM crops](#)

(Grain Central)

South Australia's Parliament has taken another step towards legalising the commercial cultivation of genetically modified (GM) crops, voting to approve a bipartisan compromise framework to allow GM crops to be grown on mainland SA, but not Kangaroo Island. South Australia has had a moratorium on the growing of GM crops since 2004. Under the compromise framework, all mainland local councils will have a time-limited ability to apply for designation as a GM-free area for trade and marketing purposes. Councils which believe they derive a premium from GM-free status can apply to the Minister for Primary Industries and Regional Development in the next six months to retain the moratorium for their council area. The final decision on whether that exemption is granted will reside with the Minister. The moratorium will remain on Kangaroo Island.

[Feed Your Mind: FDA's New Education Initiative on Genetically Engineered Foods](#)

(Latin Times)

GMO is a common term used by consumers to describe foods that have been created through genetic engineering. While GMOs have been available to consumers since the early 1990s and are a common part of today's food supply, research shows consumers have limited knowledge and understanding about what GMOs are, why they are used, and how they are made. The U.S. Food and Drug Administration (FDA), with the U.S. Department of Agriculture (USDA) and U.S. Environmental Protection Agency (EPA), launched Feed Your Mind, a new Agricultural Biotechnology Education and Outreach Initiative. The Initiative aims to increase consumer awareness and understanding of genetically engineered foods or GMOs.

[African nations warm to crop biotechnology for potential food security gains](#)

(GLP)

Though only a few African countries are now growing genetically modified (GM) crops commercially, governments across the continent are increasingly recognizing the crucial role that biotechnology can play in improving food security. In response, African governments are moving to establish an enabling policy framework to support adoption of biotechnology, including GM crops and derived products, according to a paper published in *Frontiers in Plant Science* by John Komen and five other scientists working in Africa.

[Insect-resistant Bt cotton failed in India, claims 'unprecedented' study. Prominent geneticist says report by anti-GMO authors designed to seed doubt about crop biotech](#)

(GLP)

Farmers around the world have cultivated genetically engineered (GE) crops for nearly thirty years. In that time, researchers have gathered a substantial amount of evidence confirming the safety and

utility of GE traits. Many developing countries, after years of intense political debate, are examining this research and beginning to approve the release of crops with GE traits to achieve food security and make farming a viable enterprise for small landholders. Critics of biotechnology, however, continue to challenge the cultivation of GE crops with outright fearmongering or, less frequently, sophisticated obfuscation of the benefits provided by GE technologies. Interestingly, some well-respected science journals on occasion feature opinion articles and research suggesting that the benefits of GE technology have been minimal.

[Legal challenge fails to stop Kenya's food imports](#)

(Alliance for Science)

A Greenpeace-endorsed lawsuit to prevent Kenya's government from importing maize to ease predicted food shortages has been rendered moot due to a typographical error. Raising the specter of food safety, Kenyan activist Okiya Omtatah had filed suit to stop the imports, winning a temporary stay from the nation's High Court and praise from Greenpeace. The legal move came as Kenya is struggling to deal with significant crop losses caused by heavy rains, flooding and a locust invasion, as well as a food chain disrupted by the effects of the novel coronavirus pandemic.

[Why Ethiopia needs to embrace gene-modification technology](#)

(Ethiopia Observer)

For a very long period of time, Ethiopia lacked the capacity to introduce mechanized farming and other relevant agricultural technologies. Further, it lagged far behind many (African) countries in developing its policies and relevant practices with regard to the application of plant genetic engineering technology. Arguably the most unhelpful effort on part of the Ethiopian government in the last decade has been the introduction of the Biosafety Proclamation No. 655/2009. It is possible that this proclamation was enacted as a genuine effort to protect the local farmers and the country's agriculture sector from control by a few foreign biotech industries and create a formidable safeguard against potential fallouts from untended consequences of releasing GM crops. However, it is clear from the outset that the proclamation lacked proper scrutiny by all the relevant stakeholders, not least farmers' representatives or experts from agricultural research centers in the country. In addition, it failed to recognize the potential of local agro-biotechnology research and innovation and was oblivious to the rapidly changing focus of the debate and policy shifts surrounding this emerging technology from around the world.

[Could Kenya FTA open new biotech potential in Africa?](#)

(Bilaterals)

Anti-biotech activists and sentiment are entrenched throughout Africa, but U.S. farm groups and businesses are hoping a free-trade agreement with Kenya will help the country break through its GMO barriers and provide an example to other nations of what the science can do for farmers and food security. The U.S., home to an agriculture sector that heavily depends on biotechnology to produce soybeans, corn, cotton and sugar, announced on March 18 that it would begin negotiating an FTA with the East African country that still bans the technology despite a growing interest in using it. Many African countries still look to Europe, with its open distrust of genetically modified food, as a policy role model, but desires to use biotechnology are gaining ground in countries like Ethiopia and Kenya.

And Kenya, for its part, appears ready to take on the role. Scientists there have been developing genetically modified crops to fight off disease, pests and survive drought conditions for years, but the ban and the strength of activists have been holding the country back. Biotech advocates are now hoping that will all soon change as the East African country draws closer to cementing new ties with the U.S.

