Doodh Darpan

Reflective lens that reveals the true state of milk and dairy health. Much like a mirror shows what's real, Doodh Darpan intends to reflect the impact of nutrition, care, and practices on milk quality and yield.
It's an apt name for a study that closely observes and reveals how good feeding practices using **Shunya's Nutri Ankurit Feed** can positively impact dairy performance..

Executive Summary

1. ***Doodh Darpan is a controlled Pre-Post Comparative A/B field*** study conducted by Shunya Agritech to evaluate the impact of its Nutri Ankurit Feed (NAF)—a hydroponically grown, precision-irrigated, chemical-free, and soil-less feed—on dairy productivity. The study focuses on impact on:
    - Milk quality, specifically improvements in fat and SNF (solids-not-fat) percentages
    - Milk for-sale quantity
    - Farmer milk revenue & net income, (milk revenue – cost of feed)

This comparison was made against traditional feed practices in smallholder dairy farms across rural Uttar Pradesh, during the peak summer heat of May 2025. This iteration of the study is contextual to the heat stress on milk in peak summer month of May.

2. The study involved ***monitoring two distinct cohorts*** of livestock from selected villages to evaluate milk quality—measured through Fat percentage, SNF (Solids-Not-Fat) percentage, and milk quantity for sale.
    - Cohort A: Test Group; fed on a diet including NAF (n=10 animals)
    - Cohort B: Control Group; fed on traditional diet (n=6 animals)

Both groups' performance over a Pre-NAF period before the introduction of Shunya Nutri Ankurit Feed to the test group was compared with their performance in the post-NAF period after the introduction of Shunya Nutri Ankurit Feed to the test group animals. The trended performance of the control group in the comparison period is used to provide a meaningful context to the trended performance of the Test Group as all other variables except NAF as part of nutrition are same across the 2 groups.

3. ***Data was collected digitally*** twice daily at partnered milk collection centers. Each data point was validated using official milk sale receipts ("parchis") or machine records, which detail Fat and SNF values and determine the price paid to the farmer.

4. Over ***650 individual milk sale transactions*** were tracked during the study period, forming the basis for analysis. The study was restricted to buffalos as that is the primary livestock reared by the dairy farmers in the area.

5. Key Findings:

a. ***NAF Improves Milk Fat %, Boosting Revenue Potential***: When comparing milk quality before and after the introduction of Nutri Ankurit Feed (NAF), the test group (2nd-9th May vs 9th–24th May 2025) showed a 5% improvement in average Fat content, rising from 6.67% to 7.00%, while SNF remained stable at 8.75% vs 8.73%. In contrast, the control group (which did not receive NAF) recorded no significant change in Fat levels (7.27% vs 7.28%) and only a marginal 1% increase in SNF (8.14% to 8.26%).

b. ***Milk Quantity Remained Stable Despite Heat Stress:*** The most significant difference observed was in milk quantity available for sale during peak summer. Despite the heat stress, the test group experienced only a 2% OR 50ml drop in average milk for sale per session (from 2.87 to 2.82 litres) post-NAF. In contrast, the control group saw a steep 15% decline, from 2.26 to 1.92 litres per session.

c. ***Higher Net Earnings Driven by Smart Feed Substitution:*** Moreover, the introduction of NAF allowed test group farmers to reduce or eliminate more expensive feed options, lowering their overall feed costs. As a result, their average net income per session (milk revenue minus feed cost) increased by 8%.

d. ***NAF Created an Income Advantage Over Traditional Feeding:*** During the study, test group farmers earned an average net income of ₹104 per milking session during post NAF period, up from ₹96 in the pre-NAF period. Compare that to the net income of the control group sliding down from ₹70 to ₹52, the income advantage is clearly visible. This income advantage came from a combination of improved milk fat, stable milk yield, and lower feed costs enabled by NAF.

Results at a Glance from the study

Avg per collection	Test Group			Control Group		
	Pre-NAF	Post-NAF	% Change	Pre-NAF	Post-NAF	% Change
Fat %	6.67	6.99	5%	7.28	7.27	0%
SNF %	8.73	8.75	0%	8.14	8.26	1%
Qty (litres)	2.87	2.82	-2%	2.26	1.92	-15%
Milk revenue (₹)	154	160	4%	127	109	-14%
Net income (₹)	96.7	104.2	8%	69.7	52.0	-25%

Detailed Doodh Darpan Report

1) Rationale & Background

India's dairy sector is primarily driven by smallholder farmers, most of whom depend on dry fodder and commercial concentrates for livestock feed. Green fodder is typically added only during certain seasons, making traditional feeding practices nutritionally inadequate—particularly during peak summer months. During this time, both forage quality declines and heat stress impairs rumen function, further reducing animal productivity.

Hydroponically grown nutrition feed, which combines sprouted grains and green biomass, offers a reliable alternative. It delivers a consistent, nutrient-dense, chemical-free supply of fodder, independent of soil quality or climatic conditions. Shunya Agritech produces and distributes this innovative feed—called Nutri Ankurit Feed (NAF)—through a subscription-based model, enabling farmers to maintain high nutritional standards for their livestock year-round.

