Weather forecasting improves but access remains uneven for farmers

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27 Jun 2025 Delhi Climate Finance

- *With warming temperatures and unpredictable weather patterns, farmers need timely weather updates to prevent losses.*
- *There is low adoption of weather forecast apps and a lack of hyperlocal weather updates. There are also barriers in weather information accessibility.*
- *Meanwhile, the weather forecast accuracy is improving and there are efforts to offer counselling to the*

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It was a hot morning in east Delhi's Samaspur, a village on the Yamuna floodplains. Ram Nivas and his wife Rekha were busy sorting the green beans they had plucked from their field. Two more farmers joined to help the couple who were in a hurry. "I need to finish and get these to the *mandi* (market)," said Nivas, bundling the produce on his head. Asked why the rush, the 40-year-old farmer said, "It's better to sell the produce at the earliest possible, given the unpredictable weather. I don't know when it might start raining and I will lose all that I harvested."

On the intervening night of May 24-25, severe rainfall with hail and winds clocking 82 km/hour wreaked havoc in Delhi. Like the rest of the city, Nivas too was caught off guard and ended up losing six bighas (3.7 acres) of his farm produce — spinach planted in 2.5 bighas and the rest cucumber, which he had hoped to cash in this summer.

Nivas, who works on six acres of farmland, has been farming since his teenage but saving his crops from

erratic weather continues to be a challenge. Satbir Singh, 60, a third-generation farmer from the same village could not protect his harvest as well. “I lost all the corn that I had grown in five bighas (3.1 acres). Had I got two weeks more, I would have been able to harvest the crop,” Singh lamented. “Unseasonal rainfall not only destroys crops but also washes away pesticides, reducing effectiveness and causing soil seepage.”

Singh, who has a landholding of 20 bighas, said climate change is rapidly disrupting sowing and harvesting schedules. “Cucumber yields are poor now. We stopped growing tomatoes due to *maurya* (leaf curl disease), and we don’t know how to prevent it.”

The tomato yellow leaf curl virus (TYLCV) infection leads to severe stunting, reduction of leaf and fruit size, curling of leaves, chlorosis on leaves and flowers. The virus can cause yield losses of 90-100%. Warming temperatures and altered weather patterns help its carrier, the whitefly (*Bemisia tabaci*), to spread more easily.

As temperatures rise and weather patterns become erratic, the whitefly that carries the tomato yellow leaf curl virus spreads more easily. The infection can stunt plants and cause chlorosis on leaves and flowers, leading to yield losses of as high as 90-100%. Representative image by Scot Nelson via Public Domain.

Satyawan Singh Chauhan, another farmer who owns around 52 acres of farmland in Daryapur Kalan, a village in northwest Delhi’s Narela-Bawana agricultural belt, echoed Singh’s concern. “Pests and fungal infections in crops have grown due to the erratic weather, doubling investments on prevention measures. I had to discard much of my brinjal harvest this summer.”

Receiving quick weather updates is important for all farmers, especially now, with unseasonal rainfall affecting harvests. However, not all farmers receive the updates on time.

Digital divide

Abhishek Dhama, a largescale farmer in Cullakpur, a village in North Delhi district close to the Haryana border, said open farming is getting riskier with the growing uncertainty of weather conditions in the national capital. “You can’t afford to be laidback anymore,” he said.

An engineer-tuned-farmer who owns 65 acres of farmland, Dhama always starts his day with weather updates from SkyMet, HU Weather, and Google to decide the irrigation requirement for the different varieties of crops — corn, ladyfinger, cucumber, beans, and other leafy vegetables. “If rain is forecast for

tomorrow or the day after, I ask my workers to not water the crops to their maximum requirement. If heavy rains are predicted, we skip irrigation altogether," said Dhama, who won the Indian Agricultural Research Institute's (IARI) 'Innovative Farmer' award in 2020.

Unlike Dhama who is tech-savvy and has the resources to access daily weather alerts, Nivas hardly checks such updates, whereas Singh occasionally checks weather news on YouTube and TV channels. "I don't have the time, nor am I technologically sound," Nivas said. He laughs and adds, "*Subah subah phone chalane ka samay kisaan ke paas thodi na hota hai* (Farmers don't necessarily have the time to check their phones early in the morning)."