[The 'Guardian' Of Honest Journalism? Hardly.](#)

(ASCH)

We grew up in an era when the mainstream media reported the news straightforwardly, but now much of it is bought and paid for. In other words, it is propaganda – defined as information, especially of a biased or misleading nature, used to promote or publicize a particular political cause or point of view. For decades, The Guardian has been a predictable source of disinformation and fear-mongering about molecular genetic engineering in agriculture, including a sympathetic description of

Greenpeace's rationale for the wanton destruction of genetically engineered crop research, and stories supporting critics of genetic engineering. The Guardian even had the audacity to run a story claiming that "Father of the Green Revolution" Dr. Norman Borlaug, killed millions, when in fact his research arguably saved a billion people from starvation.

[Book review: Activist-friendly 'GMOs Decoded' paints a misleading picture of crop biotech](#)

(GLP)

Sheldon Krimsky's latest book, *GMOs Decoded*, has a foreword by Marion Nestle, an emeritus professor at New York University and prolific author on the politics of food safety. Discussing the controversy over genetically modified organisms (GMOs), Nestle notes that "scientists argue that if GMOs are safe, they are fully acceptable and no further criticism is justified. But to nonscientists, safety is only one of many concerns about GMOs and not necessarily the most important.... Even if GMOs are safe, they still may not be acceptable for reasons of ethics, social desirability, unfair distribution, nontransparent marketing, or inequitable and undemocratic control of the food supply." But what if, as I believe, many of these doubts in the public mind were put there or encouraged via decades of concerted maligning of the general class of genetically modified (GM) products by groups specifically organized to oppose them? What if much of the public concerns over GMOs are the result of billions of dollars spent by "organic" lobbies in the United States, and huge agricultural subsidies for non-GM agriculture in the European Union (reported by the New York Times as amounting to \$65 billion annually)?

[Bolivia to Speed Up Evaluation of GM Crops](#)

(ISAAA)

Interim President Jeanine Añez of Bolivia issued a Supreme Decree authorizing the National Biosafety Committee to speed up the evaluation of genetically modified (GM) events of five crops namely corn, sugarcane, cotton, wheat, and soybeans. The decree was made in response to the country's current quarantine status due to the coronavirus pandemic. Supreme Decree 4232 states that the National Biosafety Committee will establish an abbreviated evaluation procedure for the said GM crops to address the country's internal food supply as well as agricultural products for export. The Committee was given 10 days to come up with the shortened evaluation procedure. The decree also states that during the evaluation, the Ministries of Environment and Water, and of Rural Development and Lands will consider the actions and measures taken by Bolivia's neighboring countries when developing agricultural and food products using the GM technology.

[More farmers to join fight against ban on GM crops](#)

(The Hindu Business Line)

The Shetkari Sanghatana (SS), the apex body of farmers in Maharashtra, will join hands with farmers in Punjab, Haryana, Uttar Pradesh, Madhya Pradesh and Gujarat to launch an agitation to sow GM seeds starting from June 12. SS President Anil Ghanwat said that farmers in these States will defy the government ban on GM crops and sow GM seeds. He said that to get technology freedom, farmers should openly sow GM seeds instead of doing it secretly. He further added that the current Kharif season will be celebrated as 'Technology Freedom Season'. Farmers will sow GM seeds of cotton, corn, rice, mustard, soya, and brinjal, said Ghanwat, announcing that farmers are ready to face action for breaking the law.

[Transgenic crops: end of an era](#)

(Producer.com)

The USDA announcement will encourage crop science companies to dedicate more resources to gene editing and other technologies. Plant breeders will certainly gravitate towards gene editing because of a more clear, predictable and efficient regulatory pathway. Also, because the cost of that technology is much more affordable. USDA decision is relatively new but the transition away from genetically modified technology is not. Since about 2015, plant breeders have focused more attention on technologies like CRISPR-Cas9, a gene-editing tool developed by scientists at the University of California, Berkeley. Plant scientists also know much more about the DNA of major crops because the genomes of wheat, canola, corn and other crops have been sequenced. Researchers can use that knowledge to identify useful genes in a crop, such as wheat, from cultivars around the globe and then

employ gene-editing tools to design a new and improved variety — maybe a wheat that uses nitrogen more efficiently.

[Enlarging Asia's Food Basket with Gene Editing](#)

(Asian Scientist)

Asia Pacific region is the largest and one of the most diverse in the world, with significant variations in climate, levels of development and urban/rural population distribution. It is home to 60 percent of the world's population, including the two most populous countries in the world, China and India. The variations across the region also result in differences in agricultural production capacity, making some countries more vulnerable to food security risks than others. There is less of a potential for stigma towards gene editing—CRISPR specifically, seeing as it is front and center in the public eye when it comes to the latest biotechnology—because it builds on an organism's naturally occurring genetic material to produce benefits that are immediately apparent for farmers and consumers.

