The Supply That Didn't Lower the Price

Rural-Urban Milk Price Divergence and the Broken Supply-Price Transmission in Indian Dairy, 2011-2025

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India's milk production grew 63% in a decade. Per capita availability is 73% above WHO minimums. In February 2023, rural milk inflation hit 9.40%, the highest in ten years. This is the story of the system that broke between the farm and the consumer.

India produces more milk than it has ever produced in its history. In 2023-24, per capita milk availability reached 485 grams per person per day, 73 percent above the WHO-recommended minimum. Production has compounded at 5.7 percent annually for more than a decade, outpacing even the Operation Flood era. No other large economy has grown its dairy output faster.

In February 2023, rural milk inflation hit 9.40 percent - the highest in a decade.

These two facts belong to the same country, the same commodity, and the same year. Understanding why they coexist is not a statistical puzzle. It is the central unresolved question of Indian dairy policy.

Two Numbers That Cannot Both be Right

Start with what the numbers say:

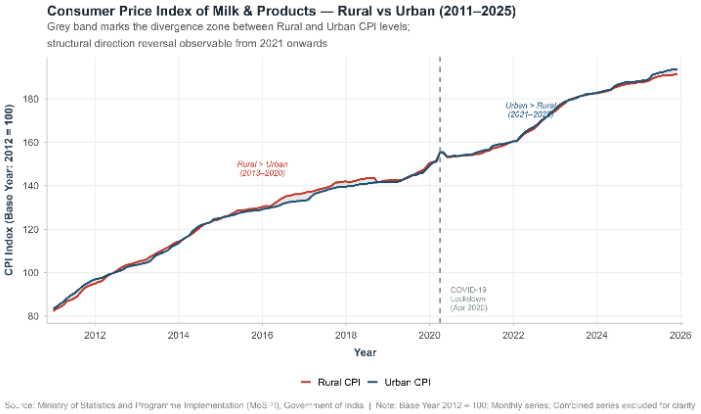
Production growth, 2014-15 to 2023-24	+63.57%
Per capita availability vs. WHO minimum	+73% above
Peak rural CPI milk inflation (Feb 2023)	9.40%
Peak urban CPI milk inflation (Feb 2023)	10.15%
Average annual rural inflation, 2014-2025	4.72%
Average annual urban inflation, 2014-2025	4.89%

In any standard economic model, a 63 percent production increase over a decade - with per capita availability already far above minimum nutritional requirements - should push consumer prices downward, not upward at nearly 10 percent. The model is broken. The question is which part of the system, between the farm and the consumer, is breaking it. Fifteen years of monthly CPI data and cross-sectional production figures across 21 states give a clear answer - and it has nothing to do with how much milk India produces.

The Reversal Nobody Announced

The first discovery in the data is structural and has gone largely unreported. For most of the period between 2011 and 2020, rural consumers paid more for milk than urban consumers - the CPI index was consistently higher in rural areas, with the gap peaking at +2.27 index points in 2016. Rural households, with lower incomes and weaker market access, bore the larger inflation burden.

Then, from 2021, the burden shifted. Urban milk inflation outpaced rural areas and remained higher, reaching a gap of -1.53 index points by 2025. Urban consumers are now



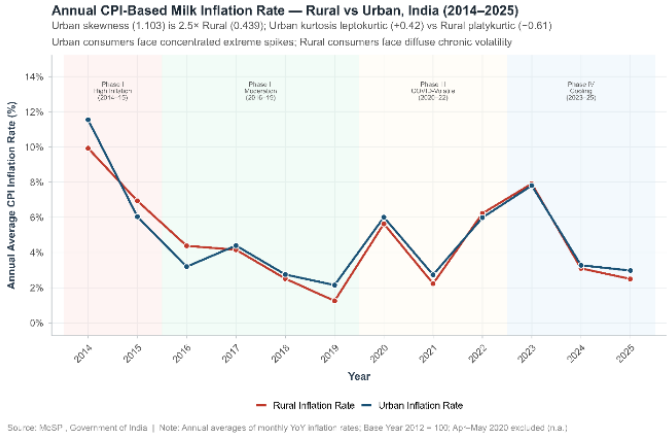
the ones paying more. This is not a temporary fluctuation - it is a structural regime change, coinciding precisely with post-COVID organized procurement expansion and rapid urban demand recovery outpacing urban supply chain capacity.