This study was undertaken to scientifically evaluate the impact of NAF on livestock productivity and farmer incomes during heat-stress conditions.

The study was conducted in Uttar Pradesh during May 2025, a month that regularly experiences extreme temperatures exceeding 38°C, leading to stress in animals and a likely drop in milk yield and quality.

Since measuring milk volume alone is often unreliable under manual hand-milking practices, fat and SNF (solids-not-fat) percentages were used as robust indicators of animal health and nutritional status. Milk quantity available for sale was taken as a surrogate for milk quantity yield as farmers try to maximise that quantity by optimizing the quantity fed to calf and retained for household consumption.

2) About Shunya Agritech & Nutri Ankurit Feed

Shunya Agritech is a dairy-focused agritech company working to solve one of rural India's most critical yet under-addressed problems: poor livestock nutrition. With dairy being the primary livelihood for millions of smallholder farmers, Shunya aims to improve both productivity and income through high-quality, affordable, and accessible nutrition.

At the heart of this mission is **Nutri Ankurit Feed (NAF)**, a freshly sprouted, hydroponically grown green fodder developed using Shunya's proprietary protocols. Unlike conventional dry fodder or crop residues, NAF is nutrient-dense, highly digestible, and rich in moisture, making it ideal for improving milk yield, fat content, and animal immunity, especially during extreme weather conditions like peak summer.

By combining controlled production, doorstep delivery, and farmer-centric education, Shunya is building a sustainable, scalable model of **"Fodder-as-a-Service"** — one that supports both animal welfare and rural prosperity.

3) Scope of the Study

Hydroponically grown fodder has been extensively studied & is proven to cause improvements in fat percentage and milk quantity among participating farmers. These studies offer strong evidence that fresh, balanced fodder like NAF can directly counteract the seasonal decline in milk quality and yield that farmers have long accepted as inevitable.

Doodh Darpan was conceptualised as a data-driven platform to quantify how Nutri Ankurit Feed affects milk productivity and farm income across seasons and geographies.

For the first iteration, we partnered with six digitally enabled milk-collection centres and collected data twice daily (morning and evening) on fat and SNF from two distinct farmer cohorts:

Cohort	Feeding Regimen	Notes
Test Group	Introduced Nutri Ankurit Feed (NAF) after a brief "status-quo" period on their usual rations. None of these animals had received NAF before the study. (n=10)	NAF was offered in a separate trough to avoid mixing with the household's other bovines.
Control Group	Continued their conventional diet rich in supplements such as *khal*, concentrates, and *choker*. (n=6)	Feeding practices remained unchanged throughout the study period.

Key design points:

- ***Separate milking & sampling*** – Test animals were milked apart from other cattle; their milk was collected and analysed independently.
- ***Digital traceability*** – Every fat/SNF assay, milk volume entry, and "milk *parchi*" (receipt) was logged electronically, preserving end-to-end data integrity.
- ***Income tracking*** – Each *parchi* reports both the per-litre price (linked to fat and SNF) and the total milk revenue, allowing direct calculation of net earnings.
- ***Farmer discretion on ration adjustment*** – Once NAF was introduced, many test-group farmers voluntarily reduced more expensive feed components, a behaviour captured in the cost data.

This rigorous setup enables a clean comparison of nutritional, productivity, and economic outcomes between NAF-supplemented and traditionally fed animals.

4) Study Objectives

- Assess the impact of Nutri Ankurit Feed (NAF) on milk quality by measuring changes in fat and SNF (solids-not-fat) percentages, both for the overall group and specific sub-cohorts (based on age, lactation stage, and mixed feeding patterns).
- Benchmark NAF performance against traditional feeding practices through a rigorous A/B analysis of milk output before and after NAF usage.
- Evaluate changes in farmer income resulting from the introduction of NAF, by comparing milk revenue and feed costs across both groups.
- Measure input cost efficiency, specifically the cost per litre of milk, to understand how NAF enables farmers to optimize or replace traditional feed components.

5) Study Design & Methodology

- Location & Timing : 6 villages in Ghatampur Block, Kanpur Nagar District, Uttar Pradesh
- Study Period: 2nd – 25th May, 2025 (peak summer; average daily highs >38°C)

