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Arcus Policy Research

Documenting Onion Operations under Price Stabilisation Fund (PSF)

A structured evaluation of reforms, implementation, and results

Shweta Saini and Shruti Priya

Arcus Policy Research

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ABOUT US

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SNAPSHOT

Arcus Policy Research

IMPACT OF ONION PSF OPERATION

- **Onion Consumers benefitted**
- **Onion Farmers benefitted**
- **Onion Markets stabilised**
- **System-wide investment multiplier triggered**
- **Production multiplier observed**

OUTCOMES ACHIEVED UNDER ONION PSF OPERATION

Consumer

- **24%** lower volatility
- Longer price-stability cycle
- **8%** lower prices
- Delhi prices **16%** below Lasalgaon

Farmer

- Farmer payment cycle shortened from 10 days to **3 days**
- **11%** higher procurement price
- **9%** higher share in consumer rupee
- **18,773** direct beneficiaries
- **6.7** lakh indirect beneficiaries

Value-chain

a. Introduction of rail over longer distances:

- **Halved** onion delivery time
- Reduced onion losses during transportation by **10%**
- Reduced transportation costs by **17%**

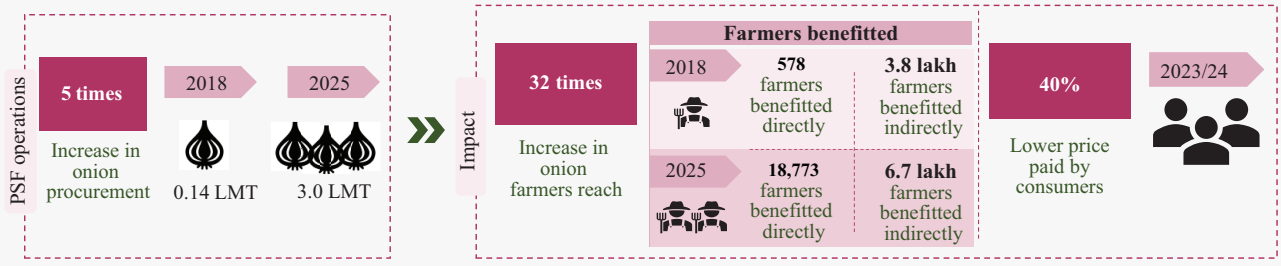
b. Using data and tech:

- Onion recovery rate improved **17%**
- Supplies in consumption centre became predictable
- **20** states now covered under onion disposal operations.
- Diversified disposal channels: E-commerce, retail outlets, kendriya bhandar, mobile-vans.

RECOMMENDATIONS TO STRENGTHEN PSF OPERATION

- Link procurement and disposal (e-commerce, retail outlets and open auction sales) to pre-announced price bands
- Develop PSF-specific cost ledgers modelled on FCI's system
- Procure from other states beyond Maharashtra
- Expand coverage to peri-urban and rural *haats*, supported by possibly digital vouchers
- Define time-bound norms for EOIs, payments, inspections, and logistics
- Use a structured MLE cycle with audits, scorecards, and counterfactual checks to assess impact and gaps
- Integrate investment & production multiplier monitoring into PSF planning
- Use multiplier evidence to guide replication across other sensitive value-chains

GROWTH METRICS OF PSF ONION OPERATION



KEY MILESTONES AND EVOLUTION OF PSF ONION OPERATION

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ACKNOWLEDGEMENTS

This study on onion operations under the Price Stabilisation Fund (PSF) has been undertaken by Arcus Policy Research Pvt. Ltd. at the request of the Department of Consumer Affairs (DOCA), Government of India. It presents an independent assessment of the evolution, performance and outcomes of PSF interventions in India's onion markets.

Arcus Policy Research expresses its appreciation to the Department of Consumer Affairs for its guidance and collaboration throughout this study. We particularly acknowledge the leadership of Ms. Nidhi Khare, Secretary, for her continued focus on building transparent and data-driven market interventions. We also appreciate the support and insights provided by Mr. I. S. Negi (Senior Economic Advisor), Dr. Kamkhenthang Guite (Economic Advisor), Ms. Lal Ramdinpuii Renthlei (Director), Mr. Brijesh Kumar Patel (Deputy Director), Ms. Muskan Jain (Assistant Director) and Mr. Uday Chand Meena (Junior Statistical Officer).

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Authors

LIST OF ABBREVIATIONS

Abbreviation	Full Form
APMC	Agricultural Produce Market Committee
BAU	Business as Usual scenario
CV	Coefficient of Variation
CWC	Central Warehousing Corporation
DOCA	Department of Consumer Affairs
DFPD	Department of Food and Public Distribution
EOI	Expression of Interest
FCI	Food Corporation of India
FPO	Farmer Producer Organisation
FY	Financial Year
GST	Goods and Services Tax
IA	Implementing Agency
IT	Information Technology
LMT	Lakh Metric Tonnes
LHS	Left Hand Side
RHS	Right Hand Side
MAPP	Minimum Assured Procurement Price
MLE	Monitoring, Learning and Evaluation
MoA	Ministry of Agriculture
NHB	National Horticulture Board
NAFED	National Agricultural Co-operative Marketing Federation of India Limited
NCCF	National Co-operative Consumers' Federation of India Limited
ONDC	Open Network for Digital Commerce
PIB	Press Information Bureau
PA	Participating Agency
PACS	Primary Agricultural Credit Society
PM-AASHA	Pradhan Mantri Annadata Aay Sanrakshan Abhiyan
PSF	Price Stabilisation Fund
SOP	Standard Operating Procedure
SWC	State Warehousing Corporation
TE	Triennium Ending
TAN	Tax Deduction and Collection Account Number

ABSTRACT

The Price Stabilisation Fund (PSF) operation under the Department of Consumer Affairs (DOCA) has emerged as Government of India's principal mechanism for moderating volatility in onion prices- one of the country's most price-sensitive commodities. This study provides the first independent, evidence-based assessment of how PSF's onion operations transitioned from a limited pilot to a structured, rules-based stabilisation system and what their impact on its various intended stakeholders has been.

Launched in 2014-15 and operationalised in 2015, the PSF has evolved through two distinct phases. The formative phase (2015-2019) established basic procurement and storage architecture under a single-agency structure, but was constrained by geography, scale, and basic monitoring. Since 2020, DOCA has introduced a series of administrative and operational reforms: multi-agency implementation, revised procurement pricing, digital monitoring through the Supply Valid platform, codified storage and logistics norms, diversified retail channels, and rail-based long-haul disposal, that have transformed PSF into a disciplined, technology-enabled intervention.

Using a 19-indicator *input-output-outcome-impact* framework, the study assesses PSF's effects across three domains: consumer welfare, farmer incomes, and value-chain efficiency. The findings demonstrate disproportionate macro-level effects from micro-scale interventions. Despite PSF covering barely 1-2% of annual domestic output, retail price volatility declined by 24%, consumer disposal prices remained 36-45% below market levels, and the frequency of price spikes halved. Farmer-level gains were equally significant: procurement prices exceeded *mandi* rates by up to 19%, the farmer's share in the consumer rupee rose from 45% to 54%, and payment cycles shortened from 7 or 10 days to 3 days. Operational improvements included storage recovery rising from 68% to 85% and freight costs falling by 17% under rail logistics.

These results suggest that PSF functions less as a procurement scheme and more as a credible market signal. By codifying rules, stabilising prices, and reducing risk, PSF has triggered production and investment multipliers that extend well beyond its operational footprint. The study recommends consolidating PSF as a permanent rules-based stabilisation architecture and embedding continuous monitoring to sustain transparency, predictability, and systemic trust.

EXECUTIVE SUMMARY

The Price Stabilisation Fund (PSF) operation under the Department of Consumer Affairs (DOCA) has emerged as a central policy instrument to moderate volatility in onion prices- one of India's most price-sensitive commodities, vulnerable to seasonal production cycles, erratic monsoons, and storage losses. The study assesses how the PSF onion operation has evolved from its inception in 2015 to its current structured form in 2025, and how its institutional reforms have influenced market stability, farmer welfare, and operational efficiency.

Commissioned by DOCA and conducted over 2024-25, this assessment draws on field visits, agency consultations, and extensive analysis of *mandi* and retail data to evaluate PSF's evolution through measurable evidence. The objective is twofold: to document the systemic reforms that transformed PSF into a structured, technology-enabled mechanism, and to measure their outcomes for consumers, farmers, and the value-chain through a 19-indicator framework.

Methodology, Data Sources, and Conceptual Framework

The report applies an input–output–outcome–impact framework that connects institutional reforms (inputs) with operational outputs (such as procurement scale, payment timeliness, and storage recovery), and with measurable outcomes and impacts (such as improved farmer liquidity, retail price stability, and reduced onion wastages).

Data triangulation was achieved through:

- Primary sources: field visits, interviews with onion farmers, FPOs, cooperatives, implementing agencies (NAFED, NCCF), and procurement and storage centre inspections;
- Secondary sources: Agmarknet *mandi* data, WPI and CPI retail indices, internal DOCA records, and Supply Valid digital dashboards;
- Analytical methods: counterfactual and business-as-usual (BAU) comparisons.

This combination allowed the study to estimate both direct and diffusion impacts – quantifying PSF's stabilisation effect not only on participating farmers and consumers but also across wider market segments.

Delhi and Maharashtra were selected to represent the two ends of the PSF value-chain Maharashtra as the principal procurement and production hub, and Delhi as a key consumption and price-sensitive market, capturing how stabilisation signals travel from farm gate to retail.

Evolution of PSF: From Formative to Structured Phase

Launched in 2014-15 and operationalised the following year, PSF initially functioned as a pilot under a single agency, NAFED, with limited geography and scale. This formative phase (2015-2019) demonstrated proof of concept that buffer stocking and calibrated releases could indeed smooth price fluctuations, but it also revealed the constraints of operating without multi-agency coordination, digital monitoring, or cost transparency.

Recognising these limitations, DOCA introduced thirteen major reforms from FY 2020-21 onwards, ushering in a structured phase (2020-2025) anchored in transparency, accountability, and technology. The key reforms under onion PSF operation is as follows:

Administrative reforms

1. Progressive upward revision of procurement targets (0.14 LMT in 2018-19 → 6.38 LMT in 2023-24).
2. Inclusion of NCCF alongside NAFED as a second Implementing Agency.
3. Expansion of participation to PACS, cooperatives, and expanding network of FPOs.
4. Revision of the Market Average Procurement Price (MAPP) formula for better reflection of market trends.
5. Reduction in admissible storage losses and introduction of geo-tagged inspection norms.
6. Expansion of disposal channels including e-commerce (ONDC, Big Basket) and mobile vans, to improve consumer access.

Operational reforms

7. T + 3 payment timelines replacing the earlier 7 to10-day cycle, improving liquidity.
8. Minimum storage capacity norms: 5,000 MT in Nashik and 2,000 MT elsewhere.
9. Digital integration through the Supply Valid platform, enabling real-time tracking.
10. Standardised logistics protocols and shift to rail transport for long-distance movement.
11. Introduction of quality-grading and inspection checklists.
12. Mandated disposal monitoring through QR-coded release orders.
13. Creation of an internal review system linking performance metrics with operational incentives.

Together, these reforms repositioned PSF from a reactive subsidy tool into a rules-based, technology-enabled stabilisation mechanism capable of rapid, traceable, and accountable market interventions.

The 19-Indicator Framework and Analytical Approach

To measure the PSF's performance comprehensively, Arcus developed a 19-indicator framework aligned with the *input-output-outcome-impact* logic. These indicators capture metrics across three domains:

- Consumer welfare: retail price volatility, affordability (disposal–retail price gap), and spike frequency.

- Farmer welfare: procurement price premiums, share in consumer rupee, payment timelines, and acreage shifts.
- Operational efficiency: storage recovery, logistics time and cost, digital traceability, and disposal diversification.

The analysis also worked with counterfactual scenarios used to estimate the absence-of-intervention scenario.

- **Results for Farmers**

The PSF intervention significantly improved farmer outcomes despite limited coverage. The farmer's share in the consumer rupee rose from 45% (TE 2018-19) to 54% (TE 2024-25). Participating farmers consistently received 3 to 19% higher procurement prices than prevailing *mandi* rates, especially during peak-arrival months when market prices typically fall.

Direct farmer beneficiaries rose from 578 (2018-19) to 18,800 (2024-25), while indirect beneficiaries (those affected by stronger *mandi* prices) grew from 3.8 lakh to 6.7 lakh. Acreage expansion in new regions such as Rajasthan underscores the confidence effect: acreage growth shifted from (-)9% to (+)3% between TE 2018-19 and TE 2024-25.

Perhaps most transformative was liquidity improvement: T + 3 settlements replaced week-long delays, reducing distress sales and improving cash flows. Collectively, these gains demonstrate that PSF strengthened both price realisation and financial security for onion growers.

- **Results for Consumers**

Consumer welfare improved markedly. Retail price volatility in Delhi fell sharply, with the coefficient of variation dropping from 0.29 (2019-20) to 0.22 (2024-25). Counterfactual simulations show that during August to November 2024, Delhi retail prices were 8% lower than they would have been without PSF interventions.

Disposal prices under PSF channels remained 36 to 45% below retail prices, directly improving affordability during seasonal peaks. Furthermore, the retail price cycle itself elongated: from annual spikes to once every 24 months, creating longer stretches of price stability for households and food-service operators. *Mandi* data also showed smoother spatial price transmission: during lean months, Delhi's Azadpur *mandi* prices averaged about 16% lower than Lasalgaon, India's primary production hub- an inversion of the usual

price hierarchy that underscores how timely PSF buffer releases and steady inflows kept supplies smooth and retail inflation contained in the consumption centre.

- **Results on Operational Efficiency**
  - Operational performance recorded some of the most striking improvements.
  - Storage recovery increased from 68% in 2018-19 to 85% in 2024-25, reflecting better storage management, ventilation, and digital oversight.
  - Transportation efficiency improved with the adoption of rail logistics, cutting delivery time by half (e.g., Nashik → Guwahati from six days to three) and reducing freight costs by 17%.
  - Procurement volumes increased from 0.14 LMT to 6.38 LMT, and the PSF's share in *mandi* arrivals rose from 5% to 16%.
  - Disposal diversity expanded rapidly: 30 % of stocks are now to reach retail channels through outlets, mobile vans, and e-commerce.

Collectively, these reflect a system that has transitioned from fragmented manual oversight to a digitally integrated, cost-efficient, and responsive value-chain.

Insights

The PSF's evolution has generated insights or deductions extending beyond onions:

- *Market discipline through codification*: Rule-based procurement, disposal triggers, and digital oversight have replaced ad hoc decision-making.
- *Liquidity as empowerment*: Faster farmer payments function as de-facto risk buffers, often more impactful than price premiums.
- *Spatial diffusion of incentives*: Procurement participation beyond Maharashtra-especially in Rajasthan, MP, and Gujarat- has reduced over-concentration risks and improved national supply resilience.
- *Dual welfare gains at low fiscal cost*: Consumer affordability and farmer income stability have advanced concurrently, demonstrating efficiency seldom achieved in buffer-stock schemes.
- *Transparency as a policy asset*: Platforms like Supply Valid, GPS tagging, and CCTV monitoring have reduced asymmetry and improved accountability.

- *Macro effect:* PSF onion procurement certainty and standardised operations have triggered a value-chain investment multiplier, driving new investments in storage, logistics and handling. At the same time, improved price stability and assured offtake have created a production multiplier, encouraging farmers in non-traditional regions to expand cultivation. Together, these effects extend onion PSF's impact far beyond the small volumes it procures.

Recommendations

Although PSF's onion procurement covers less than 1% of national production and its disposals account for under 2% of annual consumption, the programme's measured interventions have generated a far larger stabilising effect. This demonstrates PSF's potency as a market signal where transparent, rule-based actions ripple through prices, expectations, and behaviour well beyond its immediate footprint.

To consolidate these gains and prepare for the next phase, the report recommends a transition from operational expansion to institutional deepening and codified predictability, through the following priorities:

1. *Reinforce PSF's role as a market stabiliser, not a perpetual operator*: PSF should remain an intervention of choice to correct volatility, not a continuous procurement scheme. Stability should increasingly be sustained by normal market mechanisms once achieved.

2. *Enhance predictability of operations*: Introduce an annual PSF Onion Calendar pre-announcing procurement, storage, and disposal windows to align expectations of farmers, traders, and logistics operators and to discourage speculative behaviour.

3. *Institutionalise digital predictability levers*: Codify operational rules- MAPP revision schedule, trigger prices, buffer size, release thresholds, and disposal timelines- within *Supply Valid* as digital rule sets. This would make PSF actions traceable and data-driven.

