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From Forecast to Field: Turning El Niño Information into Agricultural Action

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El Niño is a climate phenomenon originating in the tropical Pacific Ocean, but its influence can extend far beyond the ocean through changes in atmospheric circulation and rainfall patterns. For India, the relationship is important because a large share of cultivated land remains dependent on rainfall and because the timing and distribution of the southwest monsoon strongly influence sowing, crop establishment, water availability and farm incomes. However, El Niño does not automatically produce drought everywhere or in every year. The agricultural response depends on the strength and timing of the event, other climate drivers, local rainfall distribution, irrigation access and the crop being grown. This article explains how El Niño information can be translated into practical agricultural action through seasonal forecasts, district contingency plans, water management, crop diversification, climate-resilient varieties and timely extension advisories.

Introduction

A farmer does not experience El Niño as a temperature anomaly in the Pacific Ocean. The farmer experiences it as a late rain, a dry spell after sowing, inadequate soil moisture, a delayed transplanting decision, higher irrigation demand or uncertainty about which crop to plant next. This is why climate information becomes useful only when it can be converted into a decision at the farm level. The India Meteorological Department (IMD) describes a general tendency for El Niño years to be associated with weaker Indian summer monsoon rainfall, but the historical record also shows considerable variation. Since 1950, there have been 16 El Niño years, of which seven had below-normal Indian monsoon rainfall. The relationship is stronger during the later part of the monsoon, particularly September (IMD, 2026a). This simple statistic makes an important point: El Niño changes the odds; it does not determine the outcome for every farmer. The 2026 season provides a useful real-world example. IMD forecast below-normal southwest monsoon rainfall and anticipated the development of El Niño conditions during the season. In response, agricultural institutions and state agencies intensified contingency planning, including alternative crops, water conservation, short-duration varieties and weather-based advisories (Ministry of Agriculture and Farmers Welfare, 2026; PIB, 2026).

Understanding El Niño

El Niño is the warm phase of the El Niño–Southern Oscillation (ENSO), a coupled ocean–atmosphere phenomenon involving unusual warming of sea-surface temperatures across the central and eastern equatorial Pacific. This warming changes atmospheric circulation and can influence rainfall and temperature patterns in distant regions. Its effects are therefore described as teleconnections. For Indian agriculture, the most important connection is with the southwest monsoon. Recent research using long-term observations shows that El Niño can affect monsoon circulation and, in some cases, delay monsoon onset through changes in atmospheric wind shear and pressure patterns (Srinivasan *et al.,* 2025). Yet the Indian monsoon is influenced by several interacting climate processes. The Indian Ocean Dipole

(IOD), intraseasonal variability and regional weather systems can strengthen, weaken or modify the rainfall response to ENSO. A 2026 study from central India, for example, found that IOD events had a stronger correlation with monsoon rainfall than ENSO events in the study area (Patil *et al*., 2026).

Figure 1. From a Pacific climate signal to agricultural decisions.

What does El Niño mean for agriculture?

The first agricultural impact is often not total rainfall, but rainfall timing and distribution. A season may receive a reasonable cumulative amount while still containing a damaging dry spell during germination, flowering or grain filling. Conversely, rainfall can arrive in intense episodes separated by long dry periods. Farmers therefore need information about when rain is expected, how much moisture is likely to be available and what action is appropriate at each crop stage. Rainfed crops are particularly exposed because they depend directly on soil moisture supplied by rainfall. Pulses, oilseeds and many coarse cereals can face higher production risk when sowing rains are delayed or when dry spells occur after establishment. Irrigated crops are not risk-free either: water demand can increase when temperatures are higher or rainfall is poorly distributed, placing additional pressure on groundwater, tanks and reservoirs. Horticulture and livestock also need attention. Water stress can reduce fruit and vegetable quality, while heat and feed shortages can affect livestock productivity. Agriculture therefore needs a whole-farm response rather than a crop-only response.

From climate forecast to farm decision

A seasonal forecast is useful only when it is translated into an operational plan. District Agriculture Contingency Plans are designed for this purpose. During 2026, ICAR–CRIDA and state agencies updated contingency plans for districts expected to face below-normal rainfall. Recommended measures included crop diversification, short-duration and drought-tolerant varieties, balanced fertilizer use, water conservation, micro-irrigation, mulching and intercropping (Ministry of Agriculture and Farmers Welfare, 2026). The practical principle is simple: do not wait until a crop fails before changing the plan. If sowing rains are delayed, farmers may need to wait for adequate soil moisture, shift to a shorter-duration crop or use an alternative variety. If a dry spell develops after establishment, moisture conservation and irrigation prioritization become important. If the season improves, the contingency plan can be adjusted again. Climate-resilient farming is therefore not one fixed package; it is a sequence of decisions.

Table 1. From climate signal to possible farm response

Situation	Agricultural risk	Possible response
Delayed onset / inadequate sowing rain	Poor germination and delayed crop establishment	Wait for adequate soil moisture; consider short-duration alternatives.
Long dry spell after sowing	Moisture stress and crop loss	Prioritise irrigation, mulching, intercrop management and moisture conservation.
Low seasonal rainfall	Reduced water availability and yield risk	Diversify crops, use drought-tolerant varieties and follow district contingency plans.
High temperature with moisture stress	Higher evapotranspiration and livestock stress	Improve water management, provide livestock shelter/water and adjust farm operations.