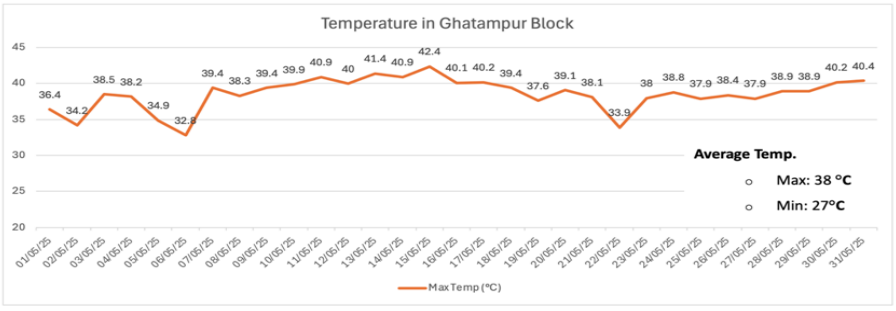


Figure 1: Temperature | Dhood Darpan

- Phases:
    - Pre-NAF Phase: 2nd – 9th May (morning) → Baseline data collection using traditional feed only
    - NAF Phase: 9th – 25th May → Test animals were introduced to Nutri Ankurit Feed (NAF); control group continued with regular feed
- Farmer Cohorts:
    - Test Group**:** Livestock in this group were supplemented with Nutri Ankurit Feed (NAF) after an initial baseline period on their existing diet (n=10). Sub-cohorts were further segmented by:
        - Animal age**:** below 3 years vs. 3 years and above
        - Lactation stage**:** early, mid, and late
        - Feed usage patterns**:** extent and frequency of NAF and traditional feed usage
    - Control Group**:**
      Livestock (n=6) continued with their existing feeding regimen, which typically included a mix of:
        - Local green forage
        - Dry fodder (e.g., hay)
        - Commercial concentrates (various brands and formulations)
        - Choker (wheat bran)
        - Khal (mustard oilcake—locally sourced)
- Data Collection:
    - Sampling Times**:** Milk samples were collected twice daily—in the morning (6:00–8:00 AM) and evening (4:00–6:00 PM)—at designated milk collection centers.
- Measurement Protocol:
    - Milk was tested using a digital analyzer approved and provided by the collecting dairy, with weekly calibration to ensure accuracy.
    - Test animals were milked separately**,** and their samples were tested independently wherever operationally feasible.
    - In certain cases, where the dairy where milk receipt were digitally send to the farmer, the actual test data was captured directly from the analyzer at the time of milking.

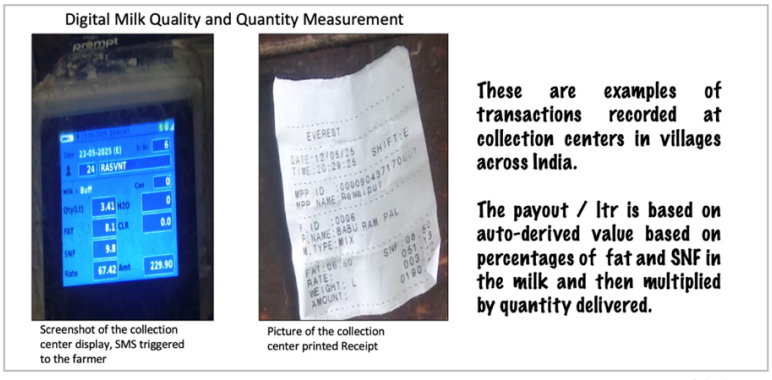


Figure 2: Transaction Receipts | Dhood Darpan

6) Key Findings

a) Impact on Fat %, SNF %, and Milk Quantity

i) Fat % in the Test Group

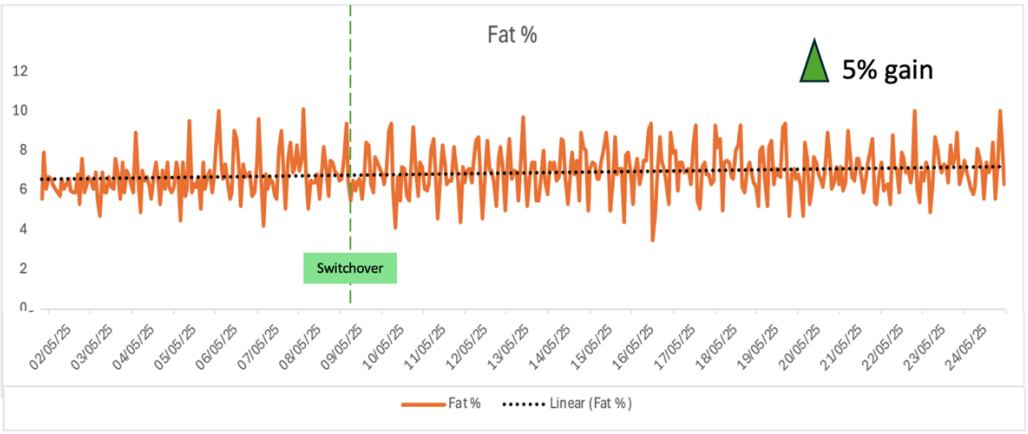


Figure 3: Fat Percentage in Test Group | Dhood Darpan

- Livestock supplemented with Nutri Ankurit Feed (NAF) demonstrated a notable improvement in milk fat content**.**
- The average fat percentage increased from 6.67% (pre-NAF) to 7.00% (post-NAF) over a 14-day period—representing a 5% gain.
- Since milk pricing is closely linked to fat content, this increase has direct economic implications**,** enhancing farmers' revenue per litre.