4. *Diversify disposal channels toward semi-urban and peri-urban markets*: Extend PSF's retail footprint beyond metros through partnerships with cooperatives, e-commerce platforms (e.g., ONDC, Big Basket), and municipal markets to improve consumer reach and lower fiscal costs.

5. *Strengthen storage infrastructure and technologies*. Invest in scientific ventilated and controlled-atmosphere facilities to **bring storage losses below 10%**, and develop rail-

linked aggregation hubs in key producing regions like Nashik and Solapur to halve turnaround time and reduce transport costs.

6. *Operationalise a cost-accounting and monitoring framework*: Create PSF-specific ledgers modelled on FCI's system to publish monthly cost sheets, and integrate a Monitoring-Learning-Evaluation (MLE) cycle that tracks indicator-based performance, quarterly SLA compliance, and counterfactual disposal impacts, embedding a *learn-adjust-reapply* loop into annual reviews.

7. *Leverage multiplier effects to strengthen PSF planning and replication:* PSF operations have triggered two key multiplier effects in the onion value-chain. First, a value-chain investment multiplier, where procurement certainty and standardised processes have spurred complementary investments in storage, logistics, and handling, highlighting the need to integrate regular multiplier monitoring into PSF planning. Second, a production multiplier, driven by price stability and assured offtake, encouraging farmers, especially in non-traditional regions to expand cultivation. These multiplier insights can guide the targeted replication of PSF-style interventions across other sensitive value-chains with similar structural conditions.

Conclusion

The onion PSF demonstrates how limited-scale interventions can deliver economy-wide market stability when designed as disciplined, transparent, and data-driven systems. Although PSF directly handles barely 1-2% of India's annual onion production and consumption, its structured, rules-based model introduced by DOCA since 2020 has generated market-wide ripple effects far beyond its operational footprint. When PSF stabilises incentives, private sector players and farmers expand production in response, extending the impact of PSF well beyond its direct coverage. Even with less than 1% of production procured and less than two per cent of consumption reached through disposal, PSF still succeeded in reducing volatility, enhancing farmer liquidity, and stabilising retail prices- underscoring its function as a credible market signal rather than a market substitute.

By codifying its operational rules, investing in scientific storage, expanding retail reach, and embedding continuous learning, DOCA can now consolidate PSF as a permanent rules-based stabilisation framework for perishables. Its design that is anchored in transparency, predictability, and fiscal prudence, offers a replicable model for extending price-stabilisation architecture across India's broader agri-market ecosystem.

INTRODUCTION

Onions hold a unique position in India's agricultural and food economy. They are not only a household staple but also a commodity whose prices often fluctuate sharply due to perishability, geographic concentration of production centres and seasonality in production cycles [Press Information Bureau (PIB), 2019; Birthal and Negi, 2018]. Maharashtra alone contributes nearly 40% of national output, yet its consumption is spread across the country (*Figure 23*). This geographical mismatch between concentrated production and widespread consumption and an almost predictable seasonality pattern (with seasonal spikes, particularly around festivals such as Diwali), make onion prices highly vulnerable to volatility, yet cyclically predictable.

Onions in India are harvested three times a year – *kharif* (October–December), late *kharif* (January–March), and *rabi* (April–June). The *rabi* crop, which accounts for nearly two-thirds of annual production, yields onions with lower moisture content and longer shelf life. Most public and private procurement activities therefore take place immediately after the *rabi* harvest, when supplies are abundant and market arrivals peak. This seasonal structure

of production and storage shapes the timing of procurement and distribution cycles in the onion trade.

To address these recurring imbalances, the Government of India launched the PSF in 2014-15 under the Ministry of Agriculture (MoA). In 2016-17, the responsibility was transferred to the Department of Consumer Affairs (DOCA) [PIB, 2017]. The PSF's core objective is to smooth inter- and intra-year onion supplies by creating and managing buffer stocks. Procurement during surplus seasons (*rabi*) prevents price crashes, while calibrated disposal during lean months (*Figure 23*) improves availability for consumers and tempers retail price surges [PIB, 2022]. Over time, onion PSF operations have been reformed to enhance efficiency through data-driven planning, the participation of multiple agencies such as FPOs, co-operatives and PACS), improve storage and logistics, and introduce digital monitoring systems [DOCA PSF, 2025]. The initiative thus seeks to support onion farmers during supply gluts and protect consumers during supply shortages.

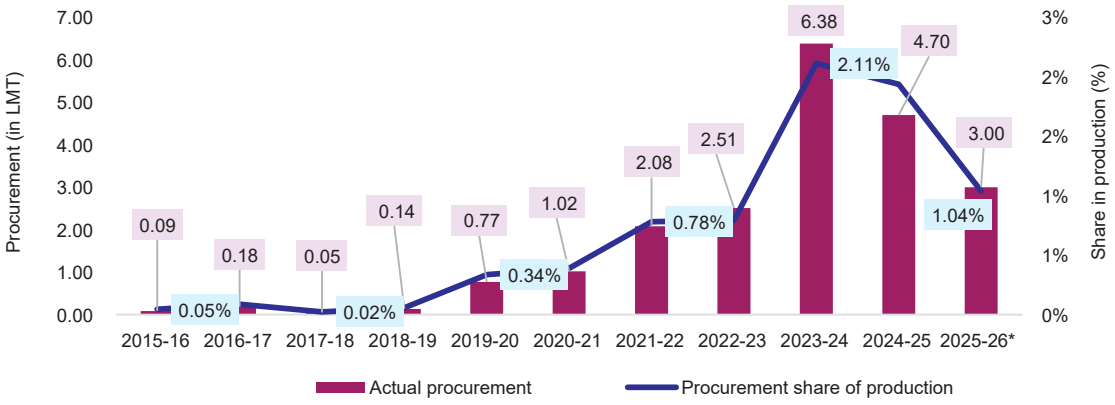
Despite its importance, systematic evidence on PSF's effectiveness in stabilising onion prices remains limited. Much of the existing discourse is derived from government communications and media reports rather than independent assessments. This report seeks to fill that gap. It provides an evidence-based evaluation of DOCA's onion PSF operations between FY 2022-23 and FY 2025-26, combining quantitative analysis of market and procurement data with qualitative insights from fieldwork, market visits and stakeholder interviews. The analysis examines the operation's impact on consumer price stability, farmer's remuneration and value-chain's efficiency.

The report is organised into three parts. Part 1 traces the evolution of the PSF, its institutional design and operational mechanisms, highlighting recent reforms undertaken by the DOCA. Part 2 evaluates the outcomes of these reforms through a structured set of indicators for consumers, farmers and the supply chain. Part 3 distils key takeaways and provides specific recommendations to further strengthen the efficiency of the PSF. Collectively these sections aim to present a comprehensive understanding of PSF's role if any in stabilising onion markets and the lessons it offers for managing volatility in other perishable commodities.

PART 1: PSF EVOLUTION: STRUCTURE AND SYSTEMS

Launched in 2014 under MoA and transferred to DOCA in 2016-17, PSF operations were subsequently aligned with the *Pradhan Mantri Annadata Aay Sanrakshan Abhiyan* (PM-*AASHA*) framework in 2024. Procurement volumes under the PSF have grown steadily from under 0.1 LMT in 2015-16 to 6.4 LMT in 2023-24, covering about 2% of India's total onion production. This is nearly a 70-fold increase in less than 10 years (*Figure 1*).

Figure 1: Onion actual procurement and share of production trend over the years

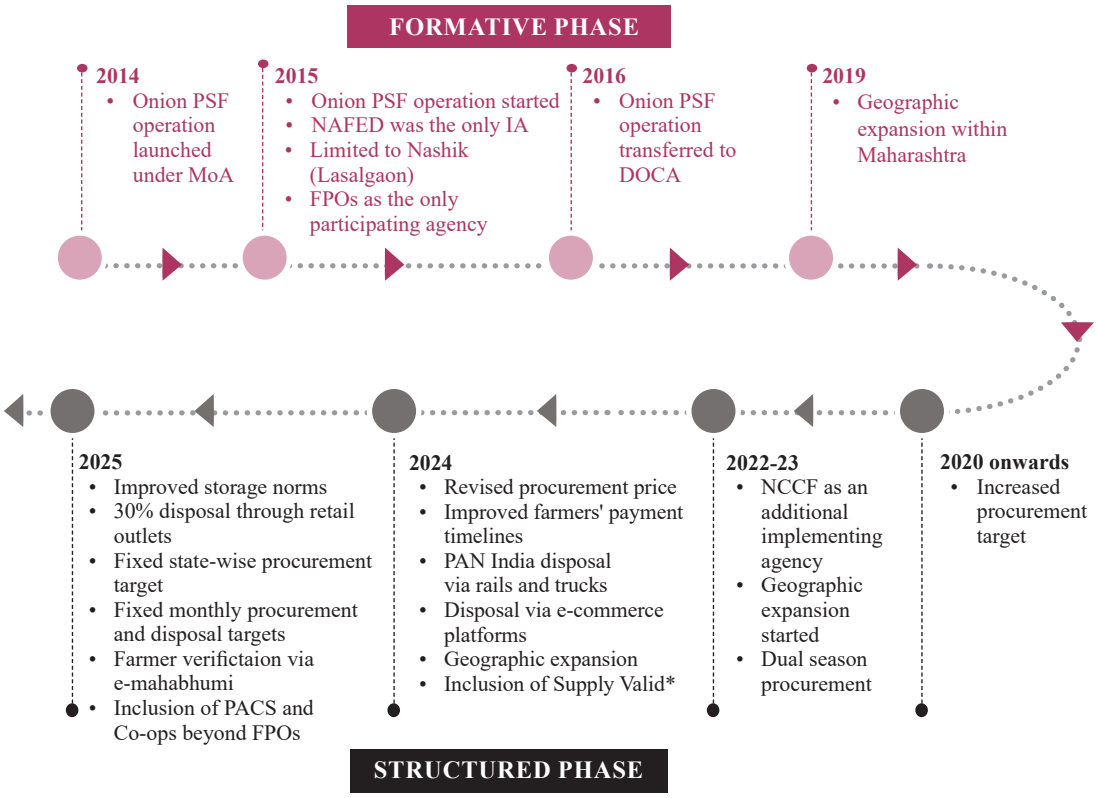


*Source: NHB | DOCA | *In 2025-26, procurement target was used instead of actual procurement*

In the 10 years since 2015-16, while onion production in the country grew by 4.3% on average (CAGR), onion procurement in the same period grew by about 10 times more at 42%. As the volumes of onion procured grew, DOCA undertook comprehensive set of reforms to update its PSF design, its implementation and onion logistics and operations. This evolution can be understood in two phases: first is the formative phase (2015-2019), which laid the institutional foundation for PSF, and the second is the structured phase (2020 onwards) which introduced reforms that expanded participation, strengthened logistics and monitoring, and aligned operations more closely with market dynamics *(Figure 2)*

The timeline above illustrates how the onion PSF operation has progressively evolved. Each milestone reflects a shift in the operation's capability and capacity. To understand this transformation more closely, we examine the two phases below.

Figure 2: Onion PSF operation key milestones (2014-2025)



*Source: DOCA | *Supply Valid is the organisation responsible to track the PSF onion procurement process*

1. Formative phase (2015-2019)

Even though PSF was launched under MoA in year 2014, it was operationalised only in 2015 when GOI undertook its first systematic attempt to intervene in the onion market through public procurement and calibrated disposal. The formative phase between 2015 and 2019 established the basic institutional and operational framework for onion PSF operation.

During this period, the NAFED functioned as the sole implementing agency (IA) responsible for procurement, storage, and disposal of onions. Initially, procurement operations were confined to the Nashik district of Maharashtra, beginning with the *Lasalgaon mandi*- the largest onion market in Asia- and by 2018 the operations extended to *Pimpalgaon*, another key onion *mandi* in Nashik.

By 2018, NAFED began engaging with Farmer Producer Organisations (FPOs) to undertake procurement and storage on its behalf. NAFED reimbursed FPOs for operational expenses.

During this phase, storage of procured onions was primarily carried out in traditional *kanda chawls* with limited quality checks or standardisation. Onion disposal was routed through

wholesale *mandis*, state allocations, and NAFED retail outlets, relying exclusively on truck transportation. Onion procured during this period were very less in quantity: 0.09 LMT in 2015-16 which represented less than 0.1 per cent of total national production that year of 189 LMT. By 2019-20, the PSF onion actual procurement had increased to 0.77 LMT, and operations expanded to two *mandis* within Maharashtra *(Lasalgaon* and *Pimpalgaon*).

However, several gaps remained during this phase. The dependency on a single-agency structure restricted the geographical spread of procurement and limited outreach to farmers outside Maharashtra. Storage continued to rely on traditional *kanda chawls*, with no fixed storage norms and any scientific storage infrastructure, leading to storage losses[1] of around 32% in 2018-19. Payments to farmers selling onions under PSF generally took 7-10 days and as the procurement prices were based on weekly *mandi* averages that fluctuated sharply, selling farmers were exposed to market volatility. PSF onion disposal during the start of this phase was majorly confined to Delhi and its adjoining regions, as longer-distance transportation from Nashik to far-off destinations across India was carried out entirely by road. This was gradually expanded to more cities like Kolkata, and Chennai but the use of trucks for such long routes made operations costly and logistically challenging (*Annexure 6, Table 10*). These limitations prevented the PSF from reaching scale or delivering consistent outcomes during its formative phase.

Despite its modest scope, the formative phase played a critical role in building the operational and institutional base for later reforms. They underscored the need to move towards a multi-agency framework to achieve wider geographic coverage, introduce scientific storage norms and digital monitoring to reduce onion losses, and revise pricing mechanisms to ensure predictable and transparent farmer remuneration. The phase also highlighted the importance of modernising logistics and disposal systems through rail-based movement and diversified retail channels. Together, these lessons shaped the design of the structured phase (2020 onwards).

2. Structured phase (2020 onwards)

From 2020 onwards, onion operations under PSF entered a structured phase marked by a series of administrative and operational reforms. These measures transformed the operation from a single-agency intervention into a coordinated, multi-agency framework supported by digital oversight and codified norms for procurement, storage, and disposal. The reforms introduced between FY 2020-21 and FY 2025-26 may be grouped into two categories: administrative reforms, which strengthened institutional design and coordination

1 Storage loss refers to the reduction in the onion quantity during the PSF onion storage after procurement and before disposal. It accounts: weight loss, quality loss or any handling losses under storage conditions

mechanisms, and operational reforms, which improved implementation processes and field-level efficiency *(Table 1)*.

