

WHITEPAPER · CLIMATE RISK AND FOOD SECURITY

Before the Rains **Fail**

Asia's El Niño readiness test, and the case for acting before the drought arrives in 2026/27

+2.1°C

Niño-3.4 sea-surface anomaly, October 2026

>90%

NOAA odds of a very strong event this winter

12.6%

India's 2026 monsoon shortfall

90%+

Share of the world's rice grown in Asia

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WHITEPAPER

INSIDE

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>90%

NOAA odds of a very strong El Niño this winter

75%

Chance Oct to Dec 2026 beats every event since 1950

12.6%

India's monsoon shortfall, weakest since 2015

US\$7

Losses avoided per US\$1 of early action, at best

All figures current as of 19 October 2026. Full sources at the end of the paper.

OVERVIEW

Executive Summary

A serious climate threat is now fully formed over the equatorial Pacific, and Asian agriculture sits directly in its path. The World Meteorological Organization confirmed on 3 September 2026 that El Niño is established, and the event has strengthened faster than most forecasters expected. By September, the US National Oceanic and Atmospheric Administration (NOAA) put the odds of a very strong event through the Northern Hemisphere autumn and winter at more than 90 per cent, with a 75 per cent chance that the October to December season would exceed every El Niño recorded since 1950. Its October update showed the key Niño-3.4 index running about 2.1°C above average. India has already felt the first blow: its southwest monsoon ended 12.6 per cent below normal, the weakest since 2015.

For Asia, this is far more than a weather headline. The region grows more than 90 per cent of the world's rice and dominates farmed seafood, palm oil, natural rubber, tea and spices. Four decades of satellite records held by the UN Food and Agriculture Organization (FAO) trace a drought corridor running from Pakistan and India through mainland Southeast Asia to Indonesia, the Philippines and Timor-Leste. In a region this central to the global food basket, even a modest monsoon shortfall during planting, flowering or grain filling can tighten supplies and lift prices well beyond Asia's borders.

The damage would not stop at the field edge. Prolonged drought and heat cut yields, thin out pastures, raise feed costs, stress livestock and disrupt the coastal fisheries and fish ponds that millions depend on. All of this is landing on top of record global temperatures, depleted groundwater, sticky food inflation and fractured trade. Low- and middle-income countries, which bear more than 80 per cent of drought-related agricultural losses, are the least able to absorb the hit.

History is unambiguous about what waiting costs. The 2015/16 El Niño put more than 60 million people at risk across 23 countries and pushed humanitarian appeals beyond US\$5 billion. Every serious review since has reached the same conclusion: acting before a drought is cheaper and more effective than responding after crops, herds and household savings are gone.

THE BOTTOM LINE FOR DECISION-MAKERS

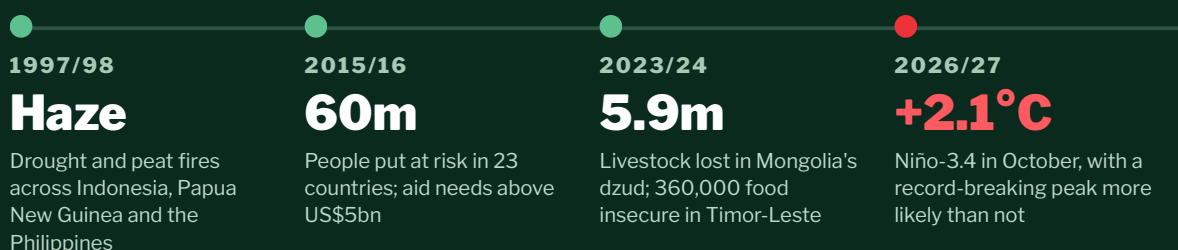
The forecast is no longer the uncertainty. Science has delivered months of warning. The open question is whether governments, agribusinesses, lenders and farmers convert that warning into action in the weeks that remain.

Preparedness pays. Drought-tolerant seed, satellite early warning, efficient irrigation, climate insurance and pre-arranged finance cost a fraction of emergency relief.

Resilience is becoming an asset class. The same tools that blunt this El Niño are forming one of agriculture's fastest-growing investment themes.

INDICATOR	LATEST READING OR ESTIMATE
Chance of a very strong El Niño, autumn and winter 2026/27	More than 90 per cent (NOAA, September 2026)
Chance October to December 2026 exceeds all events since 1950	75 per cent (NOAA, September 2026)
Niño-3.4 sea-surface temperature anomaly	About +2.1°C (NOAA, October 2026)
India southwest monsoon 2026	12.6 per cent below normal; East and Northeast driest since 1901
Asia's share of global rice output	More than 90 per cent
Share of drought farm losses borne by developing economies	More than 80 per cent (FAO)
2015/16 El Niño humanitarian toll	60 million people at risk, 23 countries, over US\$5 billion in aid

FOUR EL NIÑO EVENTS, ONE PATTERN



Where Things Stand

This is no longer a forecast exercise. El Niño has arrived, India's monsoon has already come up short, and the most damaging months for much of Asian agriculture still lie ahead. Four developments define the picture as of mid-October.