ii) Fat % in the Control Group

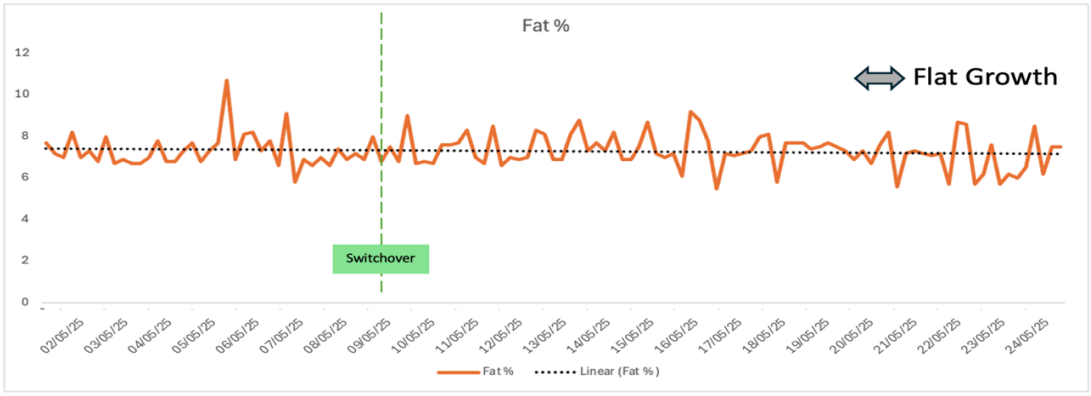
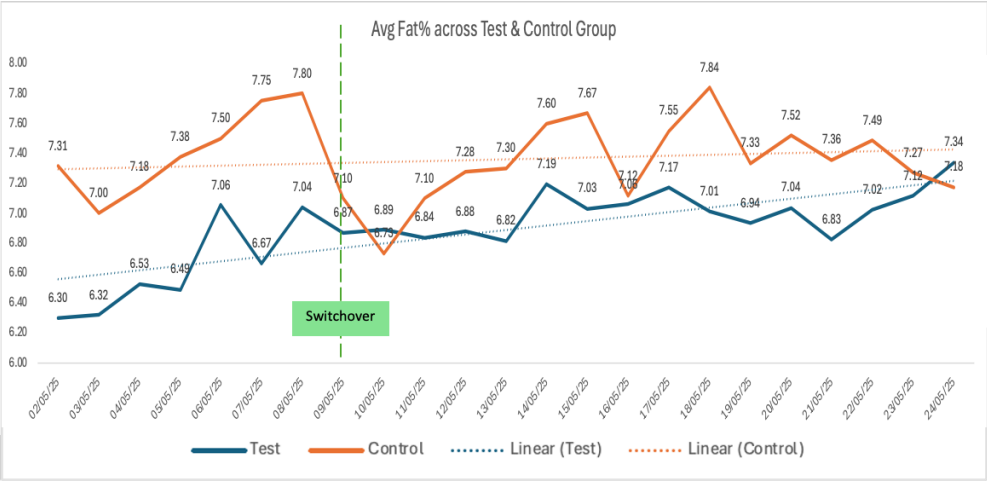


Figure 4: Fat Percentage in Control Group | Dhood Darpan

- In contrast, the control group showed no significant change in fat percentage, maintaining a steady average of 7.28%**.**
- The marginal stability in fat content may be partially attributed to reduced hydration levels during the extreme summer heat, which can elevate fat readings.
- However, this stability did not translate into improved farmer earnings**,** as there was no accompanying improvement in yield or feed cost dynamics—details of which are addressed in later sections.

iii) Comparative Insights



The Key Insight

"NAF-fed animals not only held their ground in peak summer—but pushed fat content higher, while control group performance stayed flat."

Figure 5: Fat Percentage Comparative Analysis | Dhood Darpan

- The test group exhibited a clear upward trend, with higher highs and higher lows in fat percentage after the introduction of NAF, while the control group remained largely flat**.**
- This difference is also visible in the accompanying graph: fat percentage variability and peak values improved post-NAF in the test group, crossing earlier highs.
- Field-level feedback supports this trend, suggesting that NAF has a positive and consistent impact on milk quality under heat stress conditions.

