After the success of Bt Cotton In India, since 2002 no other GM crop has been released in India. While farmers have been demanding for such technologies to improve crop productivity and control insect attack, nothing has been approved by the Government so far. Research and development are the only way to discover the efficacy of the crop and field trials are an integral part of this process. Recently, a company In India has successfully completed Event Selection Trials (EST) with maize and cotton events and is now planning to conduct the BRL1 trials. A No Objection Certificate (NOC) from the State government is mandatory to conduct BRL1 trials. The company approached many State governments including Karnataka, where the applications were reviewed by the Department of Forests, Ecology and Environment. The Department obtained opinion from the Vice Chancellors and Director of Research of the respective State Agriculture Universities, where these trials shall be conducted. The Department then published an advertisement in a newspaper seeking the public opinion (objections/comments) to conduct these confined field trials.

Since 2010 Bt Brinjal moratorium, this new rule mandated industry to seek NOCs from states for conducting trials with GM crops, after GEAC (Genetic Engineering Appraisal Committee) had given the permission for confined field trials. As expected, most of the states, under the influence of vested interests and unscientific arguments, have not been giving NOCs and is creating a huge obstacle in the research work, since field testing is an integral part of the research and regulatory work.

This problem is now further compounded by GEAC asking the applicant to get the NOC from the states before issuing their approval for conducting field trials. Through this rule, a process of approving field trials which should have been a science based regulatory assessment process, is converted into a political and public consultation process which will have disastrous results. In the absence of a uniform scientific process for issuing NOC the Forests and Environment and Agriculture departments of states may resort to seeking public opinion on such applications. Public consultation on a research experiment can only be valid and unbiased when the public has a good understanding of the technology. At the research stage, consultation should be sought from subject matter expert instead of resorting to other means like public consultation, which puts unnecessary burden on the public. In the absence of GEAC's advance approval the States should consider the experts advice for approval. Public consultation will become purely political, and it may be hijacked by activists which more than often results in backtracking the research initiative.

Instead, the government should notify some crop testing sites which are under the control of ICAR and state agricultural universities and would allow companies to conduct trials in those sites without any need for NOC from state governments. This would have helped in generating scientific information for assessment of technology. In fact, we have been hearing about the proposal to have designated field trials sites for the last several years, but no final decision or announcement has been made.

The time and investment that goes into developing a product and for conducting field trials needs a science-based outcome. Public consultation for a research experiment also highlights that the technology is undervalued, despite it addressing serious agricultural issues like fall armyworm in maize or bollworms in cotton for which our farmers are struggling. Decisions based on public consultation may set a wrong precedence for many other States who have been approached for NOC in present and will be approached in future. Such unpredictable regulatory environment will kill technology development and investments by private industry.

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

Shivendra Bajaj
Executive Director
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News from India and Around the World

OFAB And Black-Eyed Peas — An Agri Revolution In The Making?

(Daily Trust)

Controversy still surrounds genetically modified (GM) foods in many parts of Africa but for one woman pushing a continental farming revolution, the potential results of planting a crop of modified cowpeas are simply too significant to resist. It's been over a year since Nigeria released the world's first genetically modified cowpea – also known as the black-eyed pea – and the legume's most vocal supporter is thrilled with the results. So much so that she has taken to airwaves across the country advocating that farmer take advantage of the made-in-Nigeria, Pod Borer Resistant Cowpea, or PBR Cowpea, to massively increase yields. Country Director for Nigeria's Open Forum on Agricultural Biotechnology in Africa (OFAB), Dr Rose Gidado, has even become known as Mama OFAB, thanks to her tireless campaigning to see the genetically improved legume, which is resistant to the pest Maruca vitrata, planted by farmers. Her excitement, she said, is based on the results seen so far.

Can native and conventional crops coexist with GM and gene-edited varieties? The case of Honduras

(GLP)

Even if a GM crop succeeds in its path to environmental release, it faces subsequent coexistence measures implemented in each region. In the European Union, these measures are not strongly science based. In the United States and Canada, isolation is the main way to prevent gene-flow. Meanwhile, in developing nations there still is a lot of work to do since, due to the lack of capacity

and resources to make their own regulations to address coexistence. Most developing countries use the regulations from the EU, which are not adequate to their reality and domestic dynamics in their food production systems. In some coexistence regulations – as the European Union – marks as fundamental the right that consumers have the ability to decide if they want to eat genetically modified or non-genetically modified food. This concern is not applicable in regions like Latin America, Africa, and Asia, where in some cases the decisions are not based on what kind of food the consumer will prefer, but rather if the consumer will have any access to food at all. This creates some of the most problematic situations to apply foreign regulation in domestic scenarios.

