The SB CHIRPS Brazil Center-South Precipitation Signal: Brazilian Supply Overlay for Sugar

Why CHIRPS precipitation over Brazil Center-South (home to 90 percent of Brazilian sugar and 40 percent of global exports) delivers a strongly significant 26-year directional pattern on Sugar No. 11 forward 60-day returns.

David Stendahl · Market Lab Analytics · November 6, 2026

The signal with the limits stated upfront

Three things the reader must know before the rest of this brief lands.

First, the full-distribution daily Spearman information coefficient against Sugar No. 11 forward 60-day returns is plus 0.095 at p-value 8.8e-15 on a sample of 6,675 daily observations spanning 2000 through 2026. Strongly significant on the 26-year window.

Second, the phase pattern is monotone. Phase +1 (Precip Deficit) delivers plus 1.26 percent fwd60d across 434 trading days (6.5 percent of sample); Phase 0 (On Trend) delivers plus 2.65 percent on 61.5 percent majority share; Phase −1 (Precip Above Trend) delivers minus 1.63 percent across 2,135 days (32.0 percent). 2.89 percentage point Phase +1 minus Phase −1 spread.

Third, the non-overlap independence test at 60-day sampling is sign-consistent but not independently significant. Phase +1 sample is small at 6.5 percent of total observations; this increases edge-measurement uncertainty on the bullish tail compared with the more populous Phase −1 bucket.

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The thesis: Center-South monsoon as the global sugar supply channel

Brazil is the world's largest sugar producer and exporter. Within Brazil, the Center-South region produces approximately 90 percent of Brazilian sugar; the belt spans São Paulo (dominant), Minas Gerais, Goiás, Mato Grosso do Sul, and Paraná. Combined with Brazilian export share, the Center-South cane belt accounts for roughly 40 percent of global sugar exports.

The primary cane-development window runs October through April during the Southern Hemisphere monsoon season. Moisture during this window determines two key outputs: cane yield (tonnes of cane per hectare) and total recoverable sugar (ATR, kilograms of sugar per tonne of cane crushed). Below-trend monsoon moisture compresses both; sustained deficit regimes reduce Brazilian sugar production materially and transmit directly to global supply balance.

The CHIRPS satellite-rain-gauge blended precipitation product provides daily 5-kilometer-resolution rainfall estimates over Brazil Center-South with multi-decade record. CHIRPS is the standard observational product for South American agricultural regions and gives reliable precipitation estimates over the Center-South cane belt.

The signal takes CHIRPS rolling precipitation anomaly over Brazil Center-South, z-scores, inverts (deficit reads positive composite), and tanh-bounds. State thresholds plus or minus 0.2 (moderate) and plus or minus 0.5 (extreme). Phase +1 at composite above +0.3, phase −1 below −0.3. Target: ICE US Sugar No. 11 first-nearby back-adjusted close.

Historical window: CHIRPS daily series from 1981; engine runs from 2000 onward with 504-bar warmup.

What the firings have actually done

Computed over 6,675 daily observations post-warmup from 2000 onward. The baseline Sugar No. 11 forward 60-day return is mean plus 0.92 percent and median plus 0.15 percent across the live-window sample.

> **Baseline Sugar No. 11 forward 60-day return:** mean plus 0.92 percent / median plus 0.15 percent across the live-window sample.
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> **Daily Spearman IC (fwd 60d):** plus 0.095, p-value 8.8e-15, N equals 6,675. Strongly significant.
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> **Phase-conditional forward 60-day Sugar returns:** Phase +1 (Precip Deficit, 434 days / 6.5 pct): plus 1.26 percent, edge plus 0.34 pp. Phase 0 (On Trend, 4,106 days / 61.5 pct): plus 2.65 percent, edge plus 1.73 pp. Phase −1 (Precip Above Trend, 2,135 days / 32.0 pct): minus 1.63 percent, edge minus 2.55 pp.
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> 2.89 percentage point spread between Phase +1 and Phase −1 with monotone phase pattern. The directional signal is cleaner on the Phase −1 side given the larger sample.

Three findings. The daily IC is strongly significant on the 26-year window. The monotone phase pattern cleanly separates Precip Deficit from Precip Above Trend. The sample is skewed toward Phase 0 On Trend (61.5 percent) and Phase −1 Precip Above Trend (32.0 percent); Phase +1 Precip Deficit is small at 6.5 percent reflecting the generally adequate Center-South monsoon across the 2000-2026 period with episodic deficit years.

Three cases that frame how to read the signal

The canonical anchors are the 2021 Brazil drought-plus-frost, the 2010 Brazilian supply stress, and the 2018 abundant monsoon.

