



We are pleased to share a video on gene-editing technology particularly focusing on the progress done by Indian scientists on Indian agriculture. The video is created by FSII and we have taken views of several prominent scientists who are working on important crops like banana, mustard and rice.

Banana is an important crop in several developing countries, in India too it adds as a household food, important for nutritional security and is also used as a source of income generation as a cash crop. India is the largest producer of bananas with an annual production of more than 29 million metric tonnes. Another important crop is mustard as India is heavily dependent on imports to meet two-third of its edible oils demand, as seen in 2019-20 it was worth 61.56 thousand crore rupees. Rice is another staple crop for India and it needs technological intervention to address challenges like soil salinity, improve genetic traits such as water use efficiency, nitrogen use efficiency, abiotic stress tolerance, grain quality and productivity.

The use of novel technology like gene editing has showed improvement in these staple crops. With the advent of genome editing as the next generation crop breeding technology, there are enormous opportunities to develop crops resistant to emerging pathogens and environmental stresses on a faster timescale, as compared to the conventional breeding approaches. However, to harness the full potential of these technologies, urgent attention is needed to simplify the process of regulation.

You can watch the full video through the link below.



[Click here](#)

We have also 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!



**Shivendra Bajaj**  
**Executive Director**  
**Federation of Seed Industry of India-Alliance for Agri Innovation**

## News from India and Around the World

### [Treating plants with biotechnology](#)

(Terraevita)

“The rest of the world...” warns Anna Meldolesi, “is not waiting for Europe.” CRISPR, the molecular scissors at the basis of genome editing, capable of precisely inducing a change in a specific area of the genome, have taken over from other techniques. European research is fortunately not immobile. In fact, in the Old Continent about 90 projects are underway, mostly supported by European funds for the application of new sustainable biotechnologies to agricultural crops. Most are concentrated in Germany (37), France manages 16 while in Italy there are 9, in our case held back by the big obstacle of not being able to carry out field trials (but something could change thanks to the presentation of a recent design by law. According to Bruno Mezzetti, one way to overcome the obstacle is to set aside Europe’s paralyzing and misinterpreted “precautionary principle,” and overcome the practice of evaluating the method and authorizing for cultivation product by product, as happens for importing the new biotechnological solutions.

### [Shetkari Sanghatana leader Anil Ghanwat writes to PM Modi; suggests economic reforms for farmers through biotechnology](#)

(Free Press Journal)

Swatantra Bharat Party President and Maharashtra based farmer organization Shetkari Sanghatana leader Anil Ghanwat in a letter to Prime Minister Narendra Modi has suggested technological and economic reforms for farmers. Ghanwat, who was also a member of SC appointed committee on farm laws, urged the PM to lift the moratorium on GM (genetically modified) crop approvals by February 16, 2022. Ghanwat said that India's farmers can feed a growing India, even as farmers' incomes grow rapidly, through biotechnology. He added that without high-yielding varieties of seeds that led to the Green Revolution, India could not have fed its growing population. The country needs the slogan: "Biotechnology to feed India, Natural farming to starve India," he said.

### [Here’s how GMO crops could reduce greenhouse gas emissions—particularly in Europe](#)

(AnthropoceneMagazine)

If the European Union adopted genetically-modified crops more widely across its farmlands, it could reduce its agricultural emissions by almost 10%. That result comes from a new study in Trends in Plant Science that is among the first to quantify the emissions-saving benefits of GM crops. In agriculture, GM plants are typically bred to contain traits that help them resist pests and disease, make more use of nitrogen in the soil, or produce bigger seeds and fruits, among other things. The objective of engineering these traits into plants is usually to boost their productivity—and the evidence so far suggests that it pays off. A global meta analysis showed that on average, GM crops are about 22%

more productive than regular crops. In principle, that means that by using GM crops, more food can be produced using the same amount of, or possibly even less, land. Research also suggests GM crops can reduce the need for pesticides, with benefits for human health

### [CRISPR: genome editing could also be an asset against climate change](#)

(Atlantico)

The CRISPR technique has many agronomic applications... which will revolutionize the agriculture of tomorrow in terms of phytosanitary inputs and fertilizers. There are also applications to improve the health of cultivated plants (increase resistance to diseases or pests) but also to modify the composition of harvested plants such as tomato biofortified in GABA ( $\gamma$ -aminobutyric acid), a neuromodulator amino acid that has a relaxing and reduces blood pressure, or even Innate<sup>®</sup> potatoes with a lower acrylamide content which, when heated (when making French fries, for example) turns into a carcinogenic product!