"For most of the last decade, rural India paid more for milk than urban India. Since 2021, that has reversed. Neither shift was a market accident."

The reversal matters because policy responses are calibrated on the assumption that rural consumers are the vulnerable party. The data says that the assumption expired in 2021.

Three Phases and One Constant

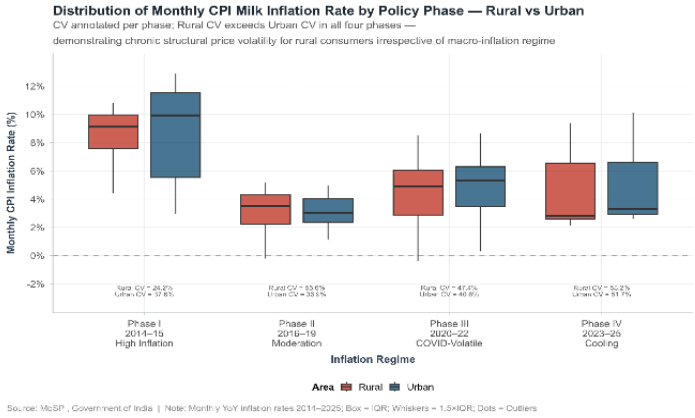
Fifteen years of monthly inflation data is divided into four regimes - not by statistical convenience, but because the external environment changed in ways that reset the whole system.



The mean inflation figures across phases are broadly similar for rural and urban consumers. But the CV column - which measures how wildly inflation swings month to month within each phase - reveals a constant that overrides every

macro-regime: **rural inflation is more volatile than urban inflation in every single phase, without exception.**

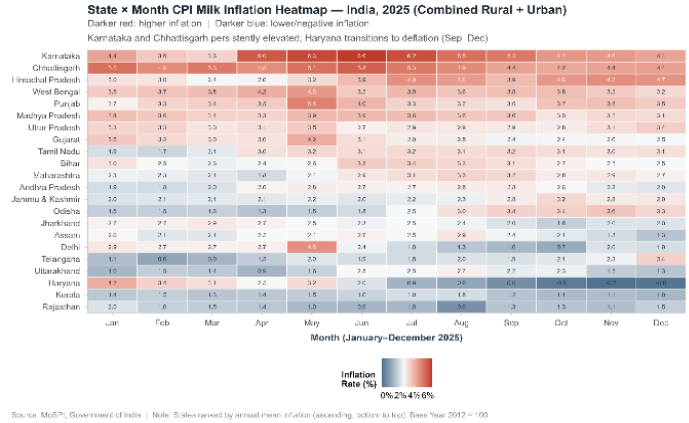
Phase	Rural Mean	Urban Mean	Rural CV	Urban CV
I - High (2014-15)	8.43%	8.79%	24.2%	37.6%
II - Moderate (2016-19)	3.07%	3.12%	55.6%	36.9%
III - COVID (2020-22)	4.64%	4.84%	47.4%	40.6%
IV - Cooling (2023-25)	4.50%	4.69%	58.2%	51.7%



The Phase II finding is particularly telling. When aggregate milk inflation was at its lowest - rural mean of 3.07 percent - rural price volatility (CV = 55.6%) was still 51 percent higher than urban (36.9%). When the national supply environment was stable and comfortable, rural prices were still swinging unpredictably month to month. That is not a supply problem. That is a market structure problem.

