

ACFI NEWSLETTER

MARCH 2024

Cabinet nod for ₹24,420-cr subsidy for P&K fertilisers

Subsidy on nitrogen (N), potassic (K) and Sulphur (S) has been kept unchanged for 2024 kharif season: Anurag Thakur, I&B Minister



Farmer-Friendly Approach

- Govt making available 25 grades of P&K fertilisers at subsidised prices
- Subsidy on P&K fertilisers is governed by the NBS scheme since 2010
- Govt has provided Rs 1.71 lakh cr as fertilisers subsidy till January

NEW DELHI

THE government on Thursday announced a Rs 24,420 crore subsidy on Phosphatic and Potassic (P&K) fertilisers for the kharif season and said the farmers will continue to get key soil nutrient DAP at Rs 1,350 per quintal. Along with DAP (Di-ammonium

Phosphate), the government asserted that retail prices of other major P&K fertilisers would remain stable. The Union Cabinet, chaired by Prime Minister Narendra Modi, has approved the proposal of the Department of Fertilisers for fixing the Nutrient-Based Subsidy (NBS) rates for the kharif season 2024-25 (April 1 to September 30) on P&K fertilisers. Briefing reporters, I&B Minister Anurag Thakur said, "A nutrient-based subsidy of Rs 24,420 crore on P&K fertilisers has been approved for the kharif season starting April 1 till September 30." The minister said the subsidy on Nitrogen (N) has been fixed at Rs 47.02 per kg, phosphatic (P) at Rs 28.72 per g, potassic (K) at Rs 2.38 per kg, and Sulphur (S) at Rs 1.89 per kg for 2024 kharif season, he said. In fact, the subsidy on phosphatic fertilisers has been increased to Rs 28.72

Cabinet approves ₹75k-cr rooftop solar scheme

NEW DELHI

THE government on Thursday approved a rooftop solar scheme, PM-Surya Ghar: Mufti Bijli Yojna, with an outlay of Rs 75,021 crore, to provide up to Rs 78,000 subsidy for the installation of solar plants and 300 units free power for one crore households. Briefing media after the Union Cabinet meeting, I&B Minister Anurag Thakur informed that approval has been given for the scheme for installing rooftop solar and providing free electricity up to 300 units every month for one crore households. "The Union

Cabinet, chaired by Prime Minister Narendra Modi, has approved PM-Surya Ghar: Mufti Bijli Yojana with a total outlay of Rs 75,021 crore for installing rooftop solar and providing free electricity up to 300 units every month for one crore households," an official statement said. The Prime Minister launched the scheme on 13th February 2024. The scheme provides a central financial assistance (CFA) of 60 per cent of system cost for 2 kW systems and 40 per cent of additional system cost for systems between 2 kW to 3 kW capacity. The CFA will be capped at 3 kW.

per kg for the 2024 kharif season from Rs 20.82 per kg in the 2023 rabi season.

However, the subsidy on nitrogen (N), potassic (K) and Sulphur (S) has been kept unchanged for 2024 kharif season. "With this subsidy, DAP which is sold currently at Rs 1,350 per bag (50 kg), will continue to be available at the same rate in the up-

coming 2024 Kharif season," the minister said. He also said Muriate of Potash (MoP) will also continue to be available at Rs 1,670 per bag, while NPK will be available at Rs 1,470 per bag. In order to reduce the import dependence on DAP, the cabinet also approved the inclusion of three new fertiliser grades under the NBS scheme.

Protests stress need for climate-smart agriculture



KOTA SRIRAJ

There is a pressing need for proactive measures aimed at protecting both farmer livelihoods and national food security



The ongoing farmer protests that began on February 13th have already claimed five lives and resulted in Delhi bearing the brunt of economic losses to the tune of 300 crores as nearly five lakh traders who did regular business in Delhi from adjoining states suspended their businesses given the unrest. Since 2020, farmer protests have unfortunately assumed a regular frequency not only in Delhi and Punjab but across India. According to consultancy firm Verisk Maplecroft estimates, India has accounted for the biggest global share of farmer protests in the past three years.

The farmer protests 2.0 again highlight the fault lines in India's agricultural viability and this time the farmers are demanding conclusive government action. The protesting farmers want a firm minimum support price (MSP) that is backed by a legal guarantee for all crops. Another demand is to implement the recommendations of the MS Swaminathan committee on agriculture which will enable increasing MSP to 50 per cent above the weighted average cost of production. Other demands include better sugar cane prices and a pension of Rs 10,000 a month for every farmer above the age of 60.

The government is engaged in feverish negotiations with the farmer unions to break the impasse. However, a breakthrough achieved may be short-lived, as the government would have only successfully attended to the symptoms and not to the problem itself. India's agri sector contributes only 15 per cent to the GDP but engages 58 per cent workforce. This lopsided proportion is made worse by the fact that 85 per cent of the farmers operate in less than five acres of land half of which in many parts of India may be dry and barren. This translates to low yields, low earnings and high debt and when combined with increasing challenges of climate change on agriculture, the problem assumes a much larger and ominous proportion.

Climate change whether it is unseasonal rain, hailstorms, floods, or drought, India's agri-sector has seen it all. The lingering uncertainty due to environmental issues



BEST FARMING PRACTICES NEED TO BE PROMOTED ACROSS THE SECTOR TO ENSURE CLIMATE CHANGE ADAPTATION AND MITIGATION

keeps the farmers on their toes leading to income insecurity and mounting debt. An example is the casualty in the current protests of a marginal farmer whose 8-acre agricultural land had 8 lacs of debt on it, making it virtually impossible for the farmer to pay it off and continue with another crop. Climate change-driven issues such as these have made the farmers demand an MSP law to act as a safety net for the time, effort and risk they invest in farming.

The perennial shortage of water resources is the first symptom of climate change's impact on the agri sector. According to Rainfed Atlas, it is estimated that between 52% and 55% of the farming community have no means of irrigation and are dependent on rain-fed agriculture. But due to climate change temperatures are spiralling and rainfall has become more erratic, with longer dry spells resulting in droughts and shorter periods of more intense rainfall causing floods. This results in a domino effect whereby crop yield is adversely impacted while high CO₂ levels cause low nutritional value of crops. This translates to low marketability of the produce therefore causing financial distress and rising debt for the farmers.

The impact of climate change on the agri-sector and the sluggish government response in managing its fallout has come as a double whammy for the farmer community. The lack of robust insulation measures that seek to protect the sector from the vagaries of climate extremes is now having a telling impact on productivity. The cereal crop productivity of most cereals is slated to decrease due to an increase in temperature and CO₂ levels, and the decrease in water availability. According to estimates, there will be a projected loss of 10-40% in crop production by 2100 if no climate change adaptation measures are

taken. A one-degree Celsius increase in temperature may reduce yields of major food crops by 3-7%. Given these troubling projections, the government must extricate the agri-sector from the clutches of climate change. This alone can ensure the best interests of farmers, safeguard national food security and protect livelihoods.

An audit of the agri-sector at the micro-level is essential to identify and remove processes that are detrimental to natural resources. This will ensure weeding out of inefficient water-intensive practices and allow optimal use of the precious resource. Similarly, best farming practices need to be promoted across the sector to ensure climate change adaptation and mitigation in the sector. For example, the raised-bed planting of wheat in the Indo-Gangetic plains enables 20-25% savings in irrigation water and also helps in reduced herbicide use. Measures such as these combined with water accounting methodologies can build long-term sustainability, efficiency and resilience of the agri-sector besides immensely benefiting the marginal farmers.

The government must also initiate climate-smart agriculture strategies which aim at adapting agriculture to climate change. This can be done by implementing technologies that help farmers plan crops by considering the climate specifics of their area through easy-to-use apps on their smartphones. This can be done by prioritising botanical research to develop crop species that are more tolerant to water deficiencies and extreme temperatures. Additionally, ecologists can evolve effective soil management methods that reduce the depletion of topsoil, promote carbon sequestration, and reduce chemical application. Advanced farm irrigation technologies can also help proper water saturation levels in the soil, prevent water flooding,

and help avoid top-soil runoff.

The government must focus on specially developed software solutions for agriculture that can help in real-time monitoring of the crops and allow farmers to accurately calculate the required inputs, which reduces costs in the short term and protects nature in the long term. Technology-assisted cover crops for instance can not only help prevent soil erosion, and promote water retention and nitrogen fixation but also serve as organic manure for fodder. Smart agri-software can help farmers implement differentiated applications of fertilisers which can help decrease soil pollution and increase crop nutrient levels. The software can also have in-built weather-related tools that provide timely alerts of extremities, elaborate weather forecasts to schedule farming events and enable prediction of general climate change tendencies by analysing historical weather data.

Currently, the agri-sector problems and farmer grievances are dealt with on a reactive basis; this is evident in the form of chronic farmer agitations that come back every year. The government must realise that a lasting solution is only possible if actual problems, including the impact of climate change on agriculture, are addressed with the participation of all stakeholders of the sector. The collaboration of farmers, policymakers, environmentalists, botanical scientists and technology experts can help chalk out long-term strategies and solutions and ensure a robust agri-sector that is resilient against climate change onslaughts. Farmer protests are a symptom of climate change's impact on agriculture. Protecting the sector from adverse impacts will automatically ensure farmer well-being and prosperity.

(The author is a policy analyst. The views are personal)

DUEL OF OPINION

NANO FERTILIZERS CAN WAIT !

Nano fertilizers utilize nanoscale porous domains on plant surfaces to enhance nutrient delivery and minimize environmental losses. It is easy on the pocket of farmers and will be effective in increasing farmers' income. It will also significantly bring down the cost of logistics and warehousing.

Despite the potential benefits, challenges exist in the widespread adoption of nano fertilizers. High production costs make them unaffordable for small farm-

ers. The production of nano-fertilizers requires strict quality control measures to ensure their effectiveness and safety. However, the lack of standardized regulations for their production and distribution has resulted in poor quality control and inconsistent results.

It has been observed that the continuous spray of Fe₃O₄-NPs (100 ppm) had a negative impact on maize physiology in the second generation. The negative impact of stress is plant-associated with phenological and biochemical changes in the plant system which resulted in abnormal function. Stress potentially reduces the productive capacity of plant systems, with yield reduction in different crops up to 70% related to the stress especially abiotic stress.

The worrisome fact about the use of NFs is the nano-toxicity, which needs to be reviewed properly. Several studies pointed out that the toxicity of NFs is dose driven, type of host plant, and environmental conditions. Studies highlight concerns regarding nano fertilizers' toxicity and their environmental fate. Nano materials may pose risks to human health and ecosystems, with studies indicating potential DNA damage and oxidative stress. Seedlings of Rice if exposed to AgNPs, increase hydrogen peroxidase formation, lipid per-

oxidation, proline accumulation and decrease sugar content in shoot and root. High dose of AgNPs increase reactive oxygen species generation which cause cytotoxicity and decrease mitochondrial membrane potential.