Table 1: Key administrative (LHS) and operational reforms (RHS) under onion PSF

S. No.	Key administrative reforms introduced
i	Revision in procurement target *(2020 onwards)*
ii	Inclusion of NCCF as another implementing agency *(2022-23)*
iii	Policy agility (Dual season procurement) *(2023-24)*
iv	Geographic diversification *(2023 onwards)*
v	Revised procurement price calculation *(2024-25)*
vi	Expanded participation to PACS and co-operatives beyond FPOs *(2025-26)* a. Greater coverage b. Greater accountability
vii	Revised storage location norms *(2025-26)*
viii	Revised disposal strategy a. Diversified geographies b. Diversified disposal channels

S. No.	Key operational reforms introduced
i	Improvement in farmer payment timelines *(2024-25)*
ii	Integration of "Supply Valid" platform *(2024-25)*
iii	Improved transport norms *(2024-25)*
iv	Reduced permissible storage loss norms *(2025-26)*
v	Strengthened farmer verification through e-*mahabhumi*) *(2025-26)*

Source: DOCA

Administrative Reforms

The first set of reforms focused on institutional restructuring and policy design:

i. **Revision in procurement target:** The structured phase began with the gradual expansion of procurement targets, marking the start of systematic capacity enhancement. Beginning FY 2020-21, annual procurement targets were revised upward to align with production trends and market requirements. The target increased from 0.09 LMT in 2015-16 to 6.4 LMT in 2023-24, representing roughly 1 to 2% of total national onion production *(Figure 19)*.

ii. **Inclusion of NCCF as another implementing agency[2]:** A key administrative reform took place in May 2022, when DOCA formally included NCCF as an additional IA

2 Implementing agency (referred to as Nodal Agencies until 2023-24) are two agencies (NAFED and NCCF) responsible for the selection of participating agencies, onion procurement and storage with quality check and inspection.

alongside NAFED. While the MoU was signed in 2022, official operations under NCCF commenced in FY 2023-24. The inclusion enabled wider procurement and disposal coverage through NCCF's retail and cooperative network.

iii. **Policy agility (Dual season procurement):** In FY 2023-24, unseasonal rainfall led to a decline in onion production by about 5 per cent, from 316.9 LMT in 2022-23 to 302.1 LMT in 2023-24. Demonstrating agility, DOCA introduced dual-season procurement under the PSF. For the first time, procurement was undertaken not only during the *rabi* season but also in the *kharif* season (annexure 2). To minimise storage losses- since *kharif* onions contain higher moisture and have a shorter shelf life- and to moderate rising prices, DOCA implemented simultaneous procurement and disposal during the *kharif* period. This approach helped prevent post-harvest price spikes. In total, 6.38 LMT of onions were procured in 2023-24.

iv. **Geographic diversification:** With the inclusion of two IAs: NAFED and NCCF, onion procurement gradually expanded beyond Nashik (*Lasalgaon*) to other locations such as *Pimpalgaon* in 2023-24, and to Pune, Ahmednagar, Solapur, Latur, and Aurangabad by 2025-26. Between 2022 to 2025 the procurement network also extended to other producing states, including Madhya Pradesh and Gujarat thereby diversifying the geographical scope of PSF operations.

v. **Revised procurement price calculation:** In FY 2024-25, the MAPP replaced the weekly *mandi* average[3]. The new method uses a three-day moving average, based equally on modal and maximum *mandi* prices. While the earlier system exposed farmers to intra-week price fluctuations, the revised pricing model addressed this volatility.

vi. **Expanded participation to PACS and co-operatives beyond FPOs:**

   a. *Greater coverage:* From FY 2025-26 onwards, scope of participation agencies (PA) widened beyond Farmer Producer Organisations (FPOs) to include PACS and cooperatives. These entities are selected through Expressions of Interest (EOIs) issued by the IAs, thereby expanding the network of eligible local partners; and

3 The Maximum Allowable Procurement Price (MAPP) was introduced by the Department of Consumer Affairs (DOCA) in FY 2020-21 to provide a uniform ceiling for onion procurement under the Price Stabilisation Fund. The MAPP is determined by assigning equal weight (50% each) to (a) the three-day weighted average of modal *mandi* prices and (b) the current season's maximum market price. This composite figure serves as the reference ceiling for all implementing agencies during PSF procurement operations.

b. *Greater accountability:* The selection process for PAs has been formalised through competitive EOIs, under which interested agencies must submit requisite documentation, including their registered address, Permanent Account Number (PAN), Goods and Services Tax (GST) number, identification proof, and details of annual business turnover (*Annexure 3, Table 7).* In addition, DOCA has mandated that all PAs disclose their expected recovery rates and a composite statement of incidental costs- covering expenses such as sorting, grading, loading, unloading, chawl storage, and agency charges- to the IAs. This structured process was to improve accountability by ensuring transparent selection, verifiable cost disclosures, and clearer traceability of agency-level operations across procurement and storage stages.

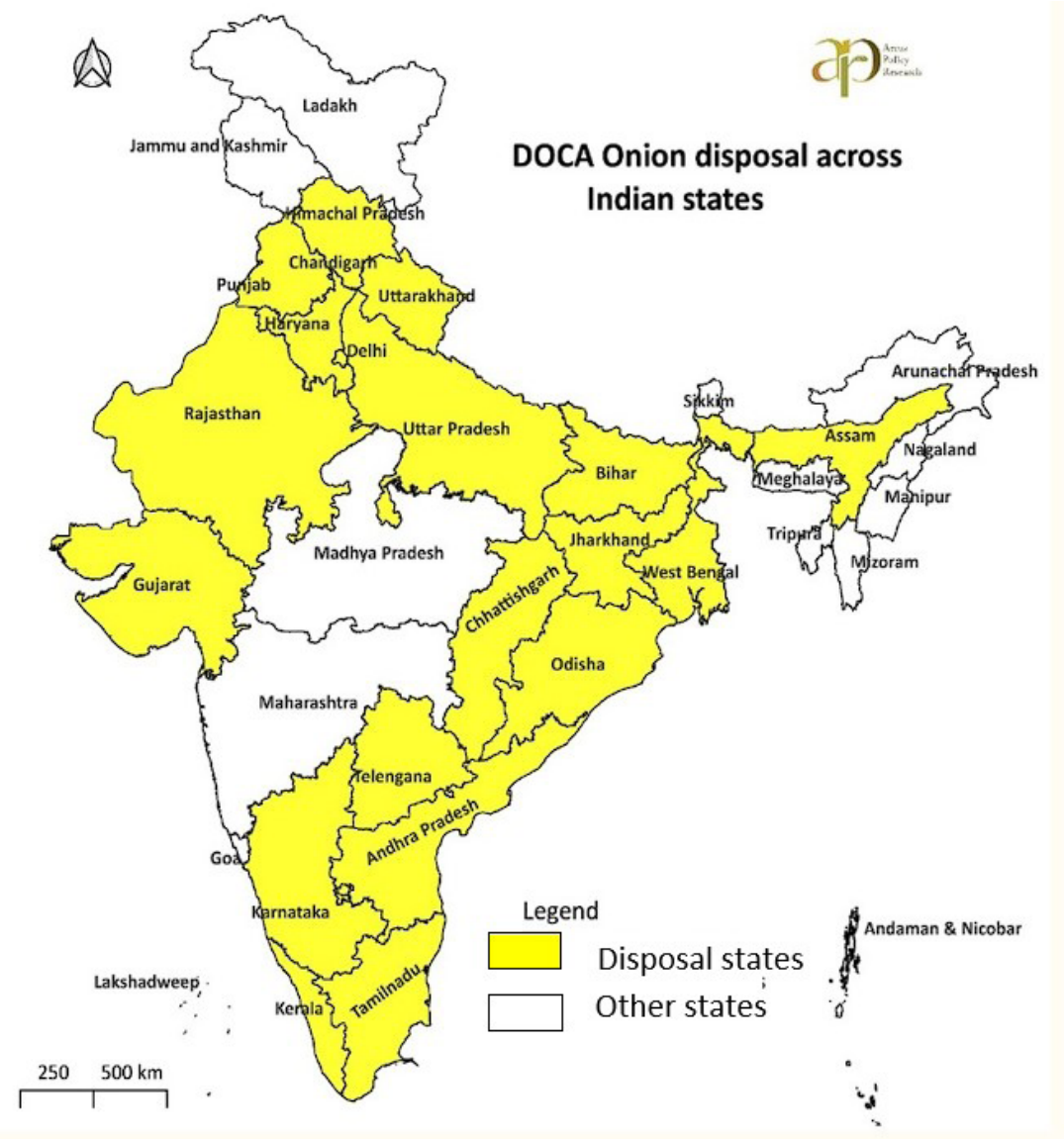
vii. **Revised storage location norms:** Storage norms were upgraded in 2025-26. Storage facilities are now required to be located within one kilometre of procurement sites, with minimum capacity thresholds of 5,000 MT in Nashik and 2,000 MT in other districts. CCTV systems with a minimum one-month data retention are mandated at each storage site to ensure transparency and enable real-time oversight. All storage points are required to be geo-tagged, ensuring accurate tracking and accountability.

viii. **Revised disposal strategy:** To enhance consumer reach, the disposal strategy under the onion PSF operation was revised.

a. Diversified geographies: During the start of formative phase, onion PSF operation conducted through truck only due to which coverage of North-east states and southern states was difficult. But with the incorporation of railways for longer routes (> 500 km) PSF onion disposal is now able to almost 20 states. North-east states (Assam), Eastern states (Bihar, Jharkhand and, West Bengal), all major Southern states (Andhra Pradesh, Telangana, Karnataka, Tamil Nadu, and Kerala) (*Figure 3*).

b. Diversified disposal channels: In 2024-25, mobile vans were introduced as an innovative disposal mechanism, allowing IAs to facilitate direct sales of onions at designated locations, thereby improving last-mile consumer access. To further strengthen the retail distribution network, in 2025-26, DOCA mandated that a minimum of 30% of disposed onions be sold through retail outlets. In addition, the disposal strategy was expanded to include e-commerce platforms such as Zepto, Big Basket, and ONDC, enhancing both the reach and affordability of onions for consumers across diverse regions.

Figure 3: Geographic disposal of PSF onions



Source: DOCA

Operational Reforms

The second set of reforms addressed field operations and process management.

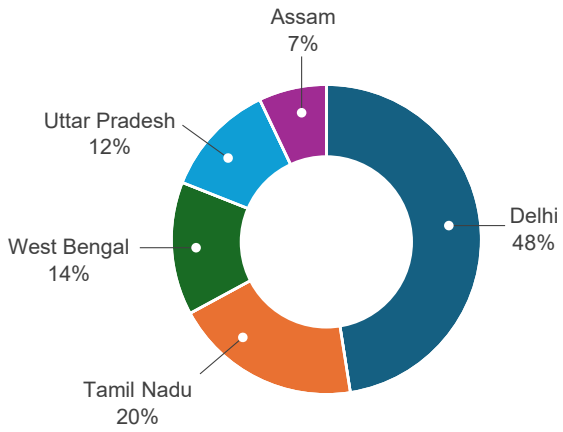
i. **Improvement in farmer payment timelines:** Payment to farmers, which previously took 7 to 10 days, was standardised to a T + 3 days[4] settlement framework in 2024-25, ensuring completion within three working days of procurement after document verification.

4 T+3 days: 'T' refers to the transaction date (day of procurement) and '+3' denotes the maximum of three working days allowed for payment settlement for selling farmers.

ii. **Integration of the "Supply Valid" platform:** The digital monitoring platform was fully integrated with DOCA's systems in FY 2024-25, enabling real-time tracking of procurement, storage, disposal, and payments.

iii. **Improved transport norms (*Truck for <500 km; Rail for >500 km):*** From FY 2024-25 onwards, railways became the preferred mode of transport for onion disposal routes exceeding 500 km, while trucks continued to be used for shorter routes. This change began with NCCF's "*Kanda* Express," later adopted by NAFED (*Annexures 4 and 5; Figure 4)*

Figure 4: State-wise onion dispsoal via railways wagons: 2024-25



Source: DOCA

iv. **Reduced permissible storage loss norms:** Due to improved storage norms and improved monitoring with the inclusion of *"Supply Valid",* the permissible storage losses are reduced from 32% in 2018-19 to 15% in 2024-25.

v. **Strengthened farmer verification through *e-mahabhumi* integration:** In 2025-26, farmer verification protocols were tightened by DOCA. The verification of farmers and crop details was linked to the *e-mahabhumi* portal in Maharashtra. This reform ensured that only genuine onion farmers were eligible for procurement and that payments were made directly into Aadhaar-linked bank accounts, thus reducing the risks of document manipulation and enhancing transparency.

Between FY 2020-21 and FY 2025-26, PSF onion operations evolved into a technology-enabled, geographically diversified for procurement as well as for disposal, and policy-

responsive framework. These changes have created a resilient and transparent model capable of stabilising onion prices, ensuring consistent availability to consumers across seasons, supporting farmers through timely payments, and enhancing value-chain efficiency. Accordingly, Part 2 of this report analyses the impact of these reforms on key stakeholders, including farmers, consumers, and the onion value-chain, and examines how administrative and operational improvements have influenced production incentives, market integration, and price stability.

Institutional framework and roles under onion PSF operation

The reformed PSF onion operation functions through a multi-stakeholder institutional framework that ensures co-ordinated action across all stages of procurement, storage, and disposal. Six key actors play distinct yet interdependent roles:

- **DOCA:** At the apex level, DOCA provides strategic leadership by framing annual Standard Operating Procedures (SOPs), setting procurement and disposal targets, and ensuring cross-agency coordination. It oversees compliance and ensures that PSF interventions remain aligned with market needs and policy objectives.
- **Implementing agencies (NAFED and NCCF):** The IAs operationalise the PSF cycle on the ground. They issue Expressions of Interest (EOIs), coordinate with participating agencies (PAs), manage storage and logistics, and maintain regular reporting. The inclusion of NCCF alongside NAFED has expanded the PSF onion operation's geographical reach and strengthened retail and e-commerce disposal mechanisms.
- **Participating agencies (FPOs, PACS, Cooperatives):** These local-level institutions directly engage with farmers, conduct procurement at the set MAPP, and facilitate logistics up to the storage stage. Their participation has enhanced field-level access, improved farmer outreach, and reduced transaction costs.
- **Technology partner (Supply Valid):** Supply Valid provides end-to-end digital monitoring across all stages of the PSF operation. It tracks procurement volumes, storage health, disposal movements, and payment timeliness in real time, thereby ensuring transparency and accountability.
- **Farmers:** Farmers serve as the primary suppliers under PSF operations. Through timely payments (T+3 system) and assured prices, the mechanism safeguards them against price crashes and distress sales, contributing to income stability.

- **Consumers:** As the ultimate beneficiaries, consumers gain from stabilised retail prices and improved availability of onions during high-price months, particularly between August and November.

This institutional framework ensures that policy direction, implementation, and monitoring are closely integrated, enabling the PSF to function as a responsive and transparent price-stabilisation mechanism.

Onion PSF operational flow in 2025-26

The onion operations under PSF follow a well-defined operational cycle aimed at ensuring efficiency, transparency, and traceability. The process integrates digital monitoring through the Supply Valid platform, which tracks each transaction from procurement to disposal. In FY 2025-26, the flow of operations can be summarised in three broad components: physical movement of onions, financial settlements, and monitoring and oversight.

1. Physical Movement of Onions

   a. **Pre-Procurement Stage**: DOCA initiates operations by circulating the Standard Operating Protocol (SOP)- typically by the first week of April- to IAs: NAFED and NCCF. The SOP outlines:

      i. The procurement window and duration,

      ii. Targeted states and state-wise procurement quantities,

      iii. Storage and disposal guidelines, and

      iv. Eligibility criteria for PAs: FPOs, PACS, and co-operatives.

On receiving the SOP, the IAs issue Expressions of Interest (EOIs) within 15 to 20 days to invite applications from eligible PAs. DOCA, along with IA and Supply Valid teams, conducts field inspections to assess readiness and infrastructure before procurement begins.

a. **Procurement Stage**: Procurement is undertaken primarily between April and July, coinciding with the *rabi* harvest. PAs procure onions directly from registered farmers at the pre-announced MAPP. Joint inspections by DOCA, Department of Food & Public Distribution (DFPD), IAs, and Supply Valid who verify the quantity and quality of onions procured. For inspection purpose, DOCA has also formed a committee of selected members to conduct inspections across various stages of onion PSF operation from procurement to storage to ensure operational efficiency. All transactions are

digitally recorded on Supply Valid platform, Supply Valid is also responsible to track the quality and quantity during procurement stage as well as during disposal in real-time and participating onion farmer payments are required within T+3 working days to maintain liquidity and build trust.

b. **Storage Stage**: Procured onions are stored in geo-tagged, ventilated *chawls* or scientific-storage facilities located within one kilometre of procurement sites. Each facility must meet prescribed storage-loss limits (maximum 28% in 2025-26) and is physically inspected by IA and DOCA teams, with live monitoring enabled through Supply Valid. Stocks are insured against storage and transit risks to safeguard both agencies and producers.

c. **Pre-Disposal Stage**: Before disposal, joint inspections are conducted by NAFED, NCCF, and Supply Valid to verify stock quality and quantity. Dispatch planning follows the First-In-First-Out (FIFO) protocol to minimise wastage and ensure timely release of stocks.

d. **Disposal Stage**: Disposal typically occurs between August and November, when market arrivals decline and prices rise. DOCA issues formal release orders specifying the quantity, destination, and schedule for each IA. Transport is arranged by road for distances under 500 km and by rail for longer routes. Distribution takes place through multiple retail channels, including NAFED and NCCF outlets, *Kendriya Bhandar*, *Safal* stores, mobile vans, and e-commerce platforms such as BigBasket and ONDC. Following disposal, DOCA conducts a final audit to ensure operational and financial compliance.

2. Financial Payments and Settlement: Financial flows under PSF operations are structured across three stages:

    a. **Advance and interim payments** (Phases I and II) are released by DOCA to IAs to cover procurement and logistics costs.

    b. **Final settlement** (Phase III) is made post-disposal, after audit verification of procurement, storage, and sale records.

IAs, in turn, disburse payments digitally to farmers, FPOs, PACS, and cooperatives through

designated bank accounts, ensuring full traceability. A post-operation reconciliation is conducted before the release of the final tranche.

3. Monitoring and Oversight: PSF operations combine digital and physical verification mechanisms:

   a. **Digital Oversight**: The Supply Valid platform provides real-time monitoring of procurement, inventory levels, and dispatches, creating an end-to-end electronic audit trail.

   b. **Physical Verification**: Periodic field inspections are conducted jointly by DOCA, Supply Valid, NAFED, and NCCF to validate stocks, assess storage conditions, and confirm compliance with SOP norms.

   c. **Audit Trail and Accountability**: The combined documentation from Supply Valid and the IAs forms a verifiable audit trail covering every transaction – from farmer payment to consumer-level disposal – ensuring transparency and accountability throughout the onion value-chain.