Water is the first line of defense

When rainfall becomes uncertain, water management becomes a farm-level risk-management strategy. Farm ponds, field bunding, mulching, efficient irrigation, rainwater harvesting and protection of stored water can extend the period during which crops can survive dry spells. The 2026 preparedness measures announced by the Ministry of Agriculture and Farmers Welfare placed strong emphasis on repairing and strengthening ponds, reservoirs, streams, check dams and other water-harvesting structures, while promoting efficient use of available water (PIB, 2026). The key is prioritization. Not every crop and not every growth stage has the same water requirement or economic value. Advisory services can help farmers decide where scarce irrigation water is likely to protect the greatest amount of yield or livelihood value. Such decisions are particularly important in dryland regions.

The role of extension: making climate information usable

Agricultural extension has a critical role between the forecast centre and the farm. Farmers do not need a climate bulletin filled with technical indices; they need clear answers to practical questions: Should I sow now? Which crop is safer if the rain is delayed? How long can the soil moisture last? Should I re-sow? When should I irrigate? What should I do with livestock? In 2026, KVKs and agro-meteorological advisory services were asked to strengthen communication through advisories, SMS, WhatsApp, call centres, radio and television. ICAR also conducted research–extension interface meetings in several states to operationalise contingency plans (Ministry of Agriculture and Farmers Welfare, 2026; ICAR, 2026a). In Kurnool district of Andhra Pradesh, ICAR–NAARM and partner institutions conducted a workshop at KVK Banavasi specifically to implement an El Niño event-based agricultural contingency plan, bringing together agricultural, horticultural, veterinary and other technical agencies (ICAR–NAARM, 2026). These examples highlight an important shift: climate preparedness should not remain a document at the district office. It must reach the farmer in time to influence the next decision.

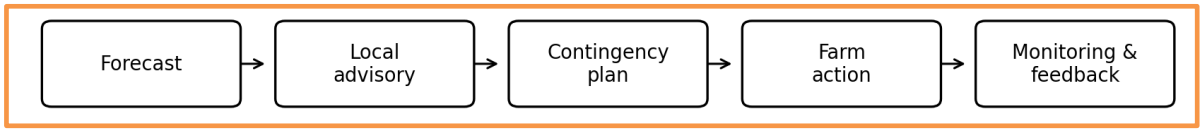

Figure 2. Turning climate information into agricultural action.

Preparedness is better than panic

An El Niño warning should not be interpreted as a signal to abandon agriculture or assume that a crop will fail. Historical data show that El Niño years can have different rainfall outcomes across India, and local conditions matter. The appropriate response is preparedness: secure quality seed, identify alternative crops, conserve water, monitor rainfall and soil moisture, protect livestock and maintain access to timely advisories. This is particularly important because contingency measures must be location-specific. In Odisha, for example, KVK-led programmes during 2026 combined climate-resilient crop demonstrations, moisture conservation, green manuring and farmer awareness. In Telangana, ICAR–CRIDA training programmes linked El Niño preparedness with natural-resource management, integrated farming, livestock care, farm ponds and water management (ICAR, 2026b; ICAR–CRIDA, 2026). Such interventions show that resilience is built from several complementary practices rather than from a single technology.

A practical preparedness checklist

- Follow IMD and local KVK weather and agro-advisories before sowing and during critical crop stages.
- Use district contingency plans when rainfall is delayed or substantially below expectation.
- Keep short-duration, drought-tolerant or alternative crop options ready where recommended locally.

- Conserve soil moisture through mulching, appropriate intercrops, field bunding and timely weed management.
- Prioritise limited irrigation water for critical crop stages and protect drinking water for households and livestock.
- Maintain contingency seed and input arrangements so re-sowing can be done quickly when necessary.
- Diversify farm income through livestock, horticulture or other locally suitable activities where feasible.
- Record field observations and share them with extension personnel so advisories can be refined to local conditions.

Evidence base and approach

This popular article synthesizes recent information from the India Meteorological Department, Indian Council of Agricultural Research institutions, Government of India advisories and recent peer-reviewed research on ENSO, Indian monsoon variability and agricultural preparedness. The purpose is not to estimate a district-specific yield loss, but to explain how a large-scale climate signal can be translated into practical farm-management and extension decisions. Current 2026 examples are used to illustrate how contingency planning is being operationalized in the field.

Conclusion

El Niño begins thousands of kilometers from Indian farms, but its agricultural significance is decided much closer to the ground. What matters to farmers is not the Pacific temperature anomaly by itself, but whether climate information arrives early enough and in a form that supports better decisions. Historical evidence shows that El Niño raises the risk of weaker monsoon conditions, but it does not produce the same agricultural outcome everywhere.

The most useful response is therefore neither complacency nor panic. It is preparedness: better forecasts, locally relevant advisories, district contingency plans, water conservation, crop diversification, resilient varieties, livestock support and rapid feedback from farmers to extension systems. The experience of 2026 shows that India is increasingly moving in this direction through coordinated work by IMD, ICAR institutions, KVKs and state departments.

The real test of an El Niño forecast is not whether the forecast reaches a government office. It is whether it reaches the field early enough to change a decision. Turning forecast into action is where climate science becomes agricultural resilience.

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