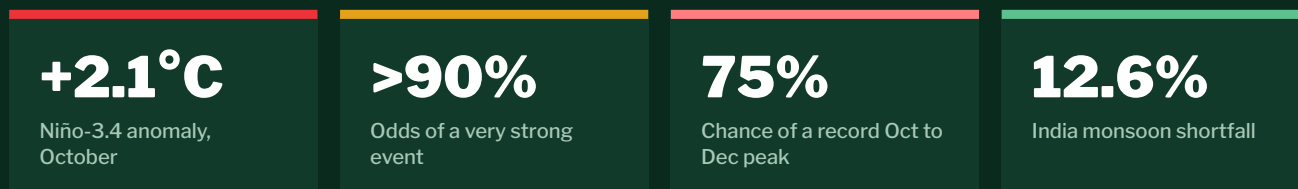
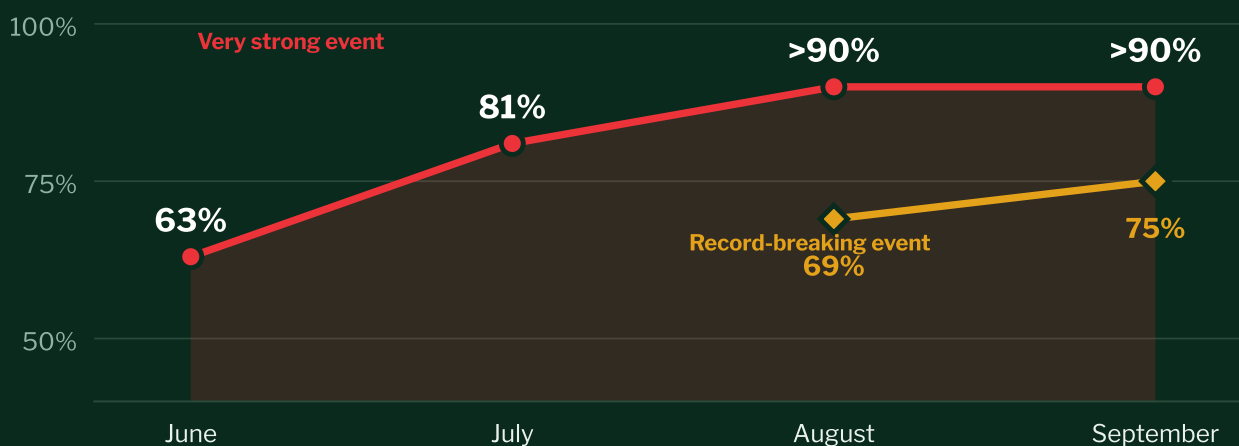
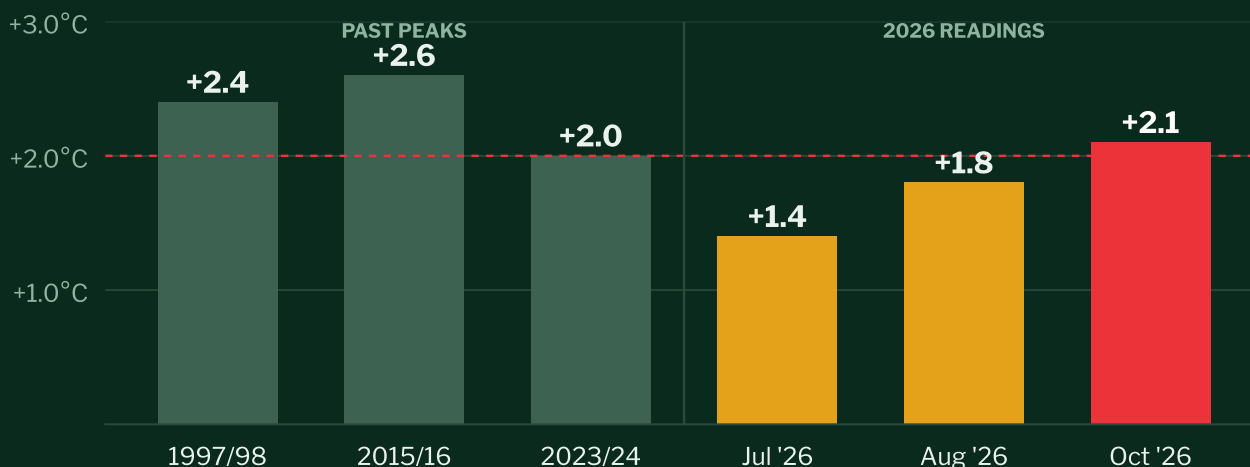


FIGURE A NOAA's odds kept climbing through 2026



Probability of a very strong event at the Oct to Dec peak (red) and of exceeding every El Niño since 1950 (gold). Source: NOAA CPC ENSO Diagnostic Discussions, June to September 2026.

FIGURE B 2026 is already in the range of Asia's worst El Niño years



Niño-3.4 anomaly, °C. Past peaks are approximate seasonal (ONI) values; 2026 values are monthly or latest readings. Source: NOAA CPC.

1. The Pacific is running hotter than the forecasts

NOAA's odds of a very strong event have climbed almost every month since June. In June the chance stood at 63 per cent. By July it had jumped to 81 per cent, and by August and September NOAA put it above 90 per cent. The September discussion added a striking new number: a 75 per cent chance that the October to December season will exceed every El Niño on record since 1950. The October update showed the Niño-3.4 index at about 2.1°C above average, with very warm water extending deep beneath the eastern Pacific, and more than an 83 per cent chance that strong to very strong conditions persist through January to March 2027. WMO says the event is almost certain to last through February 2027.

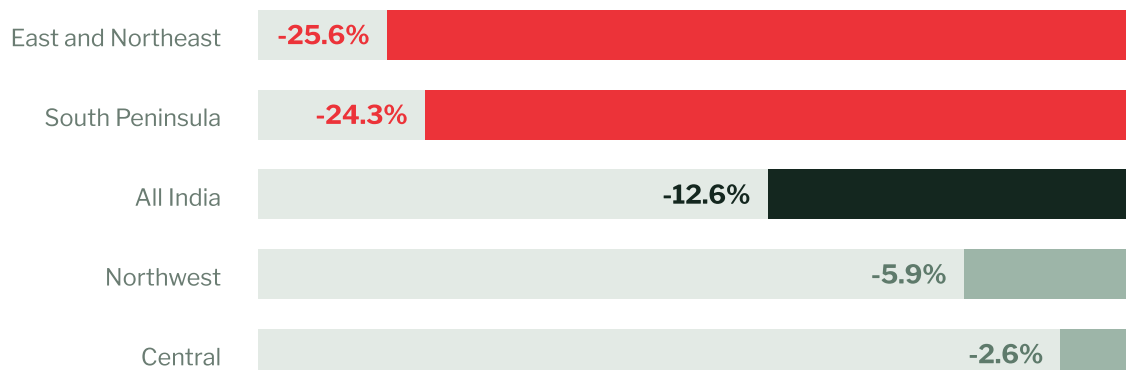
2. India's monsoon has already delivered the first blow

The southwest monsoon closed on 30 September at 759.4 mm against a long period average of 868.6 mm, a shortfall of 12.6 per cent and the weakest season since 2015. The pattern mattered as much as the total. June was 35.4 per cent below normal, one of the driest on record. July briefly recovered to a 1 per cent surplus, before August faded again. By season's end, 17 of 36 meteorological subdivisions, covering 42 per cent of the country, had recorded deficient rain.