The next section examines how these institutional and process-level changes have translated into measurable outcomes. Using a structured set of 19 indicators covering consumers, farmers, and the value-chain, Part 2 evaluates the PSF's effectiveness in moderating price volatility, improving farmer returns, and enhancing overall market efficiency.

PART 2: ASSESSING THE IMPACT OF STRUCTURED PSF OPERATION-INDICATORS AND EVIDENCE

The preceding section outlined the five-stage operational cycle of PSF onion management and traced how reforms since 2020 have streamlined procurement, storage, and disposal. This section turns to the results of that operational transformation. It evaluates whether the structured PSF stage - backed by digital monitoring, multi-agency participation, and improved storage-logistics linkages- has translated into tangible outcomes for consumers, farmers, and the onion value-chain. The assessment uses a set of measurable indicators to determine if the reforms have achieved their intended objectives of stability, equity and efficiency. We start with outlining the methodology used to assess impact.

Measurement and methodology

To assess the effectiveness of PSF reforms, a structured framework of 19 indicators was developed for this study. These indicators were designed to translate the broad policy intent

of the reforms into measurable evidence. Each indicator aligns with one of three result domains: (A) consumer-level impact, (B) farmer-level impact, and (C) value-chain efficiency - allowing a comprehensive view of PSF's performance across the onion ecosystem.

Recognising that reforms unfold through multiple layers, the indicators are organised along an impact chain:

- **Enabling indicators** track institutional and systemic improvements that created the foundation for reform. These include the expansion of procurement reach to new states, the digitalisation of payment systems ensuring faster settlements, and the broadening of implementing agencies that enhanced inclusion and operational capacity.
- **Outcome indicators** capture immediate effects, such as greater procurement volumes, faster payments, and improved storage recovery.
- **Impact indicators** assess the final results for stakeholders, i.e., more stable prices for consumers, higher realisation for farmers, and greater operational efficiency across the value-chain.

Each reform initiative introduced since 2020 was mapped to these indicators according to its intended objective, for instance, improving farmer price realisation, reducing storage and transport losses, or ensuring timely consumer access to affordable onions.

The **19-indicator framework** follows a clear analytical design based on the following principles:

1. *Multi-stakeholder impact focus*: The onion value-chain spans farmers, IAs, consumers and government institutions. The chosen indicators are designed to capture outcomes for each of these groups while highlighting trade-offs among them. For instance, farmer-centric indicators track producer welfare through procurement prices and payment timelines, while consumer-centric indicators measure affordability and timely availability. Similarly, indicators on IAs assess institutional efficiency and inclusivity.

2. *Attributive analysis*: Most indicators are structured to allow a comparison in performance between the formative and structured phase, that is, intuitively designed to represent pre- and post-reform comparisons. This temporal comparability is essential for evidence-based assessment of reforms.

3. *Adjusting indicators to seasonality*: Given the predictable procurement and disposal cycles of the DOCA with procurement concentrated in April-July and disposal in August-November, the indicators are also designed to capture performance during these windows. Where relevant, data are presented on a financial year basis; however, for tracking outcome around procurement and disposal periods, season-sensitive analysis is undertaken.

4. *Geographic focus*: Most procurement-related indicators focus on the three states of Maharashtra, Madhya Pradesh and Gujarat, with primary focus on Maharashtra, as the DOCA procures approximately 90% of onions from the state (*Figure 18)*. As Delhi NCR regions has been a key disposal zone since the beginning of the onion PSF operation, contributes nearly 100% during the start of initial phase which gradually expanded to more states. The study therefore is focused on Delhi for the consumer analysis to maintain consistency with historical onion disposal patterns.

5. *Source of data and triangulation*: Most data for the indicators are collected from GOI sources including the UPAg portal, the DOCA's public databases, the National Horticulture Board's portal and the Agmarknet portal. To assess the onion market pattern, transportation costs and PSF onion disposal impact in Delhi, field survey was conducted at *Azadpur* market, involving interviews with 6 traders and 10 transporters. To understand the reforms between formative and structured phase, a field survey in Nashik covered 2 FPO storage centres, 1 cooperative associated with IAs and *Lasalgaon mandi*, where 5-7 focus group discussions were held with onion farmers, along with an interview with an onion trader. Telephonic interviews were conducted with 5 onion farmers, 11 cooperatives, and 50 FPOs (both current and former IA associates). Physical meetings were also held with Supply Valid member, General Managers at IA headquarters (Delhi), and the Branch Manager of IAs in Nashik to understand operational and monitoring processes. This triangulated approach reduces reliance on a single source and enhances robustness.

6. *Efficiency, equity and transparency framing*: The indicators collectively map onto three evaluative dimensions: efficiency (for example, reduction in storage and transport costs), equity and inclusivity (for example, expansion of PAs: inclusion of FPOs and co-operatives) and transparency (for example, geo-tagging, timely digital payments and physical inspections). This ensures that operational reforms are judged not only by scale and impact, but also by their governance quality.

Analytical Note on Interpretation of Indicators

The 19 indicators presented in this section are designed to capture directional changes in market stability, farmer welfare and operational efficiency following PSF reforms. The results should be interpreted as indicative associations rather than deterministic causal effects. Each indicator draws on secondary and administrative data, and several use comparative or counterfactual methods that, while standard in economic analysis, may not fully isolate PSF's influence from concurrent factors such as production variability, rainfall shocks, trade or storage policy changes, and private market behaviour. The findings therefore reflect the direction and magnitude of association consistent with PSF interventions, not definitive proof of causality. We next proceed to present these indicators in detail, followed by an analysis of their performance.

> ***"A 19-indicator framework measures PSF's impact across efficiency, equity, and transparency. It compares pre- and post-reform data to show how the new system performs better for all stakeholders."***

A. Ways to measure how the PSF helps consumers

The first set of indicators assesses how PSF reforms translated into tangible benefits for consumers, primarily by moderating retail prices, reducing volatility, and improving affordability during lean months. These five indicators, situated largely at the outcome-to-impact end of the results chain, capture the direct market effects of PSF reforms rather than institutional enablers. They examine whether structured procurement and timed buffer disposal succeeded in smoothing retail price cycles, narrowing the gap between disposal and market prices, and enhancing predictability for households and traders alike. *Table 2* below summarises these five indicators and the dimensions they measure.

Table 2: List of 5 indicators to assess consumer-level impact of PSF reforms

S. No.	Indicator Name	Analytical Focus	Impact Chain Layer
1	Onion retail price stabilisation	Measures reduction in monthly retail price volatility using Coefficient of Variation (CV)	Outcome → Impact
2	Onion retail price moderation (counterfactual analysis)	Compares actual retail prices with a "no-intervention" scenario to assess the price-reduction effect of buffer disposal	Impact
3	Consumer affordability	Compares DOCA's disposal price with prevailing retail prices	Impact
4	Retail price cycle (months between price spikes)	Tracks frequency of price peaks to gauge market predictability	Impact
5	Consumption–production centre price spread	Compares prices in Lasalgaon (production hub) and Azadpur (consumption centre)	Outcome → Impact

1. Onion retail price stabilisation

This indicator measures whether PSF operations have helped stabilise retail onion prices, which serve as a proxy for market predictability and consumer welfare. Delhi has been used as the reference market since it is both a major consumption centre and a principal destination for PSF buffer disposal.

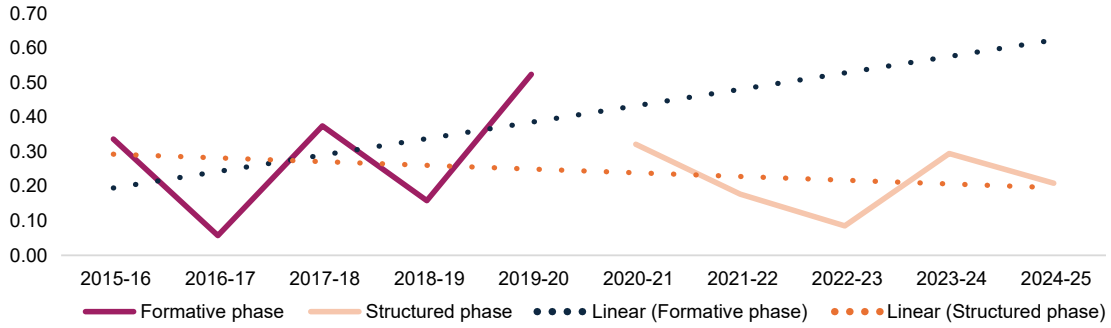
The analysis compares the coefficient of variation (CV) of monthly retail onion prices across two phases *(Figure 5)*:

a. The formative phase: FY 2015-16 to FY 2019-20, and

b. The structured phase: FY 2020-21 to FY 2024-25.

The CV, defined as the ratio of the standard deviation to the mean of monthly prices, is a standard measure of price variability in agricultural-market analysis (Birthal et al., 2019). A lower CV denotes reduced volatility and greater price stability. Data were sourced from the UPAg portal, DOCA price records, and Agmarknet, ensuring consistency through triangulation.

Figure 5: Comparison of onion retail price in Delhi: 2015-16 to 2024-25



Source: UPAg | Note: CV is widely used in agricultural economics to measure relative price variability across periods (Birthal et. al., 2019)

The coefficient of variation declined from 0.29 in the formative phase to 0.22 in the structured phase, implying a 24% reduction in retail price variability. Greater stability coincides with the years following PSF reform, when procurement volumes rose sharply and disposal was timed to coincide with the seasonal lean months of August–November

Improved coordination in procurement, storage, and logistics likely contributed to smoother market adjustment during high-price periods. However, given the relatively small scale of PSF interventions within total market supply, their influence can be viewed as that of a stabilizer in shaping overall retail price outcomes.

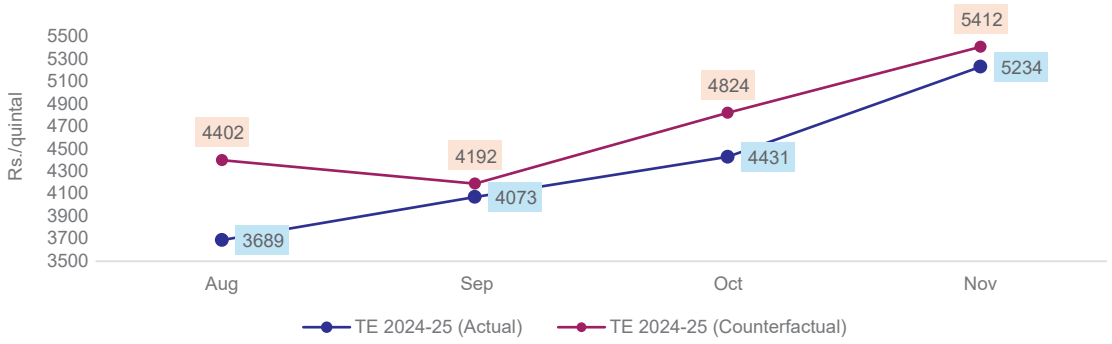
2. Onion retail price moderation (counterfactual analysis)

This indicator assesses the effect of PSF buffer stock disposal on retail price in Delhi. The indicator compares two price scenarios for Delhi during the high-price months of August to November 2024 (TE 2024-25):

- Business-as-usual (BAU) counterfactual[5], constructed by extrapolating the retail price trajectory from the formative phase (TE 2018-19) under the assumption that PSF operations were absent, and
- Actual retail prices observed under structured PSF intervention.

5 This counterfactual method follows standard practice in food-price stabilisation studies (Birthal et al., 2019; Gulati et al., 2023 Tackling Food Inflation)

Figure 6: Actual vs. BAU onion monthly retail price in Delhi: TE 2024-25



Source: UPAg

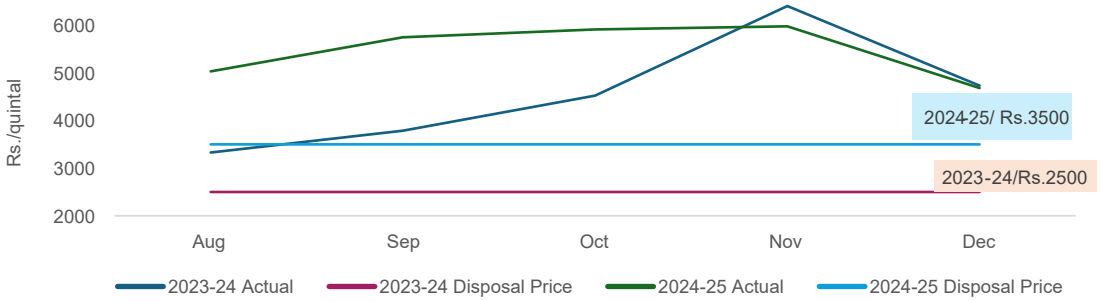
The average retail price during August-November 2024 was Rs. 4,078 per quintal, compared to a counterfactual estimate of Rs. 4,375 per quintal. This indicates an 8% reduction in retail prices relative to the BAU scenario during high-price months.

The difference suggests that structured PSF buffer disposal coincided with milder retail-price escalation in Delhi's onion market. The timing of buffer releases during high-price months likely added incremental supply and improved market sentiment, which together contributed to moderation of retail prices.

3. Consumer affordability

This indicator examines whether PSF's disposal operations have improved consumer affordability by releasing onions at prices below prevailing retail market rates. It reflects the extent to which PSF buffers serve as a price-relief mechanism during high retail inflation periods. The analysis was done for Delhi, comparing the prevailing Delhi retail price to the disposal price set by DOCA for two years, 2023-24 and 2024-25 between August and December.

Figure 7: Delhi onion retail price and disposal price set by DOCA: 2023-24 and 2024-25



Source: DOCA | UPAg

The analysis shows that for the five months between August and December,

- the disposal price was Rs. 2500 per quintal, while the retail price averaged about Rs. 4557 per quintal (a gap of about 45%) in 2023-24 and
- the disposal price was Rs. 3500 per quintal, compared to the average retail price of Rs. 5473 per quintal (a gap of about 36%) in 2024-25.

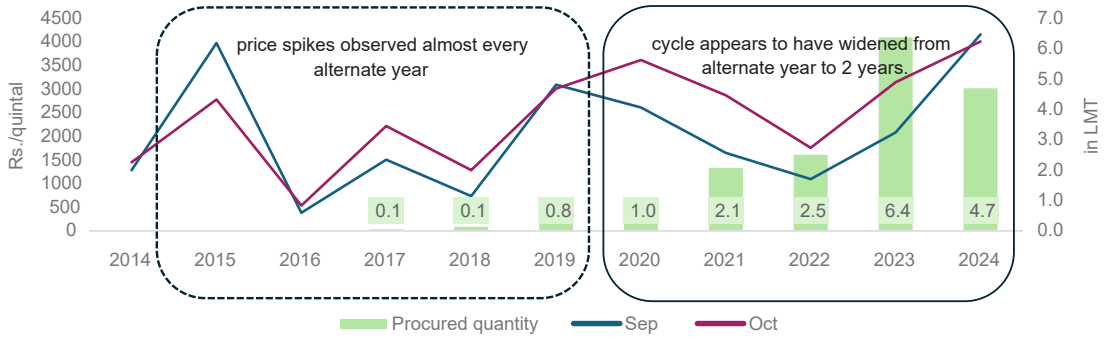
In both years, the disposal price was substantially lower than the prevailing retail price, indicating targeted affordability gains for beneficiaries. Even the persistent, and sizeable gap suggests an operational emphasis on price relief rather than revenue maximisation within the disposal window.

4. Retail price cycle (months between price spikes)

This indicator assesses whether PSF interventions influenced the frequency of retail price spikes. It is an indicator of market predictability and consumer price stability. The analysis compared the duration between consecutive price peaks in Delhi:

- FY 2015-19 (formative phase): spikes occurred approximately every 12 months.
- FY 2020-25 (structured phase): spike interval lengthened to 24 months.

