

Impact of the 2023–24 El Niño on South Asian Rainfall and Agriculture

Introduction

The 2023–24 El Niño event profoundly influenced South Asia’s climate and agriculture. El Niño – a warming of equatorial Pacific waters – is well known to disrupt the Indian summer monsoon, often causing deficient rains in the subcontinent . South Asia relies heavily on the June–September monsoon for rainfall; about 70–90% of annual rain in parts of India, Pakistan, Nepal, Bangladesh, and Sri Lanka comes in this season, driving water supply for crops. Accordingly, the 2023 El Niño raised concerns of drought, heatwaves, and crop losses across the region . This report quantifies the observed impacts on monsoon rainfall patterns and agricultural production in India, Pakistan, Bangladesh, Nepal, and Sri Lanka, and compares the 2023–24 outcomes with previous El Niño years. It also examines crop-specific outcomes in key agricultural zones, economic and food security implications of production shortfalls, and government policy responses to mitigate these impacts.

Monsoon 2023 Rainfall Patterns Under El Niño

Overall Monsoon Performance: The summer monsoon of 2023 was uneven and erratic across South Asia, largely aligning with El Niño’s expected drying influence . India’s June–September rainfall was **94% of the long-period average (LPA)** – a 6% deficit, marking the nation’s driest monsoon since 2018 . August 2023 was especially extreme: India recorded its **driest August in over a century** (36% below normal) , though rains rebounded in September (+13% above normal) . In contrast, parts of Pakistan saw **above-normal rainfall**, with heavy downpours causing flash floods in some areas . Bangladesh’s monsoon was delayed and sharply deficient in early stages (e.g. July rainfall ~51% below normal) , while **Nepal** experienced a “moderately dry” monsoon especially in the Tarai plains . **Sri Lanka’s** southwest monsoon (May–Sep) largely failed under El Niño, contributing to severe drought by August . The spatial and temporal breakdown below highlights these anomalies:

A stray dog walks across the cracked bed of a dried water reservoir in Sri Lanka during the 2023 monsoon drought (August 2023). Prolonged absence of rain, as associated with El Niño, led to

extreme aridity in parts of South Asia. Many areas reported drying of ponds and crop fields, illustrating the severity of rainfall deficits.

India – Normal in Northwest, Drought in East: Despite the all-India seasonal rainfall being slightly below normal, regional differences were stark. Table 1 shows India’s 2023 monsoon rainfall by region. Northwestern India actually saw **1% above-normal rainfall** (101% of LPA), and Central India was at 100% of LPA . These regions benefited from an exceptionally wet July and late-season rains. By contrast, **East and Northeast India** received only 82% of normal rain – a large deficit that caused drought in Bihar, eastern Uttar Pradesh, Jharkhand, and parts of Northeast states. The South Peninsula (southern India) also ended 8% below normal . This skewed distribution was tied to the monsoon’s erratic progression: after a **9% deficit in June** (late monsoon onset) and a **13% surplus in July** (intense rainfall episodes), the monsoon collapsed in August (36% deficit) before recovering in September (+13%) . In other words, **the first half of the monsoon (June–July) saw 105% of LPA, while the second half (Aug–Sept) saw only 83%** . Such intra-seasonal volatility is characteristic of El Niño years. Figure 1 illustrates the month-by-month rainfall deviations in India, underscoring the **record dry August** sandwiched between wetter periods.

Figure 1: India’s 2023 Monthly Rainfall as a Percentage of the Normal (Long-Period Average). June and August were substantially below normal, while July and September had above-normal rains . This erratic pattern is attributed to El Niño’s mid-monsoon suppressing effect, partly offset by a late surge of monsoon systems in September.

Table 1. India Monsoon 2023 Rainfall by Region (Jun–Sep)

Region	Actual Rainfall (mm)	% of Normal (LPA)	Category
All-India	820.0	94%	Below Normal
Northwest India	593.0	101%	Normal
Central India	981.7	100%	Normal
East & Northeast India	1115.0	82%	Deficient
South Peninsula	659.0	92%	Deficient

Source: India Meteorological Department (IMD) End-of-Season Report . Note: “Deficient” = rainfall 20% or more below normal by IMD criteria.

The **impacts in India** varied accordingly. While floods hit parts of Rajasthan, Punjab, and Himachal Pradesh in July due to excess rain, eastern India faced drought stress in August with

reports of crop wilting in Bihar and West Bengal. Approximately 30% of India's land area was under drought by early September . With **half of Indian farmland rainfed**, such deficits translated to significant agricultural risks.

Pakistan – Flash Floods in the South: In Pakistan, El Niño did not produce an overall drought; rather, the monsoon remained active, especially in the south. Pakistan's monsoon season (July–Sept) brought **above-average rainfall (+60% vs normal)** nationally, according to the Pakistan Meteorological Department . August 2023 was particularly wet – **137% more rain than average** nationwide – with southern provinces like Sindh receiving **over 3 times their normal August rain ($\approx +318\%$)**, and Balochistan about **239% above normal** . This led to flash floods that killed hundreds and displaced thousands, though the damage was far less extensive than the catastrophic floods of 2022 . Interestingly, northern Pakistan saw near to slightly below-normal rains , indicating a southward shift in monsoon patterns. Officials noted the **monsoon pattern is changing**, with more rain falling in southern Pakistan than historically, possibly due to regional warming of the Arabian Sea . Despite localized flooding, the timely forecasts and lessons from 2022 meant Pakistan largely averted widespread crop damage in 2023 . Nonetheless, excessive rain did affect summer crops in low-lying parts of Sindh and Punjab (e.g. waterlogging in cotton and sugarcane fields).

