

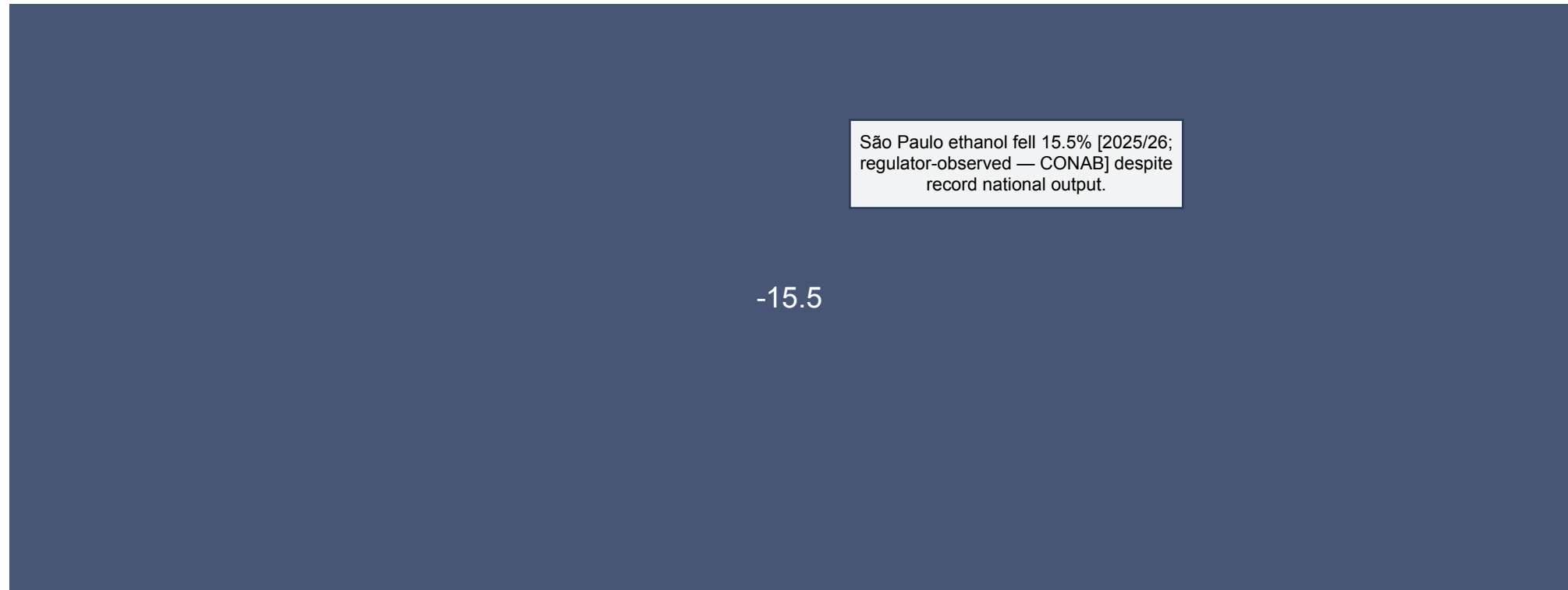
The Digest's 2026 Multi-Slide Guide to Brazilian Sugarcane Cluster Evolution

Record ethanol, a shrinking core: Brazil's cluster is migrating to corn

Brazil made record ethanol last season; São Paulo, its historic heart, made 15% less.

National ethanol reached a record while São Paulo's output contracted. Corn growth offset weaker cane ethanol, so the national total masks a shrinking historic core.

■ Ethanol output change (%)