There is no doubt that plant nutrients are supplied to the soil in a controlled and precise manner by nano fertilizers; however, little information is available about the fate of these nanomaterials in the soil. Nanomaterials can form aggregates in soil, and the behaviour of NPs in these aggregates is largely affected by the soil porosity, the soil granularity, the organic content of the soil, the soil biota, the pH, and other soil conditions. The accumulation of large-sized aggregates over time may hinder the movement of nutrients and minerals, affecting their stability. In addition, nano-toxicity may also arise in the soil and harm the plants in the long run.

It needs safety measures during its handling. So, it needs experts during its application. It also has an ill-effect on the plant system, it may plug the stomatal pore, forming a toxic layer upon the stigmatic surface, which further prevent pollen tube penetration, it may enter vascular tissue and impair translocation of water, minerals and photosynthesis.

While nano fertilizers hold promise in addressing agricultural challenges, their widespread adoption requires addressing cost barriers, ensuring quality control, and mitigating potential environmental and health risks. Further research and regulatory efforts are essential to maximize the benefits of nanotechnology in agriculture while minimizing its adverse impacts.



About the AUTHOR

Dr Kalyan Goswami,
Director General
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We balanced domestic interests with our trade needs at the WTO

India successfully defended important interests at home while enhancing its global trade prospects



ARPITA MUKHERJEE

is an economist and professor at Indian Council for Research on International Economic Relations.

India being on a path to become the world's third largest economy, with annual growth predicted at above 6% (double the world average) for the next two years, cannot be ignored in multilateral trade discussions. At the same time, our trade negotiators had a tough job balancing the interests of different domestic stakeholders with the changing dynamics of global trade and geopolitics, with India's aim of playing a key role in resilient global value chains forming an important part of the context. In the recently concluded 13th Ministerial Conference (MC-13) at Abu Dhabi of the World Trade Organization (WTO), the Indian trade negotiating team led by commerce minister Piyush Goyal deserves a round of applause for striking a delicate balance of protecting the interests of domestic stakeholders, supporting initiatives that can help promote the exports of small and medium enterprises (SMEs) and making India's voice heard at the WTO. While many delegates from member countries left after the conference's scheduled end, the Indian delegation stayed back till the actual end and contributed as a key player to the final MC-13 Declaration.

The Indian team has successfully protected our domestic policy space on industrial policy and blocked the Investment Facilitation Development Agreement, for which more domestic consultations would be needed. At

present, views differ among experts and policymakers in India on a large-scale investment agreement and its modalities. India is engaged in negotiating bilateral investment agreements with major investing countries and trusted trade partners.

The run-up to the MC-13 witnessed farmer protests, and India did not yield ground on a permanent peace clause on the procurement of foodgrain for our public distribution system, giving the government freedom to buy as much as it wants, regardless of a flawed limitation formula. India also defended its policy space for subsidies. In most WTO member countries, be it developed or developing, irrespective of the size of their agriculture sector and its contribution to GDP, farmers play a key role in trade negotiations and domestic politics, and India is no exception.

India was also successful in resisting the inclusion of environmental issues and labour standards in WTO talks. While it may have hurt the sentiments of its trade partners like the EU, with which a trade deal is under discussion, India is willing to discuss these topics bilaterally. For example, on 14 November 2023, India along with 13 other countries signed the Indo-Pacific Economic Framework (IPEF) Supply Chain Resilience Agreement, which has both these components. The IPEF Agreement, for example, proposes to set up a Labour Rights Advisory Board, to support member countries in the promotion of labour rights in their supply chains, promote sustainable trade and investment, and facilitate opportunities for investment in businesses that respect labour rights as per ILO standards. Rather than try pushing the issue at a multilateral platform, trade partners like the EU and India can set up a mechanism for tripartite consultation across government, worker organizations and employer organizations, as proposed in the IPEF Agreement. We need more domestic research, consultations and consensus-building on these issues.

I am delighted to see India softening its stance on the current moratorium on customs duty for e-commerce, which got extended for another two years. With the government supporting SME exports through e-commerce—there is a chapter dedicated to it in the recent Foreign Trade Policy—this was the right step. India is among the world's leading exporters of IT/ITeS services and with the growing digitalization of services, from education to audio-visual media, and the global expansion of our startups, it is important to understand the full scope of the e-commerce sector first. Without a clear picture of its coverage and data on trade flows, it is better to support business as usual, and that is exactly the stand India took.

In a difficult global scenario, amid pressure from some of its key trade partners, India has been able to represent the interests of the Global South, protect the interests of its domestic stakeholders and support fairness in the global trade order, while emphasizing issues like the immediate need to make the WTO Dispute Settlement Mechanism and Appellate body functional. The Indian trade negotiating team has ably defended the country's interests at the MC-13 at a time when the country is headed for national elections and we face a difficult geo-political scenario. India is expected to continue its leadership role in creating policy platforms for collaborations, partnerships and discussions on trade issues, for which it would engage academics, industry experts and other stakeholders to develop pro-active strategies for future negotiations, multilateral, plurilateral and bilateral.

Balancing the need to protect the genuine interests of a vast swathe of domestic pressure groups with the compulsions of India's burgeoning global trade ambitions was expected to be a tough task for Goyal in an election year at the WTO ministerial conference. He has again pulled a rabbit out of a hat to strike a fine balance between India's domestic and international needs.

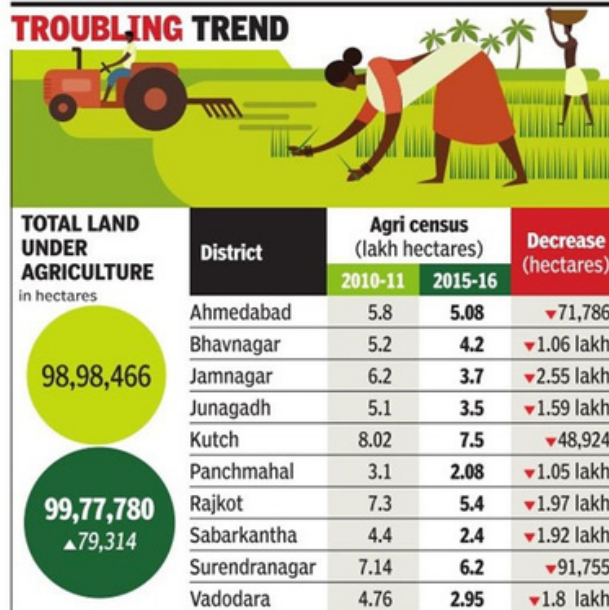
TREND SEEN DESPITE INCREASE OF 79K HECTARES IN AGRICULTURAL LAND IN STATE

Farmland shrinks near urban hubs

Kapil.Dave@timesgroup.com

Gandhinagar: Despite an overall increase in agricultural land reported between 2010-11 and 2015-16, a recent report tabled in the state assembly paints a troubling scenario for Gujarat. While the aggregate figures show a net rise of 79,314 hectares in farmland, a deeper analysis reveals a concerning trend of diminishing agricultural land in crucial districts of the state, particularly those closer to larger and mid-sized cities, as well as some tribal districts.

Responding to unstarred questions from MLAs, the state agriculture minister highlighted an intriguing pattern. The data, derived from record of land owned by farmers, indicates a total augmentation in agricultural land. For instance, the 2010-11 agriculture census recorded 98,98,466 hectares was under agriculture



which increased to 99,77,780 hectares in the 2015-16 census. However, the devil is in the details.

Experts and officials ack-

nnowledged a notable decrease in agricultural land, especially in districts housing major and mid-sized cities. Several tribal districts have

also witnessed a decline.

Among the districts experiencing a reduction in agricultural land is Ahmedabad, which saw a loss of 71,786 hectares, representing a 12.37% decline over five years. Other significant declines include Bhavnagar (-20.18%), Jamnagar (-40.91%), Junagadh (-31.01%), Rajkot (-26.97%), Sabarkantha (-43.72%), and Vadodara (-38.18%).

A senior official from the agriculture department said, "The decline in agricultural land can be attributed to various factors, including rapid urbanization, deforestation, industrialization and conversion of agricultural land for non-agricultural purposes. An urgent and comprehensive survey is needed. While the overall figures indicate a net increase, the ground reality reveals a shift in land use. This decrease could be due to rapid urbanization and industrialization."

Agri university experts sensitise farmers to judicious use of water

TRIBUNE NEWS SERVICE

LUDHIANA,

As part of the initiative 'Sensitising farming families for sustainable water use behaviour,' the Department of Extension Education and Communication Management, Punjab Agricultural University (PAU), organised a training session at Boparai Kalan village. Led by Dr Ritu Mittal Gupta, senior scientist, and Dr Preeti Sharma, assistant professor, the programme aimed to foster awareness and adoption of practices promoting sustainable water use among local farming families.

Dr Jugraj Singh, senior scientist, Soil and Water Engineering, shed light on the critical state of water resources in Punjab, empha-

sising the importance of water-saving practices at farm level. He also elaborated on various techniques to recharge groundwater level.

Dr Vinay Kumar, agronomist, highlighted the condition of water in the state. He discussed the advantages of various water saving technologies like drip irrigation system, laser leveler, small beds for wheat, etc. The participants enthusiastically participated in the discussion.

Emphasising on saving water at household level, Dr Mittal and Dr Sharma sensitised participants on judicious use of water while performing household chores in daily life. A film screening was organised to encourage the farming community to make sensible use of water at farming and household level.

Water is precious and should be judiciously used keeping in mind the future generations, added an expert.

Tejinder Kaur, a prominent local leader, extended her gratitude to the PAU experts for selecting Boparai Kalan village for the training programme, underscoring the significance of such initiatives in fostering sustainable agricultural practices and environmental stewardship.

The session concluded with distribution of water-saving kits to participants, comprising essential devices like taps, water alarm bells, showers and informative literature on water conservation. The experts expressed gratitude to women and farmers for their enthusiastic participation and encouraged collective efforts towards water conservation.

Three-day Agrotech Farmers' Fair concludes in BAU

Agriculture is the mother of all cultures, without it no culture can survive: Governor

PNS : RANCHI

Governor CP Radhakrishnan today said that agriculture is the mother of all cultures and without agriculture no culture can survive. By awarding Bharat Ratna to Dr. MS Swaminathan and Chaudhary Charan Singh, Prime Minister Narendra Modi has given honour to agricultural scientists and farmers.

The Governor was addressing the closing ceremony of the three-day Agrotech Kisan Mela organized by Birsa Agricultural University on Monday. He said that I have been a farmer for many generations and till now I have been cultivating paddy for 4 months in a year. Therefore, by going to programs related to agriculture and farmers, I feel at home in my native nature.

He suggested BAU to make special research efforts to plant Japanese variety of mango and other improved varieties in Jharkhand and check their suitability for the region. He stressed that one should not give up efforts despite all the failures. There should be no hesitation or reluctance in giving sound advice even to our superiors. Many times even people in lower positions give very good advice in the interest of the nation, society and organization. He described PM Kisan Samman Nidhi Yojana and PM Fasal Bima Yojana as revolutionary steps in the interest of farmers. Praising BAU for its research efforts and achievements, the Governor advised that a permanent consultation center for farmers should be started in the university where farmers can meet scientists without any appointment and get solutions to agricultural technical prob-



Governor CP Radhakrishnan along with others during the concluding day ceremony of 'Agrotech Kisan Mela 2024' at BAU, Kanke in Ranchi on Monday. PNS

lems.