The geography of the deficit is unusual. East and Northeast India, normally the country's wettest belt, finished 25.6 per cent short, its driest monsoon since records began in 1901. The southern peninsula was 24.3 per cent short, its fourth-lowest total since 1901. Northwest and Central India, by contrast, came in close to normal. That shifts the risk toward eastern rice bowls, plantation crops in the Northeast and reservoir-fed farming in the South. IMD also expects October rainfall below 85 per cent of normal, which matters for soil moisture going into rabi sowing and for the northeast monsoon that feeds Tamil Nadu and coastal Andhra Pradesh.

FIGURE 1 India 2026 monsoon: departure from normal by region

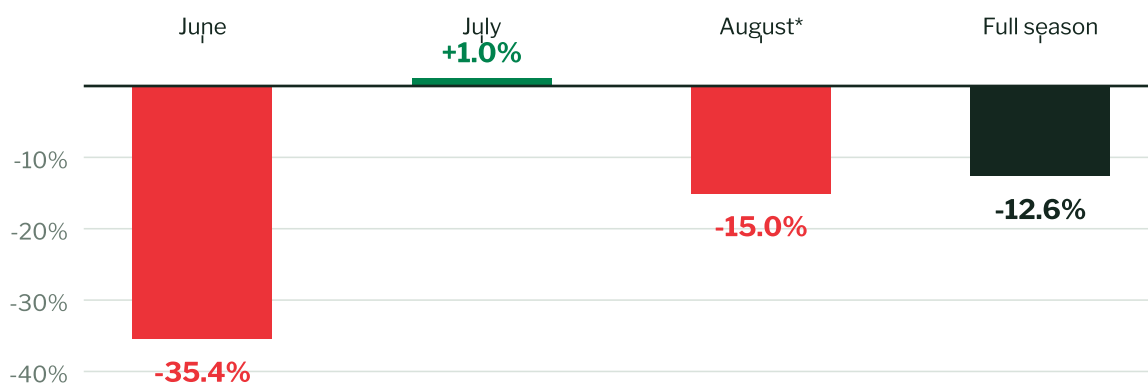
East and Northeast India recorded its driest monsoon since 1901.



Source: India Meteorological Department end-of-season statement, 30 September 2026.

FIGURE 2 A stop-start season: all-India departure by month

June failed, July recovered, August faded again.



*August to 25 August. Sources: IMD; Skymet via Business Today.

3. The real danger window for Southeast Asia is 2027

For mainland Southeast Asia, El Niño's heaviest agricultural damage has historically arrived between February and May of the second year, during the dry season. UNDP's October assessment warns that drought, water stress, crop losses, wildfires and extreme heat could intensify into 2027, even as the Pacific begins to cool. In other words, Thailand's reservoirs, Vietnam's Mekong Delta and Indonesia's peatlands face their real test months after the headlines peak. The IPCC also projects, with medium confidence, that extreme El Niño events will occur about twice as often this century as last, so this will not be a one-off.

4. Markets and humanitarian systems are positioning early

Rice markets were already tight before the monsoon failed. In May, global rice consumption was projected at around 541 million tonnes against production of about 538 million tonnes, and India was expected to supply roughly 25 million tonnes, close to 40 per cent of world trade, in 2026/27. The Philippines alone was forecast to import about 6.5 million tonnes. Any Indian export restraint after a weak kharif harvest would therefore ripple quickly through import-dependent markets.

On the humanitarian side, FAO and WFP launched a joint US\$202 million anticipatory action appeal in June to protect 8.8 million people in 22 high-risk countries, including Afghanistan, Pakistan, the Philippines and Timor-Leste. The planned measures read like a preparedness checklist: cash for vulnerable households, drought-tolerant seed, livestock protection, water harvesting, advisories and early warning. The agencies estimate up to US\$7 in avoided losses and response costs for every US\$1 invested.

WHAT CHANGED SINCE THE FORECASTS BEGAN

From risk to reality: El Niño is declared, very strong intensity is now the central case, and a record-breaking peak is more likely than not.

India has absorbed the first shock: a 12.6 per cent monsoon deficit, concentrated in the East, Northeast and South.

The clock has shifted: for Southeast Asia, the decisive months are February to May 2027, which leaves a short but real window to prepare.

FROM OCEAN TO PRICE TAG

01

Pacific
warms

02

Trade winds
weaken

03

Monsoon
falters

04

Soil moisture
drops

05

Yields and
herds suffer

06

Food prices
rise

The transmission chain this paper tracks, from sea-surface anomaly to household budgets.

01

CHAPTER 1

Understanding El Niño and Why Asia Must Prepare

El Niño and its cooler sibling, La Niña, are the single largest source of year-to-year swings in global weather. When the central and eastern Pacific warms, trade winds slacken, rainfall shifts eastward across the ocean, and the great atmospheric circulations that feed Asia's monsoons are pulled out of shape. The effects ripple a long way from the Pacific: delayed rains over the Indian subcontinent, a parched dry season across much of Southeast Asia, falling reservoirs, and agricultural markets that turn jumpy at the first sign of a weak crop.

60m

people put at risk by the 2015/16 El Niño across 23 countries

IN THIS CHAPTER

A pattern Asia knows too well

Why the 2026/27 outlook is different

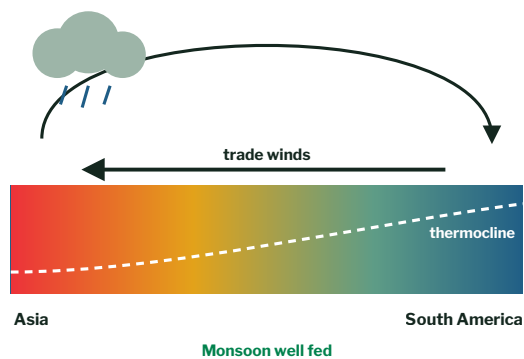
Beyond rainfall: the wider impact

The cost of waiting

HOW EL NIÑO SHIFTS ASIA'S RAIN

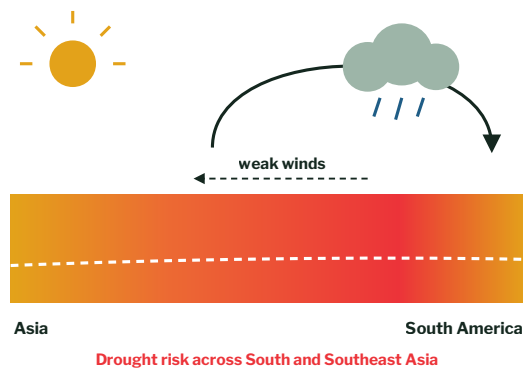
NORMAL YEAR

Strong trade winds pile warm water and rain clouds over Asia



EL NIÑO YEAR

Winds weaken, warm water and rainfall shift east, away from Asia



Schematic of the Pacific Walker circulation. Not to scale.