World Cotton Day: Shaping the future of cotton

(The Hindu Business Line)

Cotton, recognised for its versatility, forms the backbone of India's textile industry and truly so India is indisputably one of the largest producers of cotton in the world, accounting for nearly 26 per cent of the world's cotton production. However, while the country prominently occupies the largest area – 12.5 to 13.5 million hectares – under cotton cultivation globally, its yield per hectare (roughly 459 kg/ha) still falls short of the global average (757 kg/ha).

World Cotton Day - Bt Cotton's advent into making India World's largest producer

(Asian Age)

In nature, pests keep on evolving to survive and try to attack the plants and especially crops. Plants on the other hand, develop their own defence mechanisms to keep these pests at bay. The genes responsible for these defence mechanisms either can be present in the crop plants itself, their wild relatives or in other organisms which are sexually non-compatible. Scientists try to find the genes that can help plants to supplement their defence against these pests. In most crops, the host defence genes are reassembled and added to the crops so that the development of resistance by the pests can be prevented. In some crops, there are no or very limited genes which can provide resistance. Cotton is a major example, in which host genes for resistance against cotton pests are not there. Therefore, development of transgenic Bt cotton which provide resistance against major bollworms has provided a major relief to farmers for more than two decades. Bollworm pests on the other hand, have evolved and tried to develop resistance against Bt cotton. Therefore, the argument that Bt Cotton has led to resistance development in insects is simply not true.

Viewpoint: Part 2 — Which developing countries are taking the lead in crop biotechnology innovation?

(GLP)

In Part One of this series, we "set the stage" for the economic reasons for acceptance of GM foods in developing countries, and the effects of global NGOs and other organizations that oppose GMOs. Part Two examines specific actions countries are taking to approve GM (and gene edited) foods and crops. African nations have been in the forefront in recent years in adopting GE crops. On December 19, 2019, for example, Kenya approved the growing of Bt cotton after five years of field trials. Commercialization began in March of 2020. Kenya joined a growing list of African countries that cultivate GMO crops. They include South Africa (cotton, corn and soybeans), Nigeria (cotton and cowpeas), Eswatini – formerly Swaziland – (cotton), Sudan (cotton), Malawi (cotton) and Ethiopia (cotton).

Gene-edited crops: expert Q+A on what field trials could mean for the future of food

(The Conversation)

Gene editing can also change a plant's water requirements, producing crops that need less water to grow. In 2018, scientists discovered that by altering the expression of a gene that is found in all plants, they could make tobacco plants 25% more water efficient. Now they are testing this technique on food crops, like lettuce. The idea is to make crops more resilient to droughts, which are likely to become more frequent and severe in many growing regions as the world warms. I have written before about removing food allergens with gene editing, by effectively silencing genes associated with allergens. A biotechnology company based in the US has patented a process for making hypoallergenic peanut plants. The company hopes to produce other plants as part of a partnership with nearby Fayetteville State University.

Bio-fortified crops expected with new biotech center: DA

(PNA)

The agriculture sector can now develop, innovate, and generate various products or crops that will enhance the competitiveness of Philippine agriculture with the unveiling of the Crop Biotechnology Center (CBC) at the Philippine Rice Research Institute (PhilRice) in Nueva Ecija. The CBC, one of the three biotechnology centers under the Department of Agriculture (DA), aims to advance biotechnology research for development and innovation, and generate various products that will also push for food security and climate change resiliency.

'Approve norms for gene-edited plants without delay'

(The Hindu Business Line)

Pro-biotechnology intellectuals of IAAG tell PM that research has been hit With an "inordinate delay" in pronouncing safety norms for gene-edited plants delaying research, a group of pro-biotechnology intellectuals and scientists have written to Prime Minister Narendra Modi, expressing concern over the undue delay. Seeking his attention to hasten the process, the India Agriculture Advancement Group (IAAG) International said that the Draft Guidelines for Safety Assessment of Genome and Gene-Edited Plants were already reviewed by an expert committee constituted by the Department of Biotechnology (DBT).

