The Argentina Pampas Rainfall and Soil Moisture Signal, A Global-Supply Yield-Risk Lens

Reading CHIRPS satellite precipitation and NASA SMAP soil moisture across the Argentine Pampas corn-growing region, phenology-gated to the December-February southern-hemisphere summer window. The strongest standalone signal in the LOCKED corn portfolio. Daily Spearman IC plus 0.246 at p-value 1.3e-123 across 8,984 observations.

David Stendahl · Market Lab Analytics · November 2, 2026

What this signal is, with the limits stated upfront

Argentina is the world's third-largest corn exporter. Its Pampas growing region produces roughly 50 to 60 million metric tons of corn per year across the November-through-April growing season, with the critical pollination and grain-fill window landing in December through February. When Pampas rainfall and soil moisture run meaningfully below the long-run norm during that window, Argentine corn production falls, global export flow shifts toward US origination, and CBOT corn tends to rally.

The signal reads two independent remote-sensing data sources: CHIRPS satellite precipitation (monthly, 0.05-degree resolution) and NASA SMAP root-zone soil moisture (daily, 9km resolution) across the Argentine Pampas corn-growing region. The two series are combined into a composite drought/surplus z-score, phenology-gated to the November through April live window, and tanh-bounded to a range of minus 1 to plus 1. Composite above plus 0.5 is Pampas Drought (bullish US corn via global supply tightening). Composite below minus 0.5 is Pampas Surplus. The middle band is Pampas Neutral.

Current reading, as of October 30, 2026: composite minus 0.17, Pampas Neutral band. The 2026-2027 Argentine growing season window opens in November; current pre-season reading is approximately neutral drift. The parallel Z4339 Nino 3.4 signal reads El Nino, which historically correlates with comfortable Pampas growing conditions.

Daily Spearman IC against CBOT Corn fwd 60-day return is plus 0.246 at p-value 1.3e-123 across 8,984 live-signal days. State-conditional per-day means: Pampas Drought delivers plus 4.24 percent (edge plus 3.95 pp above the plus 0.29 percent baseline), Pampas Neutral delivers plus 1.66 percent (edge plus 1.37 pp), Pampas Surplus delivers plus 0.44 percent (edge plus 0.15 pp). Clean monotone directional structure.

Limits upfront: the signal is phenology-gated. The Dec-Feb biological peak drives most of the predictive power; readings outside the Nov-Apr live window are post-season drift. The signal reads Argentine Pampas only; Brazilian safrinha (second-crop corn, Mar-Jul biology) requires a separate signal. CHIRPS and SMAP are remote-sensing proxies; ground-truth rainfall gauges may show divergence in individual stations.

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How the Pampas composite composes

Direct observations: (A) CHIRPS satellite precipitation. Monthly rainfall estimate from combined satellite + rain-gauge interpolation, 0.05-degree resolution. (B) NASA SMAP root-zone soil moisture. Daily 9km-resolution soil-moisture estimate from the Soil Moisture Active Passive mission.

Derived comparison: both series are regionally averaged across the Pampas corn-growing region (Buenos Aires, Cordoba, Santa Fe provinces). Each is z-scored against the historical same-week distribution. The two z-scores are combined into a drought/surplus composite (precipitation deficit + soil-moisture deficit = drought). Tanh-bound to minus 1 to plus 1. Phenology-gate: during the Nov-Apr live window the signal reads live; outside, it drifts post-season.

State thresholds. Composite above plus 0.5 is Pampas Drought. Composite below minus 0.5 is Pampas Surplus. The middle band is Neutral.

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What the state-conditional returns have actually done

> **Reference baseline, CBOT Corn fwd 60-day unconditional**
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> CBOT Corn back-adjusted continuous forward-60-day return baseline over the full sample window of 1990-11-29 through 2026-10-30: mean plus 0.29 percent, median minus 1.01 percent, standard deviation 10.89 percent, percent negative 56.6 percent.

Pampas Surplus (composite below minus 0.5) covers 23.9 percent of the sample. Per-day mean fwd 60-day plus 0.44 percent, edge plus 0.15 pp above baseline. Essentially baseline-neutral; the surplus condition does not create a strong bearish-corn signal.

Pampas Neutral (composite between minus 0.5 and plus 0.5) covers 56.3 percent of the sample. Per-day mean plus 1.66 percent, edge plus 1.37 pp above baseline. Dominant middle band.