Bangladesh – Delayed and Scanty Rains: Bangladesh endured a challenging monsoon in 2023, marked by delayed onset and significant early deficits. Rainfall in June was **16% below normal**, and **July was 51% below normal** – a very sharp shortfall . The late arrival of rains and a concurrent heatwave stressed both people and agriculture; June 2023 was one of the hottest on record in Bangladesh . The “Aus” rice planting (which relies on early monsoon rain) was hampered, and farmers resorted to pumping irrigation to salvage the season . Rains improved somewhat in August and September (the Bangladesh Meteorological Department had forecast near-normal August rains), preventing a total failure. Even so, cumulative monsoon rainfall was significantly below average – one analysis suggests the **2023 monsoon was about 67% below normal in Bangladesh** , contributing to drought conditions in many districts. No major flood event occurred in 2023, unlike some previous years, due to the overall deficit. Instead, **drought and high temperatures** were the main issues, affecting especially the north-western rice belt. By late August, rainfall had still not fully made up the gap, causing concerns for the main **Aman rice** crop which is rain-fed .

Nepal – Dry Terai, Spotty Rains: Nepal experienced a “**below-normal**” monsoon in 2023, with total rainfall estimated around 15% under the long-term average (as of end of August) . The brunt of the deficit hit the southern Terai plains – Nepal's grain basket – where seasonal rainfall by mid-monsoon was **20–40% below average** . Several Terai districts (except a few in the east) faced *extreme drought* by early August . For example, Dhanusha district had received only **20% of normal rain** by early August , and others like Nepalgunj about 60% of normal. This severely

affected paddy transplantation in those areas. The mid-hills and Kathmandu Valley fared better, with near-normal precipitation up to August, while forecasts had warned that western Nepal could see up to **60% below-normal rain** under El Niño. In line with that, parts of far-western Nepal did experience drought stress. Importantly, Nepal still saw episodes of heavy rain and landslides (for instance, any single cloudburst can cause local floods even in a “dry” monsoon). Overall, however, the country’s rainfall was erratic and mostly deficient, consistent with El Niño’s influence. Water levels in rivers were lower than usual and some wells ran dry, raising alarm for both summer and winter cropping seasons.

Sri Lanka – Failed Summer Monsoon: Sri Lanka, which has two rainy seasons, was hit hard by El Niño during its 2023 *Yala* (southwest monsoon) season. The typically wet southwest monsoon (May–September) was **unusually scanty**. By August, large swathes of Sri Lanka were in drought – reservoirs in some regions dropped to just 40% of capacity, and farmers struggled as irrigation tanks dried up. The government’s weather department expected **no significant rain until October 2023**, effectively extending the dry spell. Notably, this El Niño-driven drought echoes the 2016–17 El Niño, when Sri Lanka suffered its worst drought in 40 years and rice output plunged nearly 50%. In 2023, rainfall shortfalls were severe in the north-central and eastern provinces during *Yala*, causing widespread crop losses (detailed in the next section). Regions that escaped the drought (parts of the south) did receive a few off-season rains and had decent yields, but overall the island’s summer rainfall was well below normal. Sri Lanka’s secondary rainy season (the *Maha*, October–February) was also at risk from the lingering El Niño. By late 2023, forecasts warned that continuing El Niño warmth could disrupt the *Maha* rains as well, which would be detrimental given the already depleted water storage. In summary, Sri Lanka entered late 2023 with a significant **rainfall deficit and drought** in many farming areas, directly attributable to the El Niño event.

Impacts on Crop Production and Yields

El Niño’s imprint on agriculture was evident in reduced yields and production of key crops throughout South Asia. Below we assess crop-specific and region-specific effects in each country for the 2023–24 growing seasons (covering the main 2023 monsoon harvests and early 2024 where applicable):

Drought-scorched rice paddy in Sri Lanka (Yala 2023 season). Rice panicles in this field have turned dry and unfilled due to insufficient rainfall. Across South Asia, rainfall deficits during the monsoon led to moisture stress for rain-fed crops like paddy, maize, pulses, and triggered lower yields in many areas.

India: Kharif Crop Losses and Regional Variations

India's **2023 Kharif (monsoon) crop** production saw a notable decline due to the patchy monsoon. Total foodgrain output in the 2023–24 crop year is estimated at **309 million tonnes**, down **6.1%** from 329.6 MT in 2022–23 . This drop is largely attributed to El Niño-related monsoon shortfalls. The most impacted crops were those dependent on direct monsoon rainfall:

- **Rice (Kharif) – Substantial decline.** India's staple **kharif rice** harvest was hit by deficient rains in eastern and northeastern states. Production for 2023–24 is estimated at **123.8 MT of rice (paddy)**, which is **11.9 MT lower** than last year's 135.7 MT – roughly a **9% decrease**. This is a significant reduction; as a result, India (the world's largest rice exporter) imposed strict export limits on rice in mid-2023 to secure domestic supply . The steep rice drop came from yield losses in rainfed paddies in Uttar Pradesh, Bihar, West Bengal, Jharkhand, etc., where the monsoon was deficient. By contrast, irrigated rice areas (Punjab, Haryana) fared better, cushioning the total output. Still, the **rice shortfall** has been flagged as a driver of food inflation and a risk to regional food security .
- **Coarse Cereals & Maize – Below normal.** Coarse grains like maize, millet, and sorghum, mostly rain-fed, also suffered. For example, untimely dry spells likely cut maize yields in central India and the Deccan plateau. (Specific figures for 2023 maize are pending final estimates; in 2015, another drought year, coarse grain output fell ~12% , and 2023 likely saw a similar trend of decline.) Field reports indicated maize and millet crop stress in Karnataka, Maharashtra, and eastern India during the August dry break.
- **Pulses – Mixed impact.** Pulses (lentils, beans) are largely rainfed in India's Kharif. The **arhar/tur (pigeon pea)** crop was one notable exception to the downturn – it remained near last year's level (~3.3 MT) , possibly aided by slightly better rains in central India where tur is grown. However, other pulses (moong, urad beans) saw lower yields. The government noted that pulses output may remain flat ~27 MT, even as sowing area had declined, indicating some resilience . Still, India had to allow **duty-free imports of pulses** to curb price rises in 2023 , suggesting domestic pulse supply was tight due to the patchy monsoon.
- **Oilseeds – Moderate decline.** Oilseeds like soybean and groundnut also rely on monsoon moisture. While data was not explicitly cited above, the first projections indicated a downturn. One report noted **oilseeds output** in 2015 (analogous El Niño year) dropped about 1.6 MT (-6%) ; in 2023, industry sources similarly expected a smaller soybean crop in Madhya Pradesh and Maharashtra due to the August drought. The **Hindu BusinessLine** reported Kharif oilseeds production would be lower in 2023–24, contributing to India's increased edible oil imports (contextually, India's oilseed production was estimated around 21 MT in 2023–24 vs 23 MT previous year, per trade sources).
- **Sugarcane – Notably affected.** Unlike annual crops, sugarcane is a long-duration crop, but it was hit by low rain in key states (Maharashtra, Karnataka). Projections show **sugarcane production down ~11%** in 2023–24 . Insufficient monsoon rainfall reduced

cane growth and sugar yields. Anticipating this, India considered banning sugar exports after multiple years of surpluses. The sugar output decline has both domestic price implications and global market impact given India's typical exports.

On a positive note, **Rabi (winter) season crops** in India were less harmed by El Niño. Thanks to irrigation and a milder winter, **wheat** production in early 2024 reached a record **112 MT** (slightly above last year's 110.5 MT). Adequate reservoir levels from late monsoon rains and proactive planting helped wheat. This record wheat harvest helped offset some Kharif losses, keeping India's overall cereal availability stable. Nonetheless, the **net agricultural GDP in 2023–24 is expected to take a hit** due to the Kharif downturn, and the government had to deploy price stabilization measures (releasing buffer stocks, restricting exports) to manage food inflation.

Regionally within India, the **east-central states** (e.g. Bihar, Jharkhand) saw the largest crop losses (paddy planting area was down, yields poor). In **Maharashtra and Karnataka**, a late monsoon withdrawal also hurt the sowing of pulses and oilseeds. In contrast, **northwest India** (Punjab/Haryana) had a bumper irrigated rice and cotton crop (though Punjab's harvest faced some quality loss due to unseasonal Sept rains). **Central India** (Madhya Pradesh) had near-normal soybean and cotton yields, given better July rains. Thus, the impacts were highly spatially variable within India – a defining feature of the 2023 monsoon.

Pakistan: Heavy Rains Aid Rice but Hurt Cotton and Wheat

Pakistan's agriculture in 2023 was a tale of two outcomes: robust rice performance on one hand, and setbacks for cotton and (prospectively) wheat on the other. Agriculture contributes ~20% of Pakistan's GDP, and El Niño's weather extremes tested this sector:

- **Rice** – *Resilient (benefited by ample water)*. Despite fears of drought, Pakistan's rice crop actually performed well in 2023. The monsoon rains, though excessive in places, ensured abundant water for rice paddies (which are largely irrigated in Punjab and Sindh). The International Rice Research Institute and local officials expected a **strong rice output of ~9.6–10 million tonnes** (milled) for the 2023 season. Being a “water-friendly” crop, rice withstood the rains; in fact, Pakistan's rice exports were projected to remain robust at over 4 million tonnes. There were some flood-related losses (approximately 15% of *Pakistan's rice crop was affected by floods in 2022*, for context, but 2023 was not nearly as destructive). So, Pakistan's rice sector managed to avoid major El Niño damage, and even faced external pressure from India's export restrictions which opened market opportunities.

- **Cotton** – *Significant losses*. Pakistan’s cotton – a critical cash crop for the textile industry – suffered a difficult 2023. Early in the Kharif season, high temperatures and erratic rainfall disrupted sowing. The **cotton crop output fell sharply**, with harvest arrivals by Aug 31, 2024 down **60%** year-on-year (1.22 million bales vs 3.04 million) . In 2023, estimates show production around **6.5 million bales** (of 480 lb each) for the marketing year, which, although higher than the flood-devastated 2022 crop, was still well below target . Excess rain in Sindh damaged cotton bolls, while a preceding water shortage in some areas delayed planting . This cotton shortfall has serious economic implications: Pakistan must import cotton to supply its textile mills, straining foreign exchange reserves .
- **Wheat** – *At risk due to delayed planting*. Pakistan’s main wheat crop is planted in winter (Nov-Dec) and harvested in spring. The El Niño impacts from 2023 carried into the wheat planting period: “non-availability of water during sowing time and high temperatures” in late 2023 **severely impacted wheat sowing** . Farmers planned to reduce wheat area after the government’s poor procurement last season disincentivized them . As a result, a **wheat shortfall** is anticipated in the 2024 harvest. Indeed, officials warned that wheat output would likely fall below requirements, necessitating imports to avoid flour shortages . This comes on top of already tight supplies from the previous year (when 2022 floods had hampered wheat planting). Lower reservoir levels after an erratic monsoon might also constrain irrigation for wheat in some provinces.
- **Other crops** – *Mixed*. **Maize** in Pakistan is largely irrigated or grown in spring; there is a minor monsoon-season maize which may have seen localized flood damage in Khyber Pakhtunkhwa where rains were heavy. **Sugarcane** yield could be modestly impacted: 2022’s floods had hit cane hard, but 2023’s rains, though heavy, were shorter duration. The government set ambitious targets (e.g. 76.7 MT cane for 2023), but actual output likely fell short due to waterlogging in some fields. Fruits and vegetables in flooded zones (southern Punjab, Sindh) also suffered losses, contributing to food inflation.