This Tomato Is the First CRISPR-Edited Food to Go on Sale

(Inside Hook)

Perhaps you're munching on the Sicilian Rouge High GABA tomato, the first CRISPR gene-edited food to go on sale as of late September, according to New Scientist. "We started shipping the tomatoes on September 17," says Minako Sumiyoshi of Sanatech Seed, a Japanese start-up selling the tomatoes directly to consumers. She also calls the tomatoes a "significant milestone for CRISPR foods" and adds that demand for the tomatoes is "not too bad." So, what exactly are Japanese consumers eating? These tomatoes actually started out as gene-edited seedlings that were purchased by over 4,200 farmers, which are now ripe enough to sell. As IFLScience points out, these modified tomatoes have reduced levels of an enzyme that breaks down Gamma aminobutyric acid (GABA), an inhibitory neurotransmitter. Result? Research suggests this now-increased level of GABA may have a calming effect on the body. And there might be more concrete evidence that GABA supplementation reduces high blood pressure.

Gene editing can help agriculture adapt to climate change and meet UN Food Systems Summit goals

(GLP)

Gene editing continues to show great promise for developing more resilient and climate-smart crops to counter the mounting threat of climate change and its adverse effects on global food security, new research shows. With its vast potential to alleviate food insecurity and improve the livelihoods of vulnerable populations, gene editing as an agricultural production tool complements the vision of zero hunger and climate action espoused in the United Nations Sustainable Development Goals (SDGS). The 2021 UN Food Systems Summit, [on] September 23 at the UN General Assembly in New York, aims to provide a platform for ambitious new actions, innovative solutions and plans to transform food systems and leverage these shifts to deliver progress across all of the SDGs. Recent research identified gene editing as a progressive biotechnology tool that has revolutionized crop improvement in terms of increasing production amid the rapid climatic shifts that are rendering older farming systems untenable.

Nigerian farmers just can't get enough of GMO cowpea seeds

(Alliance for Science)

Nigeria is witnessing a shortage of genetically modified cowpea seeds as farmer demand for the insect-resistant crop dramatically outstrips supply. Public sector scientists who developed the high-yielding variety have struggled to produce enough certified seeds to meet the huge demand as farmers who planted it in trials last year spread the news about how it helped protect their fields from attacks by the voracious pod borer pest. Nigeria approved commercial use of the pod borer

resistant (PBR) cowpea in December 2019. Hajia Dijesaidu, coordinator of the Small-Scale Women Farmers Organization, said she first planted the GM cowpea seeds last year and got higher yields and reduced pest pressure. After she invited some members of her association to see the fields, they all demanded the new variety. “They see that it gets more yields, and it didn’t consume money [on insecticide sprays]. It gives less work and less spraying. I sprayed the farm only twice. Our previous seeds, we spray about 10 to 12 times before we harvest it,” she told the Alliance for Science during a recent visit to her farm in Nigeria.

How America became dependent on corn is a weird story of genetics and politics
(Salon)
While the 1,500 miles of America's corn belt might mislead you into thinking corn is a wild crop, it was actually created roughly 9,000 years ago through selective breeding of a Mexican grass called teosinte. Geneticists have determined that farmers who likely lived in what is now Mexico's tropical Central Balsas River Valley must have seen food potential in the thin, extremely hard teosinte in their area, which would have only had a handful of kernels on their tiny cobs. Despite living in small societies and traveling with the seasons, the indigenous farmers managed over thousands of years to breed a variant that did not pack its kernels in hard cases, had cobs that stayed intact when you tried to pick off kernels and could be easily managed as a large-scale crop. This was the corn discovered, and introduced to the world, by Christopher Columbus in the late 15th century. The final result is a crop that not only does not exist in the wild, but could not exist in the wild. As Indiana Public Media wrote in 2009, "the seeds are all crammed together on the cob and wrapped tightly inside the thick husks. Seems impossible for the seeds to disperse without a human to peel the husks and separate the kernels."