Nivas shakes his head when asked if he knows about the India Meteorological Department's (IMD) Meghdoot app, which provides weather-based agro advisories and warnings of extreme climate events. "We go by intuition. Winds from the west are good. If they shift east, it means the rain is coming and we harvest early."

Satyawan Singh Chauhan from Daryapur Kalan, a village in Delhi, shifted to organic farming for most of his crops after learning of the harmful impacts of chemical inputs. He has since received multiple awards from Indian Council of Agricultural Research (ICAR)-IARI for practising and promoting organic farming. Image by Rishabh Ojha.

Dhama, though aware of Meghdoot, prefers SkyMet due to its accuracy. Launched in 2019, IMD's Meghdoot app gives district-specific crop and livestock advisories twice a week in English and 11 regional languages. It uses forecasts and historical data to advise farmers on sowing, irrigation, and pest management. These weather details are also accessible to farmers through the Mausam app. To extend real-time weather updates to the rural farmers, Agromet Field Units (AMFUs) located at the state agricultural units also use social media platforms such as WhatsApp, Facebook and YouTube to disseminate weather forecasts, severe weather warnings, and agro-met advisories.

Adoption and challenges

At the end of 2024, Meghdoot has seen around 3.75 lakh downloads across India, said Sivananda

For extreme weather events such as heat waves, the IMD typically issues alerts up to five days ahead, updated four times daily. But for rapidly forming events such as hailstorms, "the lead time is much

shorter — within six hours — due to the inherent challenges in predicting such events in advance," explained Pai, also the Programme Head of Ministry of Earth Sciences' Mission Mausam, an initiative aimed at strengthening early warning forecast systems for extreme weather events using advanced technologies such as high-resolution weather models, satellite observations, and artificial intelligence.

Ram Nivas has planted lady's finger and hopes to reap good returns on the crop this year. Image by Rishabh Ojha.

The sudden downpour on May 24 with winds gusting up to 82 km/hr was not a standalone event that created mayhem last month. On May 2, heavy rains (77 mm at Safdarjung) with strong winds disrupted flights, traffic, and killed four in a house collapse. For the May 2 storm, IMD issued a red alert on the same day. On the night of May 24-25, a Nowcast red alert was broadcast just hours before the thunderstorm struck. While both forecasts were issued in close temporal proximity to the events, short lead times limited farmers' ability to respond effectively. May 2025 clocked 186.4 mm rainfall at Safdarjung — the highest for the month since 1901, breaking the May 2008 record of 165.0 mm.

According to IMD's data on rainfall forecast accuracy in Delhi in the last 15 years, the department achieved the highest accuracy at 99% in 2022. The overall accuracy this year until May stands at 92% with the pre-monsoon season accuracy for the corresponding period at 88%, against 99% in 2022. The month-wise data also shows a dip to 81% this May from 87% in April.

Timely updates are crucial to the farming community. Even Chauhan, who regularly follows weather updates on DD Kisan and WhatsApp groups created by Krishi Vigyan Kendras and ICAR-Indian Agricultural Research Institutes (IARI), suffered losses of up to ₹2.5 lakh to peas and onion — due to a sudden downpour and hailstorm last summer.

Asked about the data gaps the IMD is facing in predicting weather more accurately for Delhi's dense urban and peri-urban areas, Pai mentioned the sparse spatial density of high-resolution observational data, especially in areas with complex land use and microclimatic variability. "Despite having Automatic Weather Stations (AWS) and rain gauges, their distribution is not always adequate to capture rapid changes in temperature, humidity, wind, or precipitation patterns that occur at the neighbourhood level. Urban heat island effects, anthropogenic emissions, and impervious surfaces make forecasting more difficult in cities, where models often fail to resolve fine-scale variability," the IMD scientist added.