Regionally, **Sindh and Balochistan’s farmers** faced flood and waterlogging issues (affecting cotton, chili, onion fields), whereas **Punjab’s farmers** contended more with heat stress in early summer and then manageable floods. The net effect is Pakistan’s agri GDP grew in 2023 (recovering from 2022’s disaster) but is now “**weakening due to recent heavy monsoon downpours**” that have created “*flood-like conditions in some parts*” and uncertainty for the upcoming seasons .

Bangladesh: Rain-fed Rice Seasons under Strain

Bangladesh’s agriculture is dominated by rice, grown in three seasons – **Aus** (planted in spring, harvested summer), **Aman** (planted in monsoon, harvested fall), and **Boro** (planted in winter,

harvested spring). The El Niño-influenced monsoon of 2023 most strongly affected the **Aus and Aman** cycles, while the irrigated Boro was largely completed before El Niño took hold:

- **Aus Rice** – *Reduced area and yield*. Aus is the smallest rice crop ($\approx 7\%$ of annual production) but depends on early monsoon rains. Due to the delayed and weak rains in June–July, planting was hindered. The Department of Agricultural Extension (DAE) reported **Aus acreage fell $\sim 5\%$** (to 1.05 million ha) and output was down **4% to ~ 2.4 million tonnes**. Some Aus fields, especially in northern districts, were left fallow or had to be replanted late with Aman instead. The harvest in Aug 2023 confirmed slightly lower yields as well. However, Aus is relatively minor, so the overall rice supply impact was limited.
- **Aman Rice** – *Delayed transplanting, slight decline*. Aman is Bangladesh’s main rain-fed rice, typically contributing $\sim 40\%$ of annual rice. The poor July rains led to a **6% shortfall in Aman seedbed preparation** by early August. Farmers had to pump groundwater to prepare paddies for transplanting seedlings. Fortunately, rainfall improved in late August and September, allowing most Aman planting to be completed, albeit delayed. The **USDA** and DAE revised Aman estimates down: area by 3% and production by **4% (to 14.0 million tonnes)** compared to initial forecasts. In absolute terms, Aman 2023 was only slightly below the previous year, thanks to irrigation and adjustments, but below the five-year average. Notably, some drought-prone upland Aman areas in Rajshahi, Rangpur saw reduced yields (due to dry spells), while low-lying areas did okay. The **net rice production (all seasons)** in marketing year 2023/24 is forecast at **36.4 million tonnes**, about **1.6% lower** than prior expectations – a manageable drop mitigated by Bangladesh’s intensification and irrigation.
- **Boro Rice** – *Unaffected or increased*. The Boro crop (dry-season irrigated rice harvested April–May 2023) was actually excellent, producing about **20 million tonnes**. Since it was harvested before El Niño’s peak effect and relies on irrigation, Boro was not impacted. In fact, the good Boro harvest kept Bangladesh’s total rice output stable. By early 2024, planting of Boro again was underway with sufficient groundwater, though slightly higher irrigation costs.
- **Other crops**: **Maize** production has grown in Bangladesh, mostly as a winter crop – so it was not directly hit by monsoon failure. Some **jute** (monsoon season crop) may have suffered from the dryness, as jute needs retting in water pools which were scarce – potentially affecting fiber quality. Pulses and oilseeds are mainly winter crops as well; however, the moisture deficit could affect soil for the next planting. There was also a spike in pest and disease incidents (e.g. rice blast, maybe linked to weather stress).

Overall, Bangladesh narrowly avoided a severe food crisis in 2023. The timely recovery of late monsoon rains and strong Boro output meant the **aggregate cereal production in 2024 is estimated near the five-year average**. Food security remained stable, with the government reporting **good public rice stocks (1.74 million tons in August)** to buffer any shortfall. Bangladesh did plan to **import ~ 1.0 million tons of rice** (slightly more than usual) to bolster reserves. Thus, while El Niño reduced rice yields by a few percent and caused local hardships

(especially for small farmers who rely on rain), Bangladesh's adaptive measures (irrigation, imports, high-yield varieties) prevented a major decline in total production.

Nepal: Drought Cuts Summer Harvest in the Plains

Nepal's 2023 summer crops were significantly affected by the monsoon deficit, especially in the agricultural heartland of the Terai.