Figure 8: Delhi onion retail price and procurement quantity for September and October



Source: UPAg and DOCA

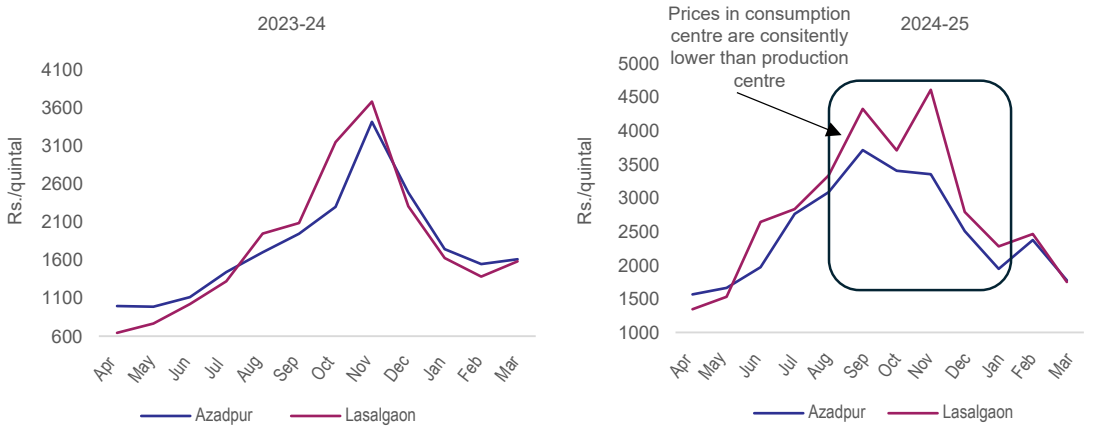
The elongation of the price cycle from annual to biennial coincides with an increase in procurement volumes (from 0.1 LMT in 2017-18 to 6.4 LMT in 2023). A longer interval between price spikes implies greater market predictability, allowing producers, traders, and consumers to adjust decisions more gradually.

5. Consumption-production price spread

This indicator examines the relative price difference between the production hub (*Lasalgaon,* Maharashtra) and the consumption centre (*Azadpur,* Delhi), reflecting market integration and efficiency. The natural expectation is that prices in consumption markets should be somewhat higher than those in production hubs due to freight, handling, and wholesale-to-retail margins.

We study this price difference for two marketing years within the structured phase: 2023-24 and 2024-25 as average for four months of September to December.

Figure 9: *Azadpur* vs. *Lasalgaon mandi* price analysis: 2023-24 and 2024-25



Source: Agmarknet

- In 2023-24: In *Azadpur mandi* market, onions traded at Rs. 2,537 per quintal and during the same time prices in *Lasalgaon mandi*, prices were Rs. 2,806 per quintal i.e., about 10% lower than in *Azadpur*, Delhi; and
- In 2024-25: while the *Azadpur* onion rates were Rs. 3,243 per quintal, the *Lasalgaon* onions traded at Rs. 3,856 per quintal, i.e., 16% lower in a consumption centre like Delhi (*Azadpur*) compared to production centre (*Lasalgaon*, Maharashtra).

Contrary to the usual spatial pattern where consumption-centre prices exceed those at production hubs, Delhi *mandi* prices remained lower than *Lasalgaon* in both the years. This atypical inversion coincided with the diversification of Delhi's supply base beyond Maharashtra, drawing arrivals from Rajasthan, MP, and southern states, alongside timely PSF buffer releases. These developments likely eased demand pressure in Delhi, while it appears that structural rigidities and concentration effects in *Lasalgaon* kept producer-market prices relatively elevated[6]. The overall effect points to improved price moderation and spatial market efficiency at the consumption end, even as production-hub markets exhibited sustained firmness.

6 The reversed price spread suggests improved supply diversification and consumption-market efficiency under structured PSF operations, though localised market behaviour in production hubs may also have influenced the observed anomaly.

B. Ways to measure how PSF reforms helped farmers

This section examines how PSF reforms have affected farmers through indicators that capture income realisation, participation, and geographic outreach. The farmer-focused indicators assess whether structured procurement ensured remunerative prices, expanded the number of participating producers, and strengthened income stability. Together, these six indicators (*Table 3*) trace the pathway from price support to income effects, using data from DOCA, UPAg, Agmarknet, NHB, DA&FW and Agriculture Census sources. Comparisons are drawn between the formative phase (FY 2015-16 to 2019-20) and the structured phase (FY 2020-21 to 2024-25), with Maharashtra as the principal procurement state and supplementary reference to Madhya Pradesh and Gujarat.

Table 3: List of 6 indicators to assess farmer-level impact of PSF reforms

S. No.	Indicator	Analytical focus	Impact chain layer
6	Farmer's share in the consumer rupee	Ratio of average *mandi* price (proxy farmer price) to retail price	Impact
7	Price realisation (MAPP vs. *mandi* prices)	Comparison of PSF procurement price with prevailing *mandi* price in procurement months	Outcome → Impact
8	Remunerative price support (rate of price recovery)	Month-on-month *mandi* price improvement during April to July in target state(s)	Outcome
9	Impact on targeted states' *mandi* price (counterfactual analysis)	Actual *mandi* prices vs. BAU counterfactual in April to July for MH/MP/GJ	Impact
10	Diversification to new producing states	Acreage/production growth outside Maharashtra	Enabling → Outcome
11	Farmers benefitted (directly & indirectly)	Estimated counts of direct PSF sellers and indirect beneficiaries via *mandi* effects	Outcome → Impact

(Table 3 continues from table 2 above)

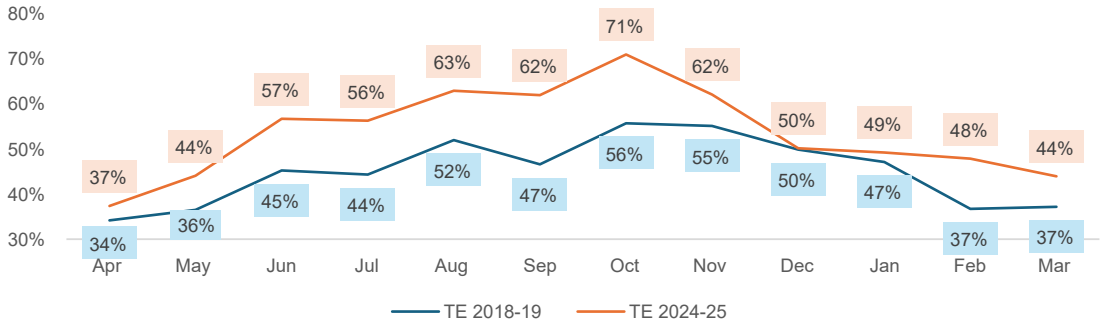
6. Farmer's share in the consumer rupee

This indicator assesses whether PSF operations improved the proportion of retail value accruing to farmers. It is calculated as the ratio of the average *mandi* price (proxy for the price received by farmers) to the average retail price (price paid by consumers). A higher ratio indicates a greater share of consumer spending reaching the producer. The annual average ratio was estimated by averaging the 12-month ratio values.

Two time periods were compared:

- Formative phase (TE 2018-19): baseline before structured PSF reforms; and
- Structured phase (TE 2024-25): after introduction of MAPP pricing and expanded procurement

Figure 10: Farmer's share in the consumer rupee: Maharashtra



Source: UPAg

The farmer's share in the consumer rupee in Maharashtra rose from 45% (TE 2018-19) to 54% (TE 2024-25).

The rise in the farmer's share indicates that a greater portion of consumer spending is reaching farmers during the structured phase. This improvement coincides with the operationalisation of MAPP-based procurement, expanded buffer stock purchases, and timely payments that provided farmers with a more stable price floor. While the trend aligns with PSF's objective of enhancing producer welfare, the increase may also reflect broader improvements in *mandi* price transmission and marketing efficiencies.

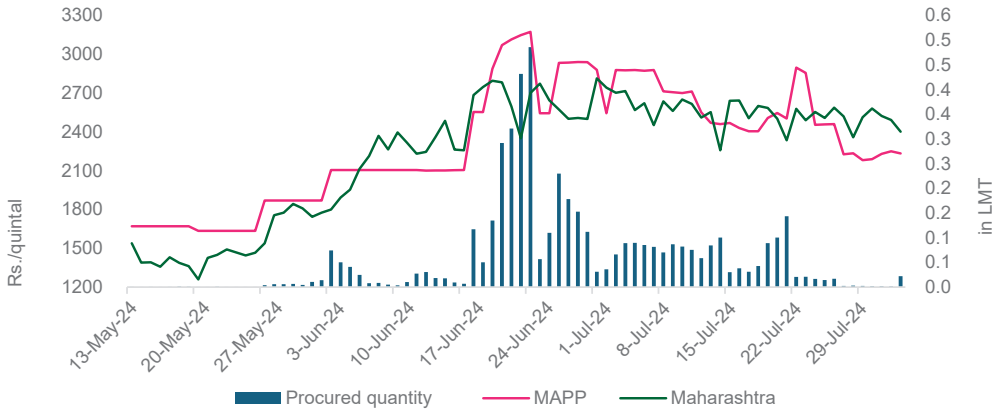
> ***"Farmers benefited from assured procurement, faster payments and better returns. Their income stability improved significantly post PSF reforms."***

7. Price realisation (MAPP vs. *mandi* prices)

Evaluates whether PSF procurement using the Maximum Allowable Procurement Price (MAPP) ensured better price realisation for farmers relative to concurrent open-market *mandi* prices during the procurement window (May-July). This indicator reflects the direct producer-level benefit of participating in PSF operations.

The analysis is based solely on Maharashtra[7], which accounts for about 90% of total PSF onion procurement and is the only state with consistent data on both MAPP and *mandi* prices. Two marketing years within the structured phase are compared FY 2024-25 and FY 2025-26 to assess annual variation in realised price differentials.

Figure 11: MAPP, *mandi* price (Rs. per quintal), and procurement (in LMT): 2024-25

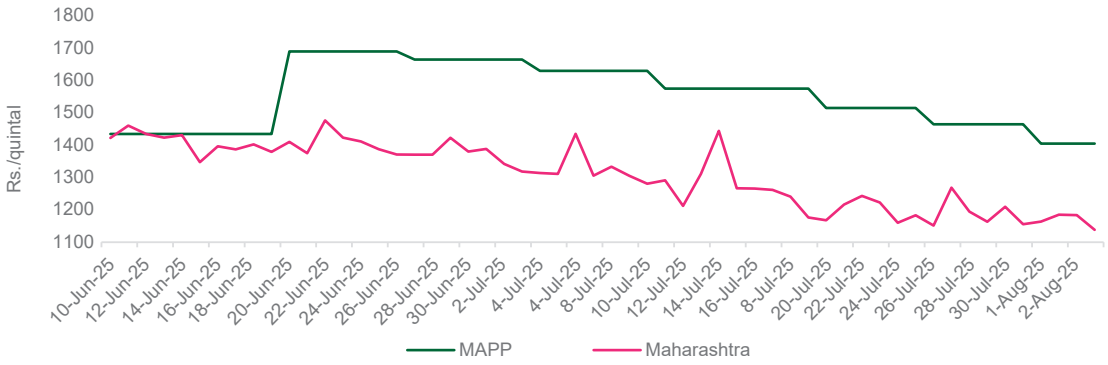


Source: DOCA | UPAg

1. In FY 2024-25, the MAPP was Rs.2,307 per quintal, while the average *mandi* price was Rs. 2,241 per quintal, indicating a premium of about 3%; and

2. In FY 2025-26, the MAPP was Rs. 1,552 per quintal and the corresponding *mandi* price was Rs.1,309 per quintal, implying a premium of about 19%.

Figure 12: MAPP and 2025-26 Maharashtra onion state average price *(Rs. per quintal)*



Source: DOCA | UPAg

7 This analysis is based on data collected from Maharashtra for the year 2024-25. MAPP data for Madhya Pradesh and Gujarat were not available during the study period; hence, these states were excluded from the present analysis.

In Maharashtra, farmers selling under PSF procurement received modest but consistent price premiums[8] over prevailing *mandi* averages, indicating that the MAPP mechanism provided a measurable cushion during the glut months. The size of the premium varied across years, reflecting both market conditions and procurement timing. These findings align with PSF's design objective of offering a remunerative floor while stabilising producer expectations in periods of oversupply

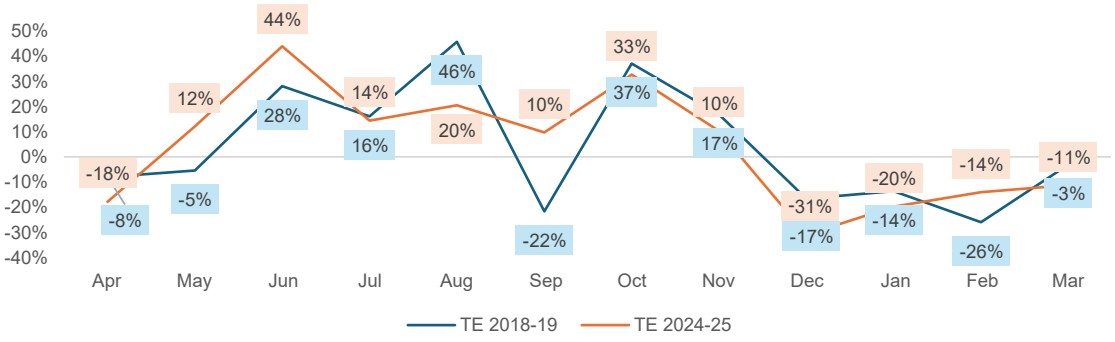
8. Remunerative price support (rate of *mandi* price recovery)

Other than the direct PSF onion beneficiary farmer, we assess that the PSF operations have been able to provide a higher floor price for the overall market too, the benefit of which accrues to even the non-PSF beneficiary farmers in the *mandi*. We assess this via the indicator that measures *mandi* price recovery during the procurement season.

It is calculated as the average month-on-month percentage change in *mandi* modal prices in Maharashtra during April-July for two set of years: TE 2018-19 (formative phase) and TE 2024-25 (structured phase).

- In the formative period (TE FY 2018-19), average *mandi* price recovery was 8%.
- In the structured phase (TE FY 2024-25), it improved to 13%.

Figure 13: Month-on-month Maharashtra *mandi* price change: TE 2024-25 vs. TE 2018-19



Source: UPAg

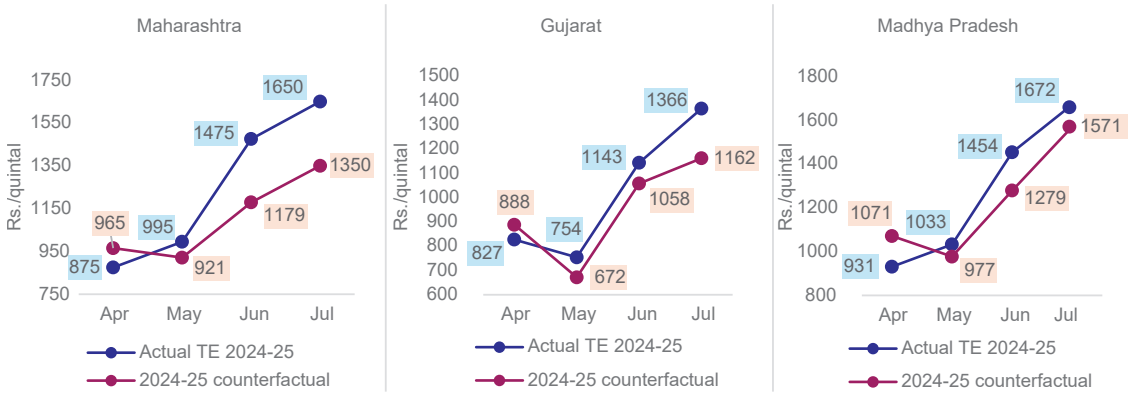
This indicates stronger price momentum in procurement months after PSF reforms.

8 Profitability has been calculated by assessing the improvement in MAPP during the procurement period (June-August) in 2024-25 compared to the Maharashtra mandi modal average price. The price improvement was divided by total market arrivals during the procurement window to estimate total profitability.

9. Impact on targeted states' *mandi* price (counterfactual analysis)

This indicator compares actual *mandi* prices between April to July in TE 2024-25 during procurement period with a business-as-usual (BAU) counterfactual price (projected using TE 2018-19 trends). This was calculated for all the three procuring states: Maharashtra, Madhya Pradesh and Gujarat for the three procurement months of April to July.

Figure 14: Actual vs. counterfactual onion monthly *mandi* modal price: 2024-25



Source: UPAg

In comparison to the estimated counterfactual prices, the actual prices were

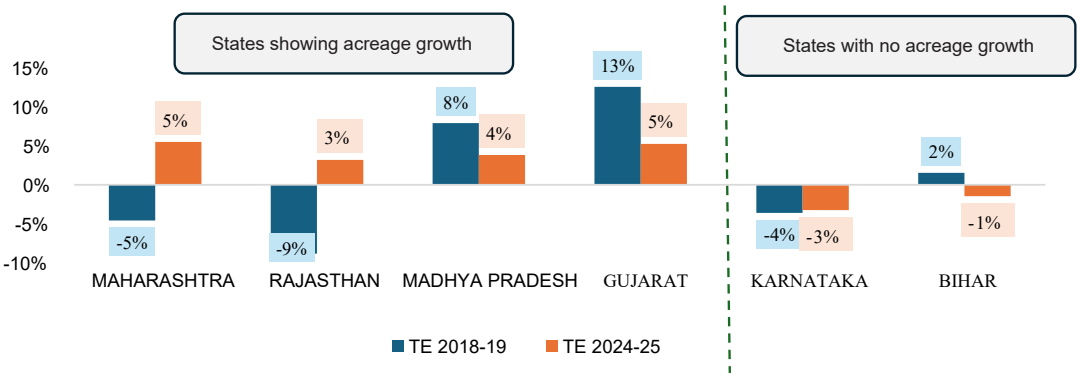
- higher by about Rs. 145 per quintal, i.e., about 13% higher, in Maharashtra,
- higher by about Rs.78 per quintal, i.e., about 4% higher, in Madhya Pradesh, and
- higher by about Rs.48 per quintal, i.e., about 8% higher, in Gujarat.