The Governor inaugurated two books of Dr. Nandani Kumari related to genetic diseases and animal breeding, a book of Dr. Sushil Prasad related to animal husbandry and Birsa Kisan Diary.

He also honoured the winners of various exhibitions in the fair and 7 innovative farmers from different districts of the state, including Kamal Mahato, Dhanbad, Praduman Mahato, Giridih, Nilesh Kumar, Khunti, Somrai Mardi, Seraikela Kharsawan, Rajeshwar Mahato, Ranchi, Chudamani Yadav, Simdega and Pani Laguri, West Singhbhum. In the garden exhibition, Indian Institute of Legal Metrology (IILM), Kanke, received maximum 6 awards in the flowers category and Ramkumar Sahu of Hochar village (Kanke) received maximum 5 awards in the vegetables category.

Agriculture Secretary Abubakar Siddiqui appealed to the scientists to develop and recommend technologies suitable for the farmers of Jharkhand based on their socio-economic conditions, educational level and conven-

ience. Focus on technologies that are low cost and perform well even in changing climates. While working on any new technology, keep in mind the circumstances of local farmers in your thinking process. He said that the department will provide whatever facilities are required to develop BAU as a leading university of the country.

While delivering the welcome address at the beginning, Vice Chancellor of Birsa Agricultural University, Dr. Sunil Chandra Dubey said that farmers, agricultural entrepreneurs from all the districts of the state and urban people of Ranchi came in large numbers in the three-day event. This event will also play an important role in promoting urban horticulture. Research efforts on mango will be increased in the university.

On this occasion, Dr. Abhijeet Kar, Director of Indian Institute of Secondary Agriculture, Namkum and Dr. Amit Pandey, Director of Forest Productivity Institute, Ranchi also presented their views.

Shift to natural farming can mark a revolutionary change: ICRIER study

Our Bureau
New Delhi

A shift to natural farming can turn out to be a revolutionary change, policy advocacy group ICRIER (Indian Council for Research on International Economic Relations) said in a report citing instances of Andhra Pradesh where yields 'seemed' to have improved. However, to balance the findings, it also warned that "if the yield and production plummet" the implications for food security can be severe.

In a report titled "Zero Budget Natural Farming — Implications for Sustainability, Profitability, and Food Security", commissioned by



Currently, chemical fertilizers are over-subsidised, causing imbalanced use and harming the environment

NABARD and released last week, ICRIER said: "The sheer disparity in the outcomes of the two experiments conducted by CESS-IDSAP and ICAR-IIFSR suggests the importance of

long-term experimentation before declaring this as a nationwide agriculture practice. If the yield and production plummet, as the ICAR and IIFSR findings advocate, the implications for food security can be severe. Naturally obtained inputs like cow dung, cow urine, leaves, etc are without any reservation sustainable alternatives to the chemical inputs which have destroyed nature's inherent ability to rejuvenate the soil. If the yields improve as they seem to have in Andhra Pradesh, then a shift to natural farming can turn out to be a revolutionary change."

FINANCIAL AID

Authored by Sandip Das,

Mahima Khurana and Ashok Gulati, the report said farmers be given financial support directly into their bank accounts on per hectare basis and the prices of chemical fertilizers be determined by free play of markets.

Currently, chemical fertilizers are excessively subsidised leading to their imbalanced use, and therefore adverse impact on environment. "Much of this can be reduced/eliminated by creating crop-neutral incentive structures," it said.

"Resilient supply chain networks for the farm inputs required in natural farming are a prerequisite to transitioning towards natural farming," the authors concluded.

IIHR develops multiple disease-resistant chilli varieties

Our Bureau
Bengaluru

The Indian Institute of Horticulture Research (IIHR) has developed three hybrid chilli varieties that are resistant to multiple diseases such as phytophthora root rot (PRR) and leaf curl virus (LCV).

Due to the vagaries of weather, PRR and leaf curl virus are becoming a serious threat to the chilli crop in the country. PRR caused by soil borne destructive fungal pathogen which causes root rot in chilli crop and it is estimated to cause annual losses to the tune of around \$100 million globally. LCV is the most destructive disease face by chilli growers in terms of incidence and yield loss



and is transmitted by the whiteflies and in the affected plants the leaf get curled and rolled resulting in stunted growth.

Madhavi Reddy K, Principal Scientist, Division of Vegetable Crops, IIHR, said three hybrids Arka Nihira, Arka Dhriti and Arka Gagan have shown combined resistance to PRR and LCV among

the 11 hybrids developed by the institute. "We will be commercialising them next year and some private seed companies have shown interest in taking the parental lines," Reddy said.

KEY FEATURES

The chemical control for PRR and LCV is ineffective and also leads to chemical residues affecting exports. The new hybrids are for different market segments with medium to high pungency targetted at key growing regions of Guntur and Warangal.

India is the largest producer, consumer and exporter of dry chillies. Exports of dry chillies had touched a record ₹10,444 crore during 2022-23.

El Niño and the monsoon

For India, the weakening of El Niño conditions, and the forecast of the emergence of ENSO neutral conditions towards the end of the summer should bring some cheer ahead of the southwest monsoon

ANJALI MARAR

BENGALURU, MARCH 7

EARLIER THIS month, the India Meteorological Department (IMD) predicted a hot summer this year, with above-normal temperatures and an above-normal number of heatwave days from March to May.

On Tuesday, the World Meteorological Organization (WMO), a specialised agency of the UN, said in a media release that the 2023-24 El Niño, one of the five strongest on record, has peaked and is gradually weakening — but it will continue to impact climate around the world in the coming months.

What are the implications for India and the southwest monsoon?

First, how has the ongoing El Niño event played out?

El Niño refers to the abnormal warming of sea surface waters in the equatorial Pacific Ocean. El Niño episodes emerge naturally during autumn-summer in the northern hemisphere, typically once every 2-7 years.

It peaks during winter (October-February) before weakening in the subsequent summer, making it a phenomenon that typically lasts for between 9 and 12 months. Occasionally, El Niño will last up to two years in a row.

El Niño episodes affect the global weather, lead to an increase in temperatures and large-scale dryness and droughts, and disrupt normal rainfall patterns globally. Large parts of East Africa have experienced multiple failed rainy seasons in recent years, in part due to El Niño conditions.

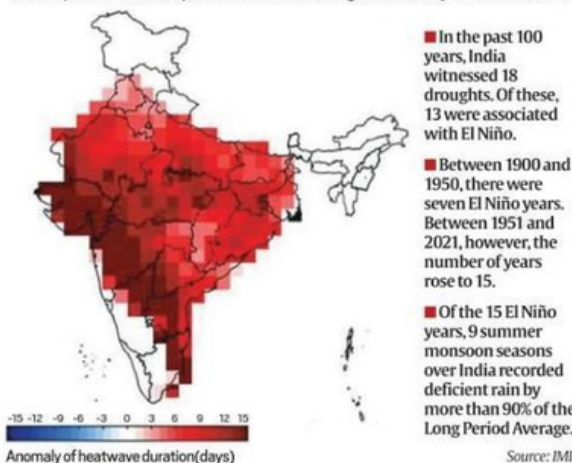
After the last episode in 2015-16, El Niño conditions emerged for the first time in June last year — and average temperatures breached new records across most parts of the world in every subsequent month. As the El Niño peaked between November 2023 and January 2024, recorded sea surface temperatures in the Pacific Ocean touched 2 degrees Celsius above the 1991-2020 normal, the WMO said. The 2023-24 El Niño played a significant role in 2023 ending as the warmest year ever recorded.

So what does the peaking and weakening of El Niño mean?

The intensity of an El Niño event is measured

A hotter March-May period

IMD has predicted harsher spells of heatwaves in the regions marked by darker shades of red



by the temperature values recorded over the sea along the equatorial Pacific Ocean.

One of the key indicators of the sea surface temperatures is the Oceanic Niño Indices (ONI) values (in degree Celsius). Data from the United States National Oceanic and Atmospheric Administration (NOAA) show that after peaking at 2 degree Celsius during November-January, the ONI value has started to decline. The timing of the fall in ONI is important because it suggests that the El Niño will not extend into another year.

What is the heat forecast for India?

The IMD has said that even as they weaken, El Niño conditions will push temperatures above normal in most of the country during March, April, and May (see map). Above normal maximum temperatures are likely to be experienced over Ladakh, Himachal Pradesh, Rajasthan, Uttar Pradesh, Jharkhand, Odisha, Maharashtra, coastal Gujarat, Karnataka, Kerala, Tamil Nadu,

Lakshadweep and the Andaman and Nicobar islands, the IMD has said in its summer forecast. Nights too, shall remain warmer than usual over almost the entire country, except some regions in Eastern India.

Heat waves are common over Central and Northern Peninsular India during March to June, when day temperatures rise 4.5 degree Celsius above normal. The IMD has warned of longer and harsher heat wave spells this summer, mainly due to prevailing El Niño conditions.

Individual spells of heat wave are expected to last for as long as 12-15 days in Maharashtra, Telangana, and North Karnataka. Heat waves are also expected to sweep over Andhra Pradesh, Gujarat, Rajasthan, Madhya Pradesh, Uttar Pradesh, Jharkhand, Odisha, West Bengal, Bihar, Delhi, Haryana and Punjab in the coming months.

And how is the Indian summer monsoon likely to be?

The four-month southwest monsoon is

India's economic lifeline. The country receives nearly 70% of its annual rainfall (880 mm) during the June to September period. A good monsoon is crucial for sustaining the agrarian economy and for replenishment of the country's water reservoirs.

Although no direct one-on-one link has been established yet, El Niño episodes are correlated with a depressed southwest monsoon. Past El Niño episodes have coincided with India receiving below average rainfall during the four-month rainy season. The 2015-16 El Niño coincided with a deficient monsoon in 2015, at 84% below the Long Period Average.

However, climatologically and historically, about 50% of El Niño events are followed by ENSO (El Niño Southern Oscillation) neutral conditions, and in 40-50% cases, La Niña conditions develop post an El Niño event.

This time, multiple global climate models have suggested that ENSO neutral conditions will emerge during the April-June period. India's Monsoon Mission Climate Forecast System (MMCFS) model has predicted ENSO neutral conditions to be established along the equatorial Pacific Ocean by May. The transition from El Niño to ENSO neutral will take some time after that.

If these conditions are realised, the desired establishment of favourable oceanic conditions could take place ahead of the onset phase of the southwest monsoon over the country.

The southwest monsoon arrives over the Andaman and Nicobar Islands around mid-May. Thereafter, it progresses and enters the mainland through the gateway in Kerala around June 1 (with a standard deviation of four days). By mid-July, it covers the entire country.

As the country awaits the Long Range Forecast (LRF) for the upcoming southwest monsoon, expected to be released by the IMD by mid-April, the prediction about the development of ENSO neutral conditions would suggest that the southwest monsoon may not be directly impacted by the ongoing El Niño episode.