Research

[Breeding a fungal gene into wheat](#)

(Science Mag)

Every year, infection of wheat by the fungus *Fusarium graminearum* results in losses of ~28 million metric tons of wheat grain, valued at \$5.6 billion. The disease is becoming more prevalent because of increasing cultivation of maize (also a host for the fungus) and reduced tillage (ploughing) agriculture, which promotes fungal survival on last season's plant debris. Wang et al. reveal the molecular identity of the *Fusarium* head blight 7 (Fhb7) gene, which encodes a glutathione S-transferase that detoxifies DON. This gene was acquired through a “natural” fungus-to-plant gene transfer in a wild wheat relative. This naturally occurring genetically modified (GM) wheat strain is therefore exempt from regulation and can be grown directly by farmers.

[Newly identified gene reduces pollen number of plants](#)

(Eurekalert)

The evidence supports the theoretical prediction that reduced investment in male gametes is advantageous. This is not only important for evolutionary biology but also for the practice of plant breeding and domestication in general. Many crop plants have a reduced number of pollen due to domestication. Lowering the cost of producing pollen may increase crop yield. On the other hand, too few pollen grains might be an obstacle to breeding and seed production. The study opens the way for molecular breeding of the optimal pollen number.

[Scientists unlocking heat-tolerant wheat](#)

(RIPE)

Researchers working on molecular-level responses in crops have taken a step closer to their goal of producing heat-tolerant wheat. This benefits the sustainability of the food system by protecting food supply as the climate changes. In plants, Rubisco activase (Rca) tells the energy-producing enzyme Rubisco to kick in when the sun is shining and stop when the leaf is deprived of light, in order to conserve energy. A team of researchers from Lancaster University have found that swapping one molecular building block out of the 380 that make up Rca in wheat enables it to activate Rubisco faster in hotter temperatures. This, the researchers believe, suggests an opportunity to help protect crops from rising temperatures.

[Non-GMO gene editing: New technique edits plant DNA without use of 'foreign' bacterial genes](#)

(NC State University)

An NC State researcher has developed a new way to get CRISPR/Cas9 into plant cells without inserting foreign DNA. This allows for precise genetic deletions or replacements, without inserting foreign DNA. Therefore, the end product is not a genetically modified organism, or GMO. In a new study published in the journal *Plant Cell Reports*, Wusheng Liu, a plant biologist and biotechnologist in the Department of Horticultural Science, demonstrated a new way of introducing the Cas9 protein and guide RNA into plant cells, which does not involve foreign DNA. This was the first time anyone has come up with a method to deliver the Cas9 protein through lipofection into plant cells. The major achievement was

to make that happen. Also, since many consumers prefer non-GMO specialty crops, this method delivers the Cas9 protein in a non-GMO manner.

[New plant gene editing approach improves speed, scalability and heritability](#)

(Nature.com)

A study recently published in Nature Plants outlines a new approach that may significantly speed the development of new plant varieties by skipping tissue culture and boosting heritability. The technique, developed by Evan Ellison, a graduate student in the lab of Dan Voytas, a professor in the College of Biological Sciences' Department of Genetics, Cell Biology and Development, draws on the ability of RNA viruses to effectively deliver genetic information to plant cells. Ellison collaborated on the study with Voytas, a master's student in the Voytas lab, and colleagues at the University of California, Davis. RNA viral vectors – natural viruses that are stripped down and disarmed before being repurposed – are one of several ways to deliver genetic information. Ellison's approach opens up a novel avenue for experimentation.

[Applying genomic resources to accelerate wheat biofortification](#)

(Nature)

The recent publication of a high-quality wheat genome sequence, alongside gene expression atlases, variation datasets and sequenced mutant populations, provides a foundation to identify genetic loci and genes controlling micronutrient content in wheat. We discuss how novel genomic resources can identify candidate genes for biofortification, integrating knowledge from other cereal crops, and how these genes can be tested using gene editing, transgenic and TILLING approaches. Finally, we highlight key challenges remaining to develop wheat cultivars with high levels of iron and zinc.

[De novo RNA sequencing analysis of *Aeluropus littoralis* halophyte plant under salinity stress](#)

(Nature)

The study of salt tolerance mechanisms in halophyte plants can provide valuable information for crop breeding and plant engineering programs. The aim of the present study was to investigate whole transcriptome analysis of *Aeluropus littoralis* in response to salinity stress (200 and 400 mM NaCl) by de novo RNA-sequencing.

[Genome-wide analysis of expression quantitative trait loci \(eQTLs\) reveals the regulatory architecture of gene expression variation in the storage roots of sweet potato](#)

(Nature)

Dissecting the genetic regulation of gene expression is critical for understanding phenotypic variation and species evolution. However, our understanding of the transcriptional variability in sweet potato remains limited. Here, we analyzed two publicly available datasets to explore the landscape of transcriptomic variations and its genetic basis in the storage roots of sweet potato. Our study provides the first insight into the genetic architecture of genome-wide expression variation in sweet potato and can be used to investigate the potential effects of genetic variants on key agronomic traits in sweet potato.