This trend indicates a clear *mandi* price effect of the onion PSF operations, that is, procurement activities were able to lift and stabilise *mandi* prices across the targeted states during peak arrivals. This suggests that the PSF intervention played an instrumental role in improving market prices when they would otherwise have been seasonally depressed.

10. Diversification to new producing states

This indicator examines the role of production shifts across key onion-growing states in stabilising supply chains and influencing market outcomes. It focuses on how acreage growth in states beyond the traditional production hub of Maharashtra contributes to a more distributed and resilient flow of onions into major consumption centres such as Delhi.

Figure 15: Onion state-wise acreage annual growth rate: TE 2024-25 vs. TE 2018-19



Source: NHB

The analysis shows that Rajasthan moved from a negative acreage growth of 9% in TE 2018-19 to a positive 3% in TE 2024-25.

While Maharashtra continues to dominate production, the steady rise in Rajasthan's acreage has expanded the production base and reduced the pressure on arrivals in consumption centres like Delhi. In 2024-25, stronger arrivals from Rajasthan, supplemented by flows from Madhya Pradesh and Gujarat, could have been a reason that retail prices in *Azadpur* remained consistently below those in *Lasalgaon* through most of the marketing year, as shown in *Figure 9.*

11. Farmers benefitted: directly and indirectly

This indicator measures the outreach of PSF operations to farming households. Beneficiaries are classified into two categories:

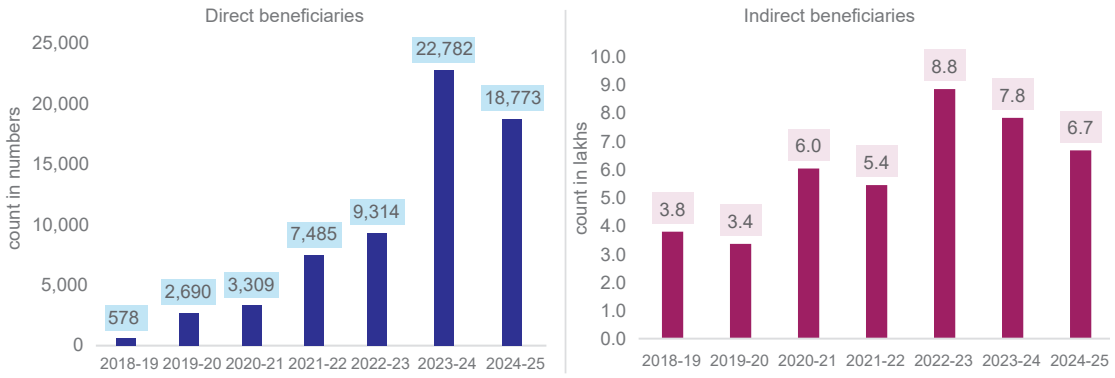
i. Direct beneficiary farmers are those who sold onions under PSF procurement. The number of farmers is estimated by using procurement quantity, average onion yield levels and average land holding size.

ii. Indirectly benefitted farmers are those who did not sell to PSF but experienced supportive price effects in *mandis* within participating districts. This number too is calculated using average landholding size and onion area in the state.

Beneficiary estimates were derived using procurement quantities reported by DOCA and implementing agencies, combined with average yield and landholding data from

the Agriculture Census and NHB. The analysis compares the formative phase (2018-19) with the structured phase (2024-25), when procurement volumes and participating states expanded beyond Maharashtra to include Madhya Pradesh, and Gujarat.

Figure 16: Onion farmers who benefitted directly and indirectly under PSF operation



Source: Agriculture Census | NHB | DOCA

The analysis shows that:

- Direct beneficiaries (those selling to PSF) rose from 578 in 2018-19 to 18,773 in 2024-25 (peaking at 22,782 in 2023-24).
- Indirect beneficiaries (those gaining from *mandi* price effects as shown *in Figure 14*) rose from 3.8 lakh in 2018-19 to 6.7 lakh in 2024-25 (peaking at 7.8 lakh in 2023-24).

The expansion in the number of both direct and indirect beneficiaries corresponds with a wider geographical spread of PSF procurement and the inclusion of additional implementing agencies (NCCF alongside NAFED). The data suggest that PSF reforms broadened programme reach and enabled more farmers to access price support either through direct procurement or improved *mandi* price conditions.

Overall, the farmer-focused indicators demonstrate that PSF procurement provided producers with more stable and remunerative returns. Farmers benefited from assured procurement prices above *mandi* levels, an increased share in the consumer rupee and improved price recovery during procurement months. The direct outreach expanded more than 30-fold, while indirect beneficiaries also increased due to higher *mandi* prices in procuring states. Faster payment cycles further supported farmer participation. Taken together, these results indicate that PSF reforms helped strengthen farmer income security and widened the operation's coverage across onion-growing regions.

C. Ways to measure efficiency of the value-chain of procured onions

This section evaluates how PSF reforms enhanced the efficiency of onion buffer operations through indicators on storage, logistics, procurement, and disposal systems. Data were collected through field visits and interviews with IAs, DOCA officials, farmers, and traders, along with analysis of SOPs and datasets from UPAg, NHB, and Agmarknet. Together, these eight indicators (*Table 4*) reflect improvements in overall onion buffer stock operations, focusing on enhanced co-ordination, better tracking and increased operational efficiency that led to stabilising the supply chain and the provision of timely support to consumers.

Table 4: List of 8 indicators to assess value-chain efficiency of PSF reforms

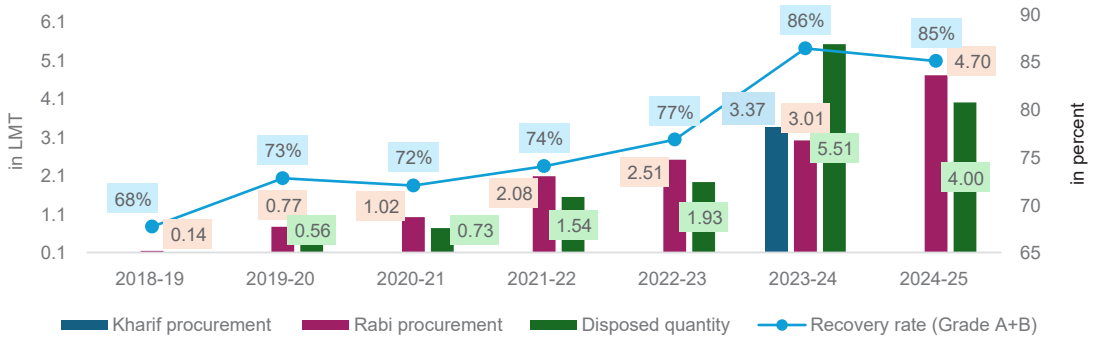
S. No.	Indicator Name	Analytical Focus	Impact Chain Layer
12	Storage efficiency (recovery rate of stored onions)	Percentage of onions successfully disposed (sold) out of the total procured quantity	Outcome → Impact
13	Procurement reach (geographical expansion)	Tracks the inclusion of newer procurement states	Enabling → Outcome
14	Increase in procurement volume	Measures the growth in procurement quantity as a share of total onion production	Outcome
15	Market share of procured onions in mandi arrivals	Measures PSF's onion procurement shares during peak arrival months	Outcome
16	Market access (diversification of disposal channels)	Evaluates diversification of disposal outlets (*Safal, Kendriya Bhandar,* NCCF, mobile vans, ONDC, etc.)	Enabling → Impact
17	Logistic efficiency via railway route	Measures reduction in delivery time from adoption of railway logistics	Enabling
18	Cost efficiency via railway route	Measures reduction in transportation costs from adoption of railway logistics	Enabling
19	Timely payment for farmers	Tracks reduction in time taken for farmers to receive payment post-procurement	Enabling → Outcome

(Table 4 continues from table 2 and 3 above)

12. Storage efficiency (recovery rate of stored onions)

Recovery rate is defined as the percentage of onions successfully disposed (sold) out of the total quantity stored. For onions under PSF (*Figure 17*), the recovery rate was 68% in FY 2018-19; in FY 2024-25, the recovery rate improved to 85%.

Figure 17: Recovery rate of onion buffer stocks: FY 2020-21 vs. FY 2024-25



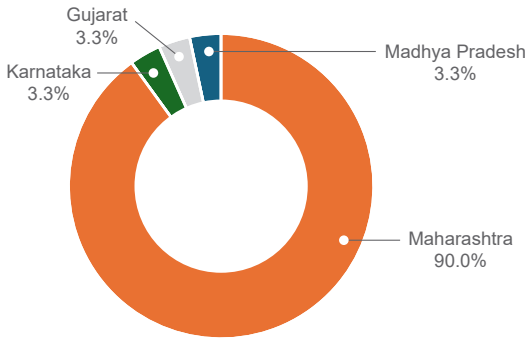
Source: SOPs | DOCA

The 17-percentage point improvement reflects reductions in storage losses with the adoption of better storage protocols and monitoring systems.

13. Procurement reach (geographical expansion)

According to the 2025-26 SOPs, procurement targets have been increased, allowing Gujarat, Madhya Pradesh, and Karnataka to each contribute 3.3% to total procurement, and Maharashtra to contribute around 90% (*Figure 18).*

Figure 18: State-wise share of procurement target: 2025-26



Source: 2025-26 SOP | DOCA

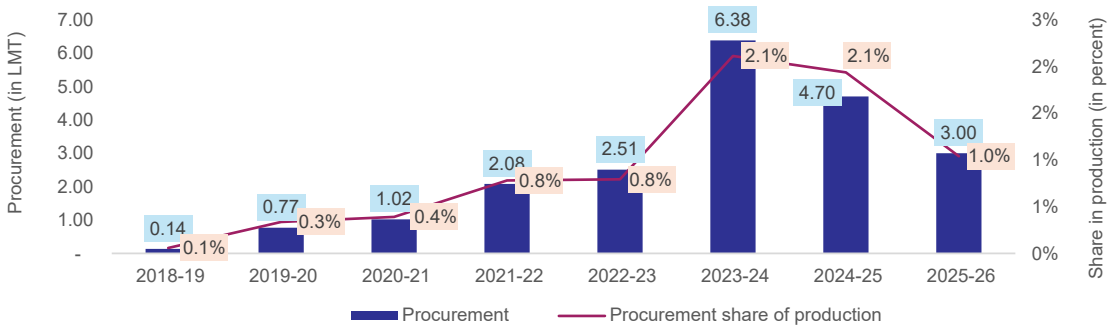
Although Maharashtra still dominates, the additional volumes from other states have increased buffer stock capacity and strengthened the government's ability to intervene strategically in the market during price surges.

> ***"Every reduction in storage loss and transport time under PSF strengthens efficiency in the onion value-chain, benefiting both farmers and consumers."***

14. Increase in procurement volume

This indicator measures the increase in procurement volume over the years as a proportion of onion production. Procurement increased steeply from 0.14 LMT in 2018-19 to 3 LMT in 2025-26. The rise was even sharper when we look at the data for the years 2023-24 and 2024-25, when procurement touched the levels of 6.38 LMT and 4.70 LMT respectively (*Figure 19*)

Figure 19: Onion production and PSF procurement share: 2018-19 to 2025-26



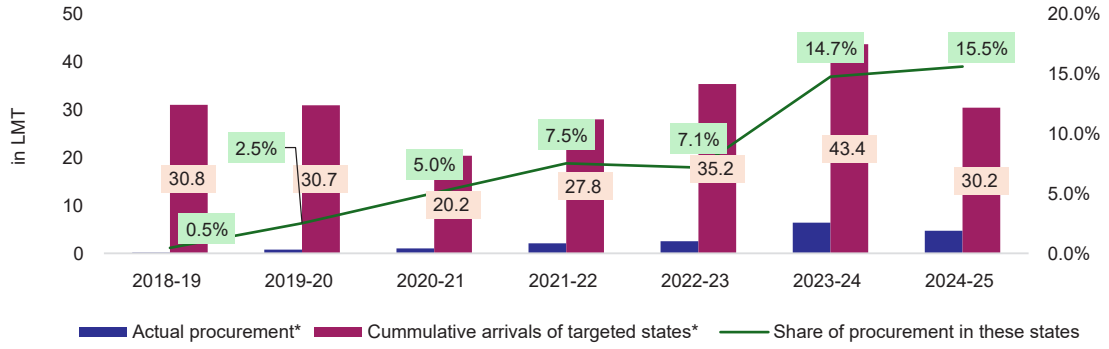
Source: SOPs | DOCA | NHB

This growth is the result of structural reforms including the inclusion of NCCF, better storage protocols and digitised monitoring systems that increased transparency and improved operational efficiency (2024 Year-End- Review for Department of Consumer Affairs, n.d.-b).

15. Market share of procured onions in *mandi* arrivals

This indicator compares PSF procurement with total *mandi* arrivals in key states. It has been estimated using data on *mandi* arrivals and procurement in the three states of Maharashtra, Madhya Pradesh and Gujarat during the peak arrival period (April-July) across FY 2020-21 to FY 2024-25 *(Figure 20)*.

Figure 20: Growth in PSF onion procurement as a proportion of *mandi* arrivals



*Source: DOCA | UPAg | *It comprise Maharashtra, Gujarat, and Madhya Pradesh, which account for the major arrival shares during the procurement period (April to July).*

The proportion of procurement in total *mandi* arrivals rose steadily from 0.5% in 2018-19 to 16% in 2024-25 respectively. PSF's market presence expanded nearly thirty times during procurement months.

16. Market Access (Disposal Channels)

This indicator tracks diversification of disposal mechanisms.

- There was no fixed retail sale before 2019.
- By 2025-26, 30% of disposal was routed through retail outlets.

Disposal expanded across outlets such as Mother Dairy (*Safal*), *Kendriya Bhandar*, NAFED/ NCCF stores, state distribution, mobile vans and digital platforms (ONDC, BigBasket).

17. Logistics Efficiency (Rail vs. Road)

This indicator evaluates the efficiency gains from shifting onion transport under PSF from trucks to rail, focusing on two dimensions: time taken for long distance deliveries (timeliness) and per quintal transportation costs (cost efficiency). The Nashik-Guwahati route (about 2400 km) was used as a representative case for analysis. Estimates for the indicator are based on interactions with stakeholders, including freight forwarders, *mandi* traders, IAs and FPOs. The analysis of two indicators is as follows:

i. Timeliness

a. In 2023-24, truck-based deliveries from Nashik to Guwahati required five to six days.

b. In 2025-26, rail transport reduced the delivery time to two to three days, a 50-60% improvement.

ii. Cost efficiency (Transportation costs)

This indicator evaluates the cost of delivering onions from procurement centres to distant consumption centres. The aim is to assess the cost of delivering onions during the disposal period on longer routes of more than 500 km.

For Nashik to Guwahati (2,400 km) July 2025:

- Truck: Rs. 2212- 2236 per quintal.
- Rail: Rs. 1840- 1866 per quintal.

This represents a 17% reduction in costs and a 10% reduction in onion losses. Longer routes such as Nashik to Guwahati are more efficient by rail, where losses are around 10% over 2 to 3 days, compared to about 20% over 5 to 6 days by truck. The cost advantage comes primarily from lower long-haul freight charges, while mandi-level expenses (labour, cess, commission, packaging) remain the same across both modes. (details in Annexure 6, Table 10). However, these gains were less pronounced on shorter routes, where road transport remains comparatively efficient due to higher transportation loss in routes like Nashik to Delhi compared to longer routes like Nashik to Guwahati.

Overall, the introduction of rail logistics under PSF reduced delivery times by half and cut transportation costs by about one-sixth. The benefits were particularly significant on longer routes: such as Nashik, Maharashtra to Guwahati, Assam, where rail movement lowered per-kilometre costs and improved delivery time. Hence, rail logistics also enabled bulk disposal to multiple consumption centres across India, strengthening supply chain efficiency and reducing the risk of shortages during high-price months.

18. Timely payment for farmers

This indicator measures the time taken for farmers to receive payments after selling under PSF procurement. Based on stakeholder feedback, delays of 7-10 days were common in earlier years.