### [5 ways gene editing is making crops climate-resilient](#)

(GLP)

"The effects of climate change have already started to emerge and will undoubtedly worsen," states a September 2021 study in *Frontiers in Sustainable Food Systems*. "Global declines in yield and crop suitability are projected over the course of the century as a direct result of climate change." A number of industries and fields of science are investigating innovative technologies to mitigate the effects of climate change in agriculture. One of these methods is gene editing, a technique that facilitates programmable and highly accurate modifications to the genomes of organisms. These changes may involve deleting, silencing or inserting desired genes. Here are five ways in which gene editing is providing some much-needed climate resilience in agriculture.

### [Dramatic visual evidence of the insect-resistant power of Bt maize, without chemical treatment](#)

(GLP)

In clearing out my office recently I came across a DVD of the video *Life in a standard and in Bt maize field* that I had been given by Czech scientists in Prague some ten years ago. It is a wonderful examination of how insect life (of non-corn pests) thrives in the presence of Bt corn. In 2011-12 I was appointed as a Jefferson Science Fellow by the National Academy of Sciences and assigned as a science advisor to the office of Agricultural Biotechnology in the Bureau of Economics and Business in the United States Department of State. What, you may ask, is agricultural biotechnology doing in the State Department? The reason is twofold: Crops are a major US export and biotech crops are a significant part of these exports, and Countries with food security are less likely to be disruptive on the intranational scene; both of these are major concerns for diplomacy. (Note that the U.S. Government does not use the term GMOs.) During my time at State, I made six trips abroad, often to multiple countries, where I gave university and conference lectures, and consulted with scientists, academics, politicians, and farmers.

### [China's approval of gene-edited crops energizes researchers](#)

(Nature)

Researchers in China are excited by their government's approval of gene-edited crops, which they say clears the way for the plants' use in agriculture and should boost research into varieties that are tastier, pest-resistant and better adapted to a warming world. Since China's agriculture ministry released preliminary guidelines on 24 January, researchers have been hurrying to submit applications for the use of their gene-edited crops. These include the development of wheat varieties resistant to a fungal disease called powdery mildew, which are described in a paper in *Nature*.

### [What is stopping gene-edited food from saving our planet?](#)

(Interesting Engineering)

Last month, a Ph.D. student at the Hebrew University of Jerusalem bred a new strain of 'supercharged' lettuce that expanded its vitamin C and beta carotene content by 800 percent and 70 percent respectively. Yarin Livneh, working under the supervision of Professor Alexander Vainstein, developed the 'proof-of-concept' lettuce, which demonstrated that the nutritional qualities of lettuce can be increased using gene-editing techniques. "Lettuce is assumed to be very healthy, but it is poor

in nutrients when compared with other leafy vegetables," Livneh tells Interesting Engineering. Leveraging the technology of CRISPR-Cas9, a transformative tool for editing genomes that permits the rapid alteration of DNA sequences and modification of gene function, she altered the regulatory components of the vegetable, essentially "tricking" the lettuce into accumulating more nutrients, for the benefit of consumers. Livneh's experiment is just one recent example who was enamored with the technology whose developers received a Nobel Prize in Chemistry in 2020.

### [Plant breeding innovations](#)

(CIMMYT)

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.

### [Agency to provide guidelines, policies on GMO crop varieties, others](#)

(The Guardian)

The Federal Government has said it will provide efficient guidelines, programmes, policies and processes to improve its national biosafety system as the country is a genetically modified organism-adopted country. The Director-General, the National Biosafety Management Agency, Dr Rufus Ebegba, said this at a review meeting of draft national guidelines on genetically modifies plants with stacked gene in Abuja. Ebegba said: "GMO is a product of any living organism that contains genetically modified through additional gene from unrelated and sometimes related life form, and whose genes has been altered."

### [Biotech can slow down climate change in 5 ways](#)

(Business Mirror)

Climate change is an urgent global challenge. A study in 2019, led by the University of Minnesota with researchers from the University of Oxford and the University of Copenhagen, reports that climate change is already affecting global food production. The study found that climate change has caused significant yield decreases in the world's top 10 crops, while half of all food-insecure countries are experiencing a reduction in crop production. The accelerating pace of climate change, coupled with the growing global population and diminishing natural resources, threatens global food security.

### [Gene editing crucial for food security and environmental sustainability](#)

(The Tribune)

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. I believe, Gene editing is crucial for food security and environmental sustainability. Gene editing is most efficient since precise tweak to a living organism's existing DNA can be made. There is no addition of foreign material. Moreover, the tweaks are indistinguishable from naturally occurring mutations. CRISPR is a gene editing technique that allows changes to a specific "target" site in the genome. It was introduced in 2012, and since then it has transformed biotechnology. CRISPR technique holds huge potential to meet the existing and new agricultural challenges.

## **New Research**

### [GM versions of fall armyworm can effectively control the insect pest, study confirms](#)

(Alliance for Science)

Genetically modified insects offer a sustainable solution for controlling fall armyworm, a devastating agricultural pest that has already developed resistance to both insecticides and Bt crops, a new study

finds. The peer-reviewed research, published in BMC Biotechnology Journal, found that Oxitec Ltd.'s Friendly technology can effectively reduce populations of fall armyworm, offering hope for long-term protection against the pest.

### [\\$10M project aims for more pest-resilient food options in Asia](#)

(EurekAlert)

A new Cornell University-led project will accelerate the application of a proven biotechnology to enhance food and nutritional security in Bangladesh and the Philippines while protecting the health of farmers and the environment. The Feed the Future Insect-Resistant Eggplant Partnership is funded by a five-year, \$10 million grant from the U.S. Agency for International Development (USAID) as part of Feed the Future, the U.S. government's global hunger and food security initiative. The new award will continue efforts to introduce genetically engineered (GE) eggplant varieties that are resistant to devastating insect infestations and can reduce or eliminate the need for harmful pesticides. The multifaceted project takes up the complex challenge of science and policy. The work will empower scientists in Bangladesh and the Philippines to develop new, locally adapted varieties of eggplant while engaging with policymakers on clear regulatory pathways for their release. The goal, according to project director Maricelis Acevedo, research professor of global development, is a more prosperous, food-secure and gender-equitable future for Bangladesh and the Philippines.

### [Dhruv Patel is daring plants to take a risk](#)

(Alliance for Science)

Dhruv Patel is using gene editing tools to research photosynthesis, a process he first noticed in the parking lot of the Los Angeles motel his family managed. Patel observed plant biology in action as his grandmother and mom grew bountiful harvests, particularly vegetables from their faraway village in India. He was astounded by what he describes as an "absurd" amount of food grown in the spaces between chain-link fences and parked cars. Now, as a Rockey FFAR Fellow and a Ph.D. Candidate in the Niyogi lab at the University of California, Berkeley, Patel studies how plants cope with excess light to optimize photosynthesis. Photosynthesis, the process by which plants, algae and microorganisms convert solar energy to chemical energy, is the foundation of our food supply and life as we know it. Contrary to what most houseplant enthusiasts may believe, more light is not always better. In fact, most crop plants suffer from excess sunlight, which has the capacity to damage cells and their constituent proteins. Understanding how plants and algae dissipate surplus sunlight could have major implications for crop performance.

### [Can Synthetic Palm Oil Help Save the World's Tropical Forests?](#)

(Yale Environment 360)

The world's cheapest and most widely used vegetable oil, palm oil production is a primary driver of deforestation and biodiversity loss in the tropics. These and other problems with the palm oil industry, such as exploitative labor practices, have for years driven interest in more sustainable options. But good alternatives have proven difficult to come by. Last year, a startup called C16 Biosciences opened a gleaming new lab in Manhattan to develop a microbial palm oil alternative, backed by \$20 million from Bill Gates' climate solutions investment fund Breakthrough Energy Ventures. A California-based startup called Kiverdi is also working to manufacture yeast oil using carbon captured from the atmosphere, and a team of bioengineers at the University of Bath is at work scaling up its own strain of oily yeast.

### [Better coffee and bananas: Durham agtech startup Pairwise could hold the genetic key](#)

(Tech Wire)

Durham-based food technology startup Pairwise is going a little bit bananas...and coffee. The company – which uses its CRISPR-Cas9 gene editing know-how to develop new varieties of fruits and vegetables – has agreed to grant access to its base editing technology to U.K.-headquartered Tropic Biosciences. Tropic, as its name implies, focuses on improving big-acre tropical crops. It will use the technology to speed up plant breeding innovation in globally important coffee and banana harvests. "As a mission-driven company, we believe it is imperative to forge alliances with other visionary companies who can extend our mission of building a healthier world," said Ian Miller, chief development officer of Pairwise. "This deal with Tropic Biosciences is an important step in the development of new varieties

of tropical crops upon which billions of consumers and tens of millions of smallholder farmers rely, and further demonstrates the ability of our platform technologies to solve problems across the plant-based economy.”

### [Genetic engineering can have a positive effect on the climate](#)

(Science Daily)

The use of genetically modified (GM) crops in agriculture remains contentious, especially in Europe. According to surveys, many people fear that these could have negative effects for human health and the environment. However, a new study shows that genetically modified crops could actually be good for the environment, and for the climate in particular. Results suggest that the adoption of GM crops in the European Union (EU) could reduce greenhouse gas emissions considerably.

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