b) Impact on SNF % and Milk Quantity

i) SNF % in the Test Group

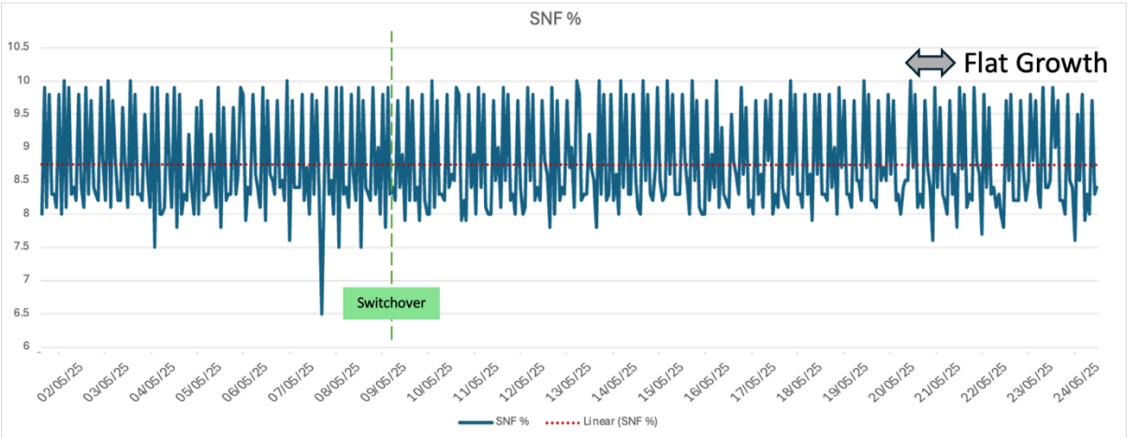
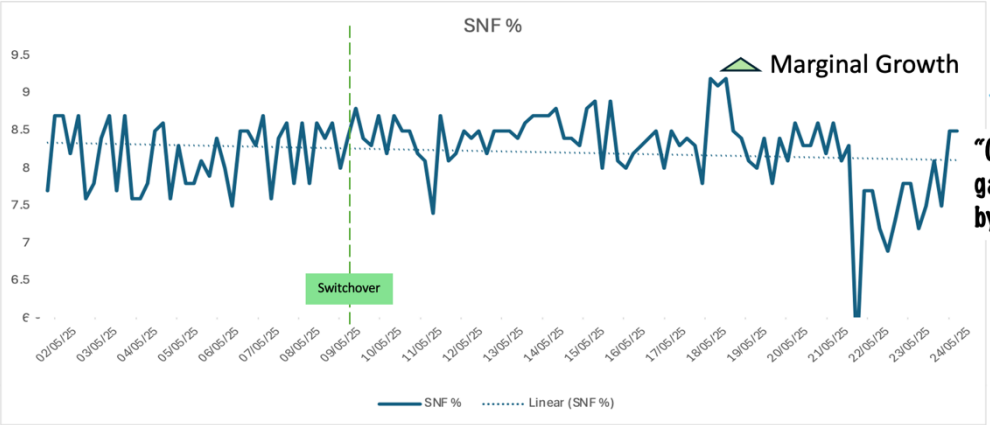


Figure 6: SNF Percentage in Test Group | Dhood Darpan

- In animals fed Nutri Ankurit Feed (NAF), the Solids-Not-Fat (SNF) content remained stable, inching up slightly from 8.73% to 8.75% over the study period.
- This stability is a key quality marker, indicating that nutritional density was preserved even during extreme summer stress—helping maintain farmer income and milk suitability for processing**.**

ii) SNF % in the Control Group



The Key Insight

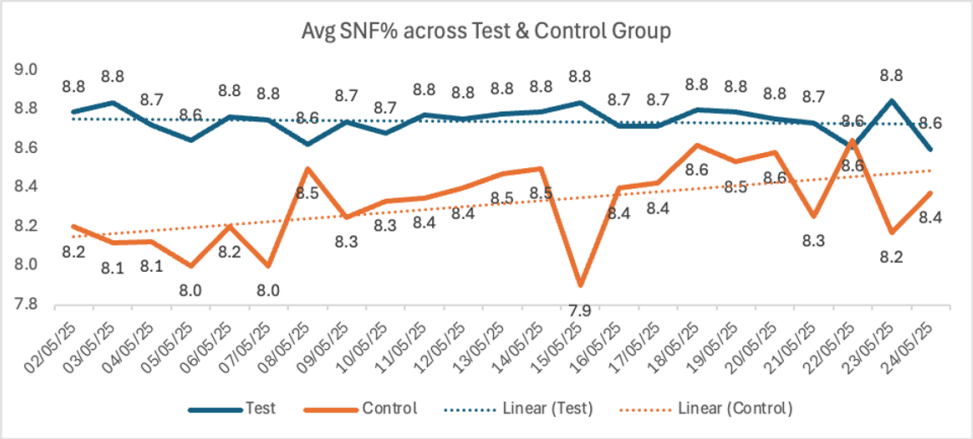
"Control group SNF gains were offset by volume losses"

Figure 7: SNF Percentage in Control Group | Dhood Darpan

- The control group recorded a modest increase in SNF from 8.14% to 8.26% - roughly a 2% gain.
- While this should have yielded higher returns, the sharp drop in milk volume effectively cancelled out any benefit from the rise in SNF.

iii) Comparative Insights on SNF %

- The test group maintained nutritional quality with greater consistency, while the control group's marginal SNF improvement did not translate into income gains due to volume declines.
- As seen in the SNF graph above, the test group's trendline stayed steady, while the control group experienced significant volatility—especially toward the end of the period.



