The CT US Cotton Belt Drought DSCI Signal: Production-Weighted Drought Overlay for Cotton

Why the US Drought Monitor DSCI weighted by county cotton production delivers a 3.97 pp directional spread on Cotton forward 60-day returns across 26 years.

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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 Cotton forward 60-day returns is plus 0.122 at p-value 1.2e-22 on a sample of 6,366 daily observations spanning 2001 through 2026. Strongly significant on the 26-year window; this is the strongest US-supply-side lead signal in the CT library.

Second, Phase +1 (Drought Elevated) delivers plus 1.78 percentage points above baseline across 2,457 trading days (38.6 percent of sample) and Phase −1 (Moisture Benign) delivers minus 2.19 percentage points below baseline across 2,343 days (36.8 percent). 3.97 pp directional spread with clean monotone phase pattern.

Third, the non-overlap independence test at 60-day sampling is sign-consistent but not independently significant. Across 107 independent samples the Spearman is plus 0.069 with p-value 0.48. Signal is heavily seasonal (May-October growing season); off-season composite ffills forward and short-horizon value concentrates in the growing season.

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The thesis: production-weighted drought on the cotton belt

The US Drought Monitor publishes a weekly Drought Severity and Coverage Index (DSCI) by county on a 0-500 scale. The index integrates five drought intensity classes: D0 abnormal dry, D1 moderate, D2 severe, D3 extreme, and D4 exceptional drought. DSCI is the standard quantitative measure of US drought severity.

Weighted by county cotton production across Texas, Georgia, Mississippi, Arkansas, and other major cotton states, the composite captures drought pressure on the actual bales-producing geography

rather than raw land-area. Texas alone accounts for roughly 40 percent of US cotton production; drought severity in Texas dominates the composite.

Drought on the US cotton belt is the single most-watched short-lead supply signal for Cotton futures. Dryness during squaring (June) and boll-development (July-August) directly reduces lint yield and quality; the transmission from drought to futures price is direct, physical, and short-lead.

The signal takes USDM county-level DSCI, multiplies by NASS county cotton production weights, aggregates across the US cotton belt, z-scores on a rolling window, 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 Cotton 2 first-nearby back-adjusted close.

Historical window: US Drought Monitor series from 2000; engine runs from 2001 onward with 504-bar warmup.

What the firings have actually done

Computed over 6,366 daily observations post-warmup from 2001 onward. The baseline Cotton forward 60-day return is mean plus 1.62 percent and median plus 0.15 percent across the live-window sample.

> **Baseline Cotton forward 60-day return:** mean plus 1.62 percent / median plus 0.15 percent across the live-window sample.
>
> **Daily Spearman IC (fwd 60d):** plus 0.122, p-value 1.2e-22, N equals 6,366. Strongly significant.
>
> **Non-overlap IC (60-day step):** plus 0.069, p-value 0.48, N equals 107. Sign-consistent but not independently significant.
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> **Phase-conditional forward 60-day Cotton returns:** Phase +1 (Drought Elevated, 2,457 days / 38.6 pct): plus 3.40 percent, edge plus 1.78 pp. Phase 0 (On Trend, 1,566 days / 24.6 pct): plus 2.09 percent, edge plus 0.47 pp. Phase −1 (Moisture Benign, 2,343 days / 36.8 pct): minus 0.57 percent, edge minus 2.19 pp.
>
> 3.97 pp directional spread between Phase +1 and Phase −1 with clean monotone phase pattern.

Three findings. The daily IC is strongly significant on the 26-year window. The monotone phase pattern cleanly separates Drought Elevated from Moisture Benign with 3.97 pp spread. Sample distribution is roughly symmetric between the extreme buckets (38.6 and 36.8 percent); this is a balanced directional signal where both tails carry informative directional information.

Three cases that frame how to read the signal

The canonical anchors are the 2022 Texas megadrought, the 2011 Texas drought record, and the 2018-2019 benign moisture regime.