The Hidden Geography of Pain

Aggregate national figures suppress the most important information in this dataset. Once the analysis moves to 22 states for 2025, a picture emerges that no national average can convey.



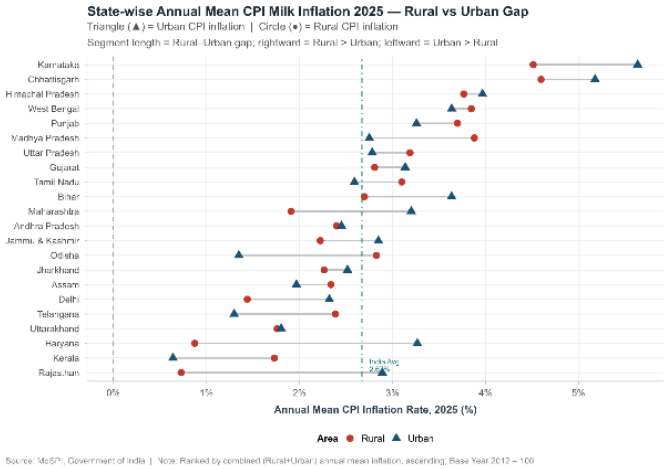
Four states define the extremes and demand individual attention.

Karnataka recorded the highest combined milk inflation among states in 2025 at 5.06 percent, with urban inflation at 5.64 percent. Karnataka is also the third-fastest growing major dairy state by 12-year production CAGR. More production, higher prices. The supply-price hypothesis fails here most visibly.

Haryana presents the most damaging welfare inversion in the dataset. Its annual average of 1.50 percent appears moderate - until you look inside the year. Rural farm-gate prices collapsed between September and December 2025, with rural inflation touching -1.69 percent in November. Urban consumers in the same state paid 3.27 percent more than the previous year throughout this period. Surplus milk suppressed farm-gate prices. Urban retail was insulated entirely. India's second most productive dairy state delivered a welfare inversion that a single annual average completely conceals. Its rural CV of 215.3 percent - the highest of any state - tells you everything the meaning does not.

Kerala is the only major state where rural milk inflation consistently exceeded urban in 2025, by +1.09 percentage points. Superior urban cold chain infrastructure, relative to dispersed rural supply, explains it: urban consumers have the structural advantage here, which is the mirror image of the national pattern.

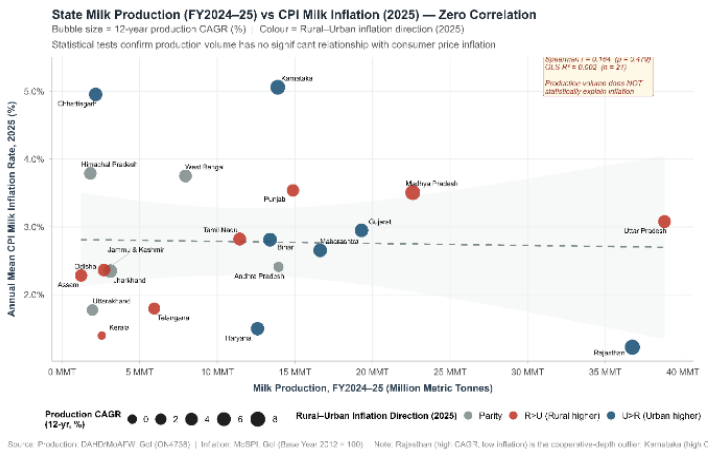
Rajasthan recorded the lowest combined inflation of any state: 1.23 per cent - despite the second-highest 12-year production CAGR at 8.41 per cent. Fast growth, lowest prices. The exact opposite of Karnataka.



"Karnataka grew its dairy output faster than almost any state in the country and recorded the highest consumer milk inflation. Rajasthan experienced the same growth and recorded the lowest. The difference is not production. It is everything that comes after."