São Paulo

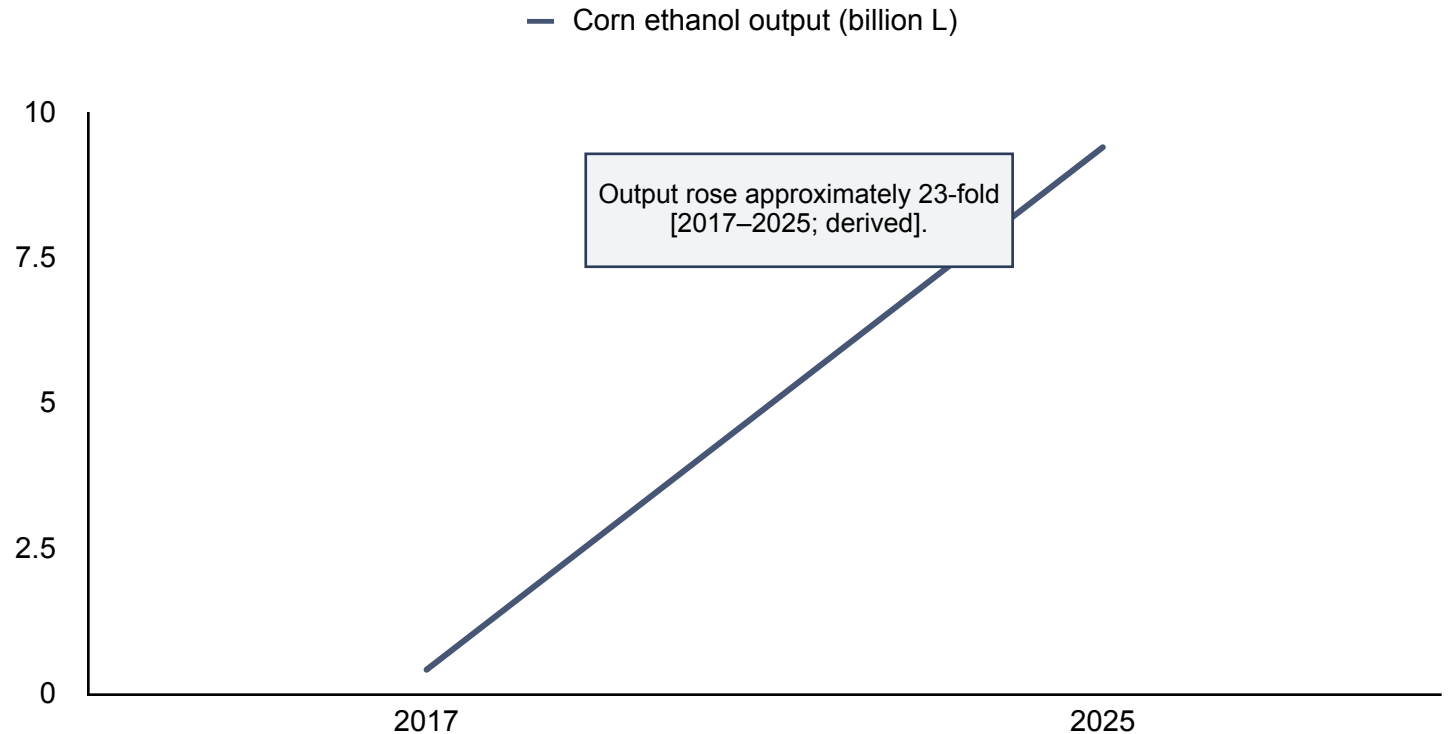
Corn ethanol grew more than twentyfold in eight years (derived), and most of it is in one state.

Brazilian corn ethanol rose from 410 million L [2017; Reported — USDA FAS] to 9.4 billion L [2025; Reported — USDA FAS], approximately 23-fold [2017–2025; derived]. Mato Grosso accounts for approximately 70% [date not specified; Reported] of production.

Growth and concentration

- Corn ethanol output rose from 410 million L [2017; Reported — USDA FAS] to 9.4 billion L [2025; Reported — USDA FAS].
- The endpoint increase is approximately 23-fold [2017–2025; derived]; intermediate annual output is not shown.
- Mato Grosso produces approximately 70% of Brazilian corn ethanol [date not specified; Reported].
- Authorised corn/flex plants: 42 plants and 16.1 billion L nameplate [date not specified; Reported]—capacity, not output.

Brazilian corn ethanol output: reported endpoints only



The cane belt shows real cross-firm links, and those links are what corn plants now reuse.

Observed power flows, transferable assets and operating production support the cluster assessment. Labour concentration remains unmeasured.

✓ Flow: grid power

Cane mills sell bagasse-generated electricity to the grid [Reported].

Bagasse cogeneration spans 12,697 MW at 428 units [Reported].

Power sales link mills to buyers beyond ethanol [Reported].

✓ Shared assets

Corn plants reuse cane-era logistics [Reported].