Case 1: The 2021 Brazil drought and frost

Precip Deficit firing through mid-2021 as Brazil Center-South experienced sustained monsoon moisture deficits followed by July frost events across São Paulo and Paraná cane acreage. The composite held in Phase +1 territory through the window. Sugar No. 11 rallied materially through late 2021 to above 20 cents per pound consistent with the Phase +1 edge; the compound deficit-plus-frost episode is the canonical Center-South supply shock of the modern sample. The 2021 episode illustrates how precipitation deficit combined with frost events (which the signal does not directly capture) can compound into severe supply stress.

Case 2: The 2010 Brazilian supply stress

Precip Deficit firing through early 2010 as Brazil Center-South experienced below-trend monsoon rainfall. The composite held in Phase +1 territory. Sugar rallied materially through 2010-2011 to record highs above 30 cents per pound consistent with the Phase +1 edge; the 2010 Brazilian supply stress compounded with the broader 2010-11 commodity supercycle setup as emerging-market demand surged. The 2010-11 Sugar high remains the canonical 21st-century Sugar peak.

Case 3: The 2018 abundant Brazilian monsoon

Precip Above Trend firing through 2018 as Brazil Center-South experienced above-trend monsoon rainfall. The composite held in Phase −1 territory. Sugar underperformed through 2018 to cycle-low pricing below 11 cents per pound consistent with the Phase −1 edge; abundant Brazilian moisture supported strong cane yields and a global oversupply regime. The 2018 episode illustrates the honest Phase −1 bearish edge working through a sustained oversupply period.

How to use this signal today

Composite is currently reading minus 1.000 in the Precip Above Trend band. The Neutral phase began October 2026, 7 trading days ago. CHIRPS daily rainfall over Brazil Center-South has run materially above the rolling mean through late 2026.

Pair with the following for stacked conviction: CFTC NY Sugar positioning (US positioning), ICE Europe white sugar managed money positioning (European positioning), Brazil Center-South Carry (term structure), BRL FX competitiveness (producer FX), crude-ethanol parity (cane-to-ethanol vs sugar trade-off), Thailand supply (second-largest exporter), Indian production, apparel and food-grade sugar demand. This Brazil CHIRPS signal gives the dominant producer-region supply lens; pair with term structure and positioning for the full read.

Reader rule: Precip Deficit firings flag bullish supply-shock setups via Brazilian yield compression and reduced ATR with the 2021 and 2010 episodes as benchmarks. Precip Above Trend firings flag bearish regimes where abundant moisture supports strong cane yields with the 2018 episode as benchmark.

Methodology

Data source: UCSB Climate Hazards Center CHIRPS daily precipitation at 5-kilometer resolution aggregated over Brazil Center-South cane belt bounding box. Computation: rolling precipitation anomaly z-scored on a rolling window, inverted so deficit reads positive composite, tanh-bounded.

State thresholds plus or minus 0.2 (moderate) and plus or minus 0.5 (extreme). Phase +1 at composite above +0.3, phase −1 below −0.3. Target: ICE US Sugar No. 11 first-nearby back-adjusted close.

Historical window: CHIRPS daily precipitation series from 1981; engine runs from 2000 onward with a 504-bar warmup for the rolling z-score.

Validation computed on 6,675 post-warmup daily observations. Daily Spearman IC plus 0.095 at p-value 8.8e-15 across 6,675 observations, strongly significant on 26-year sample. Phase +1 per-day forward return plus 1.26 percent on 6.5 percent sample. Phase 0 per-day forward return plus 2.65 percent on 61.5 percent majority. Phase −1 per-day forward return minus 1.63 percent on 32.0 percent sample. 2.89 pp Phase +1 minus Phase −1 spread. Non-overlap IC sign-consistent but not independently significant.

What this signal does not cover

The signal does not cover Brazil North-Northeast cane region (10 percent of Brazilian sugar, different monsoon system). It does not capture Center-South frost events (May-August) which are a compound-stress channel separate from precipitation anomaly. It does not capture ethanol-vs-sugar mix decisions driven by crude oil and RIN market signals. It does not capture non-Brazilian sugar supply (India, Thailand, EU, China). CHIRPS daily cadence is high-frequency but the 60-day forward horizon requires sustained regimes for signal firings.

Disclaimer

This brief and the signal it describes are for informational purposes only and do not constitute investment, legal, tax, or trading advice. Hypothetical or simulated performance results have certain inherent limitations. Unlike an actual performance record, simulated results do not represent actual trading. Also, since the trades have not been executed, the results may have under- or over-compensated for the impact, if any, of certain market factors, such as lack of liquidity. Simulated trading programs in general are also subject to the fact that they are designed with the benefit of hindsight. No representation is being made that any account will or is likely to achieve profits or losses similar to those shown. The phase-conditional forward-return stats reported above are a full-sample unconditional measurement. Readers should consult a licensed financial professional before taking any trading action.

References

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