That is why, for Asia, El Niño is an economic event as much as a meteorological one. The region produces more than 90 per cent of the world's rice, leads global production of palm oil and aquaculture, and is a heavyweight exporter of rubber, coffee, tea, spices and tropical fruit. A small change in seasonal rainfall here shows up quickly in supermarket prices in Lagos, Dubai and London.

The timing of the 2026/27 event makes it harder to manage. Global temperatures remain near record levels, freshwater reserves are already stretched, geopolitical tensions continue to reroute trade, and farmers are paying more for fertiliser, fuel and credit. Each of these pressures narrows the margin that farms and food markets would normally use to absorb a climate shock.

Each began as a sea-surface anomaly and became, within a season, a crisis of food, water and household income.

A pattern Asia knows too well

The region has been here before, and each episode has exposed a different weakness in water management, insurance or disaster planning.

EVENT	WHAT HAPPENED ACROSS ASIA
1997/98	Severe drought in Indonesia, Papua New Guinea and the Philippines hit crops at critical stages. Vast forest and peatland fires in Indonesia blanketed Southeast Asia in haze, disrupting transport, health and farming.
2015/16	India endured two consecutive weak monsoons, damaging millions of hectares of rain-fed pulses, oilseeds and coarse grains. Water shortages cut rice and palm oil output across Southeast Asia and forced irrigation rationing. Globally, over 60 million people were put at risk and aid needs topped US\$5 billion.
2023/24	A strong positive Indian Ocean Dipole compounded rainfall deficits. Drought struck Indonesia, Myanmar, Thailand, Cambodia, Laos, Vietnam and the Philippines. In Timor-Leste, nearly 360,000 people, more than 27 per cent of the population, faced severe food insecurity. In Mongolia, a dry summer followed by a brutal dzud winter killed more than 5.9 million livestock.

The thread running through all three is speed. Each began as a sea-surface anomaly and became, within a season, a crisis of food, water and household income.

Why the 2026/27 outlook is different

What sets this event apart is how quickly it has gathered strength and how confident forecasters have become. In July, NOAA already gave a 97 per cent chance that El Niño would persist into early spring 2027 and an 81 per cent chance of very strong intensity between October and December. By September, the odds of a very strong event had risen above 90 per cent, and NOAA was openly discussing the possibility of a historic peak beyond anything in the modern record. The ocean and atmosphere are now tightly coupled, with warm water extending deep below the surface of the eastern Pacific, which typically sustains an event well into the following year.

FAO's Agricultural Stress Index System, built on 41 years of satellite observations, shows where that energy is likely to bite. Its drought corridor covers India, Sri Lanka, Myanmar, Thailand, Cambodia, Vietnam, the Philippines, Indonesia and Timor-Leste, a list that reads like a directory of Asia's agricultural powerhouses.

Beyond rainfall: the wider impact

A strong El Niño does more than withhold rain. Dry soils delay sowing and depress yields, especially on rain-fed land. Rice, maize and sugarcane are most exposed at germination, flowering and grain filling, and heat on top of moisture stress compounds the loss. Livestock eat less, produce less milk and breed less successfully in high temperatures, while fodder and water shortages push up costs. In fish ponds and coastal waters, warmer water holds less oxygen, raising mortality and disrupting spawning.

The calendar itself is becoming unreliable. Late monsoon onsets, long mid-season breaks and sudden cloudbursts have made traditional planting dates a poor guide. El Niño also refuses to behave the same way everywhere: in 2023/24, Afghanistan received only 45 to 60 per cent of its normal rainfall, even though El Niño years usually bring it wetter conditions. For farmers and planners, the lesson is that past patterns are now a starting point, not a forecast.

The cost of waiting

For a smallholder, a failed harvest is rarely a one-season problem. It means lost income, new debt, distress sales of animals and less food on the table, often for years. For governments, it means diverting budgets from development to imports and relief. FAO-led anticipatory action programmes in Timor-Leste, Cambodia, Vietnam and the Philippines show the alternative: drought-tolerant seed, micro-irrigation kits, livestock feed and local weather advisories delivered before conditions turn severe. The economics consistently favour early action. The difficulty is organisational, not scientific.

THE ECONOMICS OF ACTING EARLY

US\$1

invested in anticipatory action



US\$7

in losses and response costs avoided, at best

US\$202m FAO and WFP appeal, June 2026, for **8.8m** people in **22** countries. At the upper ratio that protects up to **US\$1.4bn**.

Source: FAO and WFP Joint Anticipatory Action Appeal, 18 June 2026.

CHAPTER 1 · THE COST OF WAITING

Acting before a drought is cheaper and more effective than responding after crops, herds and savings are gone.



NIÑO-3.4 ANOMALY SCALE, 0 TO +3.0°C · MARKERS: 2023/24 +2.0 · OCT 2026 +2.1 · 1997/98 +2.4 · 2015/16 +2.6

02

CHAPTER 2

Mapping Agricultural Risk Across Asia

The first warning never arrives as a failed harvest. It arrives as a few tenths of a degree of extra warmth in the Pacific, which weakens the trade winds, shifts the rain, and eventually decides whether a reservoir fills, a crop sets grain, or a commodity market stays calm. Across Asia, that chain reaction is already being watched closely. Governments are comparing Pacific temperatures with domestic crop conditions, traders are revising supply estimates, irrigation agencies are recalculating reservoir releases, and agriculture ministries are dusting off drought plans.