Flex-mill know-how helps incumbents add corn processing [Reported].

Transferable assets connect the historic cane belt to the corn cluster [Reported].

✓ Production: operating

National ethanol reached 37.5 bn L in 2025/26 [Regulator-observed — CONAB].

The figure describes operating production, not announced capacity.

Output verifies activity; it does not measure cross-firm labour links.

? Labour: unmeasured

Labour concentration is not measured in the supplied evidence.

No workforce figure is used as a cluster test.

This test remains open rather than passing by assumption.

Cluster advantage migrates with the resource, and assets that transfer let incumbents follow it.

Corn growth in Mato Grosso draws on capabilities developed in the cane belt, while the cane core retains shared fire and yield exposure. Source: USDA FAS Biofuels Annual; UNICA.

Dense cane core	Transferable assets	Resource shift	Diverging outcomes	Risk remains
Activities • Cane mills anchor processing capability in the Centre-South. • Their concentration supports shared operating practices.	Activities • Flex operations and logistics can serve another feedstock. • Power revenue and credits complement ethanol sales.	Activities • Corn plants develop near Mato Grosso's grain supply. • Operators reuse applicable cane-era capabilities rather than relocating the crop.	Activities • Corn output lifts national production. • São Paulo can retain scale while losing marginal share.	Activities • The cane core remains exposed to regional fire and weather. • Geographic diversification does not remove risk at existing sites.
Deliverables • Established mill base	Deliverables • Flex-mill know-how • Logistics • Co-product power • RenovaBio credits	Deliverables • Mato Grosso corn plants	Deliverables • National ethanol growth • Lower core share	Deliverables • Correlated fire exposure • Correlated yield exposure

A mill that sells sugar, ethanol and power is more resilient than one that sells ethanol alone.



How the mill earns across markets

- The UNICA-tracked cane base spans 195 units in 2026/27 [Reported].
- A mill can direct cane toward sugar or ethanol as relative returns change [Reported — USDA FAS].
- Bagasse supports grid-power sales: 12,697 MW across 428 units; São Paulo accounts for 6,383 MW [Reported; date not specified]. These are generating capacity, not electricity output.
- The gasoline blend requirement, E30 from August 2025 [Regulator-observed — USDA FAS], supports ethanol demand; the supplied E32 claim for August 2026 is not corroborated by the accompanying source.

Sugar, ethanol and grid power provide distinct sources of value from cane. This flexibility can cushion a mill when ethanol is less attractive, though the cited MW figures measure capacity rather than generation.

The core still holds half the cane; the new growth sits about 1,000 km away, on corn.

São Paulo remains a major cane centre, but corn-led ethanol growth is concentrated in Mato Grosso. Falling marginal share does not mean the historic core has disappeared.

Scale remains; marginal growth moves

- São Paulo still holds about half of Brazil's cane [Reported].
- Mato Grosso produces approximately 70% of Brazil's corn ethanol [Reported].
- The growth shift runs roughly 1,000 km from São Paulo toward Mato Grosso [Reported].
- The core can lose share of incremental ethanol growth while retaining a large cane base.



Part of São Paulo's fall is a choice, not a loss.

Lost advantage

- São Paulo cane yield fell 5.4% in 2025/26 [Reported].
- Lower yield reduces the cane available for mills to allocate between sugar and ethanol.
- A smaller crop can depress ethanol output even when mills keep the same production mix.
- Yield weakness is a constraint on the core, not proof that mills lost the ability to produce ethanol.

Mix and weather

- Mills shifted their mix toward sugar rather than ethanol [Library H-12 alternative].
- That allocation choice can lower ethanol output without a matching loss of milling capacity.
- Weather-driven yield weakness and a sugar-favouring mix can operate at the same time.
- Ethanol output alone cannot separate a deliberate mix shift from a weaker cane crop.

São Paulo's ethanol decline is consistent with both lower cane yield and a deliberate shift toward sugar. Neither explanation cancels the other.

A concentrated crop is a concentrated fire footprint.



Fire exposure in São Paulo

- In Aug 2024, fires burned 231,800 ha of São Paulo cane [Reported — UNICA].
- About 90% of that burned area lay in three regions in Aug 2024 [Reported — UNICA].
- Orplana estimated losses of approximately R\$800m from the 2024 fires [Reported — Orplana].
- Cane tonnage lost to the 2024 fires was not published [Reported].