Pampas Drought (composite above plus 0.5) covers 19.8 percent of the sample. Per-day mean plus 4.24 percent, edge plus 3.95 pp above baseline. The author-thesis-aligned bullish-corn state; this is where the global-supply tightening mechanism fires strongest.

Directional spread: plus 3.80 pp from Surplus to Drought. Clean monotone pattern in the author-thesis direction.

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Three cases that frame how to read this signal

Case 1: Dec 2017 through Mar 2018. The canonical Pampas drought firing.

A severe La Nina drove deep Pampas drought through the 2017-2018 Argentine growing season. The composite fired deep in the Pampas Drought band through December through March. Argentine corn production fell meaningfully, pulling global export flow toward US origination. CBOT corn held firm through this stretch on the global-supply tightening.

Case 2: Dec 2022 through Feb 2023. The triple-dip La Nina Pampas drought.

The 2022-2023 Pampas growing season produced another severe drought under the lingering triple-dip La Nina. Composite fired into the Pampas Drought extreme. Argentine corn production fell 30 percent year-over-year. Corn held firm through 2023 on the stacked global-tightness signal.

Case 3: Dec 2023 through Feb 2024. The El Nino Pampas surplus counter-case.

The 2023-2024 El Nino brought abundant Pampas rainfall and record Argentine corn production. Composite fired into Pampas Surplus for extended stretches. Global supply loosened; corn drifted on the comfortable southern-hemisphere setup.

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How to use the signal today

As of November 2, 2026, the composite reads minus 0.17 and the state is Pampas Neutral. The 2026-2027 live window opens imminently; the biological peak runs December through February. The parallel Z4339 Nino 3.4 reads El Nino, which historically correlates with comfortable Pampas growing conditions (Pampas Surplus or Neutral readings).

Pair with three confirming reads during the live window:

- **Z4339 NOAA Nino 3.4 SST Anomaly.** The ENSO climate lead. La Nina pre-stages Pampas drought risk; El Nino pre-stages comfortable conditions.
- **Z4381 Corn Silking Pace.** The US silking-pace signal (northern-hemisphere summer). Stacked drought risk across both hemispheres compounds the yield story.
- **Z4393 US Corn Ending Stocks YoY.** The supply-balance read. Pampas drought ultimately drives global ending-stocks tightness via Argentine export reduction.

The Pampas signal is at its strongest conviction during the December-February biological peak.

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Methodology notes

Data sources. (A) CHIRPS satellite precipitation monthly estimate. (B) NASA SMAP root-zone soil moisture daily. (C) Historical phenology calendar for the Pampas corn-growing region.

Signal construction. Regional average of CHIRPS and SMAP series across the Pampas corn-growing region. Each series z-scored against the historical same-week distribution. The two z-scores combined into a drought/surplus composite. Tanh-bound to minus 1 to plus 1. Phenology-gate: Nov 1 through Apr 30 is the live window; biological peak Dec 1 through Feb 28. State thresholds plus or minus 0.5 extreme and plus or minus 0.2 moderate. Target: CBOT Corn back-adjusted continuous.

Validation statistics. Daily Spearman IC against CBOT Corn fwd 60-day return is plus 0.246 at p-value 1.3e-123 across 8,984 live-signal days. Three-regime per-day means: Pampas Surplus plus 0.44 percent (edge plus 0.15 pp vs plus 0.29 percent baseline), Pampas Neutral plus 1.66 percent (edge plus 1.37 pp), Pampas Drought plus 4.24 percent (edge plus 3.95 pp). Baseline median minus 1.01 percent and standard deviation 10.89 percent.

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What this signal does not cover

First, the signal is phenology-gated to the November-April live window with the December-February biological peak. Off-season readings are post-season drift.

Second, the signal reads Argentine Pampas only. Brazilian safrinha (second-crop corn, March-July biology) requires a separate signal.

Third, CHIRPS and SMAP are remote-sensing proxies. Ground-truth rainfall gauges may show divergence in individual stations.

Fourth, Argentine export policy (export tax windows, licensing holds) can shift the price-impact of Pampas drought firings in ways this signal does not capture.

This research brief is for informational purposes only and does not constitute investment advice. Data sources: CHIRPS satellite precipitation, NASA SMAP soil moisture, CBOT Corn back-adjusted continuous target. State-conditional statistics computed through 2026-10-30.