There are chances of normal monsoon rainfall — provided other ocean-atmosphere parameters, wind conditions, formation of low pressure systems, etc remain favourable — this year.

C-DAC develops early warning system for crops

Model Provides Personalised Advice To Ryots

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Hyderabad: In what is touted to be a first-of-its-kind IoT (Internet of Things) deployment for agriculture in the country, the city-based Centre for Development of Advanced Computing (C-DAC) developed a forewarning model for crops.

The model provides personalised agro advisories to farmers through SMS, particularly on pest/disease forewarning and optimal irrigation scheduling in crops, based on

the micro-climate data collected from farmer's field using Wireless Sensor Networks (WSN) technology. This model has been tested in about 350 acres in different parts of Andhra Pradesh and is currently being tested in the erstwhile Mahabubnagar district.

WSN is an emerging area of research that facilitates the integration of sensing systems with state-of-the-art electronic processing and wireless communication technologies. C-DAC, Hyderabad has developed WSN consisting of spatially distributed autonomous sensor nodes that cooperatively network among themselves and monitor environmental conditions, which can

HOW WSN TECH WORKS

- Forewarning model uses Wireless Sensor Networks (WSN) technology
- WSN unit senses micro-climate data at crop-canopy level
- Unit sends data directly from field to remote server through internet
- Decision support models at server create weather-based warning alerts
- Module at WSN unit sends advisories to farmers in Telugu (through SMS)
- Farmers get scheduled package of practices & alert-based advisories



be applied in agriculture fields to monitor micro-climate. According to scientists, each WSN node has a sensing

module deployed at canopy level, comprising five sensors (temperature, relative humidity, leaf wetness, soil moisture

and soil temperature), processing and communication module, popularly known as 'mote' and a solar based power module.

WSN nodes will sense the micro-climate data at crop canopy level on a real-time basis. The data is transferred to the remote server, through a field 'gateway' having internet access (SIM card). At the server level 'Decision Support Models' are executed based on the data received from the field and alerts are generated by the system. Based on the alerts generated by the system, experts will send personalised crop advisories to the farmers in their respective regional languages.

Icrisat finds defence mechanism in peanut for aflatoxin-free crop

KV Kurmanath
Hyderabad

Scientists at the Icrisat have discovered a hitherto unknown self-defence mechanism in some peanuts that helps it in fighting fungal infections. This could result in the development of a natural defence mechanism not just in other varieties of peanuts but also in other crops.

Peanut is vulnerable to *Aspergillus* infection and subsequent aflatoxin contamination. Aflatoxin contamination caused by *Aspergillus flavus* significantly threatens food safety and human health. Resistance to aflatoxin is a highly complex and quantitative trait, but the underlying molecular and biochemical mechanisms are poorly understood.

The study aims to identify

the resistance-related metabolites in groundnut that influence the defence mechanism against aflatoxin.

"The study uncovered the biochemical processes that lead to the thickening of the secondary cell wall, providing greater resistance to the fungal infection caused by *Aspergillus flavus*," an Icrisat (International Crops Research Institute for Semi-Arid Tropics).

GLOBAL CHALLENGE

Aflatoxin, a potent carcinogen and toxin, accumulates in a variety of food crops such as cereals, oilseeds, pulses and nuts due to infection by *Aspergillus* species.

"Strict government regulations on the permissible levels of aflatoxin in food commodities significantly impact the food market and export economies, especially in developing coun-



COMBATING AFLATOXIN. Developing more resistant varieties offers the most economical solution

tries," it said. While various physical and chemical methods exist to combat, minimise and manage aflatoxin contamination, developing more resistant varieties, offers the most economical solution by addressing the problem at its root.

This study offers insights that will be pivotal for breeding

groundnut varieties that are fully resistant to *Aspergillus* infection in the future.

"Icrisat's efforts, ranging from low-cost aflatoxin detection assays to post-harvest management practices, having revitalised export economies, particularly in Malawi. This study is crucial for advancing research aimed at eliminating the issue at its source, saving both cost and effort," Jacqueline Hughes, Director-General of Icrisat, said.

For this study, Icrisat researchers used a metabolomics-based systems biology approach to understand the biochemistry behind increased peanut resistance to *Aspergillus* infection for the first time. The study reports the linkage between two specific metabolites and the level of resistance exhibited by peanut varieties.

"The findings of this study

highlight the important role secondary thickening of cell walls plays in reducing infection of seed in the field. If we can combine this with other mechanisms, which further decrease infection in peanut, we can really begin to move towards an aflatoxin-free peanut, ensuring the production of safe, toxin-free food," Sean Mayes, Global Research Program Director (Accelerated Crop Improvement), said.

"This methodology is not just confined to breeding more resistant groundnut varieties but can provide a wider understanding of similar resistance mechanisms across a broad spectrum of food crops such as cereals, oilseeds and nuts, which are highly susceptible to contamination from aflatoxin and other mycotoxins," Yogen-dra Kalenahalli, the study's lead author said.

Conservation techniques for sustainable farming



HIMANSHU VERMA

In the face of challenges posed by soil erosion, water scarcity and ecological imbalance, farmers worldwide are turning to Conservation Agriculture

To fulfil the demands of the expanding global population, farmers must overcome obstacles such as soil erosion and water loss from conventional agricultural production. Conservation Agriculture (CA) makes effective use of natural resources to provide a sustainable solution. CA techniques raise revenue, boost resource efficiency, and enhance soil fertility. A traditional farming method called tillage involves adjusting the soil by ploughing, harrowing, and ploughing to attain the ideal tilth and friability.

Despite its advantages, tillage faces problems such as declining soil fertility, ecological imbalance, loss of sustainability, and water scarcity. Among its disadvantages are the depletion of soil organic matter brought on by exposure to air and sunlight, the breakdown of soil aggregates more frequently, soil erosion, increased production costs as a result of fuel consumption and wear and tear on machinery, and greenhouse gas emissions from the burning of fossil fuels, which contribute to global warming. Sustainable farming strategies, which pre-



serve resources without endangering the environment, have been introduced in response to the negative effects of conventional agricultural processes.

CA eschews ploughing and other soil disturbance practices in favour of little soil mechanical interference. With the use of sophisticated zero-tillage seeders known as zero ferti-cum-seed drills, crop seeds are directly dispersed into undisturbed soil. Herbicide application and weed-slashing/rolling are part of land planning. Organic agricultural leftovers are more likely to be deposited on untilled fields, where they form mulch that protects the soil from wind and rain, evens out soil temperature, and encourages the growth of microorganisms. This strategy distributes the best use of goods and services with less expensive production, lowering the usage of fossil fuels

and greenhouse gas emissions.

The main goals of conservation agriculture are to maintain a permanent organic soil cover to shield against the damaging effects of sunlight and rain, to supply nutrients for the quick growth of soil micro- and macroorganisms, and to modify the soil's microclimate for ideal development.

However, since burning or removing leftovers can hurt the fertility and health of the soil, residue management poses a threat to crop output in India. In CA, crops are rotated sensibly to give soil fauna and microflora a varied diet and to take advantage of soil strata for the cycling of nutrients and water. More diversified crop rotations encourage stable root channels and macropores, optimal water infiltration and a decrease in insect incidences. Crop rotation, organic residue integration, and tillage technique modifications can significantly impact soil fertility by increasing soil aggregate and nutrient availability. Organic crop residue management raises soil microbial biomass and nitrogen levels

compared to no-till systems. CA is a sustainable crop-production technique that reduces soil erosion, water and land degradation, and dependency on foreign inputs. By using less petroleum, CA enhances ecosystem quality and soil and water quality, reduces greenhouse gas emissions, and helps reduce global warming and air pollution. It also reduces labour, time and production expenses for farmers.

To encourage CA adoption, farmers, researchers, and technicians must change their perspectives on sustainable production strategies, such as minimal or no tillage combined with proper residue management. Socioeconomic barriers to CA adoption include inadequate residue management and sowing device selection. Farmers often burn leftover crop residue during crop rotation, contributing to environmental degradation and loss of sustainability.

(The author is an assistant professor at Agronomy College of Agriculture and Environmental Technology Surajmal University; views are personal)

Lack of non-agri data hinders computation of farmers' income: NITI

PNS ■ NEW DELHI

The lack of data on cultivators and their income from other sources has become a hindrance in determining whether farmers' income has actually doubled or not, Niti Aayog member Ramesh Chand said, pointing out that they are earning more from non-agricultural sources.

The Niti Aayog member further said that prices of agricultural commodities can not be fixed by a law as it has serious implications, which are neither in the interest of the agriculture sector nor individual farmers.

"The government had fixed the goal of doubling farmers' income so that we make more efforts. There is a need for this

assessment, where we are in terms of this goal. (But) the required data is not available with us," Chand told PTI in an interview.

In 2016, Prime Minister Narendra Modi-led government set a highly ambitious target of doubling farmers' incomes by 2022.

An inter-ministerial committee on "Doubling of Farmers' Income" was set up in April 2016 to recommend strategies to achieve this goal.

The committee submitted its report in September 2018. After acceptance of the panel's recommendations, the government has set up an 'Empowered Body' to review and monitor the progress.

Elaborating on the issue, Chand said: "We do not have



data on a number of cultivators...because when you want to calculate the income of farmers, you need to know the denominator".

The eminent agriculture economist further said that the government does not have data on the income of farmers

this goal (doubling farmers income by 2022) or not".

Replying to a question on the demand of some farmers' groups, mainly from Punjab, for a legal guarantee on minimum support prices (MSP) for various crops, Chand said if prices of agricultural commodities can be fixed legally then so many countries, which are struggling to give farmers remunerative prices, would have simply made it legal.

"Prices can not be fixed legally. It can lead to all sorts of problems...it has very serious implications, which are not even in the interest of the agriculture sector or interest of farmers," he asserted.

He further said that if traders are forced to buy

wheat or rice at a price which is not supported by demand and supply, then offtake will not happen.

"So, you can not force a trader to pay that price, which traders feel will not bring profit," he opined.

Chand pointed out that when the government buys something (wheat or rice) at a price again which is not supported by demand and supply, it has economic implications.

"Even in the case of MSP of rice and wheat, if you compare what is the economic cost to the government and what is the open market price. You find that in the case of rice if you are paying Rs 2,000 per quintal, you have to incur a loss of Rs 800 just to clear that in the market," he said.

WTO to tackle reforms as war hampers trade

BLOOMBERG
March 14

THE HEAD OF the World Trade Organization (WTO) will press ahead with reforms to its dispute process and a crackdown on fishery subsidies, even as a subdued global economy poses headwinds and a difficult political environment makes it hard to reach consensus, its director-general said.

"We should focus very hard on delivering those reforms," Ngozi Okonjo-Iweala said Thursday, highlighting the need to revamp the Geneva-based institution's dispute-settlement mechanism and its appellate body — the WTO's supreme arbiter on trade feuds — which has been paralyzed since 2019 after the US blocked all new appointments to it, forcing an end to its quorum.