The 2024 fires affected a concentrated area of São Paulo's cane belt, creating shared exposure across nearby growers and mills. The reported financial loss cannot be converted into lost cane tonnage because that figure was not published.

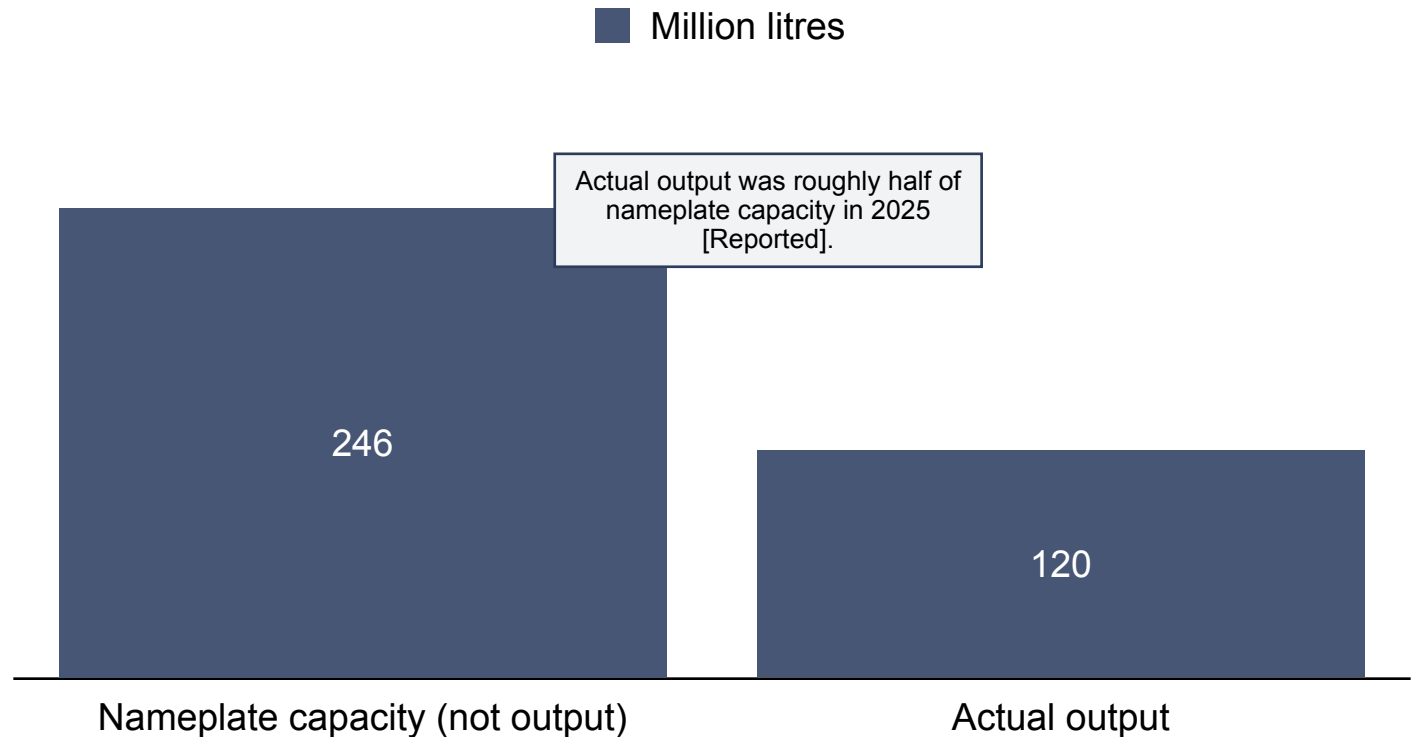
Concentrating capital in one new pathway at the old sites underperformed.

Brazil's cellulosic ethanol output was roughly half its nameplate capacity in 2025 [Reported]. The gap, alongside Costa Pinto's closure as a production unit, shows why first-of-a-kind investments need staged execution rather than concentrated commitment.