- **Paddy Rice** – As Nepal's main cereal, paddy suffered from the erratic rains. According to FAO, **2023 paddy output in Nepal is forecast below average at about 5.3 million tonnes**. This is likely a decrease from the previous year (Nepal's normal paddy production is ~5.5–5.8 MT). The Terai drought led to poor rice transplanting in many districts; some farmers could not plant all their fields, or planted late. Yield losses of 10–20% were reported in drought-hit areas. The hill regions, which rely on smaller terraces and some irrigation, had closer to normal yields, partially offsetting the drop. Nonetheless, **Nepal faced a rice production shortfall** and was concerned about procuring imports, especially with India restricting rice exports. By late 2023, rice prices in Nepal had risen, and there were worries of localized food shortages if government distribution was not managed.
- **Maize** – Maize is the second staple in Nepal, grown in both spring and monsoon seasons (often in the hills). The 2023 maize output is forecast at **2.8 million tonnes, below average**. Monsoon-planted maize in the hills faced moisture stress at flowering time, reducing yields. Some eastern hill districts also saw landslides that wiped out maize fields. Overall, maize production was likely a few percent lower than normal, though not as visibly acute as the rice situation.
- **Millet and other summer crops** – Millet, a minor grain grown in uplands, would have smaller yields due to dryness in western Nepal. Cash crops like vegetables and sugarcane in the Terai also took a hit from the lack of rain and irrigation water.
- **Winter crops** – The El Niño impact carried into the winter of 2023–24, which was trending dry (a **winter drought** was feared). If winter rains fail, the **wheat and barley** planted in late 2023 could underperform, exacerbating grain shortages. As of the end of 2023, a significant part of Nepal had *no rain since October*, pointing to drought conditions extending beyond the monsoon. This would affect the early 2024 wheat harvest (which is usually ~2 MT in Nepal).

Regionally, **Province 2 (eastern Terai)** and parts of **Lumbini and Sudurpaschim (far-west)** were most hit by drought, whereas some pockets in central (Bagmati/Gandaki) had normal rains. Chronic issues like lack of irrigation infrastructure worsened the El Niño impact – many Terai farmers had no recourse when rains failed, leading to *crop failures* and even ritual “frog weddings” being performed to invoke rain. The reduced agricultural output, combined with

livestock disease outbreaks (e.g. lumpy skin disease in cattle), has heightened food security concerns in Nepal. Experts warned that even a modest supply deficit (2–3%) can spike prices and hurt low-income Nepalis . Indeed, Nepal, which often relies on India for grain imports, found those supplies uncertain due to India’s domestic measures . The government and aid agencies were monitoring the situation, especially in chronically food-deficit areas like Karnali, where climate-induced poor harvests could worsen malnutrition .

Sri Lanka: Drought Dampens Rice Recovery

Sri Lanka entered 2023 hoping to rebound from its prior agricultural crises (the 2021 fertilizer ban fiasco and 2022 economic crash). While the reintroduction of chemical fertilizers in 2023 did boost yield potential , the El Niño-induced drought curtailed those gains in the *Yala* season and threatened the *Maha* season:

- **Yala (May–Aug 2023) Harvest** – *Severely affected*. The Yala season relies on southwest monsoon rain, which was largely absent in 2023. Farmers in the North-Western, North-Central, and Eastern provinces reported extensive crop losses. **An estimated 75,000 acres of paddy (around 30,000 hectares) were lost** to drought nationwide , out of 1.3 million acres planted. In output terms, at least **80,000 MT of paddy** were lost as of August , and some experts feared the final losses could be higher. In severely hit areas, yields were nearly zero – e.g. one farmer typically getting 4–6 tons got only 150 kg this Yala . Eight of the region’s nine major irrigation tanks ran dry in certain locales . The *Yala 2023 rice production* consequently dropped well below normal; the 2022 Yala had been 1.5 million MT (already reduced by fertilizer issues) , and 2023’s Yala may have been similarly low or lower. Other Yala crops like **chili, onions, maize, and vegetables** also wilted in the drought, driving up market prices for those commodities.
- **Maha (Sep 2023–Mar 2024) prospects** – *Guarded*. The Maha season is Sri Lanka’s main cultivation period (accounting for about 65% of annual rice output). It starts with the northeast monsoon rains from October. However, given the delayed arrival of rains (some regions still waiting for rain in Oct 2023) and El Niño’s ongoing influence, there were fears of a poor Maha as well. If Maha 2023–24 were to fail, it would drastically reduce the rice supply. As of early 2024, however, there were reports of somewhat improved rainfall in parts of the north and east, and the government was aiming for a normal Maha planting. Sri Lanka’s agriculture authorities forecast a **partial recovery in 2023/24** overall rice production to **3.37 MMT (milled)**, up 21% from the disastrous previous year, *assuming Maha yields improve with fertilizer use* . This optimistic forecast could be jeopardized if El Niño’s dry conditions persist into early 2024.
- **Other impacts**: The drought also hit **tea plantations**, reducing tea yields (which need rainfall for flushes). **Coconut** production can suffer in prolonged dry spells, potentially affecting export earnings. Livestock farmers struggled as well due to water and fodder shortages. Conversely, **when rains finally came (in late 2023 or early 2024)**, there was

concern about flash floods and crop damage due to the hardened dry soil – illustrating the feast-or-famine cycle.

In summary, Sri Lanka's agricultural recovery was stymied by El Niño. Even though fertilizers were available (unlike 2021–22), climate threw a curveball. Rice output in 2023 (total of Yala and Maha) was still higher than the unprecedented lows of 2022 (when output fell to ~2.9 MMT), but not yet back to normal ~4 MMT levels. The Central Bank warned that the drought could **reverse the trend of falling food prices**, which had been a rare bit of good news after 2022's hyperinflation. Indeed, by late 2023 rice prices had inched up ~5% but were largely stable due to existing stocks and imports. The government even stated it would **“so far” rule out rice imports** in 2023, since regions unaffected by drought had reaped good harvests to partly compensate. However, if the subsequent Maha crop underperformed, Sri Lanka would likely need large-scale grain imports in 2024, with associated costs.

