El Niño cloud on farms

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New Delhi: Poor pre-monsoon rains have already damaged Syed Ghani Khan's mango crop this year in Kiragavalu village in southern Karnataka. The farmer says only about a tenth of the fruit survived compared with last season.

Now, amid concerns about a weak monsoon unfolding in the coming months, Ghani is wondering whether he may need to switch from farming paddy to finger millet, a hardier crop that can survive with less rainfall, in a portion of his 14-acre plot.

"But finger millet comes with much higher post-harvesting expenses than paddy crop," Khan said. "Our farm is our only source of income. We're worried about what might happen this year."

Rising sea surface temperatures in the equatorial Pacific — the climate pattern known as El Niño — have amplified concerns that India may face a weak summer monsoon this year.

The India Meteorological Department forecast last month that rainfall during the June-September monsoon season is likely to be 92 per cent of the long-period average, placing it in the "below normal" category.

India's four-month summer monsoon delivers three-quarters of the country's annual rainfall, replenishing reservoirs and groundwater while sustaining the farm economy. Nearly half of India's farmland still depends on seasonal rainfall, making the rains critical for crop yields, food prices and rural incomes.

As concerns over rainfall grow, farmers and crop-weather experts are increasingly turning to hyperlocal forecasts and adaptation strategies.

"Wherever the rains weaken, farmers may have to rethink what they plant and when they plant it," said M.H. Manjunatha, an agronomist and crop-weather specialist at the University of Agricultural Sciences in Bengaluru.

Agronomists say farmers may need to shift toward shorter-duration or less water-intensive crops if rainfall weakens. They may also need to plant green-manuring crops such as sun hemp or horse gram to improve soil nutrients and water retention before sowing main crops, Manjunatha said.

Rajesh Krishnan at his farm in Wayanad, Kerala

Researchers with the Indian Council of Agricultural Research have, over the years, released short-duration varieties of rice, maize, finger millet and pulses, among other crops, intended to help farmers cope with rainfall stress.

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But for farmers, the timing and distribution of rainfall often matter more than seasonal totals. Delayed showers or prolonged dry spells during August and September can damage water-intensive crops such as rice as well as long-duration kharif crops, including cotton and groundnut.

"There's a tendency to celebrate the weather or demonise the weather," said Rajesh Krishnan, a farmer who grows mainly paddy and coffee on terraced farms in Wayanad in northern Kerala.

Krishnan and hundreds of other farmers in Wayanad have since 2021 relied on hyperlocal forecasts produced annually by researchers at the Hume Centre for Ecology and Wildlife Biology, a non-government research organisation in Wayanad. The 5-km by 5-km scale forecasts help farmers decide when to transplant crops, irrigate fields or harvest produce.

Such forecasting is expected to become increasingly relevant as climate variability intensifies and broad long-range monsoon projections offer limited local guidance, said Subimal Ghosh, the head of the Centre for Climate Studies at IIT Bombay.

Ghosh and his colleagues have also developed a crop-weather forecasting system that has helped grape farmers in Nashik reduce water use by 10-30 per cent through more precise irrigation planning. The system is now being evaluated in Maharashtra's Satara district.

While El Niño events often weaken monsoon rainfall over the Indian subcontinent, scientists say their effects are not always predictable. Climate forecasts released by the World Meteorological Organisation last month pointed to the onset of El Niño conditions during May-July.

"One example is 1997 when we had one of the strongest El Niño events, but a normal monsoon," said Parthasarathi Mukhopadhyay, formerly at the Indian Institute of Tropical Meteorology in Pune and now a visiting faculty member at Ashoka University.

An Indian Ocean temperature phenomenon called the Indian Ocean dipole sometimes appears to counteract the effects of El Niño, but Mukhopadhyay said, the Indian Ocean dipole is harder to predict than El Niño.