Capital concentration and output

- Raízen directed almost all proceeds from its R\$6.9 billion IPO to cellulosic ethanol (E2G) [Reported].
- Costa Pinto closed as an E2G production unit in April 2025 [Reported].
- Brazil produced approximately 120 million litres of cellulosic ethanol in 2025 [Reported].
- Nameplate capacity was approximately 246 million litres in 2025 [Reported]—capacity, not output.
Source: presentation evidence packet [Reported].

Brazil cellulosic ethanol: nameplate capacity versus actual output, 2025 [Reported]

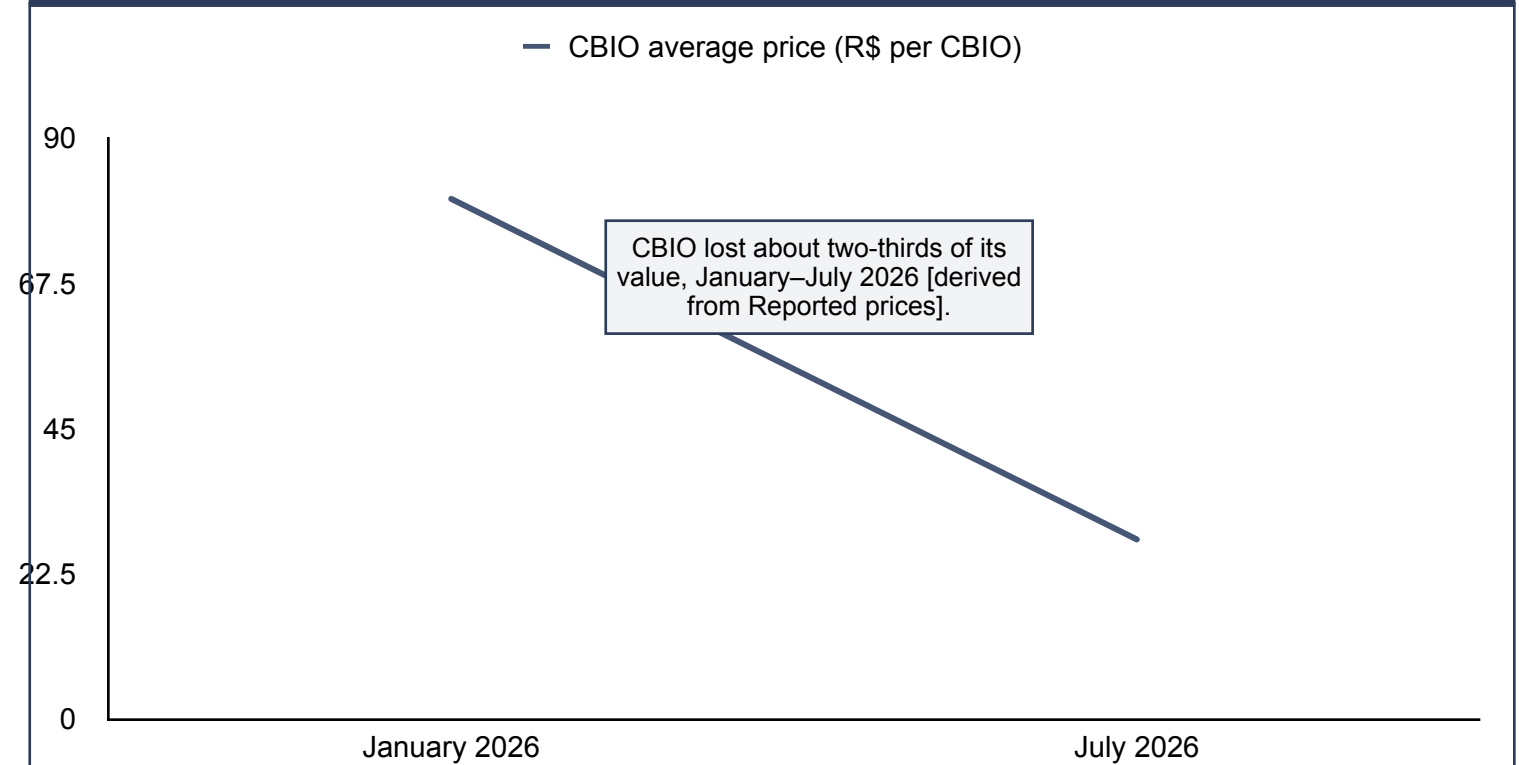


The credit that rewards low-carbon ethanol lost about two-thirds of its value (derived).