Gene editing has ‘limitless potential’ to reduce malnutrition, says global food expert
(Alliance for Science)
Gene editing is a tool with unlimited potential to help reduce malnutrition globally, said Dr. Lawrence Haddad, executive director of the Global Alliance for Improved Nutrition (GAIN). The world needs the technology because billions of people are struggling to access the nutritious meals required to stay healthy, Haddad said. The leader of GAIN, a Switzerland-based foundation launched by the United Nations in 2002 to reduce malnutrition worldwide, made his remarks during an Alliance for Science-hosted Food Systems Summit independent dialogue. Haddad also chairs the upcoming Summit’s Action Track 1, which is charged with ensuring access to safe and nutritious food. “The potentials seem limitless in terms of what can be done with gene editing and CRISPR… it’s going to take brave, bold activist governments to make that a reality,” Haddad said.

Gene editing has to go ahead, even in Scotland
(The Times)
Imagine that an extraordinary scientific discovery promised the ability to eradicate hunger, transform agricultural productivity and significantly enhance animal welfare. Imagine that the techniques first used on crops and domesticated animals could cleverly be deployed to eliminate some inherited diseases in humans and perhaps even offer the tantalising possibility of curing cancer. Then imagine that your government refused to allow any of this to happen in your country. Alas, there is no need to imagine any of this because these discoveries are already here and the Edinburgh government is not having any of it. Changing the world may be fine for other nations but in Scotland we hide from the future.

Public urged: Take part in science-based discussions on biotech products’ safety
(Business Mirror)
Gene editing is among the technologies that can be used to improve farm productivity and mitigate the effects of climate change, a biosafety expert said recently. Dr. Carl Ramage, managing director of Rautaki Solutions Inc., gave this statement at the recent webinar, “SOLVE Public Info-sufficiency on Genome-edited Crops,” where he and Dr. Saturnina Halos, president of the Biotechnology Coalition of the Philippines, presented the global and local perspectives on genome editing technologies and biosafety regulations, respectively. Ramage shared several examples of genome editing regulatory approaches implemented in countries, such as Argentina and the United States.

He said that the commercialization of gene-edited products depends on a clear pathway to market; an effective value capture model; and clear and harmonized regulatory requirements.

Agri self-goal: R&D underpins India's food security. That's why GM needs decisive intervention
(The Times of India)
From around the early stage of the Green Revolution, ICAR has developed 5,334 improved field crop varieties, an important contributor to the development of food security. Since then technology hasn't been static. The most important development was the advent of genetically modified (GM) crops in mid-1990s. India was an early adopter of GM crops when the regulatory body, Genetic Engineering Appraisal Committee (GEAC), cleared the cultivation of Bt cotton in 2002. However, subsequently GM crop technology has run into two obstacles. Opposition to the technology itself, which is often rooted in fear mongering. And the diffidence of governments, both GoI and states. But this hasn't either kept GM out of the food market in India or prevented the spread of other GM crops.

South Africa' success with GMO White Maize - lessons for the continent
(Farmers Review)
African countries in the south of the Sahara have a lot to learn from South Africa's successes in Genetically modified plant agriculture. The southern Africa country appears for significant triumph in its quest for greater food security, thanks to its embrace of agricultural biotechnology. For a continent that perennially grapples with a cute food shortages and recurrent droughts, amplified in many instances by stark poverty and unhelpful food production policies, South Africa has been doing pretty well.

Creating the crops we need to save our future
(Israel21)
Israeli startup plans to genetically change the architecture of many types of crops to enable mechanized picking. If that sounds a bit too scientific, the company's CEO and founder Ido Margalit points to one common, successful example – ketchup. "Without one genetic trait that was discovered in tomatoes a few decades ago we wouldn't have had ketchup or tomato concentrate industries. Because how is it that you pay so little money for ketchup that is made from so many kilograms of tomatoes?" The answer, Margalit says, lies in the development of industrial tomatoes.

New Research

Warmer Temperatures May Decrease Yields of Densely Planted Corn
(NC State University)
Higher temperatures could have detrimental effects on yields when corn plants are planted more closely together, according to a study from North Carolina State University. Corn yields in densely planted areas drop by about 1.86 percent with every 1 degree Celsius rise in monthly minimum and maximum temperatures through the planting season, the study's models show. Interestingly, reduced yields may be higher in conventionally bred corn than in genetically modified corn, the study models predict, suggesting that GM plants may have less need to fight for nutrients and moisture when stressed by higher temperatures. The study's findings could help farmers make better decisions about crop density and variety – whether conventional hybrid or GM crops – before planting season, based on forecasted temperatures. "We wanted to learn more about how crop yield response to planting density is influenced by higher temperatures," said Rod M. Rejesus, professor of agricultural and resource economics at NC State and the corresponding author of the study, which appears in the journal Agricultural and Resource Economics Review. "The models show that the yield benefits of crop density begin to diminish for conventional hybrid corn when temperatures rise, but GM corn yields remain relatively stable."

