

El Niño and the monsoon

India has had good monsoons from 2019-22, helped by a prolonged La Niña event. This year could see an El Niño — while all drought years in India have been El Niño years, not all El Niño years have produced droughts



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FROM 2019 to 2022, India had four consecutive years of good southwest monsoons and overall rainfall.

In these four years, the country as a whole received an average area-weighted rainfall of 1,268 mm annually and 933.1 mm over the four-month southwest monsoon season (June-September).

By contrast, the preceding five years from 2014 to 2018 registered an average annual rainfall of just 1,072.1 mm — and 812.4 mm during the southwest monsoon season.

The surplus precipitation — more than the normal or historical long period annual average of 1,160.1 mm (868.6 mm for the monsoon season) — during the last four years has helped deliver higher agricultural growth relative to the previous period that recorded poor rainfall in three (2014, 2015 and 2018) out of the five years (Table 1).

According to national accounts data, the farm sector has grown by an average of 4.3% per year from 2019-20 to 2022-23, as against 3.2% from 2014-15 to 2018-19.

The La Niña bounty

The bountiful rainfall over the last four years owes significantly to La Niña, an atmospheric wind and sea surface temperature (SST) variability phenomenon that occurs over the equatorial Pacific, but impacts weather worldwide.

La Niña basically refers to an abnormal cooling of the central and eastern Pacific Ocean waters off the coasts of Ecuador and Peru. Such cooling (SSTs falling 0.5 degrees Celsius or more below a 30-year average for at least five successive three-month periods) is a result of strong trade winds blowing west along the equator, taking warm water from South America towards Asia. The warming of the western equatorial Pacific, then, leads to increased evaporation and concentrated cloud-formation activity around that region, whose effects may percolate to India as well.

The latest La Niña event was one of the longest ever, lasting from July-September 2020 to December-February 2022-23. It brought copious rain to India — just as the

TABLE 1

AREA-WEIGHTED RAINFALL

	Monsoon*	Annual**
2014	781.7 (-11.92)	1044.7 (-12.03)
2015	765.8 (-13.71)	1085.0 (-8.64)
2016	864.4 (-2.60)	1083.1 (-8.80)
2017	845.9 (-4.69)	1127.1 (-5.09)
2018	804.1 (-9.40)	1020.8 (-14.05)
2019	971.8 (10.36)	1288.8 (9.51)
2020	961.4 (9.18)	1289.6 (9.58)
2021	874.5 (-0.69)	1236.4 (5.06)
2022	924.8 (6.47)	1257.0 (8.36)

Note: *Jun-Sep; **Jan-Dec; Figures in brackets are % deviation from normal long period average. Source: India Meteorological Department




TABLE 2

ALL BUT ONE DROUGHT YEAR IN INDIA WAS EL NIÑO YEAR

Year	Drought Intensity	El Niño Intensity
1957-58	Major	Strong
1965-66	Major	Strong
1966-67	Major	No El Niño
1972-73	Major	Strong
1976-77	Moderate	Weak
1979-80	Major	Weak
1986-87	Moderate	Moderate
1987-88	Major	Strong
1991-92	Moderate	Strong
2002-03	Major	Moderate
2004-05	Moderate	Weak
2009-10	Moderate	Moderate
2014-15	Moderate	Weak
2015-16	Moderate	Very Strong
2018-19	Moderate	Weak

TABLE 3

EL NIÑO YEARS THAT WERE NOT DROUGHT YEARS IN INDIA

El Niño Intensity	M	W	W	W	M	M	W	W	VS	M	VS	W
Weak (W)	1951-52	1952-53	1953-54	1958-59	1963-64	1968-69	1969-70	1977-78	1982-83	1994-95	1997-98	2006-07
Moderate (M)												
Very Strong (VS)												

Source: Ministry of Agriculture & Farmers Welfare and Golden Gate Weather Services

two previous "strong" La Niñas in 2007-08 and 2010-11, followed by a "moderate" one in 2011-12, had done.

The most recent Oceanic Niño Index or ONI value — a three-month running-average SST deviation from the normal in the east-central equatorial Pacific — was minus 0.4 degrees Celsius for January-March 2023. Since La Niña is characterised by a negative ONI exceeding or equal to minus 0.5 degrees, it means that the so-called ENSO (El Niño-Southern Oscillation) cycle has entered a "neutral" phase.

The El Niño threat

While La Niña is associated with good rainfall in India, this isn't the case with El Niño — the opposite "warm" phase of ENSO. During El Niño, the trade winds weaken or even reverse: Instead of blowing from the

east (South America) to the west (Indonesia), they could turn into westerlies. As the winds blow from the west to east, they cause masses of warm water to move into the central and eastern equatorial Pacific Ocean. The rise in SSTs there, thus, leads to increased rainfall along western Latin America, the Caribbean, and the US Gulf Coast, while depriving Southeast Asia, Australia, and India of convective currents.

The ENSO cycle, as already pointed out, is currently in the "neutral" state. According to the US National Oceanic and Atmospheric Administration's (NOAA's) most recent update, ENSO-neutral conditions are likely to "persist through the Northern Hemisphere early summer [of] 2023". In other words, at least till June. However, "a transition to El Niño is favored by July-September 2023",

with its chances "increasing through the fall (September-November)".

The Australian Bureau of Meteorology, too, has forecast "a 50% chance that an El Niño may develop later in 2023". This is "about twice the normal likelihood", the agency said in its March 28 report, adding that "warmer than average SSTs have [already] emerged in parts of the eastern tropical Pacific in recent weeks". The India Meteorological Department is scheduled to issue its first long-range forecast of rainfall for the 2023 southwest monsoon on Tuesday.

The implications

Most global models are seeing the transition from ENSO-neutral to El Niño happening this year. But that would probably affect the monsoon only in the second half (August-September) of the season. Will it translate into deficient rainfall after four surplus years and, by extension, low or even negative agriculture growth?

Table 2 shows that practically all drought years in India since Independence — marked by large declines in foodgrain production or monsoon failures — have witnessed El Niño events of varying intensity. The sole exception was 1966-67, although the year before that had recorded a "strong" El Niño. (To elaborate, mean SSTs have to be at least 0.5 degrees Celsius higher than average for a minimum of five overlapping three-month periods to qualify as an El Niño event. The positive ONI values or SST deviations have to be 1.5-1.9 degrees for categorisation as "strong", above 2 degrees for "very strong", 1-1.4 degrees for "moderate" and 0.5-0.9 degrees for "weak").

While all drought years have invariably been El Niño years, the reverse isn't true. Table 3 gives a list of all the El Niño years that weren't bad agriculture years. The best examples are 1982-83 and 1997-98. Foodgrain output fell only marginally in these two "very strong" El Niño years. Agricultural GDP growth was positive in the "moderate" El Niño-event years of 1951-52, 1963-64, 1968-69 and 1994-95.

To sum up, 2023 could well end the run of good rainfall years since 2019. The statistical probability of that is high, whether or not there is an El Niño. The El Niño itself can turn out to be "weak".

Either way, everyone — from policymakers to tractor companies that have posted all-time-high sales in the past four years — has to brace for a not-too-great monsoon this time. In a year leading up to Lok Sabha elections, this could present interesting political challenges.