Price signal and implication

- January 2026 average: R\$80.73 per CBIO [Reported].
- July 2026 average: R\$27.97 per CBIO [Reported].
- The endpoint decline is about two-thirds [January–July 2026; derived from Reported prices].
- A weaker CBIO premium shifts the economic advantage toward lower-cost feedstocks and sites.

CBIO average price, January–July 2026 [Reported]



The reported CBIO average price fell from R\$80.73 to R\$27.97 between January and July 2026 [Reported]. The decline reduces the credit's contribution to ethanol revenue and puts more weight on feedstock and site costs.

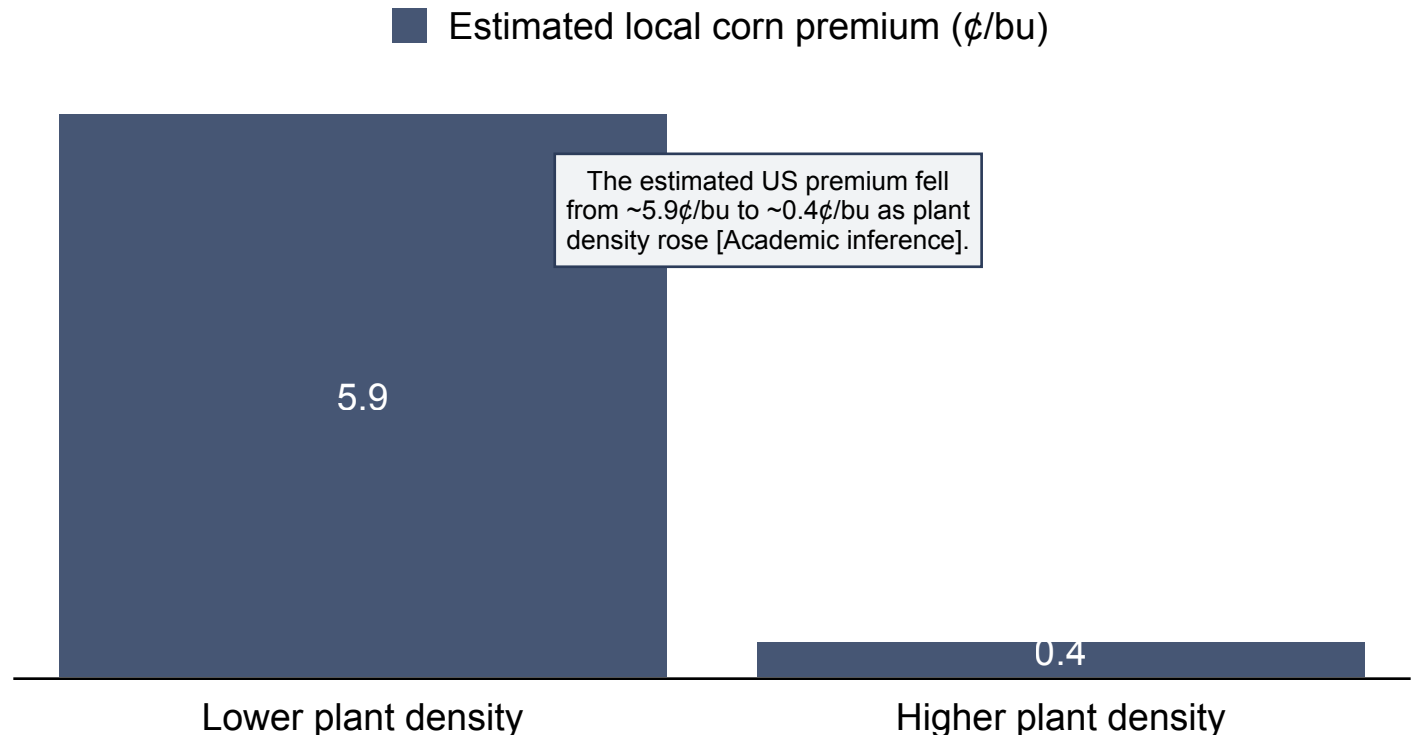
In the US Midwest, the local feedstock premium shrank as plants crowded together.