In 2024-25, the introduction of the Supply Valid digital system required daily uploading of receipts (farmer name, procured quantity, transaction details). Once verified, payments were automatically released by IAs within T+3 working days. Based on discussions with farmers and FPOs, average days taken to receive payment by farmers were as follows:

- In 2023-24: average of 10 days,
- In 2025-26: average of three days.

This represents a 57-70% reduction in payment delays, improving liquidity for participating farmers.

The value-chain reforms under PSF have improved operational effectiveness across procurement, storage, logistics and payments. Storage recovery rates increased from 72-85%, procurement volumes expanded six-fold since 2018-19 and the market share of PSF procurement in *mandi* arrivals tripled by 2024-25. The introduction of multi-channel disposal (e-commerce, mobile vans and state distribution) and the shift to rail logistics added scale, speed and cost savings, while digital monitoring platforms reduced payment delays and enhanced accountability.

Together, these measures strengthened the reliability and responsiveness of onion buffer operations, ensuring that procurement, transport and disposal were executed in a more timely, efficient and geographically extensive manner.

Summary of the results on 19 indicators

All these indicators have been summarised in *Table 5 below.*

Table 5: Summary of results across 19 indicators

S. No.	Theme	Indicator	Detail	Period I	Period II	Observation	Data taken from
Indicators to measure how PSF reforms help consumers							
1	Retail price	Onion retail price stabilisation	Coefficient of variation (CV)	0.29 (2019-20)	0.22 (2024-25)	Reduced volatility in Delhi retail prices	UPAg
2		Onion retail price moderation (counterfactual analysis)	What if: 2024-25 (August-November) Delhi actual retail prices compared with counterfactual	Rs. 47/kg (counterfactual price)	Rs. 44/kg (actual price)	Beneficiary consumers in Delhi saved more money due to PSF's onion operation	UPAg
3		Consumer affordability	Disposal price set by DOCA compared with actual Delhi retail price for 2023-24 and 2024-24	2023-24: Rs.45/kg 2024-25: Rs. 54/kg (prevailing Delhi retail price)	2023-24: Rs. 25/kg 2024-25: Rs. 35/kg (DOCA's disposal price)	Prices paid by PSF beneficiaries lower in Delhi; improved affordability	UPAg| DOCA
4	Retail price cycle	Retail price cycle (months between price spikes)	Number of months between two consecutive spikes	12 months (FY 2015-19)	24 months (FY 2020-25)	Cycle elongation: a sign of markets stabilising; producers and consumers get more time to adjust decisions (planting, stocking, investment) before the next price swing	UPAg
5	Production and consumer price gap	Consumption-production centre price spread	*Azadpur* and *Lasalgaon mandi* price difference	*Lasalgaon*: Rs. 38.5/kg (2024-25)	*Azadpur:* Rs. 32.4/kg (2024-25)	*Azadpur mandi* price was consistently lower between September to December than *Lasalgaon mandi* price	Agmarknet

S. No.	Theme	Indicator	Detail	Period I	Period II	Observation	Data taken from
Indicators to measure how PSF reforms help farmers							
6	Farmer returns	Farmer's share in consumer rupee	Calculated by comparing state *mandi* average prices (as proxy for farmer's price) with state retail average prices (as proxy for consumer's price).	Maharashtra: 45% (TE 2018-19)	Maharashtra: 54% (TE 2024-25)	Improvement in farmer's share in consumer rupee.	UPAg
7		Price realisation (MAPP versus *mandi* price)	Difference between MAPP and ruling *mandi* prices during procurement period (May to July) in 2024-25 and 2025-26	2024-25: Rs.22/kg 2025-26: Rs.13/kg (prevailing *mandi* price)	2024-25: Rs.23/kg 2025-26: Rs.16/kg (MAPP given by DOCA)	Higher MAPP provided better prices to farmers in Maharashtra	UPAg| DOCA
8		Remunerative price support (rate of *mandi* price recovery)	Comparison of TE 2018-19 *mandi* price month on month rate of change to TE 2024-25; averaged April-July	8% (TE 2018-19)	13% (TE 2024-25)	Price recovery gets better in Maharashtra during procurement post reforms.	UPAg
9		Impact on targeted procured states' *mandi* price (counterfactual analysis)	What if: 2024-25 (April-July) prevailing *mandi* modal price compared with counterfactual	Maharashtra: Rs. 11/kg, MP: Rs. 12/kg, Gujarat: Rs. 9/kg (Counterfactual)	Maharashtra: Rs.12/kg, MP: Rs. 13/kg, Gujarat: Rs. 10/kg (Actual)	Beneficiary farmers profited more due to onion PSF operation during procurement months	UPAg
10		Diversification of new producing states	Comparison of TE 2024-25 and TE 2018-19 state wise acreage annual growth rate	Rajasthan: -9% (TE 2018-19)	Rajasthan: 3% (TE 2023-24)	Rajasthan annual growth rate of acreage has increased over the years	NHB
11	Reach of farmers	Farmers benefitted (directly and indirectly)	Beneficiaries estimated using average landholding and onion production data	Directly: 578 farmers Indirectly: 3.8 lakhs farmers (2018-19)	Directly: 18,773 farmers Indirectly: 6.7 lakhs farmers (2024-25)	Better PSF implementation led to wider direct and indirect farmer reach	Agencies| NHB| DOCA

S. No.	Theme	Indicator	Detail	Period I	Period II	Observation	Data taken from
Indicators to measure efficiency of onion value-chain							
12	Storage efficiency	Recovery rate of stored onions	Comparison of change in recovery rate; pre and post reform (2024-25 vs. 2018-19)	68% (2018-19)	85% (2024-25)	Better storage methods led to a 13% increase in recovery rate.	DOCA
13	Procurement reach	Geographical expansion	Increase in number of states in which onion was procured from 2018-19 to 2024-25	1 state (2018-19)	4 states (2024-25)	Onion can be procured from a larger number of states	SOPs| Stakeholder
14	Procurement scale	Increase in procurement volume	Increase in volume of onion procurement under PSF from 2018-19 to 2024-25	0.14 LMT (2018-19)	4.7 LMT (2024-25)	Increase in onion procurement quantity	SOPs| Stakeholder
15	Market share	Procurement as proportion of *mandi* arrivals	Comparison of 2024-25 share of PSF procurement in total *mandi* arrivals to 2018-19	0.5% (2018-19)	16% (2024-25)	Target procurement shares increased in total *mandi* arrivals in targeted states	SOPs| UPAg
16	Market access	Disposal channels	Share of disposal via retail and e-commerce since 2018-19	No fixed retail sale	30% (2025-26)	Expanded to mobile vans and e-commerce platforms	SOPs| Stakeholder
17	Logistical efficiency	Timeliness (Rail vs. Road)	Time taken for transporting onion from Nashik to Guwahati in 2025-26 after inclusion of rail transport	6 days (2023-24)	3 days (2025-26)	Reduced shortage risk by ensuring quicker delivery to consumption centres	Stakeholder
18	Cost efficiency	Transportation costs (Rail vs. Road)	Comparison of cost of onion transportation through rail and trucks in 2025-26	Rs. 2212-2236/quintal (Truck; 2025-26)	Rs. 1840-1866/quintal (Rail; 2025-26)	Rail movement on long routes proved cheaper than road	Stakeholder
19	Payment efficiency	Timely payment for farmers	Days taken to clear payments after procurement; 2025-26 vs. 2023-24	~10 days (in 2023-24)	3 days (in 2025-26)	Farmers get payment quicker due to onion PSF reforms	Stakeholder| SOPs| EOIs

Even though onions procured under PSF constitute only about 1% of total Indian onion production and the disposed quantities represent less than 2% of total annual consumption[9], its influence on market behaviour and price formation appears disproportionately large. Based on deductions through the study, it appears that this apparent paradox-small volumes yet broad impact-stems from the strategic timing of interventions, the credibility of government signalling, and the structured, multi-agency design of PSF operations. Even at this limited scale, a disciplined, digitally-monitored PSF operation mechanism has exerted a stabilising effect on onion market. It has moderated retail price volatility, strengthened farmer price realisation, and improved overall supply-chain efficiency.

9 Consumption data up to 2021-22 were sourced from FAOSTAT. For the period 2022-23 to 2024-25, consumption was extrapolated by applying the average consumption-to-production ratio of TE 2021-22 (production data from FAOSTAT and NHB were same).

OVERALL INSIGHTS

The evidence from the 19-indicator framework reveals that the Price Stabilisation Fund's onion operations now function less as an ad-hoc procurement scheme and more as a calibrated market-stabilisation system. Reforms have delivered a rare balance: retail price moderation for consumers, assured remuneration and liquidity for farmers, and measurable efficiency gains across the logistics chain. These improvements, though emerging from operations covering barely 1% of national output, have had economy-wide resonance. The insights below distil what the data collectively suggest about PSF's evolving role, institutional strengths, and the policy levers that can further amplify its impact.

1. **Strategic leverage over scale**: Although PSF handles barely 1 % of national production, its timing and credibility effects exert system-level influence. The operation's market signalling- not its size- flattens price spikes and guides trader expectations.

2. **Market discipline through codified processes**: Reforms such as MAPP pricing, T+3 payments, and digital monitoring (Supply Valid) have converted PSF from a reactive

subsidy instrument into a rules-based stabiliser. The quantifiable drop in volatility mirrors this institutional discipline.

3. **Farmer empowerment by liquidity, not subsidy**: The shift from delayed payments to near-real-time settlement has likely had as much impact as the price premium itself. Liquidity stability now acts as an informal risk-buffer for smallholders.

4. **Macro effect:** The research under onion PSF operations points to two distinct multiplier effects possibly occurring across the onion ecosystem due to the PSF operations. First, procurement certainty and standardised operational guidelines induced complementary investments in storage, logistics, and handling infrastructure are assessed to create a value-chain investment multiplier. Secondly, improved price stability and assured off take encouraged farmers in non-traditional regions to expand onion cultivation, has created a production multiplier resulting in measurable supply-side gains. Together, these systemic effects extend the impact of PSF operations well beyond the volumes procured.

5. **Regional diffusion of production incentives**: Rajasthan's acreage turnaround and MP/Gujarat's procurement participation show that price signals and assured markets are diffusing spatially, reducing over-reliance on Maharashtra and enhancing national supply resilience.

6. **Systemic efficiency via logistics reform**: Rail integration and storage-loss reduction have delivered measurable cost and time efficiencies, proving that even a public price-stabilisation fund can embed logistics-sector productivity gains.

7. **Dual welfare gains with minimal fiscal cost**: The same intervention simultaneously produced consumer price moderation and farmer income stability, demonstrating a rare alignment of welfare objectives; an efficiency few commodity-buffer programmes achieve.

8. **Transparency as an operational asset**: Digital traceability (Supply Valid, geo-tagging, CCTV, *e-mahabhumi* linkage) has reduced information asymmetry, institutionalised accountability and enabling evidence-based course correction.

The analysis points to a PSF system that has matured institutionally but now needs operational deepening and strategic clarity. While reforms have delivered measurable gains in price stability, farmer liquidity, and logistics efficiency, sustaining these gains will require translating the lessons of the structured phase into codified operational standards and forward-looking investments. The following policy recommendations outline priority actions to consolidate PSF's stabilisation role, strengthen its physical and digital infrastructure, and build predictable interfaces with market actors.

POLICY RECOMMENDATIONS

Building on the evidence from 19 indicators, these recommendations propose how PSF can consolidate its stabilising role, deepen market confidence, and ensure sustained benefits for both producers and consumers.

1. **Reinforce PSF's role as a market stabiliser, not a perpetual operator**: PSF onion operations should function as a market-stabilising instrument which are activated to correct volatility, rather than as a continuous procurement mechanism. Once stability is achieved, private market forces and supply-chain actors should progressively sustain price predictability and transparency.

2. **Enhance predictability of government operations**: Publishing an annual PSF Onion Calendar with advance announcements of procurement, storage, and disposal windows would allow farmers, traders, and logistics operators to align decisions with government interventions, reducing uncertainty and speculative trading.

3. **Institutionalise predictability levers**: Operational levers such as the MAPP revision schedule, buffer size, release triggers, and disposal timelines, should be codified within Supply Valid as digital rule sets. This would make PSF actions data-driven and predictable for all market participants.

4. **Diversify disposal channels toward semi-urban and peri-urban markets**: Expanding PSF's disposal network beyond metros into semi-urban and peri-urban regions can improve accessibility while preventing local gluts. Partnerships with retail chains, cooperatives, e-commerce platforms (e.g., ONDC), institutional buyers, and municipal markets can help liquidate stocks efficiently, shorten turnaround time, and reduce fiscal outlay.

5. **Promote market-linked transition mechanisms**: Over time, PSF's stabilisation function can be co-shared with private entities through price-indexed procurement contracts, dynamic storage incentives, or strategic offtake partnerships, ensuring PSF remains a credible signal-setter without substituting for normal market behaviour.

6. **Strengthen storage infrastructure and technologies**: Long-term market stability depends on the availability of scientifically designed storage that reduces losses and preserves bulb quality.

   a. **Target storage losses to reduce to 10%:** Adopt scientifically designed ventilated or controlled-environment onion stores developed by ICAR- Directorate of Onion and Garlic Research (DOGR) and NHB that maintain moderate temperature and reasonable humidity levels, reducing storage losses from 30 to 40 % to below 10% (ICAR and NABARD);

   b. Create a National Onion Storage-Loss Knowledge Platform consolidating ICAR-DOGR, NHB, NAFED, and state data to guide investments and enable cross-state benchmarking;

   c. Promote rail-linked aggregation hubs and low-energy controlled-atmosphere storage for major producing belts.

7. **Improve logistics efficiency and market connectivity**: Logistics reforms are central to reducing turnaround time and cost from procurement to disposal.

   a. Expand rail-linked aggregation hubs for bulk movement from major producing regions such as Nashik and Solapur to consuming centres in the East and North.

b. Provide standardised rake schedules, freight rebates, and time-bound transit norms in coordination with Indian Railways.

c. Encourage multi-modal movement and real-time tracking integration with Supply Valid to reduce delays and improve accountability

8. **Digital integration and early-warning systems**: Operationalise a weather–price early-warning system for onions by integrating high-frequency rainfall and temperature data with *mandi* arrivals and retail price movements. This predictive model should trigger PSF procurement and release decisions automatically, reducing lag and enhancing responsiveness to climatic and supply shocks.

9. **Commission a periodic, independent monitoring, learning & evaluation (MLE) Audit**: Institute an annual independent MLE audit of PSF operations to assess performance against the 19-indicator framework. The audit should evaluate efficiency, cost-effectiveness, and welfare outcomes for both farmers and consumers, feeding directly into SOP revisions and inter-agency reviews. This will help DOCA institutionalise a learning cycle and maintain evidence-based accountability in PSF decision-making.

10. **Leverage multiplier effects to strengthen PSF planning and guide replication:**

    a. Integrate investment and production multiplier monitoring into PSF planning: The analyses indicates that PSF operations appeared to trigger two systemic multiplier effects across the onion value-chain. The first is a value-chain investment multiplier, where procurement certainty and standardised operational guidelines have encouraged complementary investments in storage, logistics, and handling infrastructure. Embedding regular monitoring of this investment multiplier into PSF planning will enable PSF to assess how its procurement decisions catalyse broader ecosystem strengthening beyond the immediate operational outcomes.

    b. Use multiplier evidence to guide replication across other sensitive value-chains: The second is a production multiplier, driven by improved price stability and assured offtake. These conditions have encouraged farmers, especially in non-traditional regions to expand onion cultivation, resulting in measurable supply-side gains. Evidence from both investment and production multipliers can be used to identify value-chains with similar structural characteristics, guiding targeted replication of PSF interventions where systemic impacts are likely to be highest.

CONCLUSION

Overall, the PSF onion operation demonstrates that even a small, rules-based and digitally monitored intervention can yield system-wide market stability-turning micro-scale procurement into macro-level impact. Its design principles: timeliness, transparency, and triangulated governance, offer a blueprint for stabilising other perishable commodity markets in India. A key insight emerging from the analysis is that when PSF stabilises incentives, private sector stakeholders and farmers respond by expanding production, and improving investments in storage and logistics, allowing the effect to reach far beyond PSF's direct footprint. This is particularly important given that PSF onion operations directly handle barely 1 to 2% of India's annual onion production and consumption, yet the structured, rules-based model introduced by DOCA since 2020 has generated market-wide ripple effects that extend well beyond its operational scale.

This document sets out the operational changes, an indicator-based assessment of their effects, and a policy and implementation roadmap for the onion component of the PSF. The approach emphasises clear objectives, rules-based execution and measurable outcomes. If

carried forward with the monitoring and accounting improvements outlined above, PSF can continue to provide targeted consumer affordability while preserving producer incentives with results that are testable, comparable across seasons and transparent to stakeholders.