"Hopefully we can deliver the reform by 2024," the WTO chief said in an interview Thursday in Abuja, Nigeria's capital, making the WTO a "stronger and more responsive organization."

The 166-member body held its 13th ministerial conference in Abu Dhabi ear-

lier this month, where it failed to reach consensus on further measures to reduce subsidies that lead to overfishing.

Okonjo-Iweala — whose four-year term as director-general ends on Aug. 31, 2025 — said she hasn't accomplished everything she'd set out to do, citing the fisheries deal as something she would like to achieve.

"I was a little bit disappointed we didn't get it," she said. "But I'm not too upset about because we were very close. So I think in Geneva, we just continue work to close that."

The Geneva-based institution forecast global merchandise-trade volumes would grow 0.8% in 2023 and 3% this year. Okonjo-Iweala repeated her view shared earlier in March that both outcomes will "come in lower" because "the headwinds are strong."

"The risks are all on the downside," the development economist said, singling out Russia's war in Ukraine, the conflict between Israel and Hamas, attacks on ships in the Red Sea by Iran-backed Houthi rebels in Yemen and climate change as major issues.

Godrej Agrovet's crop protection business launches pilot to reach out to cotton growers

Subramani Ra Mancombu

Chennai

Godrej Agrovet's crop protection business unit has launched a pilot project, Sankalp, to reach farmers in every nook and corner to supply its products, the unit's Chief Executive Officer (CEO) NK Rajavelu has said.

The company is planning to come out with a complete digital programme from cotton farmers partnering scientific communities and "like-minded" seed companies this year, and launch a farmer-friendly app by next cotton season. "Today, when I go to the market, I can find a Coke bottle in rural villages but not agro-chemicals. The need of the hour is to reach agro-chemicals to every nook and corner of a village," Rajavelu told *business-line* in an online interaction. With this in view, Godrej Agrovet Limited (GAVL) re-

cently launched the Sankalp programme. "This programme is to ensure that my distribution network is capable of reaching the last farmer in the rural village. We just started a pilot and we have operated in Vidarbha, Marathwada and Khandesh in Maharashtra from January onwards," the crop unit CEO said. Initial feedback showed the company got an "overwhelming" response, which gave the assurance the quality products are in demand, he said. GAVL's crop protection business unit is trying to connect with farmers through various digital methods. "We are connecting to provide them with the right information. Plus, we also make sure that they can call us back and seek some information. We call it the information sharing centre," said Rajavelu.

The crop business unit will enable a complete digital programme from this coming kharif season. "We are partner-



NK Rajavelu, CEO, Crop Protection Business Unit, NK Rajavelu

ing with several scientific communities and working out several programmes to see what the best solutions are. So we not only will support today's problems but work on medium to long term solutions," he said.

GAVL, which has a good relationship with Japanese companies such as Nissan and plans to launch several new Japanese molecules in the country, is working on another 2-3 new solutions for cotton. These will

become available over the next 3-4 years and help farmers get multiple choices. Stating that the crop protection unit has roped in 12.4 lakh cotton farmers through Whatsapp and call centres, it is trying to increase it to 20 lakh in the next one year.

INTEGRATED SYSTEM

The GAVL's arm, a leader in providing solutions to protect the cotton crop particularly weeds, has made a survey and plans to work on a farmer-friendly app that will provide growers with information. Currently, the company has an integrated system where farmers are connected directly on a daily basis to provide crop advisory.

"We will have some frequency to contact farmers and it will depend on the need. The sowing season is important. When farmers purchase seeds and the monsoon is about to set in, we look at the situation and advise them," Rajavelu said.

Backbone of the Indian Economy

AGRICULTURE has been the mainstay of Indian economy for centuries, providing livelihood support to millions of people across the country. It is a major source of income for rural households who dominate the Indian population. Despite current urbanization, agriculture sector continues to be the largest employer, more than 50% of the country's workforce providing livelihood support to millions of people. It has a multiplier effect on the economy, as it not only provides food but also raw materials to various industries in India. Food security is one of the key reasons why agriculture stands as a backbone of India's economy. This became evident during recent Covid pandemic the world faced for nearly two years when practically all activities were stand still but agricultural activity including production to distribution at door step of consumers continued unabated. The saying of our first Prime Minister Jawaharlal Nehru that "Everything else can wait, but not Agriculture" came to be true during the recent phase of the pandemic. About Indian Agriculture, Bharat Ratna Dr M.S. Swaminathan use to say that "If Agriculture goes wrong, nothing else will have a chance to go right. India's economy has also been made robust by contribution of foreign exchange earnings. India is one of the world's largest producers and exporters of various agricultural commodities such as, rice, wheat, cotton, sugar, fruits, vegetables, tea, spices etc.

It is largely accepted that Indian agriculture has delivered as expected because it could take the country out of extreme food shortages, gross dependence on imports to huge stocks of food, self-sufficiency with enough to export. With geographical area of just 2.4% and water resources of 4%, India supports world's human population of 18% and cattle population of 31%. With the commencement of green revolution, series of agricultural revolutions have been made with appropriate policy support utilized by hardworking farmers and scientists. Indeed, Indian agriculture production is a global success story. Between 1947-2023, India's population increased by a factor of 4.33, from 330 million to 1432 million, but its food pro-



DR. C.D. MAYEE
President, Indian Society for Cotton Improvement, Mumbai and South Asia Biotechnology Centre, Jodhpur-New Delhi

duction rose by a factor of 6.61, from 50 million tons to 331 million tons, in the same period. The combination of newly developed elite cultivars backed by suitable agronomic practices of nutrient and water supply brought the magic. India is no more only a grain-centric country but also made mark in milk, eggs, fish, and honey. India's milk production grew at CAGR of 5.6% in the last 10 years and the country is the largest producer of milk in the world. Agriculture's true contribution to the economy extends beyond its share of GDP. Its growth accelerates growth of service and industry sectors. Neither capital nor input intensive, the family owned small farms played a role in transformation of Indian agriculture which is unique in the world. The average size of operational land holding is only 1.08 ha, yet India's production has rapidly accelerated in recent decades.

All this sounds good but the current challenges threatening the sustainability and profitability of Indian agriculture are far outweighing the psyche of producers. There are several impediments to make the Indian economy that strong. Agriculture shall be continued as the backbone because of sheer population engagement and rural dependence. Today India ranks 107th position in

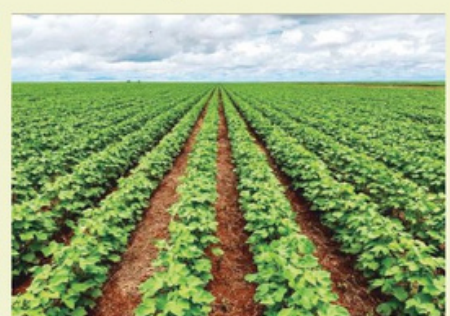


Global Hunger Index, baseline water stress because of ground water depletion, climate change, low productivity particularly in pulses and oilseeds, rising input costs of agriculture production, suboptimal farm mechanization, and yield gap between actual yield and realizable yields are pushing the Indian agriculture backwards. Soil health is adversely affected by range of factors such as; water erosion, wind erosion, water logging, salinity/alkalinity, soil acidity and many complex problems. These issues can be addressed suitably to achieve the target set for India to become US\$ 5 trillion economy. Indian farmers are fortunately multiskilled. Driven by economic necessity to maximize the returns, the small farmers have evolved through self-engineered innovation and therefore they produce variety of agricultural and allied products round the year. Given the desired policy support the farmers and farming shall deliver the targeted goals of Indian economy.

Globally agricultural sciences are experiencing series of innovations and development of technologies that could mitigate the effect of climate change, better the productivity, reduce the impact of soil salinity/alkalinity, acidity, drought, flooding and abiotic/abiotic stresses. The science of ge-



nomics has exploratory changes where many crops are improved through the newly developed genome editing techniques like CRISPER Cas 9. Globally CRISPER-Cas based genome editing has been widely adopted for developing improved crop plants such as; high yielding rice, disease resistant wheat and tomato. The recent approvals of genome edited tomato in Japan, and mushroom, soybean, petunia in the USA are significant examples of translational progress in this area that would encourage other countries including India for crop improvement. India has already developed genome edited drought resistant rice, beta-carotene enriched banana and are in process of improvement of crop yields. Leveraging emerging innovations landscape and technology trends for growth of Indian agriculture will lead to improvement of productivity, profitability, and sustainability. Precision Agriculture is one such system, being adopted world over for higher production. With precision farming, mechanization, sensor-based water and nutrient management,



IoT/AI driven supply chains and robotics, improved networks, UAV/ drones, the farmers will be able to solve the challenges of labour scarcity, traceability, soil health and climate change and change the agriculture scenario in future. The nation is looking for US\$ 5 trillion economy. The working group in the Ministry of Finance, Government of India has indicated that with the accelerated growth rate it is possible to achieve this. Two areas that need greater attention to achieve this are; export push and tripling the current rate of fruit and food processing. The Agri export Policy 2018 coupled with domestic production schemes was a pivot to transform India's agri-export in short span of time to US\$ 50 billion in 2021-22 from merely US\$33 billion five years back. Accomplishing US\$ 120

billion by 2030 would be a testimony of India's will and capability to transform farm sector and harness true export potential of agriculture products.

In the end, it is summarized that India has done a remarkable job in enhancing the agricultural production in nearly all the key areas. However, the current challenges are looming large over the coming years as the population is increasing. The country needs to step up production of many commodities by around 30% to feed the expected 1.7 billion people by 2050. Naturally strengthening research, development, and innovations to create new technologies will be an important step for Indian agriculture as a road ahead. Simultaneously like the current reforms in farm produce marketing, series of policy changes needed to give emphasis on technology and skill-intensive agriculture. Suitable policy reforms will certainly act as the confidential building mechanism amongst all the stakeholders of agriculture. Being the primary source of food, feed, fibre, income, and employment for majority of the population, agriculture shall continue to remain as backbone of Indian economy. Therefore, it is crucial to ensure its sustainable development for the benefit of the country.

Will EFTA show the way for other FTAs?

India has shown flexibility on positions that it has so far not been willing to yield in other trade negotiations

Earlier this month, India and the European Free Trade Association (EFTA) — comprising Switzerland, Norway, Iceland, and Liechtenstein — inked a new-generation trade agreement, the Trade and Economic Partnership Agreement (TEPA). The agreement, in the making for 15 years, signals two firsts for India. One, this is the first comprehensive trade agreement that the country has concluded with advanced economies. Two, India has agreed to include several key areas like intellectual property rights (IPR), and labour and environmental standards that it had resolutely refused in any bilateral trade deal. With India agreeing to include these erstwhile “non-negotiable” areas in the TEPA, will it now show similar flexibility and formalise the bilateral agreements with the EU, Canada, Australia, and the UK?