The Key Insight

"NAF-fed animals held on to the SNF level in milk, while control group animal reported a small increase."

c) Impact on Milk Sales Quantity (Litres)

i) Quantity Sold in the Test Group (NAF-Fed Animals)

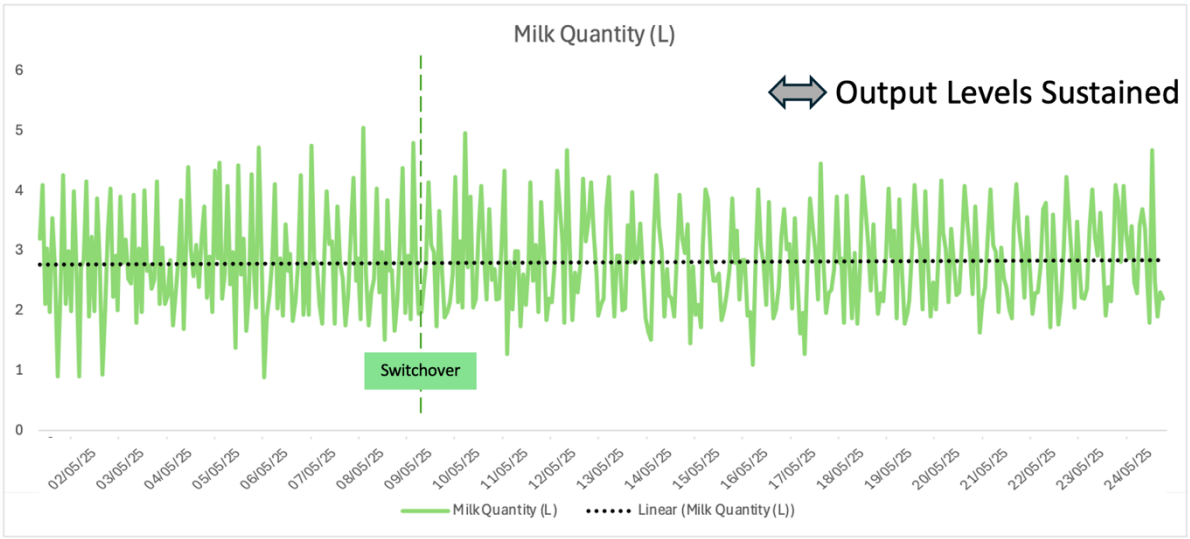


Figure 8: Milk Quantity in Test Group | Dhood Darpan

- Despite intense summer heat, animals supplemented with Nutri Ankurit Feed (NAF) maintained a stable milk yield, with no major drop in saleable quantity over the course of the study.
- The graph shows a flat trendline, indicating that NAF-fed animals were resilient to heat-induced stress, which typically leads to a drop in yield across the sector.
- The availability of consistent volume ensured that farmers had steady milk output to monetize, even as environmental stressors peaked.

ii) Milk Sale Quantity in the Control Group

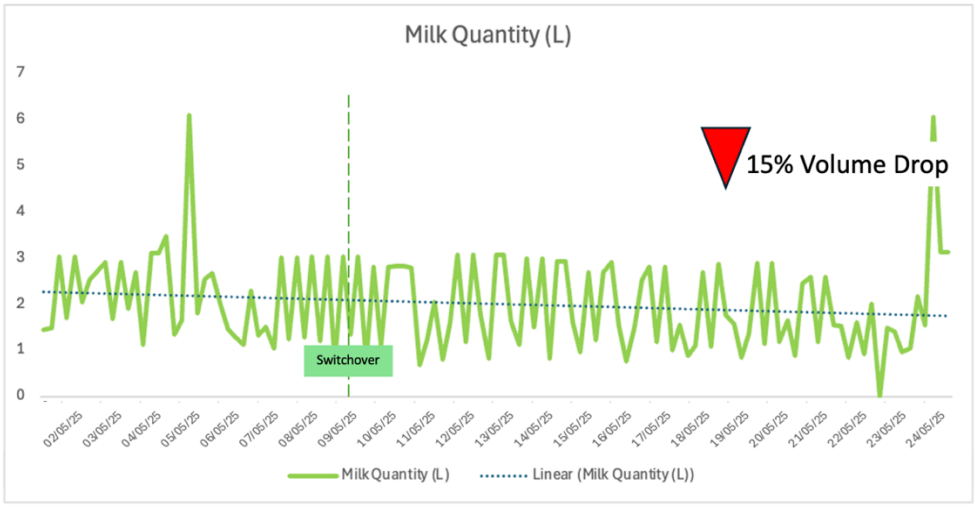
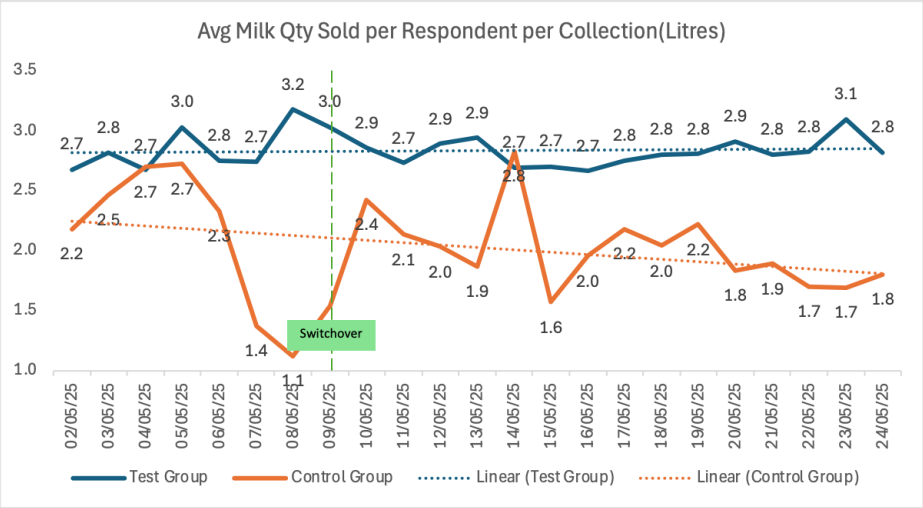