9

economies inside FAO's satellite-mapped Asian drought corridor

IN THIS CHAPTER

India: the monsoon still sets the tone

Sri Lanka: a question of water

Vietnam: when drought brings salt

Thailand: watching the reservoirs

Philippines: drought meets import dependence

The worry this time is that the region is entering the season with thinner buffers than in past El Niño years. Groundwater across parts of South and Southeast Asia has been drawn down by decades of pumping. Reservoirs are recovering slowly after successive dry seasons. More frequent heatwaves are pulling moisture out of soils faster. The World Meteorological Organization notes that natural cycles such as El Niño now play out on top of long-term warming, which raises crop water demand and adds heat stress at precisely the stages where yields are made. In short, many farming systems have less room for error than they did in 2015.

COUNTRY	PRIMARY EXPOSURE	WHAT TO WATCH
India	Rain-fed kharif and rabi crops; falling groundwater	Monsoon distribution, reservoir storage, export policy on rice and sugar
Sri Lanka	Reservoir storage for Maha paddy, tea, hydropower	Inflows to Dry Zone tanks, tea leaf growth and quality
Vietnam	Salinity intrusion in the Mekong Delta; coffee flowering	River flows, salt front movement, Central Highlands soil moisture
Thailand	Chao Phraya reservoir levels; rice and sugarcane	Dam inflows, competing urban and industrial demand
Philippines	Drought on top of typhoon exposure; rice import reliance	Irrigation schedules, regional rice export restrictions
Indonesia	Rice, palm oil, peatland fire risk	Dry season length, fire hotspots, palm yield lag
China	Northern wheat and maize heat; southern rice variability	Yangtze flows, feed grain imports
Japan, South Korea	Heat damage to quality rather than volume	Rice grain chalkiness, livestock cooling costs

COUNTRY RISK AT A GLANCE

AgroSpectrum Asia editorial assessment based on the sources in this paper.

India

HIGH

EXPOSURE

Monsoon 12.6% short; East, Northeast and South worst hit

WATCH

Rabi soil moisture, southern reservoirs, rice export policy

PEAK WINDOW

Now to Mar 2027

Philippines

HIGH

EXPOSURE

Drought plus typhoons; heavy rice import reliance

WATCH

Regional export curbs, procurement prices

PEAK WINDOW

Late 2026 to mid 2027

Indonesia

HIGH

EXPOSURE

Rice and palm oil yields; peatland fire and haze

WATCH

Dry season length, fire hotspots

PEAK WINDOW

Feb to May 2027

Vietnam

HIGH

EXPOSURE

Mekong salinity intrusion; coffee flowering

WATCH

River flows, salt front, shrimp ponds

PEAK WINDOW

Feb to May 2027

Timor-Leste

HIGH

EXPOSURE

Severe food insecurity in 2023/24 for over 27% of people

WATCH

Planting rains, household food stocks

PEAK WINDOW

Late 2026 to 2027

Thailand

ELEVATED

EXPOSURE

Chao Phraya reservoir storage for rice and cane

WATCH

Dam inflows, dry-season releases

PEAK WINDOW

Feb to May 2027

Sri Lanka

ELEVATED

EXPOSURE

Dry Zone tanks, Maha paddy, tea quality

WATCH

Northeast monsoon, tank inflows

PEAK WINDOW

Now to early 2027

China

MODERATE

EXPOSURE

Northern wheat and maize heat; feed imports

WATCH

Yangtze flows, maize and soy imports

PEAK WINDOW

2027 season

Japan and Korea

MODERATE

EXPOSURE

Heat damage to rice quality; livestock cooling costs

WATCH

Grain-filling heat, energy costs

PEAK WINDOW

Summer 2027

THE DROUGHT CORRIDOR

From Pakistan and India to Indonesia and Timor-Leste, the same Pacific signal reaches nine farm economies in different ways.

**India: the monsoon still sets the tone**

Agriculture contributes less than a fifth of India's Gross Value Added but employs more than 40 per cent of its workforce, and close to half of cultivated land still relies on rainfall. So the monsoon remains the country's most important economic variable. What matters is not just the seasonal total but its rhythm. A late onset and long dry spells in June and July, followed by intense late bursts, can do more damage than an evenly spread shortfall. The drought years of 1982, 1987, 2002, 2009 and 2015/16 all show the link between strong El Niño events and weaker output of rice, pulses, oil-seeds and coarse grains.

Irrigation is a less dependable shield than it once was. Water tables continue to fall in Punjab and Haryana, while rain-fed belts in Maharashtra, Madhya Pradesh, Chhattisgarh, Jharkhand and Odisha remain highly exposed. Because India is a major exporter of rice, sugar, cotton, spices and horticulture, a significant production dip quickly becomes a global price story, as the export curbs of recent years have shown.

Sri Lanka: a question of water

In Sri Lanka, the conversation has moved to storage. Reservoir managers must balance paddy irrigation for the Maha season against hydropower, city supply and plantation needs. Tea is the clearest bellwether: prolonged moisture stress slows leaf growth, raises costs and erodes quality, which in turn weakens export earnings. Coconut and rubber face similar pressure, and lower in-flows threaten the Dry Zone, the island's rice bowl.

Vietnam: when drought brings salt

In the Mekong Delta, a weaker river lets the sea push inland. Saltwater reaches canals, paddies, orchards and shrimp ponds. The 2015/16 drought and salinity crisis remains the reference point, and authorities have since built tighter salinity monitoring and more flexible irrigation planning. Further north, the Central Highlands coffee crop depends on adequate soil moisture at flowering. As a top exporter of both rice and robusta, Vietnam's harvest outcomes travel fast through world markets.

Thailand: watching the reservoirs

Thailand's critical number is reservoir storage in the Chao Phraya Basin, because that sets how much water can be released for rice and sugarcane. Agriculture is also competing with manufacturing, tourism and growing cities for the same supply. Keeping Thailand's place as a leading rice exporter now depends as much on water allocation as on rainfall.

Philippines: drought meets import dependence

The Philippines is used to typhoons. Drought adds a second front. Authorities are reworking irrigation schedules, widening seasonal advisories and expanding crop insurance. The deeper concern is structural: the country imports a large share of its rice. If domestic output falls just as India, Vietnam and Thailand tighten exports, prices could climb sharply and strain public procurement budgets.

East Asia: technology buys time, not immunity

If South and Southeast Asia are bracing for less rain, East Asia faces a different test: can technology keep agriculture ahead of the heat? China, Japan and South Korea have built some of the most sophisticated farm systems in the world, with dense irrigation networks, satellite monitoring, seasonal forecasting and growing use of automation and artificial intelligence.