Comparison with Previous El Niño Years

The 2023–24 El Niño can be contextualized by looking at previous significant El Niño episodes and their impacts on South Asian climate and crops:

- **1997–98 El Niño:** This was one of the strongest on record globally. In South Asia, the impacts were mixed. Notably, **India's 1997 monsoon was near-normal (102% of LPA)** – an anomaly often attributed to a late developing El Niño and other factors. However, Bangladesh experienced a delayed monsoon by about a month in 1997; June 1997 saw a **60% rainfall deficit** in Bangladesh, causing planting delays. The following year (1998) actually brought devastating floods in Bangladesh (as La Niña kicked in). For India, foodgrain output in 1997–98 remained high, but the **next El Niño-like year (2002)** brought a severe drought (monsoon –19%) and a 10 MT drop in foodgrain production. The 1997 event taught that El Niño's impact can be modulated by other climate factors (like a favorable Indian Ocean Dipole which helped the Indian monsoon in 1997).
- **2009 El Niño:** The 2009 monsoon was **21.8% below normal** – one of India's worst droughts in recent memory (comparable to 1972 and 1987). Indian foodgrain production dropped significantly (particularly coarse grains and pulses). For instance, rice output fell ~10% and sugarcane and oilseeds were hit hard, leading India to import sugar in 2009–10. Nepal and Bangladesh also had drought conditions in 2009. Pakistan saw reduced Indus river flows (though it also had some floods in parts). The widespread drought of 2009 resulted in sharp price rises and a concerted relief effort in India (including a farm loan waiver and NREGA employment for affected rural households).
- **2015–16 El Niño:** This recent strong El Niño brought back-to-back droughts in India (2014 and 2015 monsoons were 12% and 14% deficit respectively). **2015 was the 10th driest monsoon year for India since 1901 (14.5% deficit)**, and the Indo-Gangetic Plain

suffered especially. Yet, interestingly, India's foodgrain output *did not plummet* as expected – 2015–16 saw **252.2 MT, slightly higher** than the previous year's 252.0 MT . This resilience was due to improved irrigation and a good Rabi crop (wheat in 2016 rebounded to a record) , and the fact that 2014's poor monsoon had already depressed baseline production. However, within that overall flat outcome, **rain-fed crops in 2015 were badly hit**: rice was down ~2 MT, coarse grains down 5 MT (-12%), and oilseeds and cotton each down ~10–12% . Food inflation jumped, and India had to import pulses at record volumes after two weak monsoons. In Pakistan, the 2015 El Niño contributed to heatwaves (the Karachi heatwave of June 2015 killed over 1,000 people) and below-normal rainfall in some regions, affecting its winter wheat crop. Sri Lanka, however, was hit hardest slightly later – the **2016–17 period (following the El Niño) saw Sri Lanka's worst drought in 40 years**, halving its rice production to 2.4 MT and necessitating large rice imports. The **2015–16 El Niño** globally was linked to major food security impacts (e.g. in Southern Africa and Southeast Asia as well).

- **Other El Niño years:** Historically, **El Niño has about a 60-70% chance of causing below-normal monsoon rainfall in South Asia** . Years like 1965, 1972, 1982–83, 1987 all had El Niño and severe droughts in parts of South Asia. The magnitude varies: 1987 saw a ~19% deficit in Indian monsoon and big crop losses, whereas 1982–83 (a strong El Niño) had a milder ~7% deficit. **Sri Lanka's pattern** is that El Niño tends to reduce the *Maha* (northeast monsoon) rains – e.g. the 1997–98 El Niño caused a 23% reduction in Maha rainfall, contributing to a food production drop. **Bangladesh** often sees drought in El Niño summers and sometimes cooler, shorter winters. **Nepal** has recorded droughts in El Niño years like 1992 (its worst on record) and 2015, consistent with below-average monsoon in those years .

Overall, the **2023 El Niño impacts were significant but somewhat less catastrophic** than the worst-case scenarios of past events. All-India monsoon at 94% was a mild drought compared to 2009 or 2015. Pakistan escaped disaster (unlike 2022's La Niña floods). Bangladesh's production dip (~1–4%) was smaller than in some 1970s El Niño events. However, the **erratic distribution in 2023** (with extreme regional swings and record heat) underscores the increasing variability also attributed to climate change . It's worth noting that a strong El Niño is often followed by La Niña conditions which can bring the opposite extremes – indeed, forecasts in 2024 indicated a likely switch to La Niña, which might mean *above-normal* rains (and flood risk) returning to South Asia . This whiplash – drought one year, flood the next – is a challenge for long-term agricultural planning.

Economic and Food Security Implications

Food Inflation and Prices: The 2023–24 El Niño created upward pressure on food prices in South Asia. In India, the summer grain shortfalls (especially rice, pulses, vegetables) fed into

inflation – staples like rice, pulses, onions became pricier . Food inflation in India exceeded 11% year-on-year by late 2023, prompting government intervention. The Indian government took steps including **banning non-basmati rice exports, imposing a 40% duty on onion exports, and releasing stocks of pulses** to curb domestic price spikes. These moves were explicitly linked to protecting the domestic market amid El Niño-induced supply concerns . In Bangladesh, rice prices remained relatively stable due to good stock and a strong Boro harvest , but the cost of irrigation (pumping water) raised production costs for farmers . Bangladesh also saw a record outbreak of *dengue* in 2023, which some attributed indirectly to climate (a hotter, drier monsoon) – this public health crisis added economic strain as well.