Digital Empowerment Foundation (DEF), which works with rural farmers in Nuh (Haryana), Ghaziabad, Hapur, and East Delhi, calls this lack of hyperlocal precision a major barrier. Their grassroots network called 'SoochnaPreneurs' helps farmers understand advisories through local dialects. "IMD advisories are

often at the district-level, which isn't helpful for small land parcels or floodplain farming along the Yamuna," said Osama Manzar, the founder and director of DEF.

DEF has established a call centre as a dedicated helpline where farmers can contact a toll-free number to connect with trained counsellors, register queries, and provide feedback, all in their local languages. Farmers also call the number to seek financial counselling and information about products and various government schemes related to agriculture.

"The weather advisories shared by KVK-Ujwa or other government platforms often skip the outskirts of Delhi such as Narela and Bawana. So, I also keep a tab on hyperlocal weather updates on Google," Chauhan said.

Pai noted, "In peri-urban regions like Narela or Bawana, another gap is the lack of hyperlocal soil moisture, surface runoff, and land-use data, which impacts both weather and hydrological forecasts. The IMD is trying to integrate IoT-based sensor networks, high-resolution satellite data, and citizen science platforms to bridge these gaps."

"Moreover, inter-agency data sharing (with municipal bodies, CPCB, etc.) remains suboptimal, slowing down the creation of integrated urban weather systems. While the IMD has started leveraging AI/ML (artificial intelligence /machine learning) models, these need large, granular historical datasets for training, which are currently limited for urban microclimates," he added.

In the aftermath of heavy rains in Uttar Pradesh. For extreme weather events such as heat waves and heavy rainfall, the India Meteorological Department typically issues alerts up to five days ahead. However, for rapidly forming events such as hailstorms, the lead time falls to just hours. Representative image by Biswarup Ganguly via Wikimedia Commons (CC BY 3.0).

Gaps in weather info accessibility

Manzar also calls for the need of weather advisories that are relevant, timely, and adapted to the knowledge systems of the local farming communities. "From our training and sensitisation sessions in Delhi NCR and other areas across India, the key barriers we have encountered are low smartphone penetration, especially among women and older farmers, technical literacy gaps that make navigation of apps difficult, and lack of trust in digital advisories when past forecasts have been inaccurate," he said.

"Most weather apps aren't designed for low-literacy users, and updates are often delayed during fast-changing weather conditions," Manzar adds. He also pointed out that there is little scope for farmers to

“give feedback or report local anomalies” as these are one-way communication systems. “Integrating weather and financial advice, for example, sowing decisions along with cost-risk assessments, has increased trust in digital advisories,” he added.

Skymet and IMD provide weather forecasts and satellite-derived meteorological data (on rainfall probability or temperature trends). DEF’s SoochnaPreneurs(community digital leaders) then interpret this data and translate technical weather info into actionable, culturally appropriate advice for farmers to help them adjust planting, irrigation, and harvesting schedules accordingly. Programmes such as Krisarthak by DEF that aim to bridge the digital gap for farmers, reached thousands of farmers in Assam.

“The insights, combined from Skymet, IMD, and DEF’s local interpretation, helped several farmers adjust their schedules and avoid crop losses. Some also sought help to explore crop insurance schemes and financial buffers after counselling on resource management,” Manzar added.

Both Chauhan and Dhama agreed that staying profitable amid climate change requires a combination of resilient crops, smart agri-input use, and weather vigilance. “The government is doing its bit. But farmer networks are still the best way to spread critical information — be it a new advanced seed variety or a severe weather alert,” said Chauhan, who regularly collaborates with PUSA and ICAR-IARI to conduct training programmes for farmers in north Delhi and Haryana.

Sharing the IMD’s latest breakthrough in improved forecasting, Pai mentioned about the Bharat Forecasting System (BFS), launched in 2025. The system has been experimental since 2022 but was launched for operation on May 26, 2025. “It operates on a six-kilometre grid which enhances forecast precision, especially for extreme events,” he said.

Read more: Climate scientist M.N. Rajeevan’s dream book explains rainstorms, longer monsoon seasons, highlights forecast challenges [Interview]

Banner image: Ram Nivas, Rekha and another farmer sort green beans in Samaspur village. Image by Rishabh Ojha.

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