China feeds nearly a fifth of humanity on less than a tenth of the world's arable land, so food security is a matter of state. In the north, Henan, Hebei, Shanxi and Inner Mongolia may face hotter conditions and higher irrigation demand, stressing wheat and maize. In the south, monsoon-fed rice faces volatility, with long dry spells potentially followed by intense rain. The 2022 Yangtze drought, which slashed river levels and hydropower and squeezed irrigation, showed that even vast infrastructure has limits when heat and water shortage coincide. Beijing's response spans high-standard farmland, precision irrigation, satellite crop surveillance and climate-resilient breeding. Its vulnerability is scale: a modest dip in grain output can lift imports of maize, soybeans and feed enough to move world prices.

In Japan, heat rather than water is the main threat. High temperatures during grain filling leave rice volumes largely intact but produce chalky, lower-grade kernels that sell for less. Apples, grapes, peaches and citrus face sunburn, irregular flowering and compressed seasons, while live-stock farmers spend more on cooling. Robotics, AI-guided irrigation and heat-tolerant varieties, framed by the Green Food System Strategy, are Japan's answer. South Korea follows a similar path, leaning on smart greenhouses, sensor-based irrigation, AI pest monitoring and expanded farm insurance as summers grow warmer and less predictable.

East Asia's lesson for the rest of the region is a sobering one. Decades of investment can reduce the damage from drought and heat, but they cannot lower the thermometer. The question is shifting from whether crops survive a dry season to whether farms can protect yield, quality and profit as extreme heat becomes a permanent feature of the growing season.

EAST ASIA · LESSON

Technology can buy time. It cannot change the climate.



NIÑO-3.4 ANOMALY SCALE, 0 TO +3.0°C · MARKERS: 2023/24 +2.0 · OCT 2026 +2.1 · 1997/98 +2.4 · 2015/16 +2.6

03

CHAPTER 3

Government Readiness: Are Countries Prepared?

Past El Niño events were judged by crop losses. This one may be judged by how fast governments moved before the losses arrived. Across Asia, preparedness is shifting upstream: forecasts are issued months ahead, reservoir plans are revisited early, and climate data is starting to shape sowing advice, water allocation and farm support. Predicting El Niño is no longer the hard part. Turning a forecast into a timely decision is.

US\$202m

FAO and WFP early action appeal for 22 high-risk countries

IN THIS CHAPTER

India: strong systems, uneven last mile

China, Japan and South Korea: preparedness at scale

Southeast Asia: fewer resources, rising urgency

India: strong systems, uneven last mile

The India Meteorological Department is pushing localised forecasts and farm advisories through mobile apps, SMS and digital platforms, linking them to choices about sowing, irrigation and fertiliser. The Digital Agriculture Mission is knitting together satellite data, AI and digital farmer registries, while the Pradhan Mantri Fasal Bima Yojana provides a large financial cushion against weather losses. The constraint is delivery. With nearly half of cropland rain-fed, groundwater falling in key states and holdings fragmented, the challenge is getting the right advice to the right farmer early enough to matter.

China, Japan and South Korea: preparedness at scale

China uses remote sensing, drones, analytics and predictive models to track crop conditions almost in real time, backed by fast-growing agricultural insurance. Japan relies on robust irrigation, mechanisation and insurance, and is now pivoting toward heat adaptation through robotics, controlled-environment farming and resilient varieties. South Korea combines smart greenhouses, digital water management and real-time climate monitoring so that farmers can prepare for weather rather than react to it.

Predicting El Niño is no longer the hard part. Turning a forecast into a timely decision is.

Southeast Asia: fewer resources, rising urgency

Vietnam has used repeated salinity crises to modernise irrigation, expand salt monitoring and push salt-tolerant rice, with forecasts increasingly tied to planting calendars. Indonesia, scarred by 2015/16 and 2023/24, is building seasonal outlooks into cropping decisions alongside new reservoirs and drought-tolerant rice, though delivery across more than 17,000 islands remains patchy. Thailand is coordinating reservoir operations, irrigation scheduling and digital advisories, although insurance still centres on rice growers. Malaysia is protecting its plantation economy with satellite, drone and precision tools for palm oil and rubber. Singapore, with almost no farmland, has turned itself into a laboratory for vertical farming and controlled-environment agriculture under its 30 by 30 strategy, and increasingly exports know-how rather than produce.

READINESS SCORECARD: THE GAPS THAT MATTER MOST

Forecast to farmer: Advisories exist, but reach and timing remain weak in remote and small-holder areas.

Finance before damage: Insurance and credit typically pay out after losses, rather than releasing funds on a forecast trigger.

Water governance: Reservoir and groundwater decisions are still often made sector by sector rather than across agriculture, energy and cities.

Coordination: Weather, agriculture, water and finance ministries rarely work from a shared, pre-agreed action plan with defined triggers.