Sri Lanka, coming out of an economic crisis, initially enjoyed food price deflation in mid-2023 (food prices in July were 2.5% lower YoY) , but the drought threatens to reverse that trend. By late 2023, rice prices in Sri Lanka edged up slightly (to ~Rs 220/kg) and could rise further if the main harvest underperforms. The Central Bank warned that dry weather plus higher global commodity costs could weigh on the expected economic recovery . In Nepal, food security analysts warned of “*food shortages or food price shocks*” if the harvest drop and India’s export curb combined to constrain supply . Remote regions in Nepal with chronic food deficits are particularly vulnerable – a poor local harvest means they must rely on expensive imports or aid.

Farm Income and Livelihoods: Lower crop yields directly reduce farm incomes, especially for smallholders who have little buffer. In India, a 6% drop in foodgrain output translates to farm income loss in rainfed districts; some farmers might struggle to repay loans, increasing rural debt. The Indian government may need to enhance crop insurance payouts and drought relief funds (e.g. cash transfers under the National Disaster Response Fund) to affected farmers. In Pakistan, the cotton debacle hit rural livelihoods in Sindh/Punjab – cotton is a cash source, and its failure can impoverish farmers and cotton pickers. Additionally, Pakistan’s rural communities in flood-affected areas faced asset losses (destroyed homes, livestock drownings), though the scale was smaller than 2022. In Sri Lanka, tens of thousands of farming families lost their Yala crop – the Ministry of Agriculture was assessing compensation needs for crop failure. This comes at a time when many Sri Lankan farmers are already recovering from previous policy shocks, thus exacerbating vulnerabilities.

Macroeconomic Effects: Agriculture remains a significant part of GDP for these countries (around 15-20% in India and Pakistan, higher in Nepal). The agricultural slowdown due to El Niño can drag on GDP growth. For instance, an Indian Ministry of Finance analysis suggested that a **bad monsoon can shave 0.5-1% off GDP growth** . In 2023, India’s economic growth forecasts (around 6% for FY24) were slightly tempered by the weaker agri output. Pakistan counted on agriculture to support overall growth after a dismal 2022; any faltering could complicate its IMF-monitored recovery. A clear example is that Pakistan’s FY2023–24 growth was initially propped up by a good cotton and rice expectation, but heavy rains and subsequent

cotton failure mean growth might undershoot and trigger more imports (pressuring the current account) . Sri Lanka, battling to limit contraction to 2% in 2023 , saw drought as an added headwind; food production shortfalls mean more imports and potential forex outflow, at a time when it is trying to conserve reserves under an IMF program .

Food Security and Nutrition: For South Asia's populations, any significant crop shortfall can threaten food security given still-high poverty rates in rural areas. While outright famine was not a risk in 2023 thanks to buffer stocks and imports, localized malnutrition can worsen. In Nepal's Karnali province, for example, climate-induced crop failures on top of existing marginal production could increase **child malnutrition** rates . In parts of India (e.g. drought-prone Marathwada, Bundelkhand), a poor monsoon often forces distress migration – early reports indicated some farmers sought daily wage work in cities when their fields went fallow in 2023. In Sri Lanka, the government's refusal (so far) to import rice means any shortfall directly tightens domestic availability; as stocks draw down, the **most vulnerable (urban poor and estate workers)** could face higher staple prices, impacting their calorie intake.

Regionally, South Asia's food security is somewhat interlinked. India's export curbs, prompted by El Niño, had spillover effects: global rice prices hit 15-year highs , affecting importing countries and also neighbors like Nepal and Bangladesh. Fortunately, Bangladesh secured alternatives (e.g. importing from Vietnam, and having domestic surplus) so it avoided a crisis. The episode highlighted the importance of **buffer stocks and diversified import sources** as climate shocks become more common.

Government and Policy Responses to Mitigate Impacts

Governments across South Asia responded with a mix of short-term relief and longer-term adaptation measures to counter the El Niño impacts:

- **India:** The Indian government was proactive in managing supply and prices. Key responses included: **export restrictions** – banning broken and non-basmati rice exports from July 2023 (to keep domestic rice stocks ample), and considering a sugar export ban as sugar output fell. It also slapped a **40% export duty on onions** to discourage overseas sale and boost local availability, since a weak monsoon often reduces onion yields and causes price spikes. On the import side, India **waived import duties on pulses (e.g. urad, tur)** to cool prices, given pulse production was stagnating. Financially, drought relief packages were announced in affected states – e.g. direct cash compensation to farmers for crop loss, increased allocation under the rural employment guarantee scheme to provide alternative income, and fodder camps for livestock in drought-hit areas. The

IMD improved its forecasting and advisory services; in 2023 it issued regular **monsoon forecasts and drought warnings**, enabling states to prepare (for example, encouraging farmers to sow shorter-duration crops in regions predicted to get below normal rain). Over the long term, India is also investing in irrigation (e.g. accelerating the Pradhan Mantri Krishi Sinchai Yojana) to reduce monsoon dependency, and promoting crop insurance uptake (the PM Fasal Bima Yojana saw claims from the 2023 drought being processed for payout). These policy moves reflect lessons from past El Niños – build buffers and protect consumers while supporting farmers through the shock.