At first look, India's agreement with the EFTA does not seem attractive given the low levels of trade and investment between the two. In 2022, the share of EFTA members in India's exports was a mere 0.4%, while

India's share in EFTA members' exports was 3.7%. Importantly, 99% of EFTA's exports to India were from Switzerland, 84% of whose major exports were gold. If Switzerland's gold exports are excluded, India's share in its exports was just 0.7%. The question now is whether TEPA can cause a large enough increase in trade volumes, which, in turn, could have a significant impact on the two parties' economies.

Low trade volumes do suggest that there are opportunities for expanding trade flows. In 2022, organic chemicals, gems and jewellery accounted for two-thirds of India's exports to Switzerland. With India's fast-growing export sectors, namely, electronic goods and pharmaceuticals, having a relatively low presence in the EFTA markets, TEPA could help these sectors improve their presence.

TEPA would suggest that the tariff cuts India has agreed to could help the EFTA economies diversify their export basket. This possibility, though, seems limited given Switzerland's two largest export items globally are gold and medicines. While its gold exports to India have reached their limit in a sense, the chances of any large increase in pharmaceutical exports are low, given stiff competition from India's generics producers. For now, there is the possibility of increased exports of luxury items like

watches. Cheaper Swiss cheese, however, will not find its way to Indian tables, as dairy items have been excluded from tariff cuts. Against this backdrop, any meaningful chance of the EFTA's business prospects improving in India lies in the services sector, especially with increased Swiss presence in India's financial sector.



Biswajit Dhar

TEPA made headlines on account of commerce minister Piyush Goyal's announcement that it was “for the first time in the history of the world that we are inking an FTA with a binding commitment to invest \$100 billion in India from EFTA countries”.

However, the Chapter on Investment Promotion and Cooperation does not suggest that the EFTA has made a “binding commitment” to invest in India. It states that the partner countries “share the objectives” that “the EFTA States shall aim to increase foreign direct investment from investors of the EFTA States into India by 50 billion (US dollars) within 10 years from the entry into force of this Agreement and an additional 50 billion (US dollars) in the succeeding 5 years” and that “the EFTA States shall aim to facilitate the generation of 1 million jobs within 15 years”.

Such cautious language on the prospects of the EFTA's “committed investment” may have been adopted due to two factors. First, governments



At first look, India's agreement with the EFTA does not seem attractive given the low levels of trade and investment between the two

ANI

cannot direct their companies to invest in specific countries. Second, over the past two decades, EFTA investments in India have been relatively low. Data from the department for promotion of industry and internal trade show that between April 2000 and December 2023, EFTA members had invested \$11 billion, or just 1.7% of the total foreign investment in India in that period.

The Indian government would, of course, ardently hope that investments from the EFTA undergo a massive transformation given that participation of foreign companies in the country has sharply declined over the past two years. After accounting for divestment by foreign companies, FDI inflows had declined by 25% in 2022-23, and in the first nine months of the current fiscal, this decline stood at 41%. This trend needs to be reversed fast.

One of the more significant concessions offered by India relates to its patent regime. Past governments have refused to amend the Patents Act considering its significance for ensuring access to affordable medicines in India. The Patents Act seeks to fulfil

this objective, among others, by ensuring the “working of patents” in India. The rules require a patent holder to file an annual statement on this. These provisions have been diluted in the TEPA. The chapter on Protection of Intellectual Property says, “no Party shall require patent owners to provide annual disclosures of information concerning the working of a patent”. In other words, patentees would no longer be obligated to disclose whether their patented inventions are being commercially exploited in India. Such amendments of key provisions of the India's Patents Act should have been avoided for two reasons. First, it diluted the objectives of a carefully crafted law with the full concurrence of Parliament to ensure access to affordable medicines, a critical component of the health security of the citizens. Second, changes in the Patents Act offered as a part of concessions in a bilateral trade deal are unjustified since the benefits would accrue to non-members as well.

Biswajit Dhar is distinguished professor, Council for Social Development. The views expressed are personal

Dhanuka to use KVK's land for tech demos, signs MoU with ICAR

Our Bureau
New Delhi

Dhanuka Agritech has, for the first time, signed an MoU with ICAR, under which it will use KVK's land in different parts of the country for demonstration of new technologies in three key areas — seeds, nutrients and agrochemicals.

“Indian Council of Agricultural Research (ICAR) has signed an initial pact with agro-chemical firm Dhanuka Agritech for providing new technology to farmers and also promoting natural farming,” the agriculture ministry said in a statement.

The Memorandum of Understanding (MoU) was signed on March 19 by US Gautam, ICAR's Deputy Dir-

ector General (Agricultural Extension) and RG Aggarwal, Chairman of Dhanuka Agritech, it said.

CLIMATE CHANGE

The objective of this agreement is to utilise the efficiency of both institutions to deliver new technology to farmers, Gautam said adding there are more than 14.5 crore farmers across the country, of which most of them have small land holdings. Dhanuka Agritech will provide training related to agricultural production to these small farmers by associating with the central institutes, ATARIs (Agricultural Technology Application Research Institute) and KVKs (Krishi Vigyan Kendras).

Gautam also said that amid the whole world cur-



rently facing the challenges of climate change, there is a need for both institutions to work together on a new method of agricultural production which is climate-friendly.

The aim of this MoU is to promote natural farming in the changing environment, he added.

Aggarwal said the company will provide advisory service and train farmers in

collaboration with ICAR-ATARI and KVKs.

Speaking to *businessline*, Aggarwal said that Dhanuka has already been conducting awareness programmes among the farmers and has already signed MOU with about 15 State agriculture universities.

“ICAR has about 700 KVKs, which, in turn, have earmarked land for demonstration purpose. We will do comparative demonstration in two adjacent fields to showcase the efficacy of new technologies as seeing is believing and farmers will be able to differentiate the change. In one field the conventional technology that farmers have been using will be used while in the other field all new technologies will be applied,” Aggarwal said.

HARVESTING THE FUTURE OF AGRICULTURE WITH AI



AI-driven technologies provide innovative solutions to age-old challenges, empowering farmers to achieve higher yields

ANINDITA ACHARYA

Biswarup Das, a farmer from Purulia, West Bengal, faces many challenges like unpredictable weather, droughts, pests, and low yields. Like many others in India, he struggles with the effects of climate change and poor soil condition. Unfortunately, farmers commit suicide, too, in the country due to financial difficulties and harsh weather.

In a country where a staggering 54.6 percent of the total workforce is engaged in the agricultural and allied sectors, we can very well understand the significance of agriculture to India's economy. In such a scenario, AI can revolutionise farming practices across the nation. By harnessing data from diverse sources, AI has the power to empower farmers with invaluable insights, enabling them to make informed, data-driven decisions, optimise resource allocation, and mitigate environmental impact. For instance, according to the World Economic Forum, the integration of AI in agriculture holds the promise of a substantial 60% reduction in pesticide usage and a 50% decrease in water consumption.

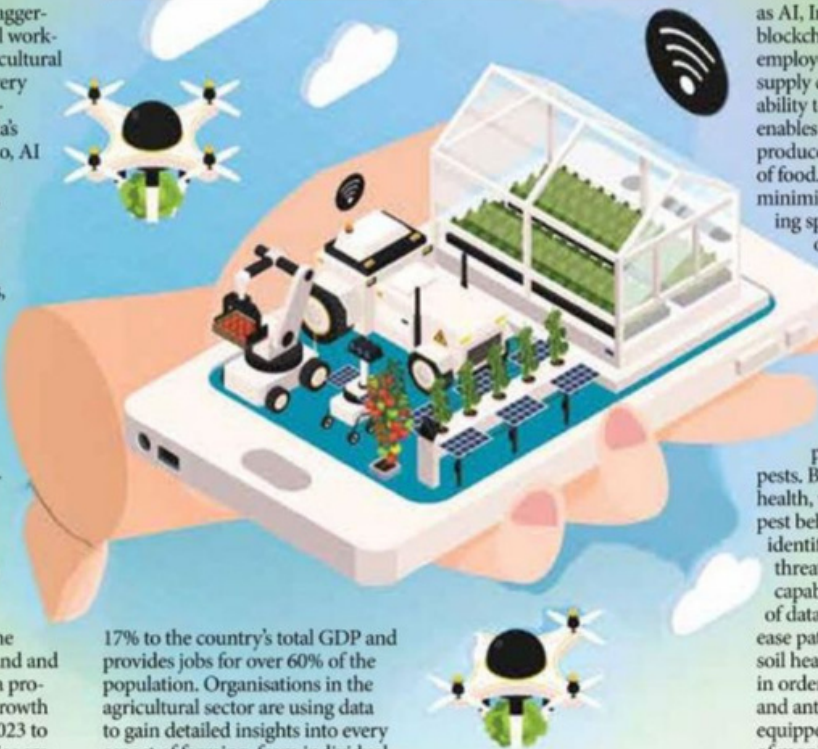
"The impact of AI on the agriculture sector is profound and continually growing, with a projected compound annual growth rate of 23.1 percent from 2023 to 2028. AI-driven technologies are reshaping traditional farming practices worldwide by addressing various challenges faced by farmers," said Rahul Paith, CEO of Machine Learning and Artificial Intelligence Technology Hub (MATH).

In India's growing agritech scene, startups are using AI to help farmers in various ways. One standout example is DeHaat, founded in 2012 by graduates from top institutions like IIT and IIM. Based in Gurgaon, DeHaat offers complete agricultural services to farmers. They use AI to tackle issues like pest control, disease management, and weather forecasting. This helps farmers improve their yields and manage risks better, ultimately making farming more efficient and sustainable.

India relies heavily on agriculture and contributes about

AI TAKES THE LEAD

- » AI can help predict and prevent crop diseases and pests
- » Predictive analytics, which uses AI algorithms, can predict optimal planting times
- » AI-powered tools analyse soil samples, providing accurate nutrient estimates
- » AI algorithms can track and monitor food supply chains
- » AI and computer vision technologies assess produce quality, detect defects, and offer preventive measures to minimise food loss
- » AI aids in addressing challenges like water scarcity



17% to the country's total GDP and provides jobs for over 60% of the population. Organisations in the agricultural sector are using data to gain detailed insights into every aspect of farming, from individual fields to the entire supply chain. "In order to improve agricultural practices, Indian farmers are increasingly adopting AI technologies. Predictive analytics, which uses AI algorithms to predict optimal planting times and agricultural management strategies based on various data points such as weather patterns, soil health or crop yields, is one of the most significant applications. In order to monitor crop health and identify areas that need attention, AI-powered drones equipped with cameras and sensors are used, enabling farmers to take targeted action more effectively. Machine learning algorithms are helping to detect pests and diagnose diseases so that timely intervention can be made to mitigate losses. In addition, market prediction models based on AI provide farm-

ers with insight into commodity prices and demand fluctuations to make informed choices about crop selection and the sales strategies. Overall, these AI applications allow India's farmers to optimise productivity, lower input costs and cope better with changes in the agricultural environment," said Heta Desai Baandal, Managing Director, Sociomark.

