



India's first non-GM (genetically modified) herbicide-tolerant rice varieties has been developed by The Indian Agricultural Research Institute (IARI). It can be directly seeded, which significantly saves water and labour compared to conventional transplanting.

The varieties, Pusa Basmati 1979 and Pusa Basmati 1985, contain a mutated acetolactate synthase (ALS) gene making it possible for farmers to spray Imazethapyr, a broad-spectrum herbicide, to control weeds. These new varieties do not need to prepare nurseries where paddy seeds are first raised into young plants, before being uprooted and replanted 25-35 days later in the main field.

The varieties have been bred by crossing existing popular varieties — Pusa 1121 and Pusa 1509, respectively — with 'Robin'. The latter is a mutant line derived from Nagina 22, an upland drought-tolerant rice variety. The mutant was identified for Imazethapyr-tolerance by S Robin, a rice breeder from Tamil Nadu Agricultural University in Coimbatore, Tamil Nadu.

Imazethapyr is effective against a range of broadleaf, grassy and sedge weeds and can't be used on normal paddy, as the chemical does not distinguish between the crop and the invasive plants. The ALS gene in rice codes for an enzyme (protein) that synthesises amino acids for crop growth and development. The herbicide sprayed on normal rice plants binds itself to the ALS enzymes, inhibiting their production of amino acids. The new basmati varieties contain an ALS gene whose DNA sequence has been altered using ethyl methanesulfonate, a chemical mutant. As a result, the ALS enzymes no longer have binding sites for Imazethapyr and amino acid synthesis isn't inhibited. The plants can also now tolerate application of the herbicide, and hence it kills only the weeds.

Dr AK Singh the director IARI said that the new varieties simply replace water with Imazethapyr and there is no need for nursery, puddling, transplanting and flooding of fields. One can sow paddy directly, just like wheat. This gives an opportunity to farmers to save huge amount of water.

Transplantation in paddy usually requires about 30 irrigations, each consuming about 5 hectare-cm of water (one hectare-cm equals 100,000 litres). Puddling alone takes up about

15 hectare-cm. In comparison, DSR is estimated to need 30 per cent less water, save Rs 3,000 per acre in transplantation labour charges, and also 10-15 days' time due to no nursery preparation. These new DSR varieties gives new hope in sustainable rice production through resource use efficiency.

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



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

## **News from India and Around the World**

### **[Need to step up efforts to tackle climate change impact on agriculture, entire ecosystem: PM Modi](#)** **(Money Control)**

Stating that climate change is a big challenge for agriculture and the entire ecosystem, Prime Minister of India stressed on the need to step up efforts to fight it as he launched 35 crop varieties which are climate resilient and high nutrition content. During a virtual ceremony, he also inaugurated the newly constructed campus of the National Institute of Biotic Stress Tolerance, Raipur, Chhattisgarh. He also distributed the "Green Campus Award" to agricultural universities and interacted with farmers who use innovative methods, before addressing a gathering. The PM said, "Not only agriculture, climate change is a big challenge to the entire ecosystem. Due to climate change, new types of pests, new diseases, epidemics are coming. Due to this, there is a big threat to the health of humans and livestock and crops are also being affected."

### **[150.5 million tonne kharif foodgrain output projected](#)**

**(Hindustan Times)**

India has projected a record foodgrain output of 150.5 million tonne from summer crops (2021-22) despite an erratic monsoon, up 4% from the previous year. The government's first of the four quarterly estimates of food production, a key indicator of the country's farm sector that employs half of all Indians, pointed to plentiful harvests of rice, coarse cereals, maize, higher pulses, oilseeds, etc. Farm-produce output and agricultural gross domestic product (agri GDP) was robust in 2020-21, too, when the wider economy came to a standstill due to strict Covid-19 restrictions, pointing to resilience of the rural sector.

### **[New Technologies & Modernisation Of Agriculture Sector](#)**

**(Outlook India)**

The global hyperspectral imaging in the agriculture market is expected to reach \$56.88 million by 2026, with a CAGR of 11.93% during the forecast period 2021-2026, according to a recent study. The

study, titled “Global Hyperspectral Imaging in Agriculture Market: Focus on Product, Application, and Country Analysis - Analysis and Forecast, 2020-2026”, says that the growth rate in the market is because of the increased emphasis on precision farming around the world. The report asserts that due to the increasing global food demand, growers must adopt better ways for growing to maximize their yield increase production. The technology provides a wide range of solutions for the agricultural industry such as crop stress detection, pathogen detection, and monitoring. With improved technological advancements and better adoption of the technology, hyperspectral imaging will help drive the precision farming market globally.