Figure 9: Milk Quantity in Control Group | Dhood Darpan

- Data from control group parchis revealed a severe impact with a 15% drop in milk volume, in line with common industry observations during peak summer.
- This volume loss eroded income, even in cases where milk quality (e.g., SNF or fat) held steady or even increased.

iii) Comparison in impact on Quantity between Test & Control Group



The Key Insight

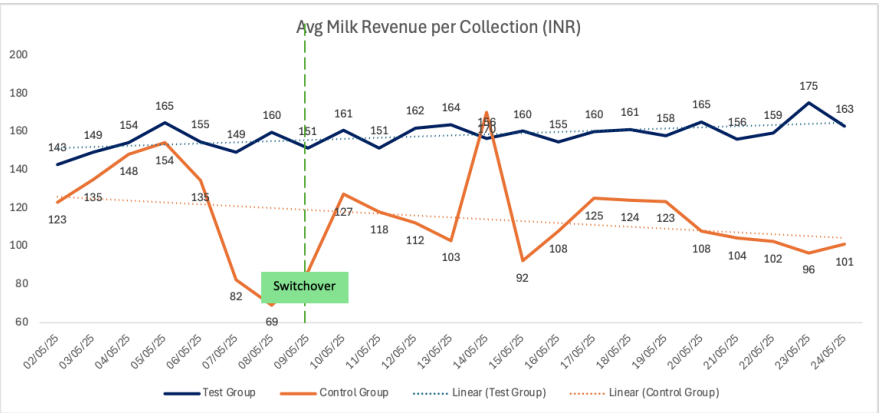
"NAF helped farmers sidestep the summer slide - delivering steady milk volumes when most others saw sharp declines."

Figure 10: Milk Volume Comparative Analysis | Dhood Darpan

- In a season where quantity typically collapses, NAF-fed animals acted as shock absorbers—preserving milk availability.
- This consistency in output, when paired with improved fat % and stable SNF, resulted in higher overall farmer income and stronger margins.
- The Animal Husbandry Department's advisory on nutrition in summers also talks about ensuring hydration as part of diet, something where NAF scores very highly versus all traditional modes of feed being used. Read more here

d) Impact on Farmer Incomes

i) Average Milk Revenue (in ₹) – Test Group vs Control Group



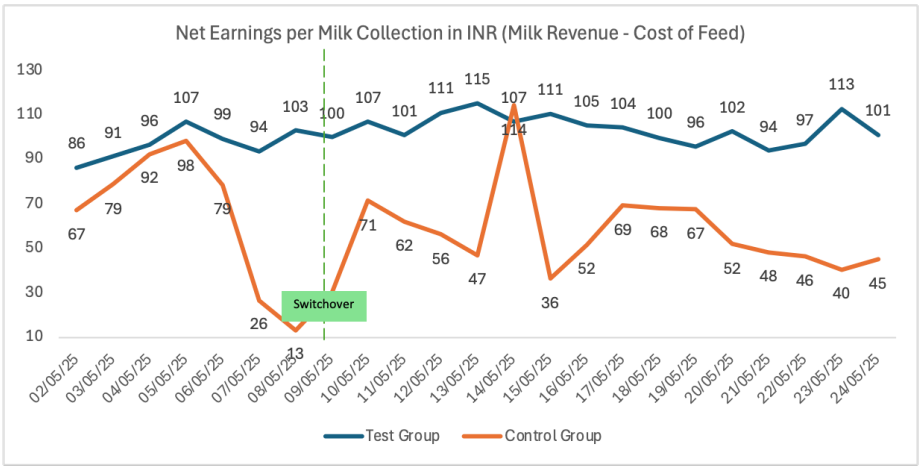
The Key Insight

"NAF-fed animals delivered higher-quality milk and protected farm revenues, while control group farmers saw earnings collapse under heat-stress pressure."