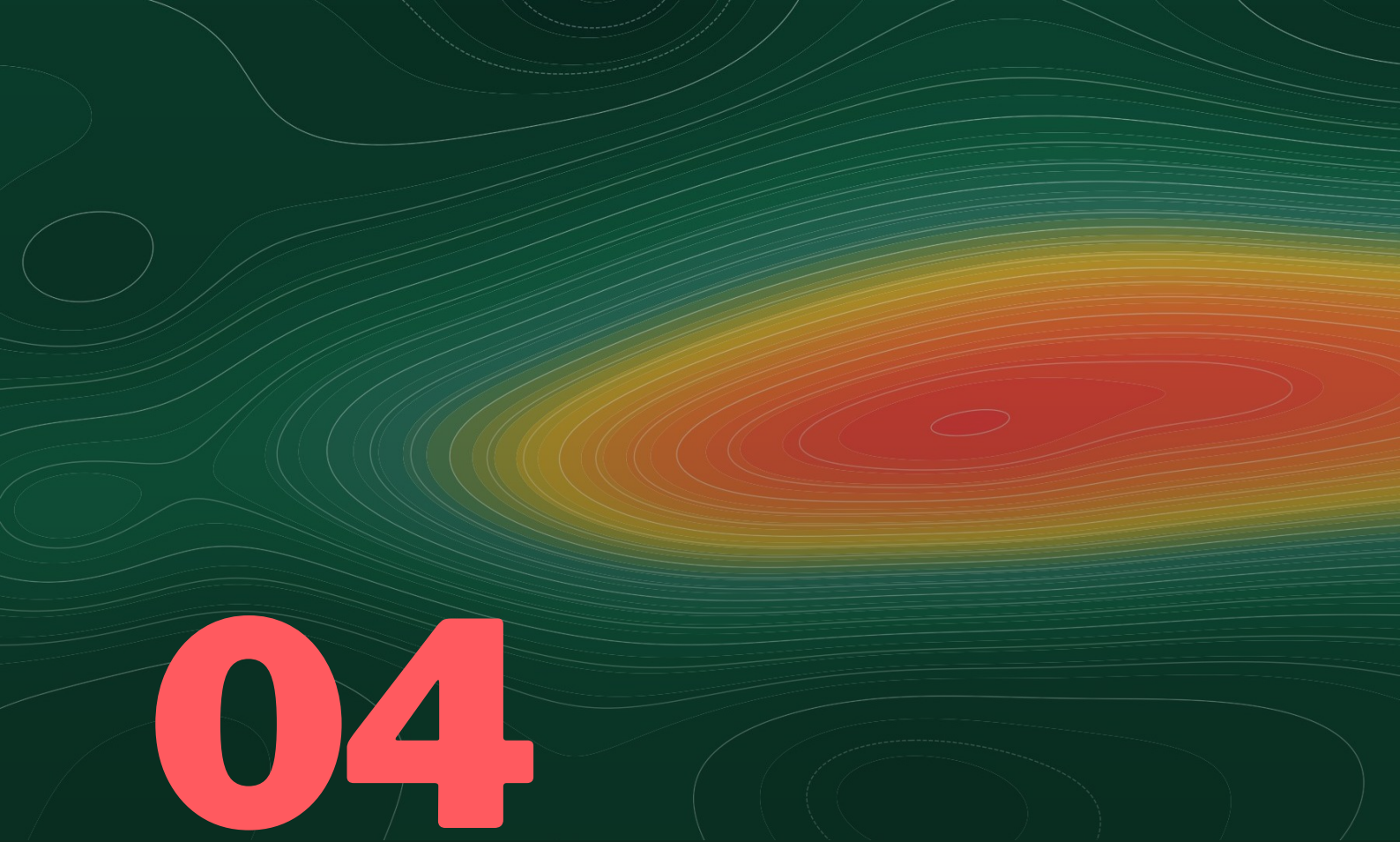
The overall picture is encouraging but incomplete. Climate preparedness is no longer the preserve of weather agencies; it now spans agriculture, water, finance, technology and rural development. Yet the widest gap remains the one between what science can predict and what a farmer can actually do with that information. Technology is moving quickly. Delivery systems need to move faster.

READINESS · THE GAP THAT MATTERS

The widest gap is between what science can predict and what a farmer can actually do with that information.



NIÑO-3.4 ANOMALY SCALE, 0 TO +3.0°C · MARKERS: 2023/24 +2.0 · OCT 2026 +2.1 · 1997/98 +2.4 · 2015/16 +2.6



04

CHAPTER 4

Climate Adaptation as Asia's Biggest Agritech Investment Theme

Every major climate event produces winners and losers. This time, the biggest commercial opportunity may lie not in commodity speculation but in the technologies that help agriculture cope with a hotter, drier and less predictable world. Across Asia, adaptation has moved from the margins of sustainability reports to the core of investment strategy. For governments it is food security. For agribusinesses it is supply chain protection. For investors it is a large and growing market.

**US\$215 to
387bn**

needed every year for adaptation in
developing countries

IN THIS CHAPTER

Where the value is concentrating

The scale is substantial. UNEP's Adaptation Gap Report estimates that developing countries need roughly US\$215 billion to US\$387 billion a year this decade to adapt to climate change, and agriculture sits at the centre of that bill. Producing more food is no longer the whole task; farmers must produce it with less water, more heat and far less predictable weather. Investment trackers such as AgFunder show capital steadily moving toward biologicals, precision agriculture, farm management software, water technology and climate data, with the emphasis shifting from maximising yield to reducing loss and smoothing output.

THEME	WHY IT MATTERS IN AN EL NIÑO YEAR	INVESTOR ANGLE
Biologicals	Microbial biofertilisers and biostimulants improve root growth and help crops tolerate drought, salinity and heat	Policy support to cut synthetic fertiliser use; rising farmer acceptance
AI and decision tools	Combine satellite, weather, soil moisture and crop models to time irrigation, nutrition and protection	Software scales across rural markets without matching cost growth
Precision irrigation	Agriculture takes about 70 per cent of global freshwater withdrawals; drip, sensors and automated pumps stretch every litre	Hardware plus services; strong public co-funding in India and China
Climate-resilient seed	Varieties that hold yield under heat, drought, flood and salt become the first line of defence	Faster breeding cycles; public and private partnerships such as IRRI
Water infrastructure	Groundwater mapping, recycling, desalination and digital allocation	Increasingly treated as farm infrastructure, not an environmental cost
Controlled environment	Vertical farms and smart greenhouses decouple output from rainfall	High capex, but improving economics for high-value crops
Robotics and automation	Narrower weather windows and ageing workforces reward speed	Japan and Korea lead; adoption spreading in China and ASEAN
Climate intelligence and finance	Hyperlocal forecasts, index insurance and satellite credit scoring	Serves farmers, insurers, banks, traders and food brands at once

Where the value is concentrating

Three shifts stand out. First, **water productivity** is becoming the defining agricultural metric. India and China are expanding micro-irrigation at scale, and the experience of Israel and Australia shows that consumption can fall sharply without sacrificing yield. Second, **genetics is being re-priced**. For decades, seed was sold on peak yield. Increasingly, farmers will pay for yield that

holds up in a bad year. Third, **information is turning into infrastructure**. Climate intelligence that once served a handful of specialists is now valuable to insurers pricing risk, banks assessing borrowers, traders managing positions and food companies protecting supply.

The next investment cycle is less about producing more at any cost and more about reducing the cost of uncertainty.

Adaptation is also opening new rural revenue streams. Conservation tillage, cover crops, agroforestry and better nutrient management conserve soil moisture and limit erosion while storing carbon. Asian agricultural carbon markets remain fragmented, but demand from food companies seeking to cut supply chain emissions is growing, and practices that pay twice, once in resilience and once in carbon value, will attract attention.