The Proof: Production Explains Nothing

The relationship between state milk production and consumer price inflation has been tested formally across 21 states. The result is unambiguous.



The Pearson correlation between state production volume and consumer inflation is -0.031 (p = 0.895) across 21 states. Production volume explains virtually zero per cent of the variation in state-level consumer milk prices. The regression line is flat. The scatter is structurally random. This is not a weak relationship. It is the statistical definition of no relationship at all.

When the test is run on 12-year production growth rate rather than volume, the direction reverses in a way that should alarm anyone who designs dairy policy: faster-growing states trend, if anything, toward *higher* consumer inflation. The Karnataka effect is not an anomaly. It is a pattern. India's record production CAGR of 5.60 percent in the 2010-2021 era - the highest in the country's dairy history - is categorically disconnected from what consumers pay at the retail counter.

Three Things Standing Between the Farm and the Consumer

If production is not the answer, three structural mechanisms explain what it is.

Cold-chain inadequacy creates localized seasonal shortages during lean procurement months, even in surplus-producing states. Around 60-65 percent of India's milk flows through unorganized channels with minimal temperature control. This is why rural prices swing unpredictably even when national supply is abundant - local cold chain failure creates local scarcity regardless of what the national production figure says. It is the direct explanation for rural prices being 51 percent above urban prices, even during India's most affordable inflation phase.

Intermediary margin absorption is where the supply chain's benefit to consumers disappears. Farm-gate prices ranged from ₹35 to ₹ 38 per liter in H1 2023. Retail consumer prices were ₹55-65 per liter in the same period. The unorganized supply chain achieved a gross margin of 44-71 percent, compared with the organized cooperative chain's 15-18 percent. When input costs rise, unorganized intermediaries pass through 100 percent of the increase while protecting their margins. When farm-gate prices fall - as in Haryana in late 2025 - the margin expands further. The consumer does not benefit from the farmer's loss.

Cooperative depth is the only proven moderating mechanism, and Rajasthan is the proof. No other variable separates Rajasthan's inflation outcome from Karnataka's - not production volume, not growth rate, not geography. Rajasthan has built a district-level cooperative procurement network deep enough to constrain both ends of the chain simultaneously: farm-gate price collapse at the bottom and retail price inflation at the top. Karnataka has not.

What The Numbers Require

India's dairy policy has spent the last decade investing in production. That investment was not wasted. The record is real. But production investment that does not reach consumers through an efficient supply chain is not a consumer-welfare policy. It is an agricultural output policy. Fifteen years of CPI data make those two things impossible to confuse with each other any longer.

White Revolution 2.0's target of 75,000 new cooperative societies by 2028-29 is directionally correct - but cooperative societies that exist on paper without cold chain connectivity, without price transmission capacity, and without the operational depth to compete with unorganized intermediary margins will not reproduce the Rajasthan outcome. Rajasthan is not a model because it has cooperatives. It is a model because its cooperatives work deeply enough to matter.

The Haryana welfare inversion - farmers losing income while urban consumers pay more in the same state, in the same month - is a near-perfect illustration of a system that has production and procurement but not price transmission. It is also the clearest warning in this dataset. When farm-gate prices collapse without a cooperative floor, and urban retail stays elevated without cooperative competition, both ends of the chain lose to the same intermediary.

India's supply growth record is not in question. What fifteen years of CPI data formally establish is that supply growth, at any speed, cannot substitute for the infrastructure that connects it to the consumer. More milk, same cold chain, same cooperative gap, same intermediary margins. Same inflation. The data have said this consistently for fifteen years.

Data: MoSPI Monthly CPI Milk & Milk Products, Jan 2011-Dec 2025 (Base 2012=100) | DAHD, MoAFW, GoI - Basic Animal Husbandry Statistics (ON3967, ON4738) | Jordbrukare India - Dairy Sector Market Sentiment Survey H1 2023 | NDDB Annual Report 2023-24

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