Figure 11: Milk Revenue Comparative Analysis | Dhood Darpan

- After the introduction of Nutri Ankurit Feed (NAF), the test group experienced a 4% increase in average milk revenue, driven by improved fat percentage while SNF and quantity remained stable.
- In contrast, the control group saw a 14% drop in average milk revenue during the same period, largely due to a sharp fall in milk quantity. Even though SNF improved and fat held steady, these gains were insufficient to offset volume losses.
- Additionally, dehydration-related inflation of fat % in the control group may have provided a misleading quality signal—but failed to deliver income resilience.

ii) Net Earnings (in ₹) (Milk Revenue – Cost of Feed) – Test Group vs Control Group



The Key Insight

"With NAF, farmers didn't just earn more - they spent less to do it, turning a nutritional upgrade into a profitability engine."

Figure 12: Milk Net Earnings Comparative Analysis | Dhood Darpan

- The study meticulously tracked feed inputs across both phases for the test group—from 2nd to 9th May (pre-NAF) and from 9th to 24th May (post-NAF).
- Feed cost was estimated using local market benchmark rates. While green fodder in the pre-NAF phase was priced at 60% of NAF, the overall feed cost still declined in the post-NAF period, due to reduction in high-cost concentrates.
- As a result, net earnings per session in the test group rose from ₹ 96 to ₹ 104, an 8% increase, driven by both lower feed cost and higher milk revenue.
- This translates to an annual gain of ₹ 6,000 per animal, potentially scaling to ₹ 10,000 per animal annually by factoring in higher yield multiplier as the milk volumes increase post summers.
- For the purpose of comparison, the average Pre-NAF feed cost was used as feed cost for the control group per session. At ₹ 57, it is a fair representation of the feed cost. With that consideration, the control group saw a 25% drop in net earnings, as milk volume fell while feed costs remained unchanged.
- Over time, this differential translates to an annual net income gap of ₹18,000–₹20,000 per animal, marking a transformational financial impact for smallholder dairy farmers.

e) Additional Observations on Fat %, Milk Income & Net Income Trends Among Sub-Cohorts in the Test Group

- Within the test group, the most significant gains were observed in older animals (approx. 8 years) and those with multiple calvings (3–4 calves). This suggests that improved nutritional profiles—such as that offered by NAF—may be especially beneficial to older, nutritionally stressed animals that typically respond poorly to sub-optimal feeding.
- Another key observation emerged from sub-cohorts that significantly reduced feed concentrates and Khal (mustard oilcake) after adopting NAF. These animals not only maintained or improved milk revenue, but also showed stronger net income gains, highlighting NAF's potential to economically replace higher-cost traditional supplements.
- Together, these findings strongly support the need for broader, longer-term studies across larger and more diverse livestock populations, to validate and optimize these early insights.

7) Limitations & Mitigations

- **Variability from Hand Milking:** Variability in hand milking was addressed through a within-farm paired design and the use of digitally calibrated analyzers to ensure consistency and quality assurance.
- **Sample Size:** With ~650 individual milk collection records over a 23-day period, the dataset is robust for a single-district field trial. However, larger, multi-state studies are essential to enhance statistical power and broader applicability.
- **Geographic Scope:** The study was conducted in a single agro-climatic zone (Uttar Pradesh), which may limit its generalizability. Future research should include diverse geographies and varying climatic conditions to capture regional variability.
- **Sample Representation:** The test group was limited in size for the statistical significance of certain observed trends. Nonetheless, the directional insights are compelling and provide a strong foundation for future research across larger sample sizes, multiple seasons, and weather extremes.

ANNEXURES

Darpan Diaries

A real-world reflection of farmer stories, milk metrics, and impact journeys.

Urmila Devi	
Location	Village Amauli, Uttar Pradesh
Primary Occupation	Farming

Kind of Livestock	Buffalo
Breed	Murrah
Age of Livestoclk	5 years
Lactation Period	3 to 6 months
No of Calvings	2
Mid Laction	3 to 6 months
Est Value of Livestock	INR 95,000

2nd May — 12th May — 23rd May

		02/05/25	12/05/25	23/05/25
Milk Parameter	Qty (L)	0.9	1.85	3.41
	Fat %	5.9	7.7	8.1
	SNF %	9.8	9.7	9.8
Milk Revenue	(INR/L)	49.38	64.14	67.42
	(INR)	44.44	118.66	229.9
Phase		PreNAF	PostNAF	PostNAF
Outcome		Low yield	Gradual Increase	Significant Increase

Darpan Diaries

A real-world reflection of farmer stories, milk metrics, and impact journeys.

Anuj Kumar	
Location	Village Rawaipur, Uttar Pradesh
Primary Occupation	Farming

Kind of Livestock	Buffalo
Breed	Murrah
Age of Livestoclk	8 years
Lactation Period	3 to 6 months
No of Calvings	3
Mid Laction	3 to 6 months
Est Value of Livestock	INR 65000/-

		02/05/25	12/05/25	23/05/25
Milk Parameter	Qty (L)	2.12	3.72	3.82
	Fat %	6.1	8.5	7.1
	SNF %	8.1	8.5	9
Milk Revenue	(INR/L)	48.76	51.13	58.44
	(INR)	103.37	190.2	223.04
Phase		PreNAF	PostNAF	PostNAF
Outcome		Low yield	Gradual Increase	Significant Increase