India holds the title of being the world's largest producer of milk, pulses, and jute. In the dairy industry, the health of cattle is paramount as it directly impacts milk output. AI has the potential to significantly contribute to predicting and preventing diseases in both crops and cattle. "AI alerts farmers of anomalies or signs of illness, enabling timely intervention to minimise

losses. AI continuously tracks cattle activity, feeding habits, and milk production, facilitating early disease detection. It also automates tasks like milking and feeding, streamlining operations for greater efficiency," said Tamal Chatterjee, Vice President Marketing, Sid's Farm, a premium D2C dairy brand.

Meanwhile, addressing agricultural food waste is a pressing concern in India. According to the Ministry of Agriculture, an estimated Rs 50,000 crores worth of food produced is wasted annually. However, emerging technologies have the potential to significantly reduce spoilage and minimize food waste. Advanced technologies such as AI, Internet of Things (IoT), and blockchain are increasingly being employed to track and monitor food supply chains more efficiently. "AI's ability to predict consumer demand enables farmers and distributors to produce and stock the right amount of food. This proactive approach minimises overproduction, reducing spoilage and waste throughout the supply chain. Also,

AI monitors storage and transportation conditions, identifying potential bottlenecks that can lead to spoilage," said Paith.

Also, AI can significantly help predict and prevent crop diseases and pests. By analysing data on crop health, weather, soil conditions, and pest behavior, AI algorithms can identify early signs of potential threats to crops. "AI systems are capable of analysing vast amounts of data such as past crop disease patterns, weather conditions, soil health and insect behaviour in order to identify possible risks and anticipate outbreaks. Drones equipped with cameras are capable of monitoring fields and capturing images, which can then be analysed by AI algorithms to detect signs of crop damage or pest infestation in real-time," said Baandal.

While AI is gradually transforming Indian agriculture, several challenges must be addressed for widespread AI integration in the sector. The accessibility and affordability of AI technologies for smallholder farmers, who make up a large portion of India's agricultural workforce, is a crucial roadblock. "One significant hurdle is the establishment of a robust data infrastructure conducive to AI applications. Farmer education, too, plays a pivotal role in facilitating AI adoption. Also, ensuring the affordability of AI-powered solutions is paramount to enable broader adoption among farmers," said Chatterjee of Sid's Farm.

Farmers from hill states feel impact of climate fluctuations as output dips

SUBHASH RAJTA
TRIBUNE NEWS SERVICE

SHIMLA, MARCH 24

Horticulturalists and agriculturalists have started feeling the pinch of climate change in a big way. While the apple growers of Himachal Pradesh are finding it tough to meet the 'chilling hour' requirement of the apple plant and the required temperatures during bloom, the impact of climate change in Kashmir is visible in the reduced production of saffron and paddy and the increasing cultivation of warm-area fruits like orange and kiwi.

In Uttarakhand, the paddy-wheat cycle has taken a

major hit due to erratic rainfall, especially over the last five-six years. The horticulturalists and agriculturalists from these regions highlighted these changes and their concerns at the recently held two-day Shimla Climate Meet.

"Snowfall has become extremely erratic over the last couple of decades. A few years have gone without any snowfall. The changing climate is having a severe impact on apple cultivation. When the snowfall is not on time or less, plants do not get the required chilling hours. Also, there's a lot of fluctuation in temperature at the

time of flowering. And excessive moisture during monsoons is triggering several fungal diseases. All this is making apple cultivation a risky affair," said Sohan Thakur, an apple grower from a small village near Shimla.

Akhtar Hussain, an environmentalist and agriculturalist from Kashmir, said that snowfall in Kashmir had been decreasing drastically over the last few years and the changing weather was changing the cropping pattern in the Valley. "The water level in Jhelum has reduced significantly and the water is not available for irrigation of paddy. As a

result, the paddy production has gone down and several diseases have also surfaced," said Hussain.

The other major change witnessed in the Valley is the shifting of bloom period from April to the starting of March. "We are getting the temperatures we used to get in April about a decade back in February now. This has pushed the bloom period, which used to start after April 10, to the start of March," he said.

In Uttarakhand, the impact of climate change is being witnessed in delayed rains, which is affecting the paddy and wheat cycle in the state.

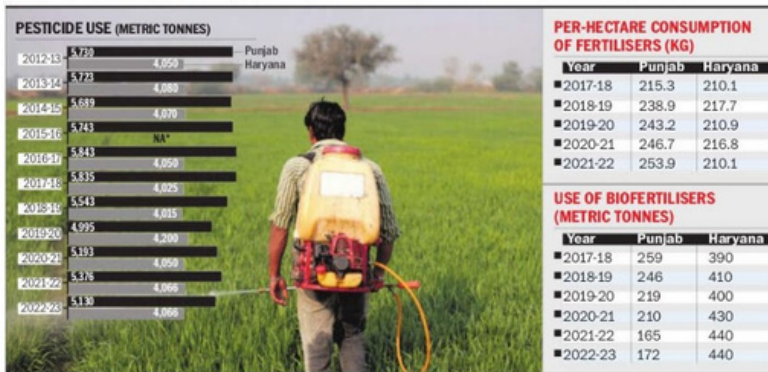
Regenerative farming vital for revitalising agro-ecosystem

SURINDER S KUKAL

Efforts need to be made to minimise the use of chemicals, be it fertilisers or pesticides. This can best be made possible through the integrated and judicious use of organic, chemical and water inputs. The modules of integrated pest management, integrated nutrient management and integrated water management need to be clubbed for integrated input management because the extent of application of each input affects the others in one way or the other.

THE food bowl of India directly needs to revitalise its agro-ecosystem to preserve natural resources such as water and soil and sustain agricultural production. The soil in Punjab and Haryana has been denuded of its inherent nutrients due to the intensive cultivation of high-yielding cultivars of rice and wheat. The non-recycling of plant and animal residue in this monoculture agro-ecosystem over the past three decades has aggravated the situation. The indiscriminate application of pesticides has polluted the soil. The water-guzzling crops of paddy and spring maize, along with the 'over-irrigation' tendency of farmers, have depleted the groundwater. Its quality has also been deteriorating with its fast depletion. Irregular rainfall with frequent dry spells in recent years has put additional burden on the groundwater in the region. Also, the climate chaos poses a huge challenge to the agricultural production system of northwest India.

We need to shift our focus towards regenerative agriculture and frame policies accordingly in Punjab, Haryana and western UP. Regenerative agriculture aspires to spur the agro-ecosystem to follow natural cycles—carbon cycle, water cycle and other nutrient cycles. Nature offers these cycles to sustain life on earth. However, due to various anthropogenic activities, these cycles have got disturbed. This has led to a scarcity of nutrients and water, coupled with pollution of air, water and soil. Regenerative agriculture aims to restore these natural cycles to a great extent, if



SOURCE: DEPARTMENT OF AGRICULTURE & FISHERIES, GOVT. OF PUNJAB & HARYANA. *NOT AVAILABLE.

not to their original status. For this purpose, we need to assess the life cycle of the prevalent cropping systems for the use of various inputs. Efforts need to be made to minimise the use of chemicals, be it fertilisers or pesticides. This can best be made possible through the integrated and judicious use of organic, chemical and water inputs. The modules of integrated water management (IWM), integrated pest management (IPM) and integrated nutrient management (INM) need to be clubbed for integrated input management (IIM) because the extent of application of each input affects the others in one way or the other. For example, a higher application of nitrogen fertiliser leads to a greater insect-pest attack and a higher use of water. Similarly, a higher use of water affects the loss of nutrients through leaching

and/or volatilisation losses, thereby impacting their availability to the plants. IIM involves integrating the nutrient, water and pesticide use with the aim of optimising input use. **Integrated water management:** IWM should aim at rainwater harvesting, soil moisture conservation, conservation irrigation techniques, etc. **Excess rainwater** needs to be collected in dug-out ponds or diverted towards groundwater recharge structures. **The frequency and amount of irrigation**, apart from crop water requirement, should take into account potential pest attacks, weed infestation and nutrient availability to plants. **Laser-levelling fields**, small irrigation plots (based on soil texture), furrow irrigation, optimum irrigation depth, conservation irrigation (including micro-irrigation), short-duration cultivars, and coinciding the crop season with low evapotranspiration season should be part of the IWM strategy. **Soil or self-mulch** must be practised for better moisture conservation, apart from the use of crop residue as mulch material. **The irrigation schedules** should take into account the profile of moisture storage during the previous crop season. Water productivity must be worked out on the basis of the cropping system as a whole, including the intervening period between two crops. **The irrigation-specific weather advisory** should be part of IWM, considering expected rainfall, relative humidity and temperature conditions. **A blend of groundwater and surface water** (wherever available) must be encouraged for better plant growth and conservation of groundwater.

Efforts must be made to allow excess rainwater to recharge the groundwater. **Integrated pest management:** IPM should aim at minimising the use of synthetic pesticides. **The habitats for insect- and disease-pests** in the form of weeds and/or peripheral crop plants and crop residue need to be removed. **Crop- and pest-specific optimum thresholds** need to be strictly followed for pest control. **Improved cultural practices**, including optimum irrigation and fertilisation, must be practiced to minimise pesticide use. **Neem and other organic insect repellents**, including water sprays, should be given top priority, followed by green pesticides. **Use of biocontrol agents and biopesticides** must be preferred for pest management. **Mechanical destruction** of weeds before seed formation

should be the thumb rule for minimising the use of herbicides. The weeds can be suppressed through mulching at the initial stages of their germination and growth.

Integrated nutrient management: INM is aimed at lowering the dependence on synthetic fertilisers for plant nutrients and reducing nutrient losses through leaching and volatilisation.

The recycling of crop residue, live crop biomass in the form of green and brown manuring, coupled with the application of well-decomposed farmyard manure, can lower the dependence on synthetic fertilisers.

Rotating the cropping system with leguminous crops can help enhance microbial activity in soils and curb the use of synthetic nitrogenous fertilisers.

Optimum irrigation frequency and depth can help minimise leaching losses of applied nutrients. **The use of crop-specific biofertilisers**, as recommended by Punjab Agricultural University, needs to be adopted strictly.

Balanced fertilisation in terms of the ideal ratio of N:P:K (nitrogen, phosphorus and potassium) with respect to the crop and the soil's inherent nutrient capacity must be adhered to while applying synthetic fertilisers.

Application of synthetic fertilisers should take into consideration localised variations in the soil type, including physical, chemical and biological aspects.

The three modules must be integrated to formulate cropping system-specific integrated input management for regenerative agriculture.

The author is a member of the Punjab Water Regulation & Development Authority

FMC India rolls out new farm intelligence platform

Arc will help farmers optimise crop yield and improve sustainability

BB BUREAU
HYDERABAD

FMC India, an agricultural sciences company, has launched its innovative precision agriculture platform, Arc, in India. The new offering is aimed at encouraging smarter agricultural practices for farmers, advisers and channel partners.

By combining real-time data and predictive modelling, Arc farm intelligence assists farmers in monitoring field conditions and pest pressure. Farmers can then ensure precise application of the recommended crop care products to optimize yield and achieve higher returns on investment.