Unravelling the Genetic Mysteries of Maize
(Agweb)
From the hilltops and back corners of Mexico's traditional farms to the sterile potted corn plants at a greenhouse atop Iowa State's Bessey Hall, associate professor of ecology, evolution and organismal

biology, Mathew Hufford, is fixed on unlocking the genetic mysteries of corn. “If you see those deep red pigmented stems, you know that’s an adaptation to high elevation,” says Hufford, motioning to pots growing corn plants with the oddly colored stalks. He’s growing out a host of unique species of maize (corn) from the highlands of Mexico. "We're trying to understand, by assembling their genomes, what the genetic basis of that adaptation is," Hufford says. Genetic or genome mapping isn't new. The first maize map for a variety or species known as B73 was published back in 2009. That work took years of painstaking effort and millions of dollars to complete. Since then, geneticists have continued to map the genomes of other species of corn. "It's taken us a while to actually get the second, third and fourth genomes put together," Hufford explains. "Recently, over the last five years or so, there's been this big leap forward in terms of the technology of gene sequencing and genome assembly."

New rules will make UK gene-edited crop research easier

(Nature)

On 29 September, the country’s Department for Environment, Food and Rural Affairs (Defra) announced that by the end of the year, researchers who want to conduct field trials of gene-edited plants will no longer need to submit risk assessments. Researchers will still need to register their study plans with the department, however. The decision will save thousands of pounds and days of work that were needed to meet the previous requirements for even a small field trial, says Wendy Harwood, a plant biologist at the John Innes Centre in Norwich, UK. “We will now be able to test promising genome-edited plants in the field at the earliest opportunity, and to assess early on which plants show promise under real environmental conditions,” she says. “This is essential, as containment glasshouse conditions can never cover the full range of environmental conditions.”

Improving soybeans reduces the cost to farmers and the environment

(Purdue)

Instead of relying solely on nitrogen in the soil, soybeans and many other legumes can pull nitrogen from the air for their growth – a natural process that is environmentally friendly and also increases soil nitrogen levels for the next crop in rotation. Plant science research at Purdue University has found a potential way to double soybean plants’ use of the process, called biological nitrogen fixation. “We are working to enhance the plant’s efficiency at utilizing the atmospheric nitrogen, so that we can reduce the need for fertilizer,” says Jianxin Ma, who led the study. “This is better for the farmer and better for the environment.” When fields become depleted of nitrogen, heavy doses of expensive and environmentally damaging fertilizer must be added to maintain yields, says Ma, a professor of agronomy in the Purdue University College of Agriculture who was recently honored by the Crop Science Society of America. Soybeans provide one quarter of the world’s edible oil and two thirds of the protein in livestock feed, and a beneficial change in the plant could impact approximately 300 million acres of farmland worldwide, he says. Using CRISPR gene-editing technology and other molecular techniques, Ma showed that soybeans have genes that suppress the formation of root nodules, where the nitrogen-fixing soil bacteria called rhizobia convert the atmospheric nitrogen into forms the plant can use. He also showed that some tiny RNA molecules produced by the beneficial bacteria can turn off the soybean genes slowing nodule formation. By precisely identifying the bacterial RNAs and mechanism involved in blocking the “detrimental” soybean gene, he discovered a path to increasing a plant’s efficiency at root nodule formation.

Research aims to increase crop drought tolerance using biotechnology

(Nevada Today)

John Cushman, foundation professor with the University of Nevada, Reno, has been awarded a $1.55 million grant from the National Science Foundation to conduct research on improving drought tolerance and water-use efficiency of plants to help preserve agricultural productivity in the face of rising temperatures and prolonged droughts. As droughts are becoming more frequent and severe and crop productivity is declining at an accelerated rate, Cushman, with the University’s College of Agriculture, Biotechnology & Natural Resources, is conducting work on a synthetic biology approach to allow the transfer of drought-tolerant traits from certain plants to major crops. The goal of his

research team in the Department of Biochemistry & Molecular Biology is to create drought-tolerant crops to aid global food production during periods of intense drought.

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