Limitations of the study

This assessment relies on administrative and market datasets that, while comprehensive for the recent period, can be strengthened. Three improvements may be planned: (a) integration of ward/market-level retail prices to sharpen micro-targeting of releases (b) lot-level cost ledgers linked to the digital transaction trail to complete economic-cost accounting and (c) a standard data dictionary for indicators (definitions, sources, frequency, quality checks). Each dataset will carry completeness and timeliness flags, with reconciliation protocols between IAs and DOCA.

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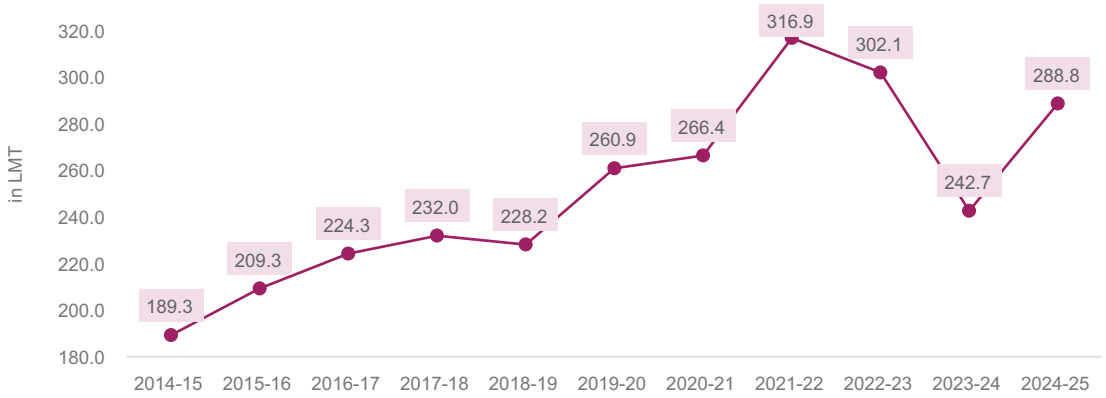
Table 6: List of other data sources

S. No.	Data source	Website/Link
1	DOCA	https://consumeraffairs.gov.in/
2	UPAg	https://upag.gov.in/
3	Agmarknet	https://www.agmarknet.gov.in/
4	NHB	https://www.nhb.gov.in/
5	DA & FW	https://agriwelfare.gov.in/en/StatHortEst
6	Agricensus	https://agcensus1.da.gov.in/statesummarytype.aspx

ANNEXURE 1: SEASONALITY OF ONION PRODUCTION AND PROCUREMENT PATTERNS

Onion production in India has recorded a CAGR of 4.3% over the past decade. Onion production has shown an upward trend increasing from the annual production of 189.3 LMT in 2014-15 (July to June)[10] to 288.8 LMT in the year 2024-25 (July-June).

Figure 21: Indian onion production trend in LMT

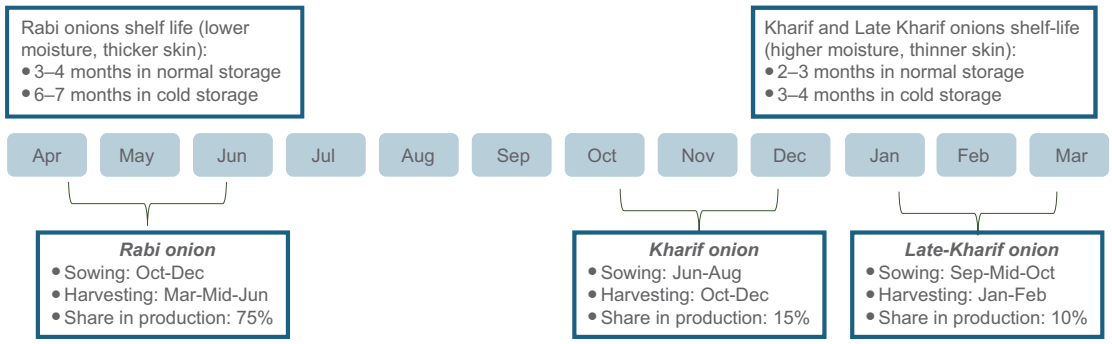


Source: NHB

The *rabi* season plays a crucial role in India's onion supply, contributing nearly 70% (PIB, July 5, 2024) of the country's total production, and is the reason why the DOCA procures during the *rabi* season. In comparison, the *kharif* and late *kharif* seasons account for around 18% and 12%, respectively. What makes *rabi* onions especially important is their longer shelf life, unlike the more perishable *kharif* varieties.

10 The National Horticulture Board (NHB) considers the period from July to June for onion production estimates as it aligns with the crop's agricultural cycle. Kharif sowing begins around June-July and harvesting continues through Rabi and late Kharif seasons up to May-June of the following year. Hence, the July-June period represents a complete production year covering all major onion growing seasons in India.

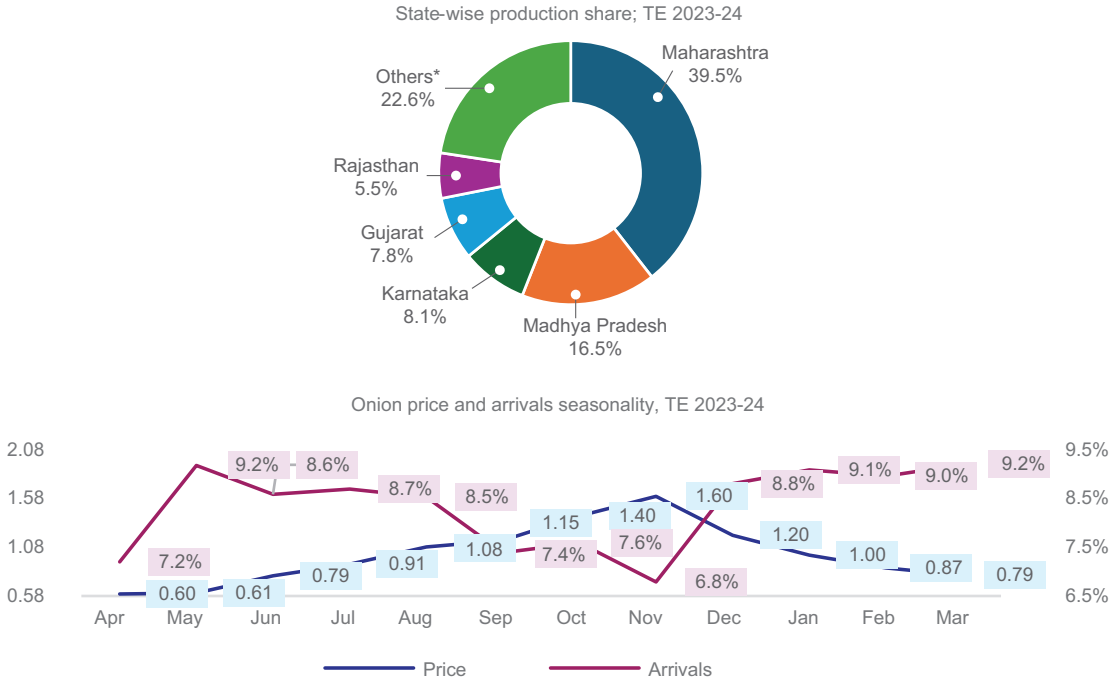
Figure 22: Onion crop calendar: *rabi, kharif* and *late kharif*



Source: PIB | UPAg | NHB

As per the TE 2023-24 final estimates of the National Horticulture Board (NHB), Maharashtra accounts for the largest share of onion production at around 40%, followed by Madhya Pradesh (17%), Karnataka (8%) and Gujarat (8%). This dominance explains why DOCA procures the bulk of its buffer stock from Maharashtra. Based on the TE 2024-25 estimates, onion prices follow a clear seasonal pattern: they are at their lowest between April and July, coinciding with the arrivals of the *rabi* crop, and rise to their highest between August and November, when arrivals decline. Recognising this seasonality, DOCA usually procures *rabi* onions during the peak harvest window (April-July) and releases them during the lean season (August-November), when retail prices are at their peak.

Figure 23: Onion production share (July-June) and all-India seasonal trends

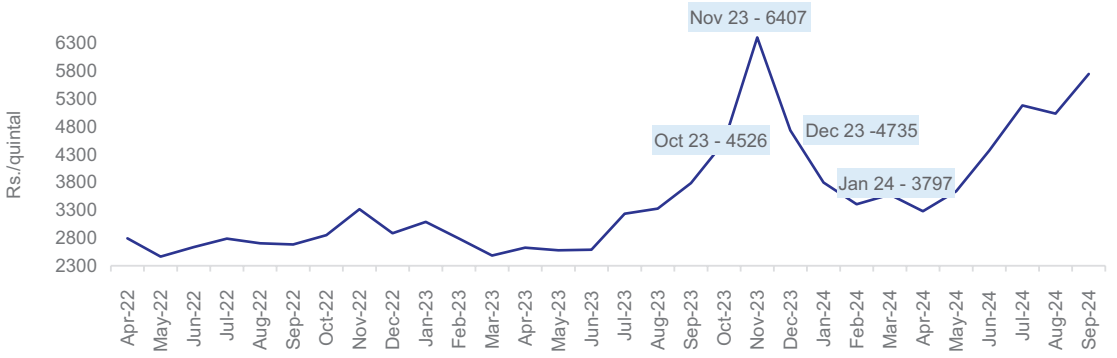


*Source: NHB | UPAg |*Note: Others include Bihar, UP, Andhra Pradesh, etc. | April to March season followed*

ANNEXURE 2: REASON FOR KHARIF PROCUREMENT IN 2023-24

As shown in *Figure 24*, to curb the inflationary pressure between August-November 2023 in 2023-24, the DOCA procured in the *kharif* season as well during the year, which led to stabilising the price from INR 6407 per quintal in November 2023 to INR 4,735 per quintal a month later, a decline of 26%.

Figure 24: Onion Delhi retail price trend (Rs. per quintal)



Source: UPAg

ANNEXURE 3: MANDATORY REQUIREMENTS FOR PARTICIPATING AGENCIES (2025-26)

Table *7* lists the mandatory requirements that participating agencies must submit along with their shared EOIs (as shared latest in EOI 2025-26). These details are verified by the IAs to ensure authenticity and compliance. The process has been designed to minimise the risk of fraud, for example, by validating storage capacity and confirming that participants are not blacklisted and to ensure that only genuine agencies are allowed to procure, thus, making the procurement process more transparent and efficient.

Table 7: List of requirements from participating agencies in 2025-26

S. No.	Particulars
1	Name of the Agency/Organisation
2	Head office address (Attach proof of address)
3	Name of the Chairperson and telephone number
4	Name of the Managing Director
5	Name and Contact details of the nodal person from organisation for the project
6	Office Phone number(s)
7	Fax
8	Email
9	Web
10	Registration Number (Attach Proof)
11	Year of Registration
12	Agency/Organisation Registered (Please mention)
13	PAN number (Attach Copy)
14	GST number (Attach Copy)
15	TAN number (Attach Copy)
16	*Mandi* Licence or other documents (Attach Copy), if applicable.
17	Declaration under Section 260AB (Format Attached)
18	Certificate of Working Capital and Positive Net Worth certified by CA (Attach Copy)

Source: EOI

ANNEXURE 4: BULK TRANSPORTATION VIA RAILWAY WAGONS

To establish national coverage, DOCA dispatched 14 rail rakes (11,798 tonnes) in 2024-25 to five major consumption centres, Delhi, Chennai, Kolkata, Lucknow, and Guwahati. Delhi received the largest share (5,607 tonnes), followed by Chennai (2,310 tonnes), Kolkata (1,640 tonnes), Lucknow (1,407 tonnes) and Guwahati (835 tonnes).

Table 8: Date and rake wise onion disposal for the first time through rails in 2024-25

S. No.	Destination	Date of disposal	Quantity in MT
1	Delhi	17-October-24	1,657
2	Delhi	09-November-24	726
3	Delhi	13- November -24	833
4	Delhi	16- November -24	787
5	Delhi	18- November -24	704
6	Delhi	26- November -24	901
	Delhi total		**5,607**
7	Chennai	22-October-24	779
8	Chennai	23- November -24	789
9	Chennai	09- December -24	742
	Chennai total		**2,310**
10	Guwahati	29- October -24	835
	Guwahati total		**835**
11	Lucknow	19- November -24	717
12	Lucknow	16-December-24	690
	Lucknow total		**1,407**
13	Kolkata	26- November -24	810
14	Kolkata	29- November -24	830
	Kolkata total		**1,640**
TOTAL	**14 (Rakes)**		11,798

Source: DOCA

ANNEXURE 5: PAN-INDIA DISPOSAL OF BUFFER ONIONS UNDER PSF (2023-24)

As per DOCA data for 2023-24, Bihar and Delhi emerged as the largest disposal centres, each accounting for 18% of total buffer onion disposal, followed by Uttar Pradesh (10%) and West Bengal (9%). The following data shows the pan-India availability of buffer onions under PSF. Under the PSF, the DOCA determines the quantity and location of disposal based on state-wise onion consumption patterns and prevailing price trends.

Table 9: State-wise onion disposal in 2023-24 (in MT)

S. No	States	Disposal in MT	Share in total disposal
1	Bihar	70,005	18%
2	Delhi	69,541	18%
3	Uttar Pradesh	37,477	10%
4	West Bengal	35,446	9%
5	Andhra Pradesh	24,848	6%
6	Tamil Nadu	23,357	6%
7	Punjab	21,144	5%
8	Telangana	18,170	5%
9	Karnataka	16,443	4%
10	Orissa	15,064	4%
11	Chandigarh	13,446	3%
12	Jharkhand	11,630	3%
13	Kerala	8,231	2%
14	Himachal Pradesh	7,903	2%
15	Assam	5,187	1%
16	Chhattisgarh	4,431	1%
17	Haryana	4,233	1%
18	Rajasthan	3,778	1%
19	Uttarakhand	1,948	0%
20	Gujarat	696	0%

Source: DOCA

ANNEXURE 6: MEASURING COST EFFICIENCY GAINS FROM RAIL TRANSPORTATION

Cost efficiency has been calculated for July 2025 by comparing per quintal costs via trucks and railways, based on stakeholder interviews (traders, FPOs, and co-operatives). The desired outcome is lower per quintal transportation cost, which implies improved supply chain and cost efficiency (*Table 10*).

Table 10: Transportation cost comparison: Nashik vs. Guwahati *(Rail vs. Truck)*

S. No.	Components*	Unit	Truck	Rail rake	Notes
A	**Costs at wholesale *mandi*-level (common for both modes of transportation)**				
1	Onion buying price	*Rs. per quintal*	1400*		
2	Leno bags	*Rs. per quintal*	22-26		
3	*Sutali* + stitching (including labour)	*Rs. per quintal*	10-Dec		
4	Labour cost for grading, sorting and weighing	*Rs. per quintal*	22-40		
5	*Hamali:* at *mandi* level	*Rs. per quintal*	10		
6	*Mandi* cess- 1%	*Rs. per quintal*	14		Fixed at 1%
7	Commission agent charge: 6%	*Rs. per quintal*	84		On an average- 6-8%
B	**Logistical cost (costs incurred once onions exit *mandi* yard)**				
1	Local transport: *Mandi* to rail loading point	*Rs. per quintal*		15-20	Including: loading, unloading and transportation costs
2	Nashik to Guwahati station	*Rs. per quintal*	650	250	Freight charges vary based on fuel and distance
3	Local transport: Guwahati station to *mandi godown*	*Rs. per quintal*		10	Including: loading, unloading and transportation costs
	Total cost	*Rs. per quintal*	**2212-2236**	**1840-1866**	

*Source: Stakeholders' interaction | *Onion buying price was taken as on 17th Jul, 2025*

ANNEXURE 7: DETAILS OF FIELD VISIT

Image 1 captures the first-time bulk movement of onions by railway wagons in 2024-25 under PSF. This innovation reduced transport costs and ensured faster delivery to distant consumption centres.

Image 1: Glimpses from bulk transportation through railway wagons in 2024-25

Source: DOCA

The visuals in image 2 and 3 show NAFED and NCCF retail outlets in Delhi (New *Motibagh* and Patel Chowk metro gate) and visits to *Azadpur mandi*. They provide insights into the retail interface of PSF and wholesale dynamics during seasonal peaks.

Image 2: Glimpses from visit to NAFED and NCCF retail outlets

Image 3: Glimpses from visit to *Azadpur mandi*

Photographs from the field highlight activities at NCCF, FPOs and NAFED co-operatives, including farmer interactions, quality checks by Supply Valid, storage in *chawls*, and *mandi* auctions. These pictures in image 4 demonstrate the on-ground processes that drive procurement, storage and trading.

Image 4: Glimpses from field visit to *Nashik* and *Lasalgaon mandi*

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