The common thread is simple. The next investment cycle in Asian agriculture is less about producing more at any cost and more about reducing the cost of uncertainty. The companies that matter most in the coming decade may be those that help farmers use less water, withstand harsher weather and keep production moving when conditions turn against them.

THE ADAPTATION FINANCE GAP



Annual adaptation finance developing countries need this decade, with agriculture at the centre of the bill.

Source: UNEP Adaptation Gap Report.

ADAPTATION · A MARKET IN ITS OWN RIGHT

The companies that matter most may be those that help farmers keep production moving when conditions turn against them.



NIÑO-3.4 ANOMALY SCALE, 0 TO +3.0°C · MARKERS: 2023/24 +2.0 · OCT 2026 +2.1 · 1997/98 +2.4 · 2015/16 +2.6

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CHAPTER 5

The Road Ahead: Building a System That Can Take the Next Shock

If the 2026/27 El Niño proves anything, it is that Asia can no longer treat climate shocks as temporary interruptions. They are becoming structural features of farming, shaping planting decisions, irrigation schedules, commodity prices, food inflation and export competitiveness. The question is no longer whether the next major event will come, but whether the region can adapt fast enough before it does.

US\$7

in avoided losses for every US\$1 of early action, at best

IN THIS CHAPTER

An action agenda

There is reason for cautious optimism. Governments have absorbed hard lessons from 1997/98, 2015/16 and 2023/24, and seasonal forecasting has never been better. But forecasts do not save harvests on their own. Their value depends on follow-through. Can irrigation departments adjust reservoir releases before shortages bite? Can extension officers reach farmers before sowing, not after crops wilt? Can lenders release emergency credit quickly enough for smallholders to buy drought-tolerant seed or micro-irrigation? Increasingly, the line between resilience and crisis is drawn not by prediction but by action.

An action agenda

STAKEHOLDER	PRIORITY ACTIONS FOR THE NEXT 6 TO 12 MONTHS
Governments	Agree forecast-based triggers that release seed, feed, water and cash automatically; coordinate agriculture, water, energy and finance ministries around one plan; protect groundwater with managed recharge and metering.
Agribusinesses	Stress-test sourcing for a very strong El Niño; diversify origins; co-invest with suppliers in irrigation, resilient varieties and soil health; build buffer stocks for exposed inputs.
Banks and insurers	Scale weather-index and parametric cover; use satellite data to price and pay faster; pre-approve contingent credit lines for farmer producer organisations.
Investors	Back proven, scalable adaptation tools such as drip systems, biologicals, decision software and climate data, with a focus on smallholder affordability.
Farmers and FPOs	Shift to short-duration and tolerant varieties, adopt alternate wetting and drying in rice, conserve soil moisture, and enrol in insurance and advisory services before the season.

Water will sit at the heart of this transition. Decades of over-extraction have eroded Asia's buffer against dry years, so the priority must move from expanding irrigation to raising water productivity through micro-irrigation, watershed restoration, aquifer recharge, rainwater harvesting and digital water accounting. These belong at the centre of agricultural policy alongside fertiliser and price support.

The line between resilience and crisis is drawn not by prediction but by action.

The private sector's role is just as decisive. For agribusinesses, climate resilience is moving from a sustainability line item to a commercial necessity. Much of what is needed already works: drip irrigation, alternate wetting and drying, conservation agriculture, short-duration varieties, precision nutrient management and mobile advisory networks. The task is not to prove them, but to

make them affordable and bankable for millions of smallholders. The richest opportunity may lie where resilience meets rural finance, as satellite risk assessment, digital lending and index insurance change how farm risk is measured, priced and shared.

Together, public policy, private capital and technology are forming a new agricultural economy in which resilience itself is a competitive advantage. Countries that can produce reliably through heat and erratic rain will strengthen their trade positions. Agribusinesses that de-risk their supply chains will look more attractive to institutional capital. And farmers who adopt climate-smart practices can build operations that are both more profitable and harder to knock over.

THE DEFINING LESSON

Climate is no longer the only unknown. Science now provides months of warning, and technology offers a growing toolkit. The real test of the 2026/27 El Niño is whether governments turn forecasts into action, investors turn capital into execution, and innovators turn technology into resilience at scale.

EL NIÑO 2026/27 · THE TEST AHEAD

Turn forecasts into action, capital into execution, and technology into resilience at scale.



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REFERENCE

Sources and Notes

NOAA Climate Prediction Center, ENSO Diagnostic Discussions, 9 July, 13 August, 10 September and 8 October 2026. FAO Agricultural Stress Index System and FAO and WFP Joint Anticipatory Action Appeal, 18 June 2026. India Meteorological Department end-of-season monsoon statement, 30 September 2026. UNDP Asia-Pacific, 1 October 2026. Commodity market reports on rice supply, May 2026. World Meteorological Organization El Niño updates. UNEP Adaptation Gap Report. FAO AQUASTAT on agricultural water withdrawals. AgFunder Global AgriFoodTech Investment Reports. Forecast probabilities are updated monthly; readers should consult the latest NOAA discussion, scheduled for 12 November 2026, before citing figures.

- NOAA Climate Prediction Center, ENSO Diagnostic Discussions: 9 July, 13 August, 10 September and 8 October 2026
- World Meteorological Organization, El Niño declaration, 3 September 2026
- India Meteorological Department, end-of-season southwest monsoon statement, 30 September 2026
- FAO and WFP, Joint Anticipatory Action Appeal for El Niño, 18 June 2026
- UNDP Asia-Pacific, "A very strong El Niño is building", 1 October 2026
- FAO Agricultural Stress Index System; FAO AQUASTAT
- UNEP Adaptation Gap Report
- AgFunder Global AgriFoodTech Investment Reports
- Commodity market reports on global rice supply, May 2026

Forecast probabilities are revised monthly. The next NOAA ENSO discussion is scheduled for 12 November 2026. Country risk ratings are an AgroSpectrum Asia editorial assessment.



About this whitepaper

Before the Rains Fail examines how a very strong 2026/27 El Niño threatens Asian agriculture, how prepared governments are, and where capital is flowing into climate adaptation. It is published by AgroSpectrum Asia, part of MM Activ Sci-Tech Communications.

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