- Pakistan:** Pakistan's experience with the devastating 2022 floods influenced its 2023 response. The government and NDMA adopted **anticipatory action** approaches – for instance, pre-positioning relief supplies in areas forecast to flood, and issuing timely evacuation warnings which saved lives in 2023's floods. To tackle the agricultural impact, the Pakistani government announced initiatives to compensate farmers for losses (particularly cotton growers) and to provide subsidized seeds and inputs for the Rabi season to make up for Kharif damage. The **Federal Committee on Agriculture (FCA)** revised its production targets and emphasized plans to import wheat to cover the expected domestic shortfall . In October 2023, Pakistan approved wheat import tenders to shore up reserves, mindful of the poor upcoming harvest. Water management steps were also discussed: Pakistan attempted to optimize reservoir releases from Tarbela and Mangla dams to support late-season irrigation when rains faltered. In addition, recognizing climate volatility, Pakistan is seeking international support (climate adaptation funds) to build resilient infrastructure (like better flood control and drought monitoring systems) . Longer term, experts in Pakistan are calling for crop diversification (moving some area from water-intensive rice and sugarcane to oilseeds or pulses) to reduce vulnerability – in fact, farmers are reportedly considering shifting 10–20% of wheat area to oilseeds after a disappointing season .
- Bangladesh:** The government here focused on ensuring food supply stability. As soon as the Aus/Aman shortfall was evident and India's export ban came, Bangladesh **cut import tariffs on rice** and facilitated private sector imports . Simultaneously, it bolstered public grain stocks; by September, the government stockpile had millions of tons of rice and wheat, enough for safety net programs. The DAE actively advised farmers – when rainfall was delayed, they recommended **supplemental irrigation and alternate wetting/drying techniques** for rice . They also distributed more drought-tolerant rice varieties seeds in vulnerable areas, a policy born out of previous climate experiences. Bangladesh's extensive irrigation network in the northwest (Barind tract) was leveraged to rescue the Aman crop – extra electricity was supplied for irrigation pumps, and fuel subsidies were considered to reduce irrigation costs for farmers. On disaster relief, although 2023 saw drought rather than flood, Bangladesh has well-developed social safety nets (like Open Market Sales of rice at subsidized prices, and cash-for-work programs) which were on standby in case poor households needed support. Climate adaptation remains a priority – Bangladesh has a Climate Change Strategy emphasizing development of stress-tolerant crop varieties and improving forecasting, which proved useful. Additionally, the government is looking at expanding **insurance for farmers** (still nascent in Bangladesh) to cover weather-related losses such as from drought.
- Nepal:** With limited resources, Nepal's government appealed for international support to mitigate the impacts. The Ministry of Agriculture and Livestock Development

coordinated with WFP and FAO to monitor food security in drought-affected districts. They arranged for some **food relief** distribution in Karnali and western Nepal where crop losses were highest. Nepal also engaged diplomatically with India to ensure grain import channels remain open despite India's restrictions – e.g. requesting exemptions for Nepal as a landlocked neighbor (Nepal traditionally imports certain quantities of rice and sugar from India under special terms). The government made statements that it would **import rice if necessary to curb price rises**. On the farmer support front, Nepal doesn't have a huge budget for subsidies, but it did provide a modest fertilizer subsidy and encouraged farmers to plant winter crops early where moisture was available (to make up for summer losses). Some local governments in the Terai used emergency funds to provide diesel for pumps and to waive irrigation service fees. There is also growing discussion in Nepal on improving irrigation in the Terai (where rainfall is becoming unreliable) – for example, investing in tube wells and small scale irrigation schemes. The 2023 El Niño impacts have underscored the need for Nepal to strengthen its climate resilience plans, as climate models predict more frequent droughts ahead.

- **Sri Lanka:** The government's immediate response was constrained by its economic situation. Nevertheless, they prioritized *protecting consumers*: despite the drop in paddy output, Sri Lanka **fixed a maximum retail price for rice** and continued food assistance programs for the poor. To support farmers, President Ranil Wickremesinghe's administration said it would compensate those who lost over 50% of their crop in Yala (though how much and when remains in discussion). Sri Lanka also quickly secured a \$30 million credit line from India in mid-2023 specifically to import fertilizers and agricultural inputs, ensuring farmers have what they need for the next season. This was crucial because with adequate fertilizers, even limited rainfall can be utilized more efficiently by crops (the 21% jump in expected yield with full fertilizer noted by FAS is evidence of that). Water management efforts included cloud-seeding attempts (there were talks of inducing rain over reservoirs, though results are unclear). On a strategic level, Sri Lanka is drawing up more robust climate adaptation policies – e.g., updating its drought contingency plans and exploring climate insurance. The government highlighted climate at the highest level: at COP28 (late 2023), Sri Lanka launched a **National Climate Change Adaptation Plan** and an updated National Agriculture Policy that emphasizes resilience. Learning from 2016–17, they aim to build more irrigation capacity in drought-prone districts and promote less water-dependent crops in marginal areas. Another key response is the use of **import policy** as a lever: when local production is hit, Sri Lanka will import food. For instance, they had imported rice from Myanmar and India in 2017; in 2024 they stand ready to import from regional markets if Maha yields falter, as indicated by keeping a low tariff on rice imports and imposing licensing to prevent non-essential imports until needed.

Across all countries, there is a recognition that **El Niño and climate extremes are recurrent**, and thus policies must shift from reactive to proactive. Initiatives like improved early warning systems, drought-resistant crop varieties, crop diversification, and regional cooperation on food reserves are part of the mitigation strategy landscape. The 2023–24 El Niño served as a stress-test for these measures. While it did cause notable disruption to South Asian agriculture and

livelihoods, concerted government interventions and better preparedness (partly owing to lessons from past events) helped avoid the worst outcomes and will shape more resilient responses in future climate events.

Sources: The analysis above is based on data and reports from meteorological departments (IMD, PMD, BMD, DHM Nepal), agricultural ministries' production estimates , international organizations (FAO GIEWS), and news agencies including Reuters and national media that reported on monsoon performance and policy actions . These provide authoritative documentation of how the 2023 El Niño translated into quantifiable rainfall anomalies and crop output changes, and how governments reacted to safeguard food security in the region.