Ravi Annavarapu, President, FMC India and South-West Asia, said, "Farmers encounter numerous challenges in the field on a daily basis while navigating today's complex and evolving agricultural landscape. Arc farm intelligence, a one-stop solution for farmers, will support them in making informed decisions based on real-time field insights for more effective and efficient crop care, thus providing them with enhanced



The digital platform simplifies smart farming by using predictive modeling based on real-time data, enabling farmers to view emerging hotspots and target crop protection products precisely where and when they are needed, for more cost-effective control

precision, productivity and profitability".

We are confident that farmers will gain a significant advantage and stay ahead with these technology-driven services, he added.

The platform, available through a new app, will not only provide in-depth insights into FMC's leading product portfolio, but also enable farmers to participate in several digital initiatives and contests throughout the

year to win attractive rewards.

The app will also provide farmers easy access to FMC India's boom spray service. Available at their fingertips, farmers can easily schedule a spray and pay using an integrated payment gateway on the app. Farmers can better plan their spray calendar with ten days' advance weather forecast and make informed crop-care decisions. Additionally, farmers across India can access door-step delivery of FMC's leading products via the app, as it is directly linked to FMC's brand store on Amazon. Farmers can now access Arcplatform by downloading the app on their mobile devices from iOS and Android app stores. The multi-lingual app is available in Hindi, English, Tamil, Telugu, Kannada and Marathi languages.

Govt to launch e-trade platform for identifying export barriers

100-DAY PLAN. Includes measures to boost exports to achieve \$2-trillion goal by 2030

Amiti Sen
New Delhi

The Commerce Department has sought inputs from export bodies on trade barriers and non-tariff measures they face in different countries to incorporate ways to combat such barriers in the 100-day action plan to be presented to the new government that takes over after the general elections.

The 'Trade Connect ePlatform', which seeks to provide information to new and aspiring exporters on identification of products for export, non-tariff barriers, updated tariff schedule of items, applicable customs duty and benefits under India's FTAs, will also be launched as part of the 100-day action plan, a source tracking the matter told *businessline*.

"The 100-day action plan will contain various measures to boost exports to move towards achieving the \$2-trillion goal for 2030. Launch of the Trade Con-



BREAKING LOGJAM. The 'Trade Connect ePlatform' seeks to provide information to new exporters on non-tariff barriers, updated tariff schedule, customs duty and benefits under FTAs

nect ePlatform is also a step in the direction. Addressing non-tariff barriers is also likely to be part of the plan as they hinder export growth in markets where tariffs are already low," the source said.

Prime Minister Narendra Modi, at a Cabinet meeting earlier this month, asked Ministers to draft a roadmap for the first 100 days of the

new government and another one for the next five years of the government.

UK-OMAN FTA

"Most of the export bodies have already given their inputs to the Commerce Department on non-tariff measures and other trade barriers for their particular sectors in various countries.

The inputs are now being collated," the source said.

The 100-day action plan is also likely to include the Commerce Department's intention to seal Free Trade Agreements with the UK and Oman. "As the FTA with Oman has been almost fully negotiated and is going through legal vetting and the one with the UK has just a handful of issues to be sorted out, these will probably be included in the 100-day plan," the source said.

On the Trade Connect ePlatform, the source pointed out that it was almost ready but would be launched as part of the 100-day action plan. The ePlatform will act as a one-stop-shop for exporters and importers to connect with existing portals.

In the April-February 2023-24 period, India's goods exports contracted 3.5 per cent to \$394.99 billion as continued slowdown in Western economies and geopolitical stress affected demand.

Why Nov-Dec temperatures may decide the rabi output

HARISH DAMODARAN
NEW DELHI, MARCH 28

IN RECENT times, wheat has often been hit by a spike in temperatures in March, just when the crop is in the final grain-formation and filling stage. In the current crop season, maximum temperatures have so far been near normal in much of northwestern and eastern India.

With more than half the grain-filling period — 30-40 days of the kernels accumulating starch, proteins and other nutrient matter — over in the major wheat-growing regions, and the crop already or near-harvested in central India, chances of yield loss due to heat seem low. "The crop expression has been overall excellent in Punjab, Haryana, UP, and Bihar. We can expect high yields and good production in these states," Rajbir Yadav, principal scientist at the genetics division of the Indian Agricultural Research Institute (IARI), said.

Less-than-cold start

Yadav was, however, less sanguine about wheat production in central India — Madhya Pradesh, Maharashtra, Gujarat, and parts of Rajasthan. Reason: the late onset of winter. Monthly average minimum temperatures over central India were 1.67 degree and

2.12 degree Celsius higher than normal in November and December respectively. This led to premature initiation of flowering — the crop, whose earheads bearing flowers (and eventually grain) should take 75-80 days to fully emerge from the wheat tillers (shoots), came to heading in 60-70 days.

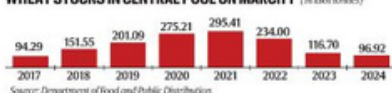
Northwestern and eastern India too had above-normal temperatures in November and December, but the deviations weren't as much. Also, in central India, wheat is sown from the last week of October to mid-November, earlier than the first half of November in northwestern India, and mid-November to mid-December in eastern UP and Bihar.

The delayed winter would have affected the crop sown earlier, cutting short its vegetative growth (roots, stems, leaves) phase. The impact would have been more in central India, where the crop's growth duration is 125-130 days, compared to 140-145 days in Punjab and Haryana.

While winter did set in fully by late December, the crop in central India suffered due to fog and a lack of sunlight in January. After having flowered early, the wheat now recorded poor pollination and seed-setting.

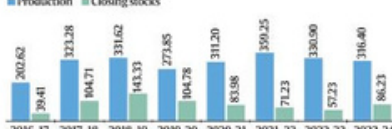
"There has been a reduction in the number of tillers per plant as well as seeds formed per spike (ear-head), which may translate into lower grain yields in central India," Yadav said.

CHART 1
WHEAT STOCKS IN CENTRAL POOL ON MARCH 1 (in lakh tonnes)



Source: Department of Food and Public Distribution

CHART 2
SUGAR PRODUCTION AND CLOSING STOCKS (in lakh tonnes)



Source: National Federation of Cooperative Sugar Factories Ltd.

Production effect

Laxmi Narayan Dubliya, a wheat grower from Polajyagi village in Sonkatch tehsil of MP's Dewas district, said, "Pehle do mahina mein vjeron mazamun raha. Fasal to thand nah mil jayegi (The weather was adverse in the first two months, not cold enough for the crop)."

Dubliya, who is also a director of the Dewas Kisan Producer Company Ltd, estimated the average yield in his area for the wheat sown during November 1-15 at 20 quintals per acre, down from last year's 25 quintals. "Those who sowed earlier, during October 20-31, harvested hardly 14 quintals. Unlike our kisan shaakshya bane (their crop developed fewer tillers)," he said.

Of the total 34.2 million hectares (mha) area under wheat in the 2023-24 rabi season, MP accounted for 8.7 mha, with Gujarat and Maharashtra together adding another 2.3 mha. If the lower yields from central India are offset by bumper harvests in the northwest and east, the country can still end up producing more wheat than in 2022-23 and 2021-22. The need for a better-than-average crop is more this year, given that wheat stocks in government godowns are at a seven-year low (Chart 1).

Tuber trouble, too

Potato too, has been hit by the unusually warm November-December, followed by a cold but sunless January. Doorgar Singh, a farmer and cold store owner from Khandauli in Etanadpur tehsil of UP's Agra district, said potato requires sufficiently low temperatures during planting from mid-October to mid-November to enable vegetative growth.

Even when temperatures fell in January, there was no sunlight, Singh said. Thus, not only were fewer underground tubers formed, their development through photosynthesis was impeded. "Last year, yields were 250-300 packets (each of 50 kg) per acre. This year, we got 25-35 packets fewer," he said.

Government data show potato retailing at Rs 20 per kg, compared to its year-ago all-India average modal (most-quoted) price of Rs 10. Retail prices of onion and tomato have posted increases of Rs 20-30 per kg. In their case, dry weather and depleted water levels in reservoirs and aquifers, especially in Maharashtra and Karnataka, has led to a reduction in rabi planted acreages as well.

One sweet story

There's good news on the sugar front, though. The last sugar year (October 2022-September 2023) ended with stocks of 5.7 million tonnes (mt), the lowest since 2016-17. The current year is likely to see a production decline, and yet closing stocks recovering to a four-year-high of 8.6 mt (Chart 2).

Prakash Nainkare, managing director of the National Federation of Cooperative Sugar Factories, said two factors were responsible. First, Maharashtra received good rain in November and December, which provided a lifeline to the standing cane. Second, the Centre's decision in December 2023 to restrict the use of sugarcane juice's syrup and intermediate-stage 'B-heavy' molasses for the production of ethanol. "These factors will contribute to higher than expected output and comfortable stocks position," he said.

India a potential superpower, will seal FTAs on our terms: Goyal

EXPRESS NEWS SERVICE
MUMBAI, MARCH 29

INDIA IS a potential superpower and would not rush into closing Free Trade Agreements (FTAs) unless these are on New Delhi's own terms, said Piyush Goyal, Union Minister of Commerce and Industry, Consumer Affairs and Food & Public Distribution, and Textiles.

Responding to a question at *The Indian Express's* Idea Exchange (a detailed transcript will be published Monday) on



India now is not the India of 2009 or 2010: Goyal



FTA talks between India and the UK, and the failure of the two countries to reach a consensus ahead of 2024 Lok Sabha elections, Goyal said, "India now is not the India of 2009 or 2010... The Modi government goes about FTA negotiations very cautiously, with a great deal of stakeholder consultations, and

CONTINUED ON PAGE 2

AI can predict yield, fight disease in crops: Experts

Amisha.Rajani
@timesgroup.com

All innovators should now focus on utilising artificial intelligence (AI) models to address grassroots issues in society, particularly those affecting agriculture and farmers, who constitute majority in India, Swecha founder Y Kiran Chandra has said. He said this during AI conference's 'AI Days 2024, AI for Society' held at Jawaharlal Nehru Technological University on Saturday.

"AI, comprising data and training, is an open-source platform that transcends mere writing models, with the potential for integration into various facets of daily life, including those of farmers. Numerous farmers continue to depend on manual labour or outdated machinery for cultivation,"



Pic: Suman Reddy D

AI FOR ALL: A panel discussion at 'AI Days 2024' conference at Jawaharlal Nehru Technological University in the city

Chandra said at the two-day AI conference, 'AI Days 2024', being organised by Swecha, a non-profit organisation.

"Insufficient knowledge of operating outdated machinery, combined with their deteriorating condition, poses life-threatening risks. Each year, thousands of farmers get electrocuted. Hence, AI offers numer-

ous agricultural solutions, including basic tasks like voice-automated operation of electric motors, eliminating the need for manual intervention," Chandra said.

By integrating machine learning in drone technology, a farmer could also detect disease, if any, that crops might be facing, he added.



I want to emphasise on the word intelligence from Artificial Intelligence... We are thinking intel for auto drivers, tailors, garment seller. We aim for intelligence for all — **Gaurav Raina** | PROFESSOR

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