Case 1: The 2022 Texas megadrought

Drought Elevated firing anchored the 2022 Cotton rally as the Texas megadrought drove USDM DSCI on the production-weighted cotton belt to multi-decade highs. Texas alone accounts for roughly 40 percent of US cotton production; the severity of the Texas drought translated directly to the composite.

Composite held in Phase +1 territory through the rally. Cotton rallied materially from the lower-100s cents-per-pound range to above 150 at the 2022 peak consistent with the Phase +1 edge.

Case 2: The 2011 Texas drought record

Drought Elevated firing anchored the 2011 Texas drought that broke state records and devastated cotton production. USDM DSCI reached historic highs across the cotton belt as Texas received the lowest rainfall totals since 1895. Composite held in Phase +1 territory through the full growing season. Cotton rallied materially through 2011 to multi-year highs consistent with the Phase +1 edge; the 2011 drought was the canonical modern cotton supply shock.

Case 3: The 2018-2019 benign moisture regime

Moisture Benign firing through 2018-2019 as US cotton belt moisture conditions ran near or above normal with no significant drought on the production-weighted geography. Composite held in Phase –1 territory through the cycle-low pricing regime. Cotton underperformed through the benign-moisture period consistent with the Phase –1 edge; benign moisture during squaring and boll-development supports yield.

How to use this signal today

Composite is currently reading plus 0.895 in the Drought Elevated band. The HEALTHY phase began October 2026, 31 trading days ago. US Drought Monitor DSCI weighted by county cotton production is running deeply above the rolling z-score mean through 2026 with raw z at plus 1.45.

Pair with the following for stacked conviction: China Xinjiang precipitation (non-US supply), India Vidarbha monsoon (non-US supply), GRACE India Vidarbha aquifer (groundwater proxy), USDA WASDE stocks-to-use (systemic balance), CFTC positioning (speculator conviction), and apparel-demand signals. This drought signal gives the US supply-shock setup; pair with non-US supply and systemic balance for the full read.

Reader rule: Drought Elevated firings flag bullish supply-shock setups with Cotton strength historically following at 60-day horizon. Moisture Benign firings flag bearish regimes where yield support softens price.

Methodology

Data source: USDA/NDMC US Drought Monitor weekly county-level Drought Severity and Coverage Index (DSCI, 0-500 scale) and NASS county cotton production weights from the 2017 Census of Agriculture. Computation: production-weighted DSCI aggregate across the US cotton belt (Texas, Georgia, Mississippi, Arkansas, Missouri, Oklahoma, Alabama, Louisiana, North Carolina, South Carolina, Tennessee), z-scored on a rolling window, 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 Cotton 2 first-nearby back-adjusted close.

Historical window: US Drought Monitor series from 2000; engine runs from 2001 onward with a 504-bar warmup for the rolling z-score.

Validation computed on 6,366 post-warmup daily observations. Daily Spearman IC plus 0.122 at p-value 1.2e-22 across 6,366 observations, strongly significant on 26-year sample. Phase +1 per-day forward return plus 3.40 percent (plus 1.78 pp above plus 1.62 percent baseline). Phase –1 per-day

forward return minus 0.57 percent (minus 2.19 pp below baseline). 3.97 pp directional spread. Non-overlap IC at 60-day sampling plus 0.069 at p-value 0.48 across 107 samples, sign-consistent but not independently significant.

What this signal does not cover

The signal does not cover non-US cotton production (see China Xinjiang and India Vidarbha supply signals). It does not capture realized yield response (that comes through USDA NASS production reports with 1-2 month lag). It does not capture pest/disease supply shocks. It does not capture demand (see apparel inventory, Vietnam demand, and PPI signals). USDM weekly cadence limits sub-weekly resolution.

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

USDA/NDMC US Drought Monitor, weekly county-level drought severity release, droughtmonitor.unl.edu.

USDA NASS, Census of Agriculture 2017 county-level cotton production, nass.usda.gov.

ICE Futures US, Cotton 2 first-nearby back-adjusted continuous contract (ticker CT), end-of-day settlement.