In the US Midwest, the estimated corn-price premium associated with a new ethanol plant narrowed as plant density rose [Academic inference]. Mato Grosso has no comparable measurement, so the US result is a monitoring question, not a Brazilian forecast.

US evidence; Brazil remains unmeasured

- PADD 2 holds 94.5% of US ethanol nameplate [Measured — EIA; date not supplied]; this is capacity, not output.
- At lower plant density, the estimated local corn premium was ~5.9¢/bu [Academic inference; date not supplied].
- At higher density, that estimate narrowed to ~0.4¢/bu [Academic inference; date not supplied].
- Mato Grosso's equivalent premium is not measured; monitor local corn costs without projecting the US result.

US local corn premium associated with a new ethanol plant [Academic inference]



India shows what happens when grain ethanol outgrows its basin.

India's maize import surge illustrates how rapid grain-ethanol growth can strain a feedstock basin. Poultry demand and restrictions on diverting sugar to ethanol also contributed, so the import jump cannot be attributed to ethanol alone.

Feed-market pressure

- India imported 0.9 Mt of maize in 2024 [Reported].
- Imports increased 7,940% year on year in 2024 [Reported].
- Maize ethanol rose from 315M L to 2.86 bn L in one year [Reported; dates not supplied].
- Poultry demand and sugar-diversion curbs also drove the squeeze; ethanol growth alone does not explain it [Reported].

India maize imports: prior year versus 2024 [Reported]



Leaders can switch feedstock and spread footprint; laggards are single-crop, single-region, single-bet.

Feedstock and geographic flexibility reduce exposure to one crop and one weather footprint; pathway scaling and revenue mix depend on execution. Source: The Digest analysis; USDA FAS Biofuels Annual; UNICA.

Observable differences between leaders and laggards

Observable	Leaders	Laggards	Structural or execution?
Feedstock flexibility	Flex mills that can add corn	Cane-only mills	Structural
Geographic exposure	Cane and corn regions	One fire and drought footprint	Structural
New-pathway scaling	Staged, partnered	One concentrated first-of-a-kind bet	Execution
Revenue mix	Sugar, ethanol, power	Ethanol plus CBIO	Execution

The new pathway at old sites failed; the old pathway on a new resource succeeded.

Novel conversion technology at cane sites delivered roughly half its stated capacity in 2025 [derived]. Corn ethanol instead grew around a different feedstock basin, shifting the cluster's growth centre without replacing the cane core.

New tech, old site

- Cellulosic ethanol used cane residues at established milling sites.
- Brazilian cellulosic output was ~120 million L in 2025 [Reported], against ~246 million L of 2025 nameplate [Reported].
- Output was about half of nameplate in 2025 [derived]; nameplate is capacity, not production.
- Costa Pinto ceased operating as a cellulosic production unit in April 2025 [Reported].

Old tech, new resource

- Corn ethanol applied established fermentation to grain concentrated near Mato Grosso.
- Mato Grosso supplied ~70% of Brazilian corn ethanol in 2025 [Reported].
- Corn supplied ~27% of national ethanol output in 2025/26 [Reported].
- The growth centre sits about 1,000 km from the historic cane core [Reported].

Follow the resource, add it at existing sites, and price the shared fire.

Corn flexibility can extend the cluster, but it does not erase the cane core's shared fire and yield exposure. Capital decisions should test feedstock costs, CBIO sensitivity and correlated regional risk together.

Producers

Add corn where existing flex sites can use established logistics and operating know-how.

Stage new production pathways rather than concentrating capital in one unproven route.

Use partners to share the execution risk of new-pathway scaling.

Investors and lenders

Price fire and yield exposure across sites that depend on the same cane region.

Stress-test returns against a weaker RenovaBio credit (CBIO) price.

Assess whether feedstock flexibility reduces exposure or merely relocates it.

Policymakers

MME and ANP, with UNICA, should compare São Paulo output with national output.

Treat a national ethanol record as insufficient evidence of a healthy cane core.

Track whether corn growth reuses existing assets while cane-region risks remain concentrated.

Watch list

Compare São Paulo ethanol output with national output as new data arrive.

Monitor the CBIO price when evaluating low-carbon ethanol economics.

Watch Mato Grosso feedstock costs for signs that plant growth strains local supply.