### [Lankan food crisis shows perils of organic farming](#)

(The Times of India)

India has been moving towards organic farming. Narendra Modi has showered praise on “zero budget farming,” with no purchased chemical inputs. Sikkim claims to be the only state with 100% organic farming. Andhra Pradesh, Odisha and other non-BJP states are also enthusiastically encouraging organic farming. They should pause and learn from Sri Lanka’s agricultural crisis. President Rajapaksa banned the import of chemical farm inputs in April, hoping to make his country the first fully organic one. Alas, the result has been spiralling food prices, severe food shortages and fears of production crashes of export crops like tea and rubber.

### [Higher investment required in agriculture R&D: India says at G20 agriculture meet](#)

(The Hindu)

India stressed at G20 agriculture meeting that there is a need to increase investment in agricultural research and development amid the challenges of climate change and expected increase in food demand by 2030. The G20 Agriculture Ministers' Meeting is one of the ministerial meetings organised as part of the G20 Leaders' Summit 2021 to be hosted by Italy in October. Addressing a session on the topic 'Research as a driving force behind sustainability', Agriculture Minister Narendra Singh Tomar shared that agricultural research has played a major role in transforming India from a net food importer to exporter. "Today with an annual production of 308 million tonnes of food grains, India is not only in the realm of food security but is also catering to needs of other countries," he said and added India has experienced a revolution in the field of agricultural produce due to the efficient research of scientists.

### [Centre plans 3 lakh primary agriculture cooperatives in 5 years](#)

(The Times of India)

In the first major policy statement after the ministry for cooperation was formed, home and cooperation minister Amit Shah said that the centre will work with states and expand the number of primary agriculture cooperatives from current 60,000 to 3 lakh in the next five years. Addressing the first national cooperative conference, Shah said, “We will work with all states to take forward the cooperative movement.” Over 2,100 representatives of different cooperatives were present at Talkatora Stadium and nearly 6 crores took part online.

### [Agriculture Real Strength Supporting India's Fuel Energy Security: Nitin Gadkari](#)

(NDTV)

Road Transport and Highways Minister Nitin Gadkari referred agriculture as India's real strength and stated that the government intends to diversify it into the energy and power sector. While addressing the Bio-Energy Summit 2021, Gadkari said, "India's fuel energy security can be well supported by agriculture as it provides opportunities for concepts such as waste to wealth and waste to energy and ultimately leading to the benefit of all." He mentioned that the target will be achieved through a five-phased strategy: adopting biofuels and renewables, implementing energy efficiency norms, improving refinery processes, increasing domestic production and achieving demand substitution. Gadkari said the five-phased strategy uses a role for biofuels in the Indian energy basket.

### [Survey shows income of farmers has risen: Agriculture secretary](#)

(Hindustan Times)

Amid continuous protests against the contentious farm laws, a Situation Assessment Survey (SAS) of Agricultural Households, Land and Livestock Holdings of Households of Rural India, 2019, conducted

from January to December 2019 revealed a 59% surge in farmers' incomes that are not adjusted for inflation, on a nominal basis. The survey also showed that farmers' incomes adjusted for inflation -- which economists call real income -- have risen by about 2%. However, when the inflation-unadjusted incomes are distributed among the number of farming households to derive per capita farmers' incomes, one gets a figure of ₹27 a day.

### [UAE-US plan to drive farming revolution set for launch, US agriculture chief says](#)

(The National)

US Secretary of Agriculture Thomas Vilsack has said a US-UAE plan to fight hunger by driving research into new farming techniques was growing fast and would likely be launched at key climate talks in Glasgow starting next month. Mr Vilsack said the number of countries involved in the Agriculture Innovation Mission for Climate had tripled to 18 since it was unveiled at US President Joe Biden's climate summit in April and that research priorities were being identified. Once operational, the "AIM for Climate" initiative will drive research into innovations to boost agricultural output and feed the world's 800 million hungry people while cutting the industry's emissions of carbon dioxide and other heat-trapping gases.

### [The offshoring of American agriculture](#)

(Blue Book Services)

A new federal program is evaluating "the U.S. defense and public health industrial bases, information technology, transportation, and supply chains for food and agriculture" for possible reshoring, according to Thomas Industry Reports. Yet for many fruits and vegetables, offshoring continues to advance, with little possibility for reversal. A recent article in UC-Davis's Rural Migration news does not exactly tell us anything new, but it does encapsulate the situation in Florida. "Florida has been losing market share to Mexican imports in bell peppers, blueberries, tomatoes, and strawberries," says the article. "For example, Florida in 2000 provided 46 percent of the bell peppers consumed in the US between November and June; by 2020, the Florida share of a larger bell pepper market was 12 percent."

### [Rerouting billions in agriculture subsidies could boost global food security](#)

(Popular Science)

Agriculture is an extremely polluting and extractive industry, using up significant amounts of groundwater water in the United States and emitting greenhouse gases by picking, packaging, and then shipping food around the world. How agriculture is funded is part of the problem. The United Nations described how the current subsidies system contributes to pollution in a recent report. It was published by the UN Food and Agriculture Organization (FAO), the UN Development Programme (UNDP) and the UN Environment Programme (UNEP), in the days leading up to the UN food systems summit. What they found was that agricultural subsidies are hurting the planet—but that cold hard cash can be repurposed into more sustainable crops and other ways to make the industry more sustainable. Almost 90 percent of the \$540 billion of annual global government support to agricultural producers includes measures that distort prices and hurt human health and the environment, the report found. So many polluting aspects of agriculture like milk and beef tend to receive the most subsidies unlike vegetables.

### [Vietnam and Belgium boost agricultural trade](#)

(Hortidaily)

Minister Le Minh Hoan emphasized that over the past 50 years, Vietnam-Belgium cooperation has been promoted in many fields, including agriculture, and highly appreciated Belgium's close cooperation and support for the Vietnamese agricultural sector. 2018 marked an important milestone when the two countries became each other's strategic agricultural partners. Therefore, Minister Le Minh Hoan proposed to focus on promoting this strategic cooperation on the basis of effectively exploiting the potential and advantages of both sides.

### [Vietnam allows fully vaccinated people to produce, deliver agricultural goods](#)

(VN Express International)



The government has issued a directive allowing people who have received two doses of a Covid-19 vaccine to produce and deliver agricultural products. The directive, signed by Deputy Prime Minister Le Van Thanh, aims to promote production and exports in the key agricultural sector amidst the ongoing pandemic. Prime Minister Pham Minh Chinh has asked localities to prioritize vaccination for workers in the agricultural sector and to ensure that pandemic safety measures in safe and low-risk areas are favorable for workers to resume production. Localities should develop production and export plans for agricultural products to avoid disrupting production chains and promote agricultural growth, he said.

### [Youths in agriculture: Empowering, enabling sustainable agri environment for next gen](#)

(Manila Standard)

The findings in the study, "Aging Filipino Rice Farmers and Their Aspirations for Their Children," conducted by Florencia G. Palis of the University of the Philippines Los Baños showed Filipino farmers are aging fast and more than 65% of interviewed farmers do not wish for their children to follow their footsteps. Thus, posing a threat to food security in the country. Encouraging the younger generation to view agriculture and fisheries as viable business ventures requires information dissemination, training and empowerment. "We have numerous projects in the Department of Agriculture (DA) to support students and young agripreneurs to start their agri-fishery enterprise and realize their aspirations. Aside from these, the youth engagement in agriculture, like the AFY, is also one of the key strategies we are implementing under the 'OneDA Reform Agenda'." added Sec. Dar.

### [France's Roquette Warns Of Price Rise In Plant-Based Food Market](#)

(Successful Farming)

pea production slumped this year due mainly to a severe drought this summer in top supplier Canada that cut output by 45%, pushing prices up 120% from last year. Meanwhile in France the crop was severely damaged by wet weather during harvest. The global pea protein market is projected to increase about 12% per year to reach \$554.9 million by 2028, according to research firm Grand View Research. Other key ingredients of plant-based protein such as soybeans, corn and wheat have also seen prices rally over the past year on strong international demand and a lack of global supplies.

### [High Prices Spur Europe's Top Producers To Sow More Rapeseed](#)

(Successful Farming)

A surge in rapeseed prices this autumn will generate more rapeseed sowing in leading European rapeseed producers France, Germany and Britain. But poor weather means reductions are possible in Poland. Prices for rapeseed, Europe's most important oilseed for edible oil and biodiesel, have risen sharply on concern about tight global supplies, especially after estimates of Canada's crop were cut. "There's a lot of rapeseed being sown with the high prices and the good yields in the harvest," a French trader said. "This year rapeseed generated the best margins per hectare. Farmers are getting prices of close to 600 euros a tonne, that represents a very healthy gross margin."

### [Abu Dhabi to register agricultural farm leases](#)

(Khaleej Times)

All agricultural land lease contracts in Abu Dhabi will be registered so as to enhance the sector's legislative infrastructure and promote agricultural and livestock production. The Department of Municipalities and Transport (DMT) has issued decision No. 85-2021 to register agricultural land leases in Abu Dhabi. Each respective municipality will register farm leases, in accordance with applicable laws and regulations, after meeting the necessary requirements. The lessee should be a legal entity and the farm used in line with approved agricultural activities, specified by Abu Dhabi Agriculture and Food Safety Authority (Adafsa).

### [Cherry farming blooms in Kashmir, government to airlift produce to help farmers in marketing](#)

(Money Control)

Cherry farmers in Kashmir who were not able get most of their produce to the markets last year because of the COVID-19 pandemic are hoping for good returns this year. As the farmers were facing troubles in marketing their produce, government has come forward to help the growers sell their major food crop. As per reports, the government has signed a MoU with Go-Airlines to airlift the

produce from Kashmir Valley to various parts of the country and around the world. The move is aimed at benefitting farmers monetarily and ensures that the fruits are not damaged while waiting for buyers.

### [England to ease regulations on gene editing in agricultural research](#)

(Reuters)

Britain's farming and environment minister George Eustice announced on Wednesday that regulations related to gene editing in agricultural research would be eased in England following a public consultation. Rules will now largely be aligned with conventional breeding methods for research and development into plants although scientists will still be required to notify the government of any research trials.

### [Aloe vera village farmers jubilant after PM's pat in Mann ki Baat](#)

(The Times of India)

"We were chosen for training to adopt plantation of aloe vera by the Birsa Agriculture University in 2018 and at least three dozen villagers under Deori panchayat decided to try out cultivation of the medicinal plant instead of traditional crops like vegetables. The input cost is less, as we don't have to purchase seeds every year and the produce, mature leaves in this case, are readily sold."

### [Red Okra Variety Grown by Madhya Pradesh Farmer Is More Nutritious Than The Green One](#)

(News 18)

farmer in Madhya Pradesh is growing red okra (ladyfinger) in his garden. Middle-aged Misrilal Rajput hails from Bhopal district's Khajuri Kalan area. He sowed the seeds in July and in just 40 days, the crop started growing and now his garden is filled with red pods. "It is more beneficial and nutritious than green ladyfinger. It is extremely beneficial for people who are facing heart and blood pressure issues, diabetes, high cholesterol," said Rajput. According to Rajput, the market price for the red ladyfinger ranges from ₹75-80 to ₹300-400 per 250 grams or 500 grams. He claims that he did not use any harmful pesticides during the cultivation of this product. Rajput believes that one could grow about a minimum of 40-50 quintals and a maximum of 70-80 quintals on an acre of land.

## New Research

### [Chinese scientists complete starch synthesis from CO<sub>2</sub>, revolutionary for agricultural production and promoting carbon neutrality](#)

(Global Times)

The world top academic journal Science published a major breakthrough in the artificial starch synthesis made by a research institute of the Chinese Academy of Sciences (CAS). The research is the first time in the world to achieve synthesis of starch from carbon dioxide. Scientists believe it will have a revolutionary impact on future agricultural production and bio-manufacturing. Ma Yanhe, director of the Tianjin Institute of Industrial Biology (TIB) and corresponding author of the paper named "Cell-free chemoenzymatic starch synthesis from carbon dioxide," said that the institute designed a new pathway of unnatural carbon dioxide fixation and starch synthesis from scratch in an 11-step reaction.

### [India gets first herbicide-tolerant & non-GM rice varieties; launch today](#)

(The Indian Express)

The Indian Agricultural Research Institute (IARI) has developed the country's first-ever non-GM (genetically modified) herbicide-tolerant rice varieties that can be directly seeded and significantly save water and labour compared to conventional transplanting. The varieties — Pusa Basmati 1979 and Pusa Basmati 1985 — contain a mutated acetolactate synthase (ALS) gene making it possible for farmers to spray Imazethapyr, a broad-spectrum herbicide, to control weeds. This dispenses with the need to prepare nurseries where paddy seeds are first raised into young plants, before being uprooted and replanted 25-35 days later in the main field.

### [BHU scientists develop high yielding wheat variety](#)

(Hindustan Times)

A high yielding wheat variety -- Malviya 838-- developed by the scientists of Institute of Agricultural Science-BHU-- was dedicated to the nation by the Prime Minister of India. "This is a biofortified wheat variety and gives relatively higher output. It is rich in zinc and iron," professor Vinod Kumar Mishra said. The biofortified varieties are 1.5 to 3.0 times more nutritious than the traditional varieties. Wheat production in neighbouring Bangladesh has been adversely affected by a fungal disease Wheat Blast. Being a neighbouring country, there is a possibility of this disease coming to our country as it spreads through air. However, there is no effect of this disease on Malaviya 838. It is completely resistant variety. Therefore, if this variety is grown in the states of India adjacent to Bangladesh, then we can stop this disease from coming to India.

### [Clover growth in Mars-like soils boosted by bacterial symbiosis](#)

(Science Daily)

Clover plants grown in Mars-like soils experience significantly more growth when inoculated with symbiotic nitrogen-fixing bacteria than when left uninoculated. As Earth's population grows, researchers are studying the possibility of farming Martian soils, or "regolith." However, regolith is lacking in some essential plant nutrients, including certain nitrogen-containing molecules that plants require to live. Therefore, agriculture on Mars will require strategies to increase the amount of these nitrogen compounds in regolith. Harris and colleagues hypothesize that bacteria could play a cost-effective role in making Martian soils more fertile. On Earth, bacteria in soils help convert or "fix" atmospheric nitrogen into the molecules that plants need. Some of these microbes have symbiotic relationships with plants, in which they fix nitrogen within nodules found on plant roots.

### [Research to optimize hybrid seed production](#)

(Hortidaily)

Hybrid seeds are produced when crops are cross-pollinated to improve the characteristics of the offspring plants. Over the past century, the large-scale use of hybrid seeds has contributed to a revolution in agriculture production, both fortifying crops and increasing yields. However, hybrid seeds need to be generated afresh every season. The seed production process is labor-intensive and results in higher costs for farmers. To circumvent this production bottleneck, the Foundation for Food & Agriculture Research (FFAR) awarded a \$600,000 Seeding Solutions grant to the University of California, Davis (UC Davis) to develop hybrid plants which produce seeds that are genetic clones of the parent plant, substantially reducing their climatic impact and farmers' bottom lines.

### [Gene study shows how to get more out of sorghum without affecting natural resources](#)

(Down to Earth)

About 80 per cent of the crop's grain size characteristics depend on genes, and can thus be inherited, according to QAAFI Research Fellow Yongfu Tao. The quality of the yield can be improved without much alterations to environmental resources, such as water or nitrogen, he added. Tao used genetic information available for other cereals such as rice and wheat to identify the genes associated with grain size on the sorghum genome. Wild varieties of domesticated sorghum and Australian native sorghum were studied for over six years, the report stated. "New variants have been identified that are capable of doubling grain weight," the scientist said. He added: As many as 125 regions in the sorghum genome have now been identified where variation in the DNA sequence was associated with grain size and response to environmental conditions.

### [Sustainable irrigation based on co-regulation of soil water supply and atmospheric evaporative demand](#)

(Nature)

Irrigation is an important adaptation to reduce crop yield loss due to water stress from both soil water deficit (low soil moisture) and atmospheric aridity (high vapor pressure deficit, VPD). Traditionally, irrigation has primarily focused on soil water deficit. Observational evidence demonstrates that stomatal conductance is co-regulated by soil moisture and VPD from water supply and demand aspects. Here we use a validated hydraulically driven ecosystem model to reproduce the co-regulation pattern. Specifically, we propose a plant-centric irrigation scheme considering water supply-demand dynamics (SDD) and compare it with soil-moisture-based irrigation scheme (management allowable depletion, MAD) for continuous maize cropping systems in Nebraska, United States. We find that,

under current climate conditions, the plant-centric SDD irrigation scheme combining soil moisture and VPD, could significantly reduce irrigation water use (-24.0%) while maintaining crop yields, and increase economic profits (+11.2%) and irrigation water productivity (+25.2%) compared with MAD, thus SDD could significantly improve water sustainability.

### Reconciling regional nitrogen boundaries with global food security

(Nature)

While nitrogen inputs are crucial to agricultural production, excess nitrogen contributes to serious ecosystem damage and water pollution. Here, we investigate this trade-off using an integrated modelling framework. We quantify how different nitrogen mitigation options contribute to reconciling food security and compliance with regional nitrogen surplus boundaries. We find that even when respecting regional nitrogen surplus boundaries, hunger could be substantially alleviated with 590 million fewer people at risk of hunger from 2010 to 2050, if all nitrogen mitigation options were mobilized simultaneously. Our scenario experiments indicate that when introducing regional N targets, supply-side measures such as the nitrogen use efficiency improvement are more important than demand-side efforts for food security. International trade plays a key role in sustaining global food security under nitrogen boundary constraints if only a limited set of mitigation options is deployed. Policies that respect regional nitrogen surplus boundaries would yield a substantial reduction in non-CO<sub>2</sub> GHG emissions of 2.3 GtCO<sub>2</sub>e yr<sup>-1</sup> in 2050, which